MSBA Module 3 Feasibility Study

Preferred Schematic Report:

Updated for Downtown Site Option

Submitted to the Massachusetts School Building Authority:
May 9, 2018

Lowell High School

City of Lowell, Massachusetts
Lowell Public Schools



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SKANSKA

TRANSMITTAL

Shipped via:
First class mail
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To:	Ms. Kathryn DeCristofaro
Company:	Massachusetts School Building Authority
Address:	40 Broad Street, Suite 500, Boston, MA 02109
Date:	**May 9, 2018**
Project:	Lowell High School
Re:	*Preferred Schematic Report (PSR)* *Updated Submission*

We are sending:
- [x] Herewith
- [ ] Separate cover
- [ ] Plans
- [ ] Shop drawings
- [ ] Samples
- [ ] Specifications
- [ ] Brochures

Quantity	Drawing no.	Latest date	Description	Pages
1 Electronic file PDF	N/A		***Lowell High School*** PSR Submission	
1 Hard Copy			***Lowell High School*** PSR Submission	

These are transmitted:
For approval
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- [ ] For job use
For estimate
- [ ] Approved
- [ ] Approved as noted
- [ ] Resubmission not required
- [ ] Resubmission required
- [ ] Disapproved-resubmit

If enclosures are not as listed above, kindly notify us at once.

Signature: Mary Ann Williams, Skanska USA Building, Inc. 617-293-6869

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SKANSKA

Mary Ann Williams
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Skanska USA Building Inc.
101 Seaport Boulevard, Suite 200
Boston, MA 02210

May 9, 2018

Ms. Kathryn DeCristofaro, Capital Program Manager
Massachusetts School Building Authority
40 Broad Street, Suite 500
Boston, MA 02109

Lowell High School – FSA – Updated Preferred Schematic Report (PSR) Submission

Dear Ms. DeCristofaro,

Pursuant to the Module 3 - Feasibility Study requirements and in accordance with Section 8.1.1.2 of the OPM Contract, we have reviewed and coordinated the materials associated with the enclosed *updated* Preferred Schematic Report Submittal. We certify, to the best of our knowledge, that the information is accurate, complete and in full compliance with the MSBA's Feasibility Study requirements.

The submittal has been attached electronically as requested by the MSBA. We look forward to our next meeting with the MSBA team, in order to review our progress with the program to date.

Please contact us should you have any questions or concerns regarding this submission.

Sincerely,

Skanska USA Building, Inc.
Mary Ann Williams
Project Executive

Acknowledgements

We wish to thank the following individuals for their assistance and their contributions to this feasibility study:

State Delegation

Eileen Donoghue, Former Senator
David Nangle, State Representative
Thomas Golden, State Representative
Rady Mom, State Representative

City Councilors

William Samaras, Mayor
Vesna Noun, Vice Chair
Karen Cirillo, Councilor
David Conway, Councilor
Rodney M. Elliott, Councilor
Edward J. Kennedy Jr., Councilor
John Leahy, Councilor
Rita M. Mercier, Councilor
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Kevin Murphy, Former City Manager
Michael McGovern, Assistant City Manager
Rodney Conley, Treasurer
Heather Varney, Deputy CFO

City Clerk

Mike Geary, City Clerk

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Andre P. Descoteaux, Member
Jackie Doherty, Member
Robert J. Hoey, Jr,, Member
Dominik Hok Lay, Member
Connie A. Martin, Member
Gerard Nutter, Member

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William Samaras, Mayor, School Committee Chair
Rady Mom, State Representative
Edward J. Kennedy Jr., Councilor
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John Sousa, President

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3.3.1 Introduction

A. Overview of the Process

B. Summary of Updated Project Schedule

C. Summary of Existing Conditions Evaluation Since the PDP

D. Summary of the Final Evaluation of Alternatives

E. Summary of the District's Preferred Solution

F. Copy of the MSBA's PSR Review and District Response

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3.1.1 Introduction

A. Overview of the Process

Since the submission of the Preferred Schematic Report (PSR) on June 27th, 2017, the City of Lowell continued to be divided in their support of the Preferred Option of a new High School at the Cawley Stadium Site. Many City officials, School Department members, and residents felt strongly that the High School should remain in the existing downtown location, which is the long-standing location of the school, and is readily accessible to public transportation, parking garages, and local services. As a result, at the MSBA PSR Board Approval meeting on August 23rd 2017, the MSBA requested that the City pause to evaluate the situation and garner more unanimous support for the project before proceeding into Schematic Design.

A ballot referendum in November 2017 confirmed that the majority of the voters in Lowell preferred to keep the High School in the downtown location. As a result, in consultation with the MSBA, the City elected to update the PSR and study design options for the existing downtown site. Accordingly, in February of 2018, the Lowell City Manager's Office, City Council, School Committee(SC), School Building Committee(SBC), Educational Leadership Team (ELT), the Lowell Community, Skanska, and Perkins Eastman|DPC with its consultants (the Design Team) have made continued progress in developing a design that best suits Lowell High School's unique educational program.

The updated PSR includes the requisite addition/renovation and new options including modifications to the previous Addition/Renovation Option 2 and Addition/Renovation Option 3 on Expanded Site, as well as a New option which utilizes the expanded site. In response to MSBA comments and discussions, all of these options removed the pool from the project. The three options under consideration which all meet the District's Educational Program are:

- Addition/Renovation Option 2A
- Addition/Renovation Option 3A – Expanded Site
- New Option A – Expanded Site

The updated Preferred Schematic Phase started in February 2018 requiring the previously scheduled May 18th, 2018 SD submission extend to February 20th, 2019.

During the updated PSR period, the Design Team continued to reach out to the LHS Community at a City Council meeting, and the greater Lowell Community through 2 forums. The Design Team also met with all City Departments and regulatory Agencies in Lowell to review the project.

B. Summary of Updated Project Schedule

The updated schedule includes the following milestones:

- May 9th 2018 – MSBA PSR Resubmission and FAS
- June 27th 2018 – MSBA Board Meeting and Vote on Updated Preferred Schematic Report
- June 28th 2018 – February 19th 2019 – Schematic Design
- February 20th 2019 – MSBA SD Submission
- March 13th or 27th 2019 - FAS
- April 10th 2019 – MSBA Board Meeting and Vote on Schematic Design Project Scope & Budget
- April 10th thru August 1st 2019 – City Funding
- August 2nd 2019 thru May 14th 2021 – Detailed Design
- May 17th thru July 30th 2021 – Bid / Award
- July 1st 2021 thru July 2026 – Construction
- July 23rd 2026 – Substantial Completion
- August 18th 2026 - Occupancy

C. Summary of Existing Conditions Evaluation Since the PDP

Based on the existing conditions explorations during the Preliminary Design Program phase, Perkins Eastman| DPC recommended additional existing conditions work be performed. The additional investigations that were performed are listed below.

- **Civil Soil Testing** was done at the Existing HS and Cawley sites
- **Endangered Species investigations** at the Existing HS and Cawley sites
- **Energy Analysis (Preliminary)** for the 3 design options under consideration for the updated PSR
- **Geoenvironmental**:
  - Phase II Environmental Assessment at the Existing High School
  - The report was updated to include only the 3 design options under consideration for the updated PSR
- **Geotechnical Borings** were done at the Existing High School site and the geotechnical report was updated to refine information for the 3 design options under consideration for the updated PSR
- **Hazardous Materials** testing was performed in the interior of the 1922 Building and the exterior of the 1922 building and the report was updated to include information for the 3 design options under consideration for the updated PSR
- **Structural** investigations were performed in the 1922 Building
- **Traffic Impact Studies** for the Existing HS and the report was updated to include only the 3 design options under consideration for the updated PSR

The findings are included in Section 3.3.2 and copies of these documents are included in the Appendix.

D. Summary of the Final Evaluation of Alternatives

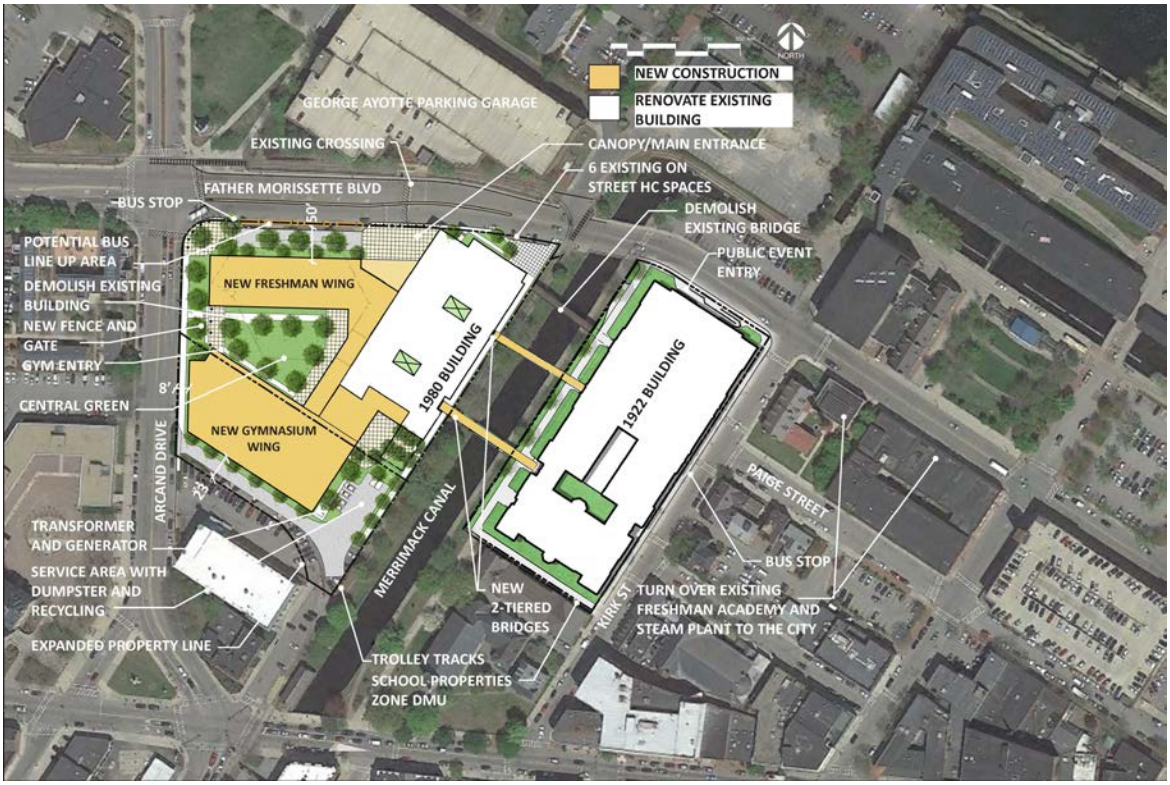
The Updated PSR has focused on the existing downtown site with updates to Option 2 (referred here as Option 2A on existing site), Option 3 (referred here as Option 3A on expanded site), and an All New Option (referred here as New Option A on expanded site.) The updates to these Options removed the swimming pool per comments from the MSBA and also made small adjacency improvements and plan efficiencies for the betterment of the design. The All New Option A on expanded site updated a previous PDP proposed plan which completely demolishes the 1980s buildings on the west side of campus, and builds an all new building on an expanded site. This Option was brought up to the same PSR level of design as Options 2A and 3A.

p

			
Building/Site •Acreage •Gross Size •Stories/Ht	6.0 acres 618.7k gsf (445.5k reno+173.2k add) Exist'g (63'), 5 Story (68'-8"FA) and 2 Story (58' Gym)	7.4 = 6.0 acres +1.4 exp. lot 622.2k gsf (432.6k reno +189.6k add) Exist'g (63'), 5 Story (68'-8"FA) and 2 Story (58' Gym)	7.4 = 6.0 +1.4 exp. lot 579.4k gsf 5 Story+ Basement (68'-8")
Prelim. PROS/CONS	+ Consolidated Campus (new freshman academy) – Temporary Gym Required – Windowless Labs Remain – Limited Green + Loading	+ Consolidated Campus (new freshman academy) + No Windowless Labs + Added Green + Loading – Gym Areas More Remote – Eminent Domain	+ Consolidated Campus (via 5 story + basement) + Good Classroom Orientation – 24 Temporary Classrooms & Temporary Gym Required – Limited Green Space – Eminent Domain
Educ-Program	Meets Educational Objectives : +Freshman Academy Connected ±Public/Activity Areas Spread & Split +F.A. Teams + STEM/Hum. Clusters +Meets New Standards (Count/Size) +More Efficient/Effective Field House	Meets Educational Objectives : +Freshman Academy Connected ±Public/Activity Areas Spread & Split +F.A. Teams + STEM/Hum. Clusters +Meets New Standards (Count/Size) +More Efficient/Effective Field House	Meets Educational Objectives : +Freshman Academy Connected ±Public/Activity Areas Spread & Split +F.A. Teams + STEM/Hum. Clusters +Meets New Standards (Count/Size) +More Efficient/Effective Field House
Construction	4 Year (+ summer) Phased Project +Kitchen/Boiler Built in First Phase –Temporary Gym Facilities Required	5 Year Phased Project +Kitchen/Boiler Built in First Phase +No Modulars or Temporary Gym ±Only 4 Years of 5 On School Site –Land Acquisition/Eminent Domain	4 Year (+summer) Phased Project +Kitchen/Boiler/Temp Caf. Built in First Phase ±Only 2 Years of 4 On School Site –Land Acquisition/Eminent Domain –Temp. Gym and 24 Temp. Classrooms Req'd
Project Budget	$333,040,000	$345,400,000	$361,624,000
City Share	$124,282,000	$135,960,000	$160,955,000

E. Summary of the District's Preferred Solution

The Preferred Solution, Option 3A on expanded site, was almost a unanimous decision for the School Building Committee, 16 were in favor of this option, with 1 vote for Option 2A and 1 for New A, the Lowell City Council cast 8 votes for Option 3A and 1 for Option 2A. The City has rallied behind the non-binding referendum decision that the existing downtown location is what is best for the students and community as a whole. The City believes this location, despite the phased occupied renovation, will be the most advantageous and fiscally responsible project for Lowell High School.



Option 3A on expanded site is not without its challenges (eminent domain, phased occupied renovation, tight urban site) but it does accomplish many objectives set out by the City. It meets the Educational Program, brings all students onto campus, has natural daylight in all teaching spaces, provides outdoor green space, requires no temporary facilities during construction, develops a "heart to the school", establishes zones for school/community use, and ensures security measures are integral in the design. Meeting these educational goals on the downtown site make this the clear choice as illustrated by the SBC and City Council votes.

The proposed plan consists of two major new construction additions as well as two new bridges over the canal. The two new wings consist of a 5-story academic wing for the Freshman Academy (FA) oriented for predominantly North/South facing classrooms and a 2-story gymnasium wing to house all physical education, adaptive PE, ROTC drills, associated team and locker rooms and mechanical space. This building is zoned for Community Use and can be completely separated from the academic spaces, but designed to be adjacent to and accessible from the "heart of the school." The 1980's building and the 1922 building will be renovated as new for Academics, Administration, dispersed SPED, Visual and Performing Arts as well as fully renovating the existing Auditorium.

The site improvements include a new entry plaza with overhang, sidewalk and lawn along Father Morrisette Boulevard, internal Lawn/Green Space, an outdoor plaza off the Cafeteria facing the canal, a new service, and a delivery drive with a modest amount of parking.

F. MSBA's PSR Review and Corresponding District Response

A summary of the District's responses to the MSBA's PSR comments is as follows (and numbered as such).

3.3.1 INTRODUCTION

2a) Comments provided regarding proposed schedule which negated by the revised PSR schedule attached in this document. An extension was granted for the Feasibility Study Agreement at the MSBA Board Meeting on February 14, 2018.

3.3.2 EVALUATION OF EXISTING CONDITIONS

1) Acknowledgment of abatement costs for contaminated soils needs to be a line item in the cost estimates and included in SD submittal as ineligible.

3.3.3 FINAL EVALUATION OF ALTERNATIVES

2) Comments regarding moving functions out of the City's center are provided, this information is negated by the revised PSR site location.

6) Comments provided about Fire Pump. Need will be determined during Schematic Design.

8) Comment regarding State and Local approvals and Work Plan are provided.

10) No response required

3.3.4 PREFERRED SOLUTION

3) Clarification provided about meeting or exceeding the MA (base) energy code by 20% to receive the 2% reimbursement for the MSBA Green School Program.

5) Comments provided regarding off-site work required on Cawley site, this information is negated by the revised PSR site location.

5b) Comments provided regarding public outreach. Also information provided regarding transportation required for Cawley site, this information is negated by the revised PSR site location.

5c) Comments provided regarding parking at the Cawley Site, this information is negated by the revised PSR site location.

5i) Comments provided regarding Article 97 related to the Cawley site, this information is negated by the revised PSR site location.

6a, b) No response required

6c, f, g) Comments provided regarding financing of the City local share.

7a) Comment regarding MHC. Comment regarding the future plans for the downtown school site, this information is negated by the revised PSR site location.

7d) Comment provided regarding the local vote by the Lowell City Council for PS&B. This date will change and will be updated in the revised PSR submission.

3.3.5 LOCAL ACTIONS AND APPROVALS

2a) No response required

Additional responses to MSBA comments include;

- Comments provided in response to July 27, 2017 FAS Meeting
- Comments provided regarding previous MSBA payments/grant from prior projects.
- Complete comments provided on Attachment B in response to the MSBA proposed space summary.
  Highlights of the comments include the following:
    - Spaces Accepted:
        - Core Academics (SPED subject to DESE)
        - Art & Music
        - Vocations & Tech (Store, Bank & TV Studio still under review)
        - Health & Phys-Ed (Athl. Secr./Bursar/Conf still under review)
        - Media Center
        - Food Service
        - Other Category (Catie's Closet & Comm Hlth Ctr still under review)
    - Spaces Under Review:
        - Admin. & Guidance (overage)
        - Custodial & Maint. (overage)
    - Spaces Rejected:
        - Auditorium Delta (2,126sf above MSBA upper limit for new construction.) Revised PSR has existing Auditorium to be renovated.
        - Pool (removed)

3.3.2 Evaluation of Existing Conditions

A. Overview of Building(s) and Site(s)

- Executive Summary

B. Developable Property

- Determination of Historic or Other Registrations
- Permitting Requirements

C. Existing Building(s)

- Structural Assessment
- Hazardous Materials

D. Existing Site(s)

- Environmental Assessment(s)
- Geotechnical, Soils and Borings
- Civil Soils
- Endangered Species
- Traffic Study

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3.3.2 Evaluation of Existing Conditions

A. Executive Summary :

Since the PDP, the design team has performed various additional investigations related to the existing High School buildings to inform the selection of the Preferred Option. These additional investigations have included:

- Structural explorations in the 1892 and 1922 portions of the 1922 Building and Freshman Academy due to the lack of existing drawings and hard finishes that conceal structure
- Hazardous materials sampling of interior plaster at ceilings and tops of walls and also damproofing on the foundations of the 1922 building
- Geoenvironmental:
    - Phase II Environmental Assessment at the existing high school based upon Phase I Environmental Assessment done during the PDP
- Geotechnical borings at the existing High School and site to inform foundation designs
- Civil soils test pits at the existing High School site to inform stormwater design
- Endangered Species investigations for the existing High School site
- Traffic Impact Studies for the existing High School site

These investigations are explained in further detail later in this section. The results of all of these additional existing conditions investigations have been included in the PSR cost update as appropriate.

Since the design team's investigations during the fall of 2016, the High School has experienced ongoing roof leaks in the flat roof sections of the 1922 and 1997 additions in the "1922 Building". As a result, the City hired Gale Associates to prepare bid documents for this separate reroofing project which is not part of the design team scope. The bid documents dated February 2, 2018, include re-roofing of the 1922 Building. Based upon information provided by the City, this new roofing is targeted to be completed by October 2018 during the Schematic Design phase. The Design Team will observe the existing conditions once the re-roofing project is completed.

Should a renovation project be selected as the preferred option, a full laser scan will need to be performed to provide accurate base drawings for Schematic Design. The reason being, the lack of architectural drawings for the original construction and subsequent numerous renovations for the 1922 Building, and Lord Buildings. Although existing conditions information is also sparse for the Freshman Academy and the Steam Plant, these buildings are not included in any of the design options under consideration for the updated Preferred Option, so no additional scanning of these buildings will be required as part of the High School project.

See the appendix for further information.

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3.3.2 Evaluation of Existing Conditions

B. DEVELOPABLE PROPERTY

Determination of Historic & Other Registrations

An updated PNF for the existing High School site was filed with the Massachusetts Historical Commission on March 26th, 2018 and is included in the appendix.
A response from the Massachusetts Historical Commission (MHC) was issued on April 26th stating that the following properties associated with the proposed design options are listed in the State and National Registers of Historic Places as contributing elements to the Lowell National Historical Park (LOW.BC). The properties are also located within the Downtown Lowell Historic District (LOW.BE) which is listed in the State Register of Historic Places:

- Lowell High School (LOW.44), referred to in the PNF/PSR as the 1922 Building
- Lowell High School Annex (LOW.1143), referred to in the PNF/PSR as *the Freshman Academy*
- Lowell High School Powerhouse (LOW.2580), referred to in the PNF/PSR as *the Steam Plant*
- Lowell High School Annex (LOW.1774), referred to in the PNF/PSR as *the 1980 Building*
- Professional Park (LOW.1116), referred to in the PNF/PSR *as the Medical Office Building*

The project also includes pedestrian bridges over the Merrimack Canal (LOW.933) which is listed in the State and National Registers of Historic Places as a contributing element to the Lowell National Historical Park and the Locks and Canals District (LOW.c). The Locks and Canals District is also a National Park Historic Landmark.

The 1922 Building, the Steam Plant, Merrimack Canal, and Medical Office Building are also within the City Hall District (LOW.A), which is listed in the State and National Registers of Historic Places.

The 1980 Field House is not included in MHC's *Inventory of Historic and Archeological Assets of the Commonwealth,* and the Lowell High School Annex and Professional Park appear to be outside of the period of significance for both the Lowell National Historical Park and the City Hall District.

The City Hall District and the Downtown Lowell Historic District are Local Historic Districts, and as such the City may need to see a Certificate of Appropriateness from the Lowell Historic Board pending the selection of the Preferred Option.

MHC noted that the design options include turning buildings over to the City of Lowell: the 1922 Building, the Freshman Academy and the Steam Plant. All three of these buildings are listed in the State Register of Historic Places, and the MHC recommends that the City of Lowell develop appropriate plans for their maintenance and re-use. If any work will be undertaken on these buildings by the City in connection with the Lowell High School project or with any state and/or federal funding licensing or permitting, project information should be submitted to the MHC for review and comment. At this time, the Design Team anticipates and work related to buildings that are turned over to the City are not part of the Lowell High School project.

MHC commented that New Option A –Expanded Site would have the least potential adverse effects on historic properties, and that Addition/Renovation Option 2A and Addition/Renovation Option 3A - Expanded Site which includes the demolition of the two existing one-story pedestrian bridges over the Merrimack Canal and the construction of two two-story bridges, one in the same location and the other in a different location, would have an adverse visual impact on the historic viewshed of the Merrimack Canal and the Locks and Canal District.

The MHC has been in contact with the staff of the Lowell National Historical Park and understands that the proposed reconstruction of the pedestrian bridge closest to the Father Morissette Boulevard over the Merrimack Canal in a different location would require a land exchange between the Lowell National Historical Park and the City of Lowell. This transfer of federal land would trigger the review of the project under Section 106 of the National Preservation Act of 1966 (36 CFR 800). See the City Air Rights memorandum in the Appendix for further information.

The MHC also requested that as once Preferred Option is selected and as the design develops, that the Design Team submit written narratives and drawings that include elevations and perspective views that would explain and proposed exterior renovation or demolition of historic properties.

See the MHC letter in the appendix for further information.

Permitting Requirements

The City of Lowell owns all parcels of land contained in each of the Design Options, with the exception of the 75 Arcand Drive parcel associated with the Addition/Renovation Option 3 on Expanded Site. The City is currently in the process of taking the 75 Arcand Drive parcel via Eminent Domain. See the Appendix for summary of the Eminent Domain process and the associated timeline.

Meetings were held at Lowell City Hall on May 22, 2017 and April 4, 2018 with the Design Team and City of Lowell Departments to review the permitting and approvals required for the project for the existing High School sites. Those permits and approvals required for the Dowtown site are included in the Approvals/Permit table below. This table also includes subsequent information provided by the City of Lowell related to the Air Rights for the Proposed Bridges. Refer to Appendix AA for further information.

Approval/Permit	Reviewing Agency
Article 97 of the Massachusetts Constitution	Executive Office of Environmental Affairs (EOEA), National Parks, Conservation Commission
Air Rights Easement for Pedestrian Bridges over Canals /Lucy Larcam Park /Railroad & Trolley Track	Air Rights over the Merrimack Canal are currently owned by the Massachusetts Department of Conservation and Recreation (DCR). Air Rights over the trolley tracks are currently owned by the United States National Park Service (NPS). NPS's air rights are subject in applicable part to "Easement to maintain overhead bridge.
Permit Application for Construction and/or Associated Access to DCR Park Lands & Roadways	The Department of Conservation & Recreation (DCR) owns the air rights over the Merrimack Canal and any proposed work (including the demolition and construction of the bridges) would require the filing of a Permit Application for Construction and/or Associated Access to DCR Park Lands & Roadways.
General License w/ Enel	Enel. Ownership of the Merrimack Canal is by Enel GreenPower North America. This may be required for any work associated within the walls of the Merrimack Canal. Pending any new storm outfalls into the canal.
Section 106 of the National Historic Preservation Act of 1966 (NHPA)	Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires Federal agencies to take into account the effects of their undertakings on historic properties, and afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment. The historic preservation review process mandated by Section 106 is outlined in regulations issued by ACHP. Section 106 review made be needed for any proposed storm drain outfalls into the Merrimack Canal since LHS is located in a National Register Historic District. This may also traverse Federal land (trolley tracks) for the outfall that could trigger a full MEPA review of the project. Consulting with the National Park Service for clearer guidance on this is recommended. As with Enel, the National Park Service prefers that storm drain outfall tie into existing outfalls, as opposed to creating new outfalls.
Certificate of Appropriateness	Lowell Historic Board
Building Demolition Permit	Lowell Development Services/ISD, Lowell Fire Department
Building Permit	Lowell Development Services/ISD
Construction Stormwater Discharge Permit	Mass. Department of Environmental Protection (Bureau of Resource Protection)
Construction Management Plan	Lowell Development Services/ISD, Lowell Traffic and Transportation Department
Dewatering Permit	EPA
Driveway Permit	Lowell Depart. Engineering
Electrical Make Safe Permit	Lowell Development Services/ISD
Electric Utility Shut Off Notice	National Grid

Electrical Permit	Lowell Development Services/ ISD
Eminent Domain	City of Lowell
Emergency Responder Review	Lowell Fire Department, Lowell Police Department
Fire Alarm Permit	Lowell Fire Department (Fire Prevention Bureau)
Fire Flow Tests	Lowell Regional Water Utility
Fire Pipe Shut off Permit	Lowell Fire Department
Food Establishment Permit, Certifications	Lowell Health Dept., Lowell Dept. Planning / Division of Development Services
Gas Utility Shut Off Notice	National Grid
Health Department	Health Dept. via Division of Lowell Development Services
Historic	Massachusetts Historic Commission, Lowell Historic Board, National Park Service
Hydrant Metering Permit	Lowell Regional Water Utility
Infiltration and Inflow (I/I) Removal Program	Mass DEP/Lowell Regional Wastewater Utility
MGL Chapter 40 §54A	MassDOT and coordination with the Lowell Building Inspector
Notice of Abatement	Mass DEP
Notice of Intent (NOI/Order of Conditions) for Wetlands Protection Act and local wetlands bylaw	MassDEP & City of Lowell Conservation Commission. The Canals would be considered in a Floodplain per the latest Flood Insurance Rate Map (FIRM) and as such, any work within and over the canal would be under the jurisdiction of the Lowell Conservation Commission and would require the filing of a Notice of Intent. Portions of the demolition and proposed additions will be within 100' of the Merrimack Canal on the Eastern side. This would minimally require an RDA, but a Notice of Intent may need to be filed per local Wetland Ordinance (Ch. 280 Sect. 1-14). A proposed outfall would automatically require a NOI.
Paving/ Street Opening Permit	Lowell Department Public Works
Plumbing Make-safe Permit	Lowell Division of Development Services/ISD
Plumbing Permit	Lowell Development Services/ISD
Sewer Demolition Permit	Lowell Regional Water Utility
Sewer New Services Permit	Lowell Regional Waterwater Utility
Site Plan Review	Lowell Development Services
LFD Demo Permit	Lowell Fire Department
Sprinkler (Fire Protection) Permit	Lowell Fire Department (Fire Prevention Bureau)
Stormwater Connection Permit	Lowell City Services / Lowell Regional Water Utility
Permits for Construction on Railroad Rights-of-Way	Massachusetts Department of Transportation Rail and Transit Division (MassDOT), in accordance with MA General Law Chapter 40.
Water Demolition Permit	Lowell Regional Water Utility

Water, Domestic and Fire Protection New Service Permit	Lowell Regional Water Utility
Zoning:	Zoning Board of Appeals Lowell
FAR, Lowell Zoning By-Laws Article V, Section 5.1	Lowell Planning & Development Allowable: 4.0 Provided: Option 2A: 2.37 Option 3A – Expanded Site: 1.93 New Option A: 2.82
Parking, Lowell Zoning By-Laws Article VI, 6.1.4.3c. Table of Parking Regulations	Lowell Department of Planning & Development: Required:6 parking spaces per instructional space • Existing instructional spaces = 219 • Proposed instructional spaces = 215 Initial comments by Lowell Planning & Development indicate that if number of proposed instructional spaces is less than existing, than no Variance may be required. • Existing Parking Spaces Provided: George Ayotte Garage = 1200 available On-site = 4 HC spaces • Proposed Parking Provided: George Ayotte Garage = 1200 available On-site = 6 HC spaces
Special Permit	Required for Additions greater than 10,000sf

See the appendix for further information.

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3.3.2 Evaluation of Existing Conditions

C. EXISTING BUILDINGS

Structural:

The structural engineer, Foley Buhl and Roberts Associates (FBRA), performed additional investigations in March of 2017 to determine the structure of the 1892 and 1922 portions of the "1922 Building" and Freshman Academy which were largely unknown due to the lack of original structural drawings and hard finishes that obscure the structure. The structural engineer utilized the exploratory openings made by the Hazardous Materials consultant to determine the general layout and details of the floor and roof structure in these buildings. No new structurally deficient conditions or structurally related issues were found at the 1922 Building or the Freshman Academy during the March 2017 investigations. The composition of the structure observed is noted below.

1922 Building:

- Typical roof construction at the 1922 addition is steel framed, with trusses and beams supporting a 4" thick, concrete slab placed on metal lath forms.
- Typical floor construction at the 1922 addition is a one-way reinforced concrete joist/rib slab supported by masonry bearing walls and by steel beams and columns.
- Joist/rib slab construction in the classroom areas is 13½" deep (10" deep pans), with 6" wide ribs spaced at 2'-1"+/- o.c.
- Joist/rib slab construction in the corridor areas is 9½" deep (6" deep pans), with 6" wide ribs spaced at 2'-1"+/- o.c.

The purpose of the March 2017 structural investigations at the 1922 Building was to gain a general understanding of the floor and roof structural systems/details and to determine the organization/layout of the framing. No structural materials testing and/or destructive structural investigations were conducted. As the design of the project progresses, should the 1922 Building be renovated, and specific structural design issues are identified, future additional investigations (potentially including destructive investigations) and structural materials testing will likely be required. Refer to the geotechnical investigations for recommended foundation systems for all design options.

As a result of the collective structural investigations, costs to bring the existing buildings up to code were included in the estimate.

Since the previous PSR, the City has provided the Design Team with a copy of the 1922 Building Roof Replacement Bid documents dated February 2, 2018 which included some structural reinforcement of the existing parapets. The work is targeted to be completed in October of 2018. These parapet reinforcements done under the separate City project are factored into the updated PSR estimate. See the appendix for a copy of the Roof Replacement plans and specifications and the updated Structural report.

See the Structural Existing Conditions report in the appendix for further information.

In addition, the geotechnical recommendations for foundations systems for both Existing High School sites were included in the cost estimates. See the updated geotechnical in the appendix for further information.

Hazardous Materials:

The hazardous materials consultant, Universal Environmental Consultants (UEC) performed selective destructive investigation on the interior and exterior of the school in March of 2017. Interior investigation was performed at the1922 Building and Freshman Academy. Exterior investigation was performed at the 1922 Building. UEC retained the services of a contractor to demolish, remove and dispose of non-Asbestos Containing Materials (ACM) at various locations within the 1922 Building and Freshman Academy. Selective demolition included ceiling plaster, wall plaster and ceiling tiles. No hidden ACM was found during the selective demolition.

The contractor also performed selective excavation of the grounds around the 1922 building by removing approximately four (4) feet of the soil at several locations to expose any suspect material (damproofing and flashing) that might exist on foundation walls. Damproofing was found on the foundation walls within the 1997 addition only and bulk samples were collected. Sample results indicated that no asbestos was found in the damproofing. Bulk samples analyses for asbestos were performed using the standard Polarized Light Microscopy (PLM) Method in accordance with EPA standard. Bulk samples were collected by a Massachusetts licensed asbestos inspector Mr. Jason Becotte (AI-034963) and analyzed by a Massachusetts licensed laboratory EMSL, Woburn, MA.

As a result of these investigations, the hazardous materials narrative has been revised, however the cost estimate did not need to be updated since no additional ACM's were found during these investigations. However, placeholder estimates were included to abate the existing building at 75 Arcand drive to include in the cost estimate for Design Option 3.

See the appendix for the updated hazardous materials report/estimate which has deleted the Steam Plant and Freshman Academy buildings which are not part of this project.

3.3.2. Evaluation of Existing Conditions

D. EXISTING SITES:

Geonvironmental:

The geoenvironmental, Nobis Engineering (Nobis) engineer performed a Phase II Environmental Assessment at the Existing High School site in April and early May of 2017 which was focused on the portion of the campus located to the west of the canal since this is where the vast majority of demolition and construction (and therefore direct contact with soil) would occur under the proposed Addition/Renovation options. Ten samples were collected to evaluate soil conditions in areas where potential construction activities would result in exposure to soils by construction workers and generation of excess soils requiring off-site reuse or disposal. Review of soil sampling results suggests that historical fill materials contain levels of Polycyclic Aromatic Hydrocarbons (PAH's) and lead that would not permit unrestricted use of excess soils that may be taken off site during construction. Review of soil sampling results indicated that arsenic concentrations in shallow soils located adjacent to the railroad tracks are above levels that are suitable for a school campus, and therefore required removal and off-site disposal. MassDEP was notified of the condition, and plans were made to remove these soils from the site. This remediation is beyond the scope of this study and is being addressed directly by the City.

As a result, costs to remove soils required for construction of the Design Options at the existing site were included in the estimate. In addition, placeholder estimates to remove soils from 75 Arcand Drive were included in the cost estimates for Design Option 3A at the expanded site, as well as New Option A. See the updated Geoenvironmental report in the appendix for additional information.

Geotechnical:

The geotechnical engineer, Geotechnical Partnership Inc (GPI), reviewed the limited existing boring information for the existing High School site, and drilled borings at both the existing High School site during March of 2017.

The existing High School boring included: (nine (9) total borings; two observation wells) indicate a subsurface soils profile with fill, overlying a layer of loose to medium dense glacial fluvial soils above glacial till. The thickness of the various soil materials varies. Bedrock was encountered in several borings at depths ranging from 18 feet to 39 feet. Accordingly, bedrock is not expected to be a factor in the design and construction of the proposed new additions. Groundwater was encountered at depths ranging for 8.0 feet to 12.0 feet below the ground surface (Elevation 26.7"+/- and Elevation 21.5'+/-, respectively); a seasonal high water elevation of EL. 24.5' has been recommended for this site. Groundwater is not expected to be an issue during construction or in service, as no basements are planned for the additions. Liquefaction is not considered to be a concern.

As the existing fills are not suitable for the support of footings, and significant solid waste (abandoned foundations and debris) was encountered below grade, GPI recommended that a pile foundation be used for new construction (additions and the new building) at this site. Piles would be the conical point pipe type; 10.75" diameter with a 190 Kip (95 Ton) capacity, driven to bear in the dense glacial till, weathered rock, or on bedrock (30 to 50 feet long). Alternate foundation systems include drilled concrete micropiles and ground improvement (i.e. rammed aggregate piers). Refer to updated Geotechnical report in the appendix for additional information.

Should the existing High School site be chosen as the preferred option, additional soils explorations may be recommended, to better determine the most cost effective foundation system for new construction, including but not limited to borings at the 75 Arcand Drive parcel.

Civil Soils:

The civil engineer, Nitsch Engineering (Nitsch), performed 10 test pits at the existing High School site on April of 2017 to determine soils characterization to inform the site drainage design. The engineer performed 10 test pits at the existing High School in the vicinity of the 1922 Building, Lord and Fieldhouse buildings. The results of the soil testing indicated fill material observed in each test pit of varying depths. No groundwater or soil mottling was observed in any of the test pits. Ledge was not encountered in the test pits.

As a result the cost estimates included pricing for stormwater systems based upon these test pits.

Endangered Species:

On behalf of the City, the civil engineer filed an application with the Division of Wildlife and Fisheries in March and a response was received in April of 2017 that indicated that there were no endangered species on the existing High School sites that would result in a prohibited take of state-listed rare species. This review was completed in April and are valid for five years.

As a result, no endangered species considerations were included when developing the Design Options.

Traffic Study:

The traffic engineer, Bryant Associates, produced a Traffic Impact Study for both the existing high school site. The consultant worked with the City and Lowell Traffic Engineer to determine the scope of the study. The High School also performed a survey to determine the modes of transportation utilized by the staff and students to get to and from the existing high school.
The traffic study indicated that the High School renovation project would have minimal impact should the school remain in the downtown location. It is anticipated that the proposed school in the Downtown area will be slightly more congested than

the current traffic operations found at the school due to the projected increase of the student and staff populations. The traffic survey indicated that many of the students in the existing location currently walk (27% am/ 34% pm) or take the City, LRTA, bus (20% am / 39% pm). The students and staff will also continue to park at nearby parking facilities including the George Ayotte garage, and the John St. garage.

See the updated Traffic report in the appendix for further information.

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3.3.3 Final Evaluation of Alternatives

A. Analysis of Prospective Site(s)

B. Construction Impact for Each Alternative

C. Conceptual Building & Site Drawings

D. Outline of Structural Systems

E. Summary of Utilities

F. Major Building Systems Narratives

G. Proposed Total Budget

H. Permitting Requirements

I. Design & Construction Schedule

J. Preliminary Design Pricing

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3.3.3 Final Evaluation of Alternatives

A. Analysis of Prospective Site(s)

As of January 2018, the City has decided to pursue a design option on the Existing High School downtown site only, including the potential to expand the site by acquiring the parcel at 75 Arcand Drive. The following is a summary of the three options that were considered.

Existing High School: The below notes refer to all existing Site Options and are followed by specific notes for each option.

Location: Existing Site: Lowell High School (LHS) is located along Father Morissette Boulevard and Arcand Drive. The Freshman Academy is detached and located at the intersection of Paige Street and John Street adjacent to which is the Steam Plant. The two main high school structures are the 1980 building and the 1922 Building which span a segment of the National Historic Park's Merrimack Canal and Lucy Larcom Park. The total site area is 6.0 Acres.

Current school hours are 7:50 AM to 2:30 PM. The peak morning arrival hour is 7:15 am- 8:15 am. The afternoon peak departure hour is 2:30- 3:30pm. Transportation is not provided to Lowell High School Students to get them to or from school. If a student wishes to use the Lowell Regional Transit Authority (LRTA) the cost of a bus pass is 20$ per month. A breakdown of existing modes of transportation to and from the school are as follows:

- Morning Arrival: 27% Walk, 8% Drive, 20% take the LRTA, 6% Carpool, 37% Ride with a family or friend and 2% take a Special Education Bus.
- Afternoon Departure: 34% Walk, 8% Drive, 29% take the LRTA, 6% Carpool, 21% take a special education bus.
- Daily 11 LRTA buses transport students at drop off and pick up times, lining up along French Street and Kirk Street. Approximately 83 SPED students are transported to and from LHS separately each day with a total of 10 total vehicles: specially equipped wheelchair vans, yellow buses and smaller vehicles.
- Transportation for athletics is extensive. Daily about 7 buses line up at the main entrance on Father Morissette Boulevard to transport students to practices at Cawley Stadium, the boat house and Shedd Park. Students provide their own transportation home from practice. On game days, there can be an additional 4 buses that transport students to games.

Circulation/The 1922 Building: There are four (4) secured entry/egress points along Kirk Street. These doors are locked for entry by visitors. All visitors are directed to the main entrance at the 1980 Building. Kirk Street is one way heading north with two

through lanes and temporary on-street parking/ 30 min loading spaces on either side. The majority of spaces on the west side of Kirk directly in front of the school are marked as tow zone. There is an accessible entrance/ramp at the North side of the 1922 Building.

Sidewalks along Kirk are a minimum of 8-feet wide with the western sidewalk being wider. There are approximately 5 crosswalks spanning Kirk Street in front of the 1922 Building all of which are flush and denoted with paint. Other streetscape features are limited but include post lights and street trees.

Circulation / 1980 Building/Fieldhouse Building: The field house has the largest street frontage on the corner of Father Morissette Blvd and Arcand Drive. The main entrance is located between the field house and the 1980 Building along Father Morissette Blvd across from the George Ayotte Garage. All (dedicated) bus drop-off takes place at this entrance. This includes limited drop-offs in the morning and transportation to afterschool activities in the afternoon. There are approximately 4 compact HC spaces at this entrance and an additional 4 spaces are located at the south side of the field house.

Circulation/ Freshman Academy: The Freshman Academy is located between Paige Street and French Street with secured entrance on Paige Street and the HC Entrance on the west side of the building. Both Paige and French Street are two way with ample sidewalks. There are numbered on-street parking spaces on the south side of Paige Street. Street furnishings such as lights and trees are limited along Paige Street. French street is wider with 4 lanes of traffic and is the extension of Father Morissette Blvd. Sidewalks are approximately 8' but with limited site furnishings. The entrance on French street is directly aligned with Boarding House Park. Parking for the Freshman Academy is on-street or at the George Ayotte or Joe Downes Garage.

Downtown parking is currently provided at the George Ayotte Garage where approximately 605 parking passes are reserved for about 360 faculty and 245 students. The overall parking capacity of the garage is 1200. Another 120 vehicles park throughout the downtown at other parking facilities including the Joe Downes Garage. Overflow parking is provided via on street parking around the school. All parking garages are owned and managed by the City of Lowell. Parking in the George Ayotte Garage is free for employees. Student parking passes cost $17 a month.

Addition/Renovation Option 2A- Existing Site:

New addition allows for an improved north south classroom orientation. The Freshman Academy is incorporated into the new building and a new courtyard is created, central to the Lord Building. The entire courtyard is approximately 3,600 sf which will be a combination of hardscape and greenscape. The entrance plaza is located in the same space it is today but the size is greatly reduced to 1,200 sf.

Bus, Vehicular and Pedestrian Circulation remains as detailed above. All parking is located off site in the George Ayotte Parking Garage, Joe Downes Garage or on street. The only HC spaces available to service the school are the existing spaces located on Father Morissette Blvd and outside of the school property lines. Sidewalks surrounding the school including HC walkways will be improved for better pedestrian access. The entrance plaza remains in its current location and will be upgraded to include new paving, planting and site furnishings. The entrance plaza is reduced in size as compared to the Full Renovation and shifted east. The crosswalk connecting the school and George Ayotte Parking Garage will need to be shifted to accommodate this change. The space available for a sidewalk along Father Morissette Blvd in front of the new addition and 1980 building is limited to only 5'. A small plaza space is created at the corner of Arcand Drive.

Emergency Access: Fire and emergency access will be provided around the existing school except for fire truck access along the canal. The access drive along the south property line of the school is only 20' in width and back up area is not possible with this configuration. The driveway access is off of Arcand Drive.

Trash Removal and Deliveries: Service area includes (1) 40 yard dumpster and (2) 10 yard dumpsters and is located on the south side of the school. A transformer and generator are located behind the dumpsters. A turnaround is not possible in this configuration and all delivery trucks including smaller box trucks will need to either pull in and back up or vice versa.

LHS uses two City-owned facilities- Shedd Park and Martin Cawley Athletic Complex. These two complexes accommodate the majority of the high school's athletic programs. The Cawley Complex has a brand new track and a synthetic turf football field (10 years old and in good condition). Both complexes are maintained by the City and students are bused to them. The Cawley complex is about 2 miles from LHS.

The greenspace created in the new central courtyard is too small to be used for physical education (approximately 3,600 sf) and it is anticipated that the occasional gym classes and teams will use the small lawn area (14,000 SF) outside of the Tsonga Center across from the school.



Addition/ Renovation Option 3A - Expanded Site:

Project site is expanded to include the neighboring property to the south. The new addition in this scheme allows for optimum north south classroom orientation. The Freshman Academy is incorporated into the new building. The new building is pulled away from Father Morissette Blvd providing the opportunity to create plaza and streetscape improvements along the school. The new entrance plaza is enhanced and in alignment with the George Ayotte Parking Garage. The centerpiece of the new school is a large campus quad surrounded by a combination of hardscape and planting. The green space is approximately 15,000 sf. This area is surrounded on three sides by building and visually opened to Arcand Drive but secured with an ornamental fence and gate. The corner of Arcand Drive and Father Morissette is improved with plaza and street trees.

Bus, Vehicular and Pedestrian Circulation remains as detailed above. In this scheme a bumpout is created along Father Morissette to stack 4 buses. The entrance plaza remains in its current location and will be upgraded to include new paving, planting and site furnishings. The entrance plaza is expanded in size and directly across from the crosswalk connecting the George Ayotte Parking Garage. All parking is located off site in the George Ayotte Parking Garage, Joe Downes Garage or on street. HC Parking is created for approximately 6 cars and located to the south of the 1980 Building. Approximately two loading spaces are provided in the service area.

Emergency Access: Fire and emergency access will be provided around the existing school except for fire truck access along the canal. Fire access is increased in this option along the southern portion of the site to run 200' along the canal. The driveway

access is off of Arcand Drive. A turnaround is created that will allow Fire and Emergency vehicles to turn around on site.

Trash Removal and Deliveries: Service area includes one (1) 40 yard dumpster and two (2) 10 yard dumpsters and is located at the corner of the parking lot. This is the largest parking and service area of the three existing site schemes and the only plan that creates a turnaround from delivery and service vehicles on site.

LHS uses two City-owned facilities- Shedd Park and Martin Cawley Athletic Complex. These two complexes accommodate the majority of the high school's athletic programs. The Cawley Complex has a brand new track and a synthetic turf football field (10 years old and in good condition). Both complexes are maintained by the City and students are bused to them. The Cawley complex is about 2 miles from LHS.

The green quad created in this plan is 15,000 sf and just slightly larger than the space being used now across the street. This space is large enough for use by physical education classes, marching band and any number of activities. Creation of this space will eliminate the need for physical education classes to leave the school site.



New Option A - Expanded Site:

Similar to Option 3A, the project site is expanded to include the neighboring property to the south (75 Arcand.) The new construction in this scheme allows for good north/south classroom orientation for the academic spaces. The building is planned to be constructed in a couple major phases. The first phase will build the Freshman Academy wing on the expanded adjacent property. That portion of the building would be built first to provide swing classrooms for subsequent phases as the existing buildings are taken down for the balance of the new building to be constructed.

Project site is expanded to include the neighboring property to the south. The Freshman Academy is incorporated into the new building. Like option 2a the new building is pushed closely against Father Morissette Blvd providing limited plaza, and sidewalk space. An overhang at the entrance extends from the building to the sidewalk. The new gym plaza is added on the southwest corner of the school. Small fingers of green are created along the canal and are anticipated to be a combination of green and hardscape. The combined greenspace totals approximately 8,000 sf. Due to the height of the building and eastern exposer of these spaces it is anticipated that both of these areas will be in the shadow of the building for most of the day.

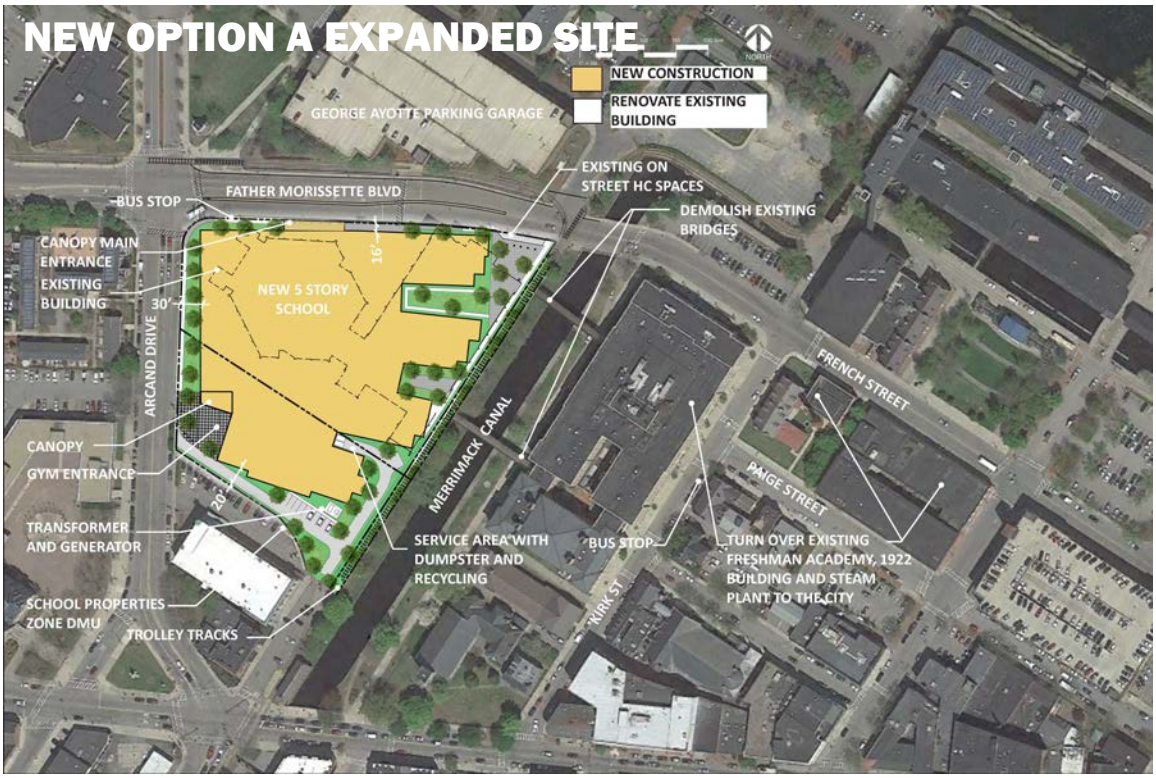
Bus, Vehicular and Pedestrian Circulation remains as detailed above. In this scheme the entrance plaza shifts left from its current location and is very limited in size. All parking is located off site in the George Ayotte Parking Garage, Joe Downes Garage or on street. HC Parking is created for approximately 10 cars (6 will be HC spaces) and located to the south of the 1980 Building. Approximately two loading spaces are provided in the service area. The proposed southern and northern turn-space areas along the driveway are too small for large vehicles to utilize. The southern turn-space area has small curb radii and the northern turn-space area is too shallow to accommodate large vehicles. The “U” shaped geometry of the driveway (adjacent to the canal) is not conducive for large vehicles to maneuver efficiently when accessing the service area, especially due to the lack of turn space and small radii.

Emergency Access: Fire and emergency access will be provided around the existing school except for fire truck access along the canal. Fire access is increased in this option along the southern portion of the site to run 200’ along the canal. The driveway access is off of Arcand Drive.

Trash Removal and Deliveries: Service area includes one (1) 40 yard dumpster and two (2) 10 yard dumpsters and is located at the corner of the parking lot. As mentioned above the “U” shaped geometry of the driveway (adjacent to the canal) is not conducive for large vehicles to maneuver efficiently when accessing the service area, especially due to the lack of turn space and small radii and will make trash removal and deliveries challenging.

LHS uses two City-owned facilities- Shedd Park and Martin Cawley Athletic Complex. These two complexes accommodate the majority of the high school's athletic programs. The Cawley Complex has a brand new track and a synthetic turf football field

(10 years old and in good condition). Both complexes are maintained by the City and students are bused to them. The Cawley complex is about 2 miles from LHS.



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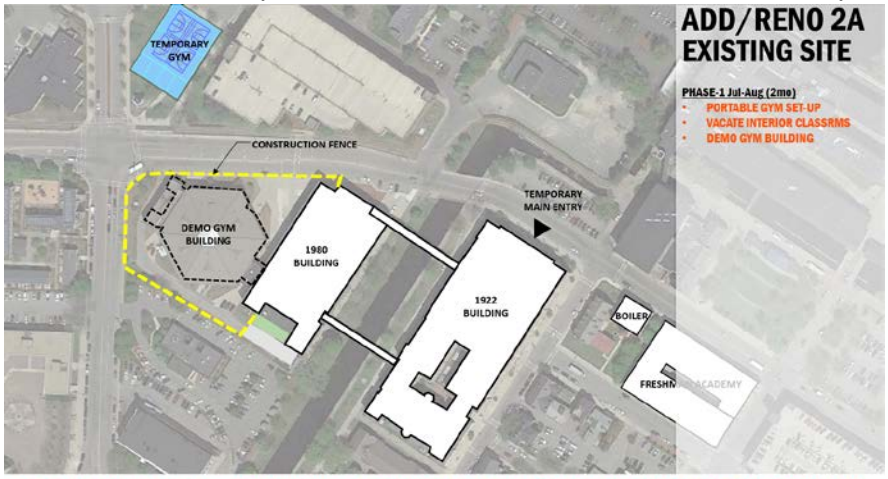
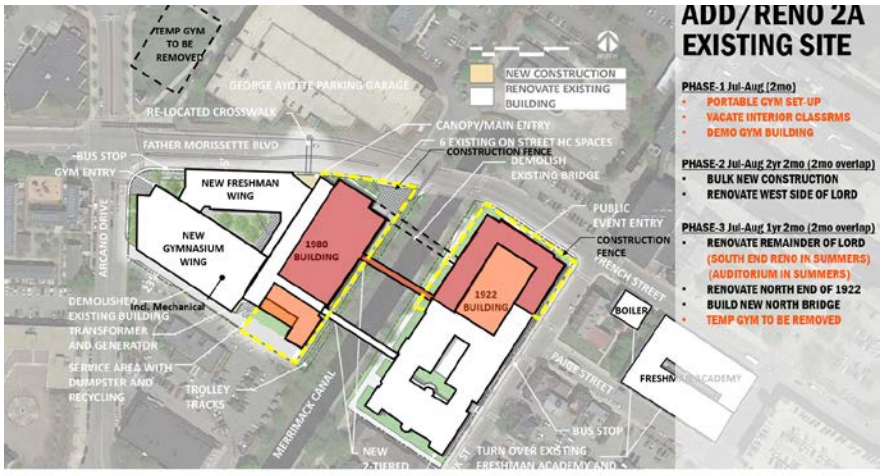
B. Construction Impact for Each Alternative

Each of the options that our team studied have differing impacts on construction phasing, construction duration, impact on students/staff as well as overall cost. The urban downtown site does not lend itself to easy construction trailer locations, contractor lay down, nor modular/temporary space. We also looked at phasing, construction duration and cost for each option with the highlights for each listed below:

Add/Reno Option 2A renovates 445,500 SF of the multi-building campus and adds 173,200 SF of new construction for a 618,700 SF facility. The construction phasing spans over 3 separate phases each with a 1 or 2 school year(s)+ overlapping summers to be completed in a total duration of 4 years + 3 months. A temporary gymnasium will be needed during Phase I when the existing gymnasium is taken offline and demolished. A new two-story Gymnasium/Locker Room building and five-story Freshman Academy building will be constructed in the existing gymnasium location. These buildings will be available for use during Phase II- no temp gym needed after Phase I. The new Freshman Academy provides 64 classroom spaces, plus the 40 freed up classrooms in the existing building provide enough swing space to rotate through the additional three phases to renovate the balance of the campus.



Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager



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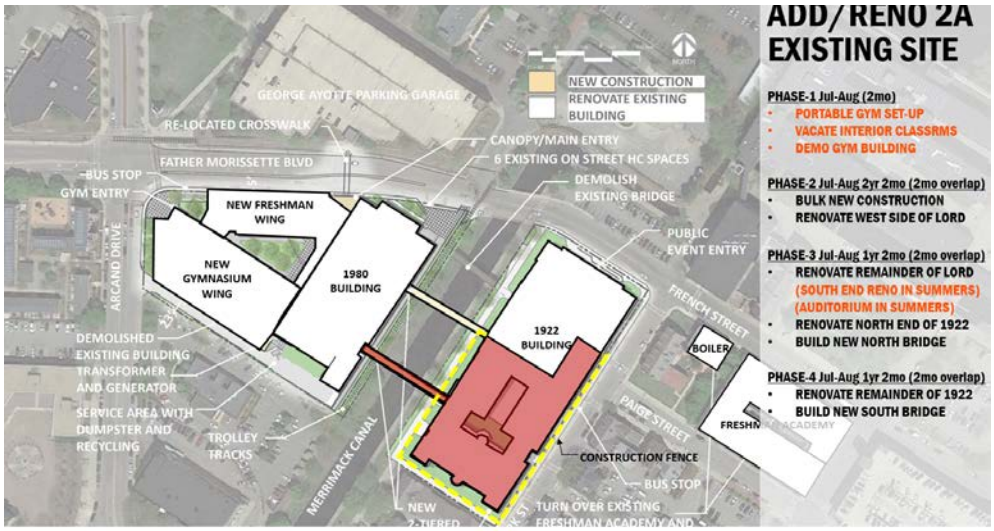

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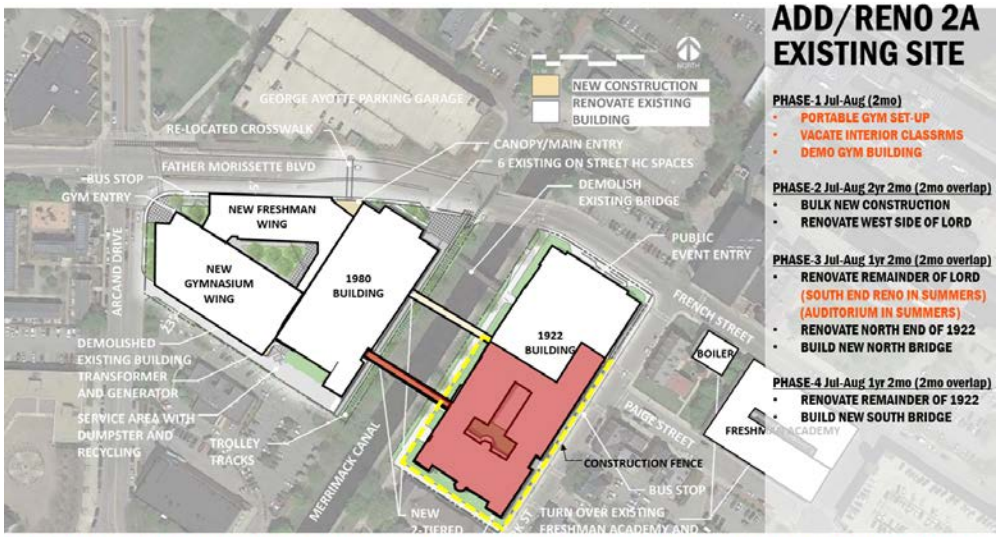

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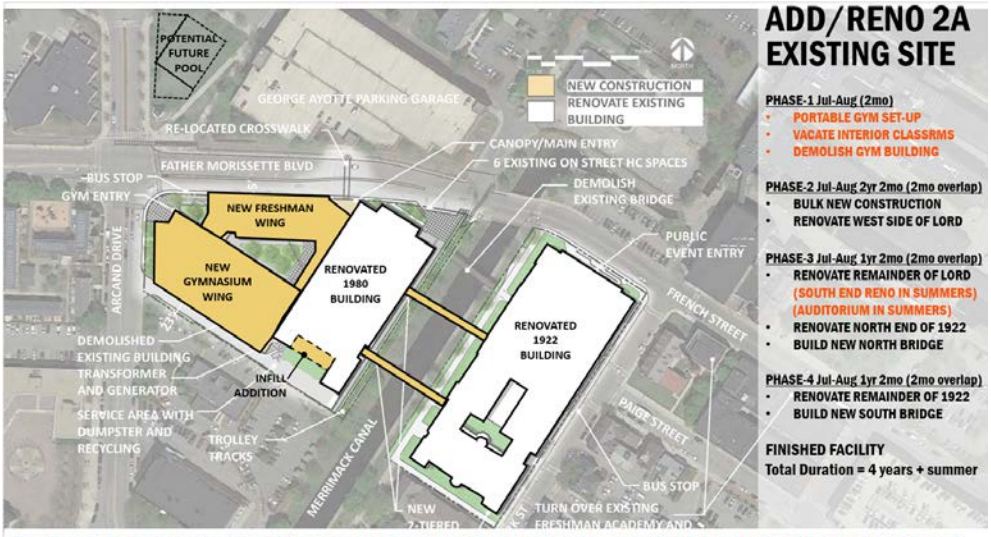
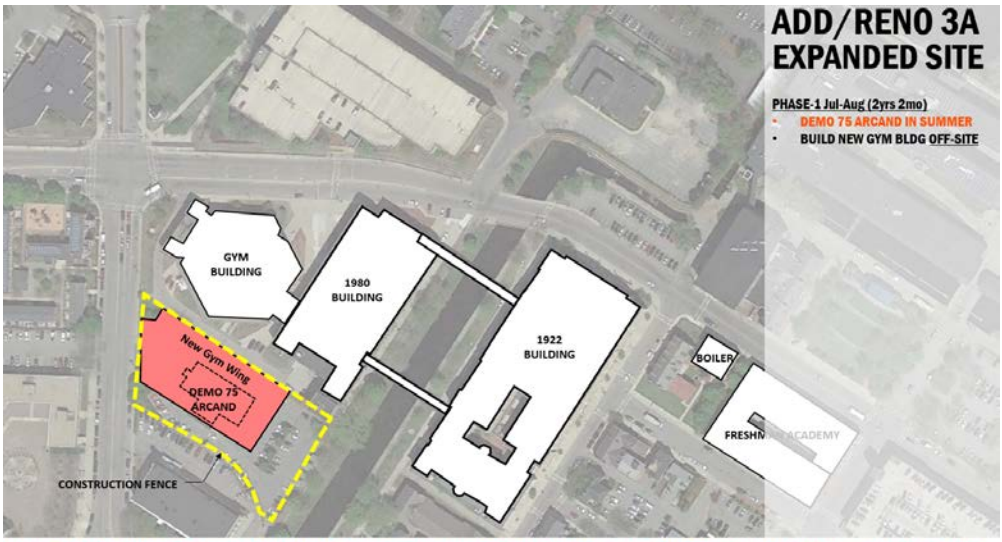


Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

Add/Reno Option 3A - Expanded Site renovates 432,600 SF of the multi-building campus and adds 189,600 SF of new construction for a 622,100 SF facility. The construction phasing spans over 4 separate phases starting with a land acquisition of a 1.4 acre adjacent property to enlarge the campus. The new two-story Gymnasium would be constructed on this parcel without any disruption to the students or school operation. Phase I is 2years +2months. During Phase II, the new Gymnasium will be utilized while the existing Fieldhouse is demolished to make room for the five-story Freshman Academy building over a 1 year+ 6 month construction duration. The new Freshman Academy provides 64 classroom spaces, plus the 40 freed up classrooms in the existing building provide enough swing space to rotate through the additional two phases to renovate the balance of the campus. The total construction duration is 5 years (4 on current LHS site.)



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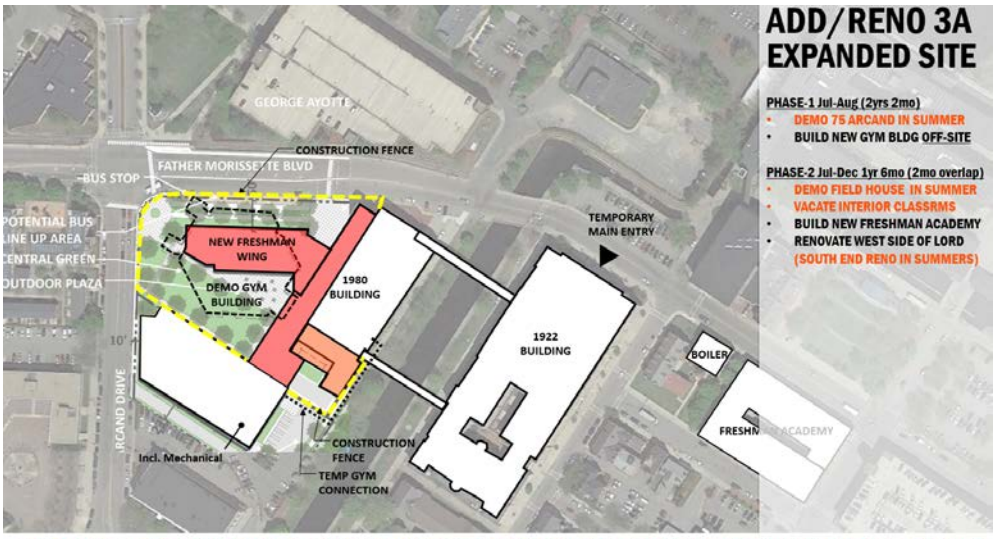
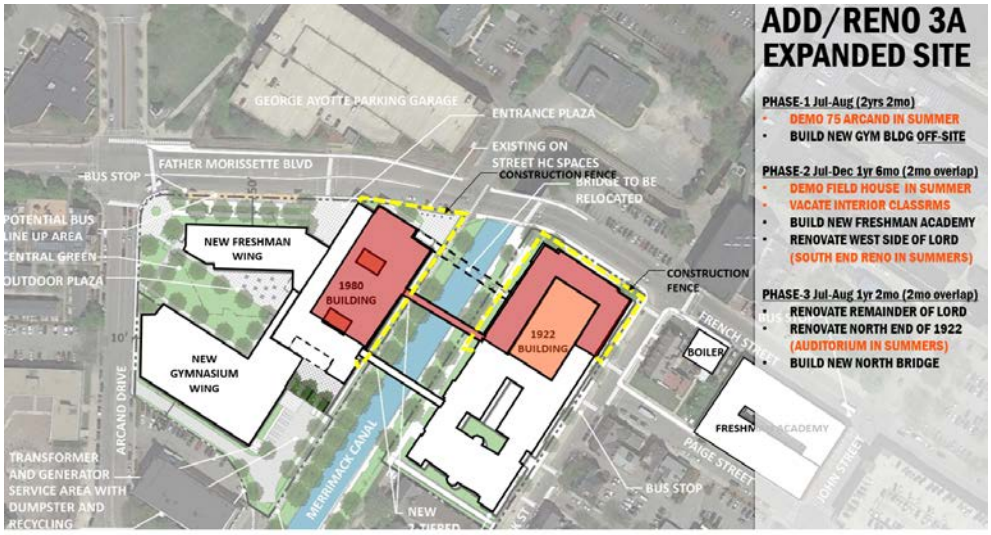


Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.



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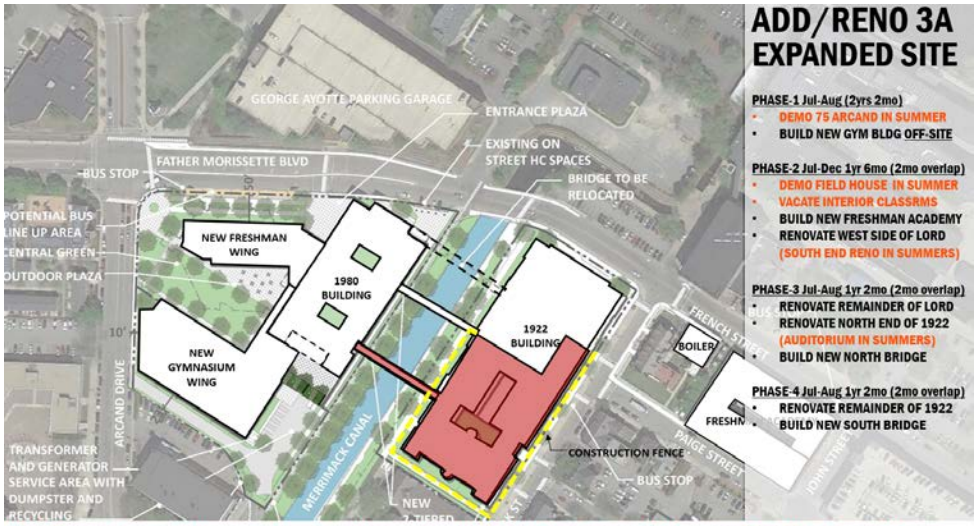
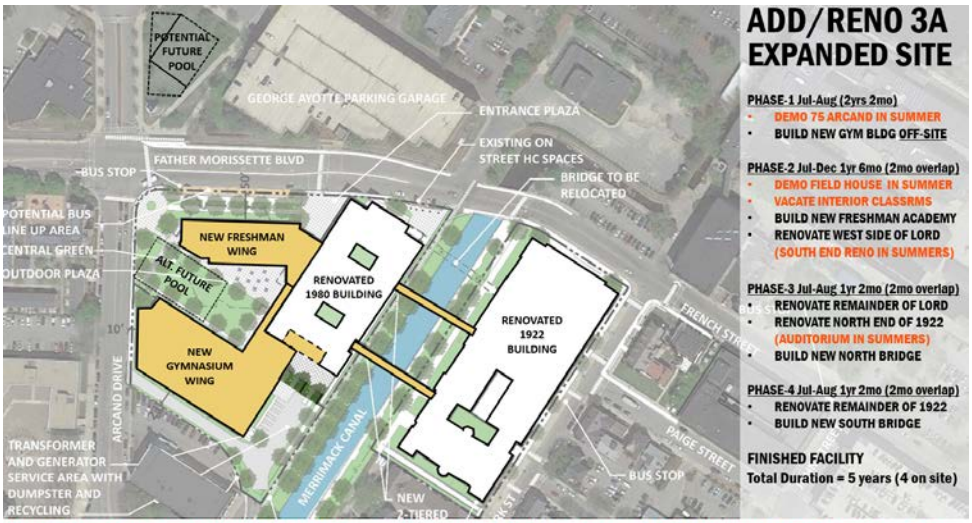
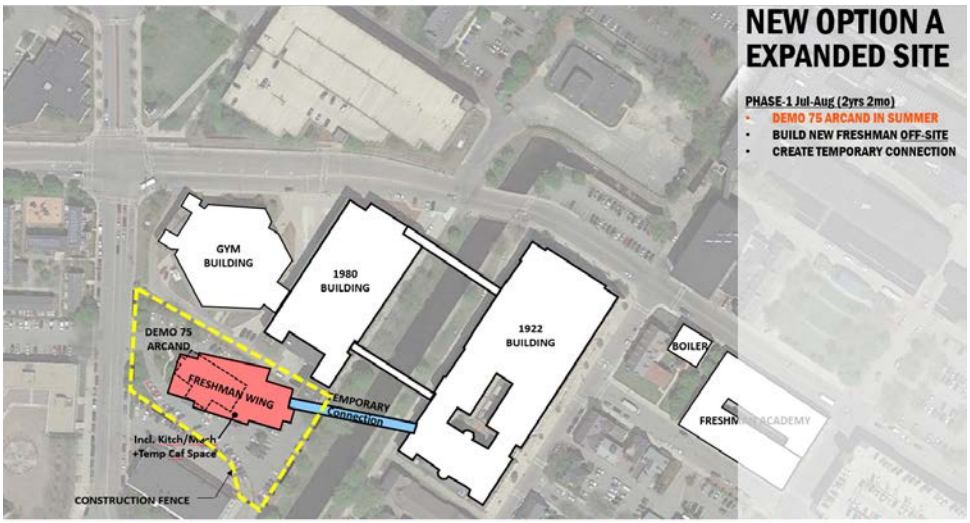


Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

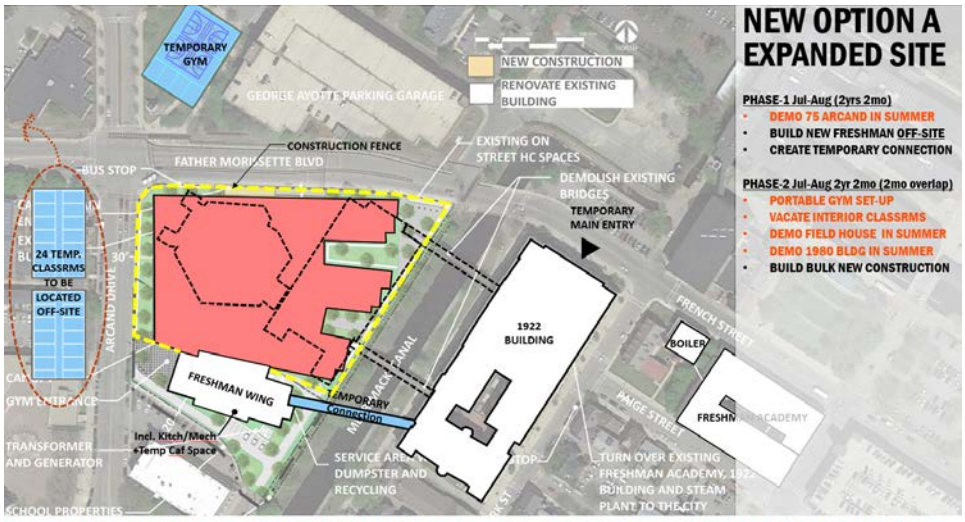


Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

New Option A - Expanded Site builds a new five-story (+ basement) 579,400 SF on an expanded site which includes the neighboring property to the south (75 Arcand.) The building is planned to be constructed in a couple major phases. The construction is assumed to be 4 years+ 3 mo (summer) Phase I is assumed to be 2yrs+2mo, this phase demolishes the existing building on 75 Arcand, and builds the Freshman Academy Wing on the adjacent property without impact on the current school. Phase II is also assumed to be approx. 2yrs+2mo and will require a portable Gymnasium (off-site) and approximately 24 portable classrooms (off-site.) Phase II demolishes the existing Fieldhouse and 1980 Building during the summer, and constructs the remaining portion of the new building. A temporary connection back to the 1922 Building will be required for students to connect to the other side of the campus. A short Phase III will complete the finish work before the building is fully completed.



Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager



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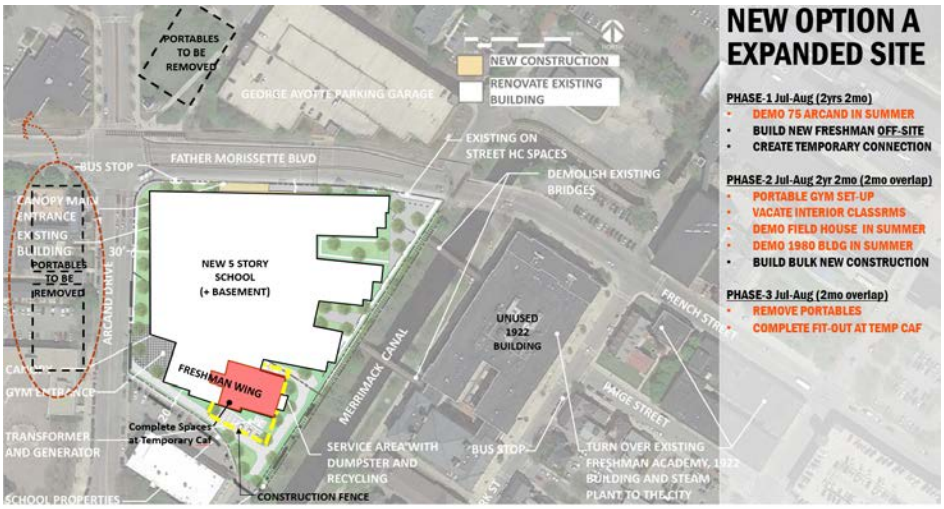

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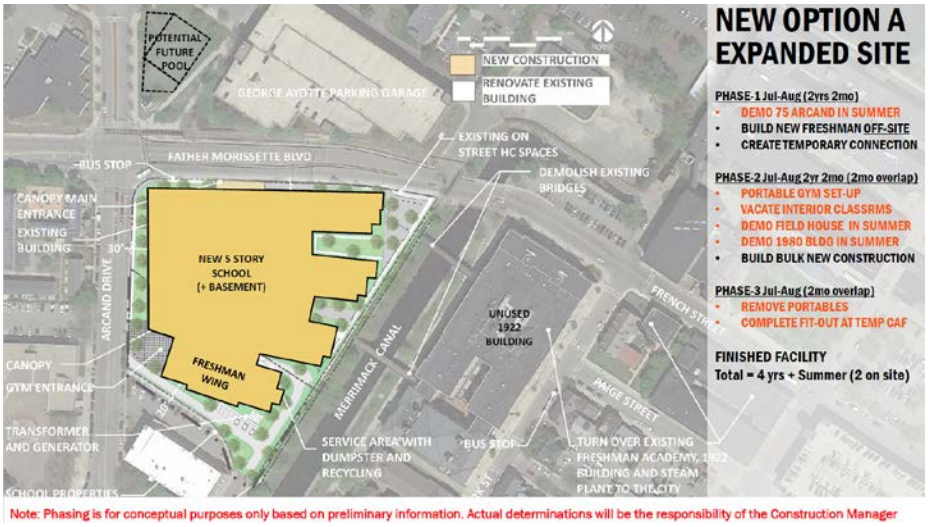


Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

C. Conceptual Building and Site Drawings(s)

The range of renovation options studied during the updated PSR include two Addition/Renovation scenarios that replace the existing Field House and replicate the Freshman Academy as new construction on campus. Add/Reno Option 3A and New Option A both look at the potential to expand the existing site by acquiring adjacent property. Building upon interest in the previous PSR, Add/Reno Option 3A is favorite because it provides a state of the art building that requires no temporary facilities during construction, and the expanded allows for additional green space in the tight urban downtown site. The following is a summary and description of all three options that were considered.

Add/Reno Option 2A renovates all existing buildings except for the Field House; that portion of the building will be demolished to make room for a new Freshman Academy and new Gymnasium thus allowing this option to meet all of the goals of the Educational Program by bringing all students onto one unified campus. Two new two-story bridge connectors are planned to replace the ones spanning over the canal. A new small addition at the front entry would create an improved entry sequence with better visibility and improved security. A modest amount of green space between the Freshman Academy and the new Gymnasium provides some much desired green space on this very urban site. A downside to this option is that some Science Labs that currently don't have exterior windows still are not afforded in these spaces. The classroom clusters are not ideal in that they are spread out due to existing wall and corridor constraints.

Pros(+) and Cons (-) of Add/Reno Option 2A:

Building Size/Location- Existing Down-Town Site(s)
- \+ Proximity/Frequency of City Buses
- \+ Proximity To City/Social Services
- \+ Adjacent Pkg Garages (Covered)
- ± Existing Service Access Remains
- — Limited Access To Green Space
- — Busing Req'd for Some Athletics

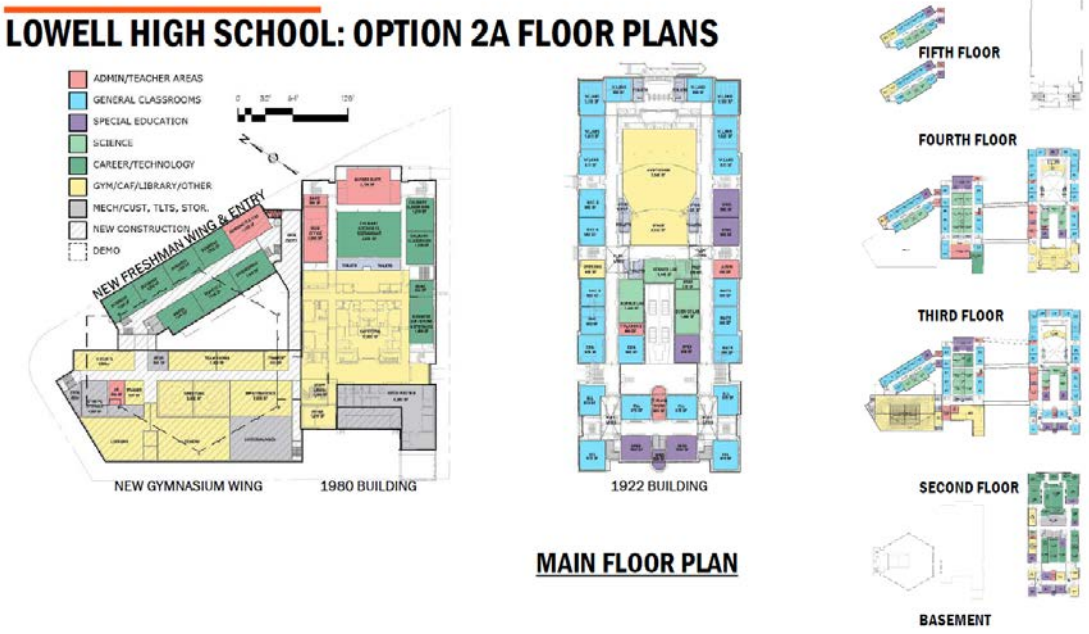
Educational Program- Meets Objectives Except as Noted:
- \+ Freshman Academy Connected
- ± Public/Activity Areas Spread & Split
- \+ F.A. Teams + STEM/Hum. Clusters
- \+ Meets New Standards (Count/Size)
- \+ More Efficient/Effective Field House

Sustainability- Extent of Exist. Ext. Wall Upgrades -TBD
- ± Existing Is Problematic/New FA Ideal
- — Windowless Classrooms/Labs Exist
- — Higher Operating Costs (Multi-Bldgs)

Construction Duration- 4 Year (+ summer) Phased Project

+ Kitchen/Boiler Built in First Phase
— Temporary Gym Facilities Required





Add/Reno Option 3A – Expanded Site is afforded all same construction upgrades as Add/Reno Option 2A with the added benefit of an enlarged site due to land acquisition of the adjacent site; the advantage is two-fold. One strong advantage is new Gymnasium is designed to fit independently on the adjacent parcel; therefore it can be constructed at the onset of the project and with no disruption to the operations of the school. The second is that the expanded site allows for a much larger green space on campus for outdoor learning, marching band practice or physical education delivery. This option pokes light wells into the existing Lord Building to get natural light into the science labs that currently don't have exterior windows- this provides natural light into all learning spaces.

Pros(+) and Cons (-) of Add/Reno Option 3A (expanded site):

Building Size/Location- Existing Downtown Site + Adjacent Lot

+ Proximity/Frequency of City Buses
+ Proximity To City/Social Services
+ Adjacent Pkg Garages (Covered)
+ Improved Service/Access
± Modest Green Space Created
— Busing Req'd for Some Athletics

Educational Program- Meets Objectives Except as Noted:

+ Freshman Academy Connected
± Public/Activity Areas Spread & Split
+ F.A. Teams + STEM/Hum. Clusters
+ Meets New Standards (Count/Size)
+ More Efficient/Effective Field House

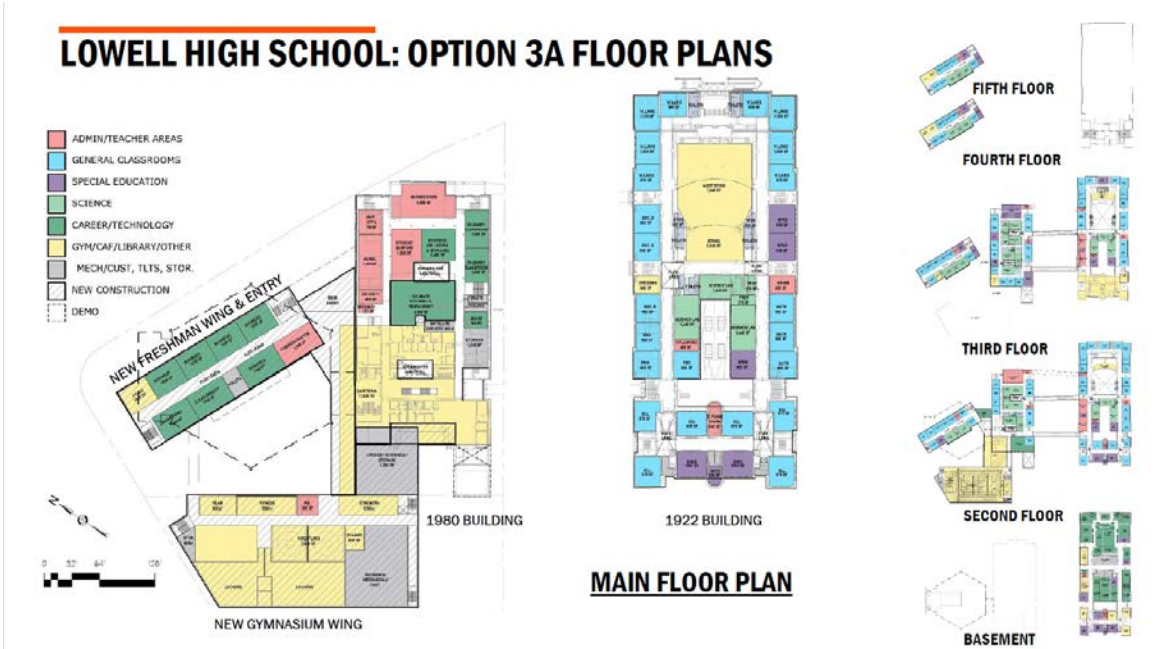
Sustainability- Extent of Exist. Ext. Wall Upgrades -TBD

± Existing Is Problematic/New FA Ideal
+ Light Wells = No Windowless Labs
— Higher Operating Costs (Multi-Bldgs)

Construction Duration- 5 Year (+ summer) Phased Project

+ Kitchen/Boiler Built in First Phase
+ No Modulars or Temporary Gym
± Only 4 Years of 5 years On School Site
— Land Acquisition/Eminent Domain
—


OPTION 3A EXPANDED SITE
NEW CONSTRUCTION
RENOVATE EXISTING BUILDING
GEORGE AYOTTE PARKING GARAGE
EXISTING CROSSING
CANOPY/MAIN ENTRANCE
6 EXISTING ON STREET HC SPACES
FATHER MORISSETTE BLVD
BUS STOP
DEMOLISH EXISTING BRIDGE
PUBLIC EVENT ENTRY
POTENTIAL BUS LINE UP AREA
DEMOLISH EXISTING BUILDING
NEW FENCE AND GATE
GYM ENTRY
CENTRAL GREEN
NEW FRESHMAN WING
1980 BUILDING
1922 BUILDING
NEW GYMNASIUM WING
ARCAND DRIVE
PAIGE STREET
TRANSFORMER AND GENERATOR
SERVICE AREA WITH DUMPSTER AND RECYCLING
MERRIMACK CANAL
NEW 2-TIERED BRIDGES
KIRK ST
TURN OVER EXISTING FRESHMAN ACADEMY AND STEAM PLANT TO THE CITY
BUS STOP
EXPANDED PROPERTY LINE
TROLLEY TRACKS
SCHOOL PROPERTIES ZONE DMU


LOWELL HIGH SCHOOL: OPTION 3A FLOOR PLANS
ADMIN/TEACHER AREAS
GENERAL CLASSROOMS
SPECIAL EDUCATION
SCIENCE
CAREER/TECHNOLOGY
GYM/CAF/LIBRARY/OTHER
MECH/CUST, TLTS, STOR.
NEW CONSTRUCTION
DEMO
NEW FRESHMAN WING & ENTRY
1980 BUILDING
NEW GYMNASIUM WING
1922 BUILDING
MAIN FLOOR PLAN
FIFTH FLOOR
FOURTH FLOOR
THIRD FLOOR
SECOND FLOOR
BASEMENT

New Option A - Expanded Site building consists of two major wings; one a 4-story academic wing of twin double-loaded corridors oriented for predominantly North/South facing classrooms and having centralized light-wells, the other a 2-story wing housing all major activity/community use spaces and the main office/lobby. The lobby connects through to both sides of the building, allowing controlled access to separate bus and car loops and is set up for good visibility from the main office and/or security. The main lobby is set-up to connect the Cafeteria and Auditorium vertically and visibly to the Media Center and create a vibrant heart to the school.

Pros(+) and Cons (-) of New Option A at Downtown Expanded Site:

Building Size/Location- Existing Downtown Site + Adjacent Lot

+ Proximity/Frequency of City Buses
+ Proximity To City/Social Services
+ Adjacent Pkg Garages (Covered)
+ Improved Service/Access
± Modest Green Space Created
— Busing Req'd for Some Athletics

Educational Program- Meets Objectives Except as Noted:

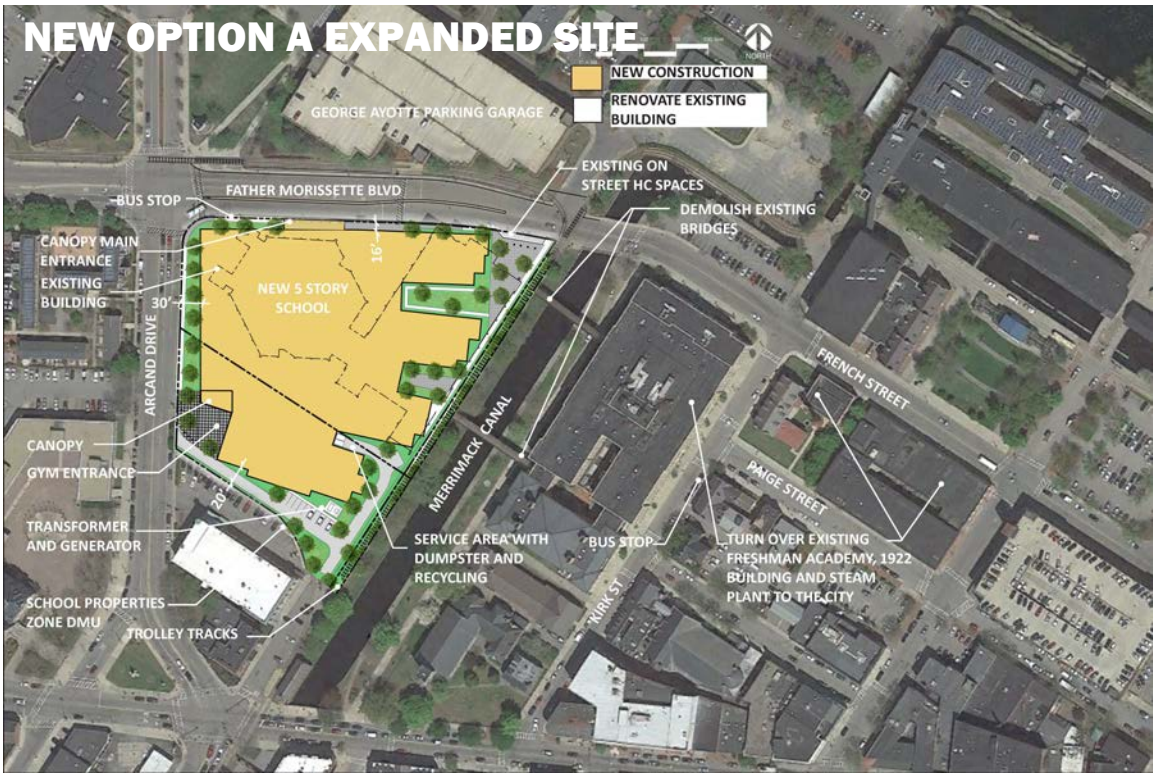
+ Freshman Academy Connected
± Public/Activity Areas Spread & Split
+ F.A. Teams + STEM/Hum. Clusters
+ Meets New Standards (Count/Size)
+ More Efficient/Effective Field House

Sustainability- Extent of Exist. Ext. Wall Upgrades -TBD

± Good for All Teaching Spaces
+ No Windowless CRs + Ideal Daylight
+ Lower Operating Costs

Construction Duration- 4 Year Project

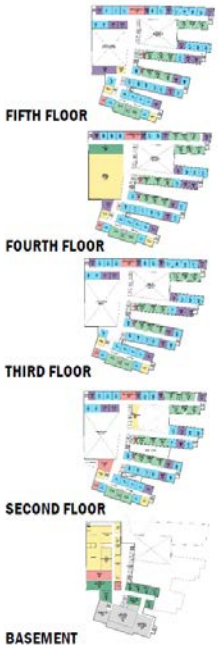
+ Kitchen/Boiler Built in First Phase
— Temporary Classrooms and Gym Facilities Required
—



LOWELL HIGH SCHOOL: NEW OPTION A FLOOR PLANS



MAIN FLOOR PLAN



D. Outline of Structural Systems

I. INTRODUCTION

The following reports describes the Structural systems for the proposed Lowell High School Project based upon investigations by Foley Buhl and Roberts and Associates, Inc. (FBRA).

BASIS OF DESIGN - NEW CONSTRUCTION (ALL OPTIONS)

The basis of the structural design for new construction (New School at Cawley or additions to the existing High School) in all options is described in this section.

Codes and Design Standards

Building Code:	Massachusetts State Building Code (780 CMR) - Ninth Edition
Concrete:	ACI 318 and ACI 301; latest editions.
Masonry:	ACI 530 and ACI 530.1; latest editions.
Structural Steel:	AISC "Specification for Structural Steel Buildings" and AISC "Code of Standard Practice"; latest editions
Steel Deck:	Steel Deck Institute (SDI) – Referenced Standards; latest editions.

Design Loads/Parameters

Live Loads:

Classrooms (with partition allowance):	65 PSF
Upper Floor Corridors:	80 PSF
Open plan areas:	100 PSF
Stairs and First Floor Corridors (Including Pedestrian Bridges):	100 PSF
Library/Media Center:	100 PSF
Mechanical Areas:	150 PSF

Snow Loads (Lowell):

Basic Ground Snow Load:	30 PSF
Minimum Flat Roof Snow Load:	30 PSF

Wind Loads (Lowell):

Wind Speed:	134 MPH

Seismic Parameters (Lowell):

Spectral Response – Short Periods:	S_S = 0.310g
Spectral Response – 1-Second Periods:	S_D = 0.074g
Occupancy Category:	III
Seismic Design Category:	B
Site Class:	D
Structural System:	Building Frame System
Lateral Load Resisting System:	Steel Braced Frames (*Not Specifically Detailed for Seismic Resistance*)
Response Modification Factor (R):	3.0
System Overstrength Factor (W0):	3.0
Deflection Amplification Factor (C_d):	3.0

Foundations:

Foundations for the 1997 addition to the 1922 Building are spread footings, designed on the basis of a 4.0 tons per square foot allowable bearing capacity. It appears that Coburn Hall is supported on conventional spread footings as well. The Academic Wing and most of the Fieldhouse/Natatorium at the Lord Building are supported on a pile foundation. The balance of the Fieldhouse/Natatorium is supported on conventional spread footings, designed on the basis of a 4.0 tons per square foot allowable bearing capacity. Foundations for the building on the 75 Arcand Drive property are unknown; however, conditions are assumed to be similar to those at the 1980 building site. Additional subsurface soils investigations are planned if the Preferred Option includes this parcel on the expanded site.

Available geotechnical/subsurface soils information for the Lowell High School was limited; however, the December 8, 1995 Geotechnical Engineering Report prepared by GZA GeoEnvironmental, Inc. for the 1997 addition to the 1922 Building and the addition to the Lord Academic Wing (south end) was made available to the Design Team. Additional subsurface explorations were conducted in March 2017 by Geotechnical Partnership, Inc. (GPI). Refer to the March 24, 2017 *Feasibility Phase Geotechnical Data Summary Report* and the March 28, 2018 PSR Pricing Narrative – Geotechnical for additional information. Foundation related comments that follow in this report are based on the recommendations provided in these reports.

Existing High School Site

Borings taken by GPI in March 2017 (nine (9) total borings; two observation wells) indicate a subsurface soils profile with fill, overlying a layer of loose to medium dense glacial fluvial soils above glacial fluvial (alluvial) till. The thickness of the various soil materials varies. Bedrock was encountered in several borings at depths ranging from 18 feet to 39 feet. Accordingly, bedrock is not expected to be a factor in the design and construction of the proposed new additions.

Groundwater was encountered at depths ranging from 8.0 feet to 12.0 feet below the ground surface (Elevation 26.7"+/- and Elevation 21.5'+/-, respectively); a seasonal high water elevation of EL. 24.5' has been recommended for this site. Under Addition/Renovation Options 2A and 3A – Expanded Site, groundwater is not expected to be an issue during construction or in service, as no basements are planned. A partial Basement Level (at Elevation 22.9'+/-_ is planned for New Option A – Expanded Site: groundwater will be an issue both during construction (dewatering required) and in service. The basement level slab will be structured to resist hydrostatic uplift (as well as dead and live loads). As this level will reside in the permanent water table, both the slab and the walls will be fully waterproofed. Additional groundwater readings will need to be taken to futher evaluate the impace of groundwater on this construction.

Liquefaction is not considered to be a concern.

As the existing fills are not suitable for the support of footings, and significant solid waste (abandoned foundations and debris) was encountered below grade, GPI has recommended that a pile foundation be used for new construction (additions and the new building) at this site. Piles would be the conical point pipe type; 10.75" diameter with a 190 Kip (95 Ton) capacity, driven to bear in the dense glacial till, weathered rock, or on bedrock (30 to 50 feet long). Alternate foundation systems include drilled concrete micropiles and ground improvement (i.e. rammed aggregate piers). Refer to the March 28, 2018 *PSR Pricing Narrative – Geotechnical* for further information.

Construction Classification:

New construction (Addition/Renovation Options 2A, 3A and New Option A – Expanded Site will be Type IB (Noncombustible, Protected: to be confirmed). Floor construction (except slabs on steel floor deck) and roof construction (including the steel roof deck) will require applied fireproofing to achieve the required fire resistance rating. In all options, the new construction will be fully sprinklered. Other (less resistrictive) construction types may ultimately be allowed, pending the further evaluation of fire wall/building separation issues (refer to expansion joint comments in the following section).

Sustainable Design Considerations:

Sustainable design considerations will be incorporated in the building design (LEED v4).

I. STRUCTURAL SYSTEMS DESCRIPTIONS - NEW CONSTRUCTION (ALL OPTIONS)

Structural systems for new construction in all options (Addition/Renovation Options 2 and 3 and the New School at Cawley Option) are described in this section. The anticipated scope of structural work in the existing buildings (Full Renovation Option and Addition/Renovation Options 2 and 3) is described in the **Section V** below.

Structural Bays/Spans: Structural bays/spans will vary; however, the average structural bay will be square or rectangular, approximately 1000 square feet in area. Roof construction over the new Fieldhouse (Addition/Renovation Options 2A and 3A) will clear span the fourth floor construction in New Option A – Expanded Site (at the two-story Media Center) will clear span the Gymnasium below (approximately 125 feet). Roof construction over the Auditorium in New Option A – Expanded Site will clear span the north-south width of the space, approximately 85 feet.

Story Heights/Floor Elevations: Typical story heights will be +/- 13'-4".

Foundations: As noted earlier in this report, the preliminary foundation design for Addition/Renovation Options 2A and 3A and New Option A – Expanded Site is based on 190 Ton capacity, conical point pipe piles.

Drainage: Foundation and underslab drainage systems would be required in cases where an occupied floor level will be located below the exterior finished grade (Basement Level of New Option A – Expanded Site).

Lowest Level Floor Construction for the new additions on the existing site (Addition/Renovation Options 2A and 3A) will be 10" thick, reinforced concrete structural slab, underlain by a vapor barrier and rigid insulation (with stick clips).

The basement slab in New Option A – Expanded Site will be a 12" thick, reinforced concrete structural slab, underlain by a vapor barrier and rigid insulation (with stick clips). A 12" thick layer of compacted gravel will be placed on top of the slab, and will serve as a sub-base for a 5" thick concrete slab on grade (reinforced with 6x6-W2.0 x W2.9 WWF). Two integral sump pits will be provided in the slab on grade. Sub-slab piping and utilities will be located in the 12" thick layer of compacted gravel, to avoid penetrating the waterproofed slab below. In the event that there is a breach in the waterproofing system, water which enters the layer of compacted gravel can flow to the sump pits and be pumped out of the building.

In all options, intermediate slab support piles (one per structural bay) will be driven at the intersection of the diagonal centerlines of each structural bay. Piping, conduit and other sub-slab utilities will be hung form the structural slabs.

Typical Level Floor Construction: Composite structural steel framing: 4½" thick (minimum), normal weight concrete topping slab on a 2" deep, 18 gauge, composite type, galvanized steel floor deck (6½" minimum total slab thickness), reinforced with welded wire fabric, spanning to composite wide flange steel beams. Steel beams span to composite wide flange steel girders that are supported by wide flange steel columns or HSS (tube) steel columns. All composite steel beams and girders will be *unshored.* Composite action will be achieved by field welding ¾" diameter x 5" long headed shear studs through the deck, to the top flanges of the beams and girders. To avoid compromising composite action, conduit or other, similar embedded items *should not* be placed in the concrete slab on steel deck construction. Slabs on composite steel floor deck will be placed at the required elevation, adding concrete

to compensate for the deflection of the (unshored) steel framing (assume an approximate average of ¾" additional concrete required over the bay area).

Fourth Floor Construction – Media Center – New Option A – Expanded Site: Fourth floor construction at the Media Center (over the Gymnasium) in New Option A – Expanded Site will be similar to the described above for the typical floor construction; however, composite steel beams will span approximately 32.5 feet to 10+/- feet deep (fireproofed) steel trusses (four total) that clear span the space. Composite steel floor deck will be the cellular acoustic type. A further evaluation of acoustic issues will be required; construction of a secondary, isolated (floating) slab may be necessary to achieve the desired acoustical separation.

Roof Construction: Typical roof construction for all new construction will consist of a 3" deep, 18 gauge, Type DR galvanized steel roof deck spanning to wide flange steel beams. Steel beams are typically supported by wide flange steel girders, which span to wide flange steel columns or HSS (tube) steel columns. Steel beams over the Auditorium in New Option A – Expanded Site will clear span the space.

The New Gymnasium Wing superstructure in Addition/Renovation Options 2A and 3A will be a clear-spanning, pre-engineered steel framed building, designed and constructed by a Specialty Contractor. The pre-engineered building will be supported on a composite steel floor system at Level 2, constructed by the General Contractor.

Where practical, roof drainage will be achieved by sloping the steel to the internal drains. Some areas of tapered insulation should be anticipated, at locations where it is not practical to slope the steel.

Concrete slabs on composite steel deck will be provided below rooftop mechanical units, for acoustical purposes. Screens will be provided around rooftop equipment for acoustic and aesthetic purposes.

Pedestrian Bridges (Addition/Renovation Options 2A and 3A- Expanded Site): The existing pedestrian bridges will be demolished and removed to accommodate the construction of two (2) new, two-tier pedestrian bridges (approximately 165 feet long) which will connect the Second and Third Levels of the Lord Academic Wing and the 1922 Building. The bridges will be steel framed, with supports on the east and west sides of the canal (creating three (3) spans). An expansion joint will be provided at each end of each bridge at each level. The new bridges will have a pile foundation.

Steel Framing Connections: Type 2 simple framing connections (shear only); double clip angles typically.

Columns: Typical columns will be wide flange steel sections or HSS (tube) steel sections.

Lateral Force Resisting System: Lateral (wind and seismic) forces will be resisted by steel bracing, for reasons of economy, stiffness, reduced structural depth and smaller column sizes. Bracing members will be square or rectangular HSS sections. Brace configurations may include chevrons, inverted chevrons ("V"), or single

diagonals in short bays, as required by architectural considerations. The bases of all braced frames will be tied together below the lowest level slab on grade with 2'-0" wide x 2'-6" deep reinforced concrete grade beams.

Expansion (Seismic) Joints: In Addition/Renovation Options 2A and 3A, the two, small additions at the south end of the 1980 Building will be structurally attached to the existing building. The new Freshman Academy Wing and the Gymnasium Wing will be separated form the 1980 Academic Wing by an expansion (seismic) joint. The New Freshman Academy Wing will also be structurally separated from the New Gymnasium Wing. A further evaluation of fire wall/building separation issues at expansion joint locations (impacting permissible construction types) will be conducted.

The three, east-west classroom wings in the new school construction in New option A – Expanded Site will be separated from the Gymnasium/Media Center Wing and the Auditorium by an expansion/seismic joint. A further evaluation of fire wall/building separation issues at expansion joint locations (impacting permissible construction types) will be conducted..

Elevator Shafts: New elevator shafts will be 8" thick, 100% solid grouted, reinforced concrete masonry unit (CMU) construction, supported on 12" thick reinforced concrete elevator pit walls and a 2'-0" thick reinforced concrete elevator pit mat.

Exterior Walls: Exterior walls will typically be masonry veneer (cavity wall construction), with areas of glazed curtainwall and architectural panels. A galvanized, light gauge steel stud backup wall (16 gauge minimum thickness) will be constructed at masonry veneer areas. Vertical slip joints will be provided in the metal stud backup system at each level. Due to the height of the proposed additions (Addition/Renovation Options 2 and 3) and new building (New School at Cawley Option), continuous galvanized steel relieving angles will be required to limit the height of masonry veneer to 30 feet or less. Intermediate, HSS Steel girts will be provided at the Gymnasium exterior walls (New School at Cawley Option), to laterally support the wall construction at mid-height.

III. ESTIMATED STRUCTURAL QUANTITIES - NEW CONSTRUCTION (ALL OPTIONS)

Approximate structural quantities for new construction in all options (Addition/Renovation Options 2 and 3 and the New School at Cawley Options (4-story and 5-story)) are presented in this section. Refer to the Structural Systems Descriptions in **Section III** above for steel floor and roof deck types/gauges, slab on grade and slab on steel deck information, and elevator shaft construction.

FOUNDATIONS/CONCRETE:

The estimated quantities of foundation concrete and reinforcing for the various options are summarized below.

Typical Perimeter Frost Walls, Footings and Pilasters (All Options):

*18" thick, 4'-6" deep continuous grade beams (no footings), including an 8" wide masonry shelf, with continuous top and bottom reinforcing **90.0+/-plf**), spanning to pile caps. The outside surface of perimeter grade beams will receive a troweled-on bituminous mastic. The bottom of the grade beam will be a minimum of 4'-0" minimum below the exterior finish grade for frost protection. Pilasters at perimeter column locations/pile caps will be 24 inches square, with **40 plf** reinforcing.*

Typical Full Height Basement Walls (New Option A – Expanded Site Only):

16" thick including an 8" wide masonry shelf, with horizontal and vertical reinforcing each face (7/0+/- pas). A continuous, reinforced concrete pile cap with one 95 Ton, conical point pipe pile spaced at 3'-0" o.c. (staggered) will be provided at the base of the wall. The outside surface of perimeter basement walls will be fully waterproofed.

Typical Interior Column Pile Supports (New Option A – Expanded Site):

Six, 95 Ton, conical point pipe piles with a reinforced concrete pile cap at each column location.

Typical Perimeter Column Pile Supports (New Option A – Expanded Site)"

Classroom Wings:

Three, 95 Ton, conical point pipe piles with a reinforced concrete pile cap at each column location.

Gymnasium/Media Center Wing:

Four, 95 Ton, conical point pipe piles with a reinforced concrete pile cap at each column location.

Typical Interior Column Pile Supports (Addition/Renovation Options 2A and 3A):

Gymnasium Wing:

Two, 95 Ton, conical point pipe piles with a reinforced concrete pile cap at each column location.

New Freshman Academy Wing:

Six, 95 Ton, conical point pipe piles with a reinforced concrete pile cap at each column location.

Typical Perimeter Column Pile Supports (Addition/Renovation Options 2A and 3A):

South Additions – 1980 Academic Building (3ST):

Two, 95 Ton, conical point pipe piles with a reinforced concrete pile cap at each column location.

Gymnasium Wing (2 ST):

Two, 95 Ton, conical point pipe piles with a reinforced concrete pile cap at each column location.

New Freshman Academy Wing:

Three, 95 Ton, conical point pipe piles with a reinforced concrete pile cap at each column location.

Typical Intermediate Slab Support Pile (All Options):

Provide one (1), 95 Ton, conical point pipe intermediate slab support pile per 800+/- square feet of lowest level floor area. Locally thicken the structural slab on grade to 18" deep at each slab support pile.

Grade Beams at Lateral Bracing Bays (All Options):

2'-0" wide x 2'-6" deep with 75 pounds of reinforcing per foot.

Assume 60 linear feet of grade beam required for each 5,000 square feet of new building footprint.

Lowest Level Reinforced Concrete Floor Slab (Addition/Renovation Options 2A and 3A):

10" thick with 7.0 psf reinforcing.

Lowest Level Reinforced Concrete Floor Slab (New Option A – Expanded Site):

12" thick with 8.5 psf reinforcing: fully waterproofed

Welded Wire Fabric for Concrete Topping Slabs on Steel Floor Deck (All Options):

6x6 – W2.9 x @ W2.9 WWF

Welded Wire Fabric for Concrete Slabs on Grade (New Option A – Expanded Site):

6x6 – W2.9 x @ W2.9 WWF

Pedestrian Bridge Foundations (Addition/Renovation Options 2 and 3 (Four (4) Locations):

8'-0" wide x 16'-0" long x 3'- 6" deep foundation mat with 4,000 pounds of reinforcing, supported on eight (8), 95 Ton, conical point pipe piles.

STRUCTURAL STEEL:

The estimated weight of structural steel for the various options is summarized below (including, beams, columns, bracing, plates, relieving angles, frames, connections, etc., but excluding equipment screens, entry canopies and miscellaneous metal components).

Addition/Renovation Options 2A and 3A:

1980 Building South Additions: ***14.0 psf***

New Gymnasium Wing (Level 2 only; excluding Pre-Engineered Gymnasium Superstructure Above): ***12.5 psf***

Freshman Academy Wing: ***15.25 psf***

Two Pedestrian Bridges (2 ST): ***185.0 Tons***

New Option A – Expanded Site:

Average weight – Entire Building: 15.50 psf

II. ANTICIPATED SCOPE OF STRUCTURAL WORK - RENOVATIONS

Comments relating to proposed renovations, alterations and additions to Lowell High School (Full Renovation Option and Renovation/Addition Options 2 and 3) are presented in this section. Renovations, alterations, repairs and additions to existing buildings in Massachusetts are governed by the provisions of the Massachusetts State Building Code (MSBC - 9th Edition) and the Massachusetts Existing Building Code (MEBC). These documents are based on amended versions of the 2015 International Building Code (IBC) and the 2015 International Existing Building Code (IEBC), respectively.

The area of reconfigured spaces in the renovated 1922 Building and the 1980 Building may ultimately exceed 50% of the total floor area: accordingly, the proposed renovations to these buildings would be classified as Level 3 Alternations. Seismic hazards such as anchorage of floor and roof diaphragms to masonry walls, bracing of chimneys and parapets, etc. will need to be addressed by the code.

Modifications to existing masonry walls which contribute to the lateral force resistance for each building will be minimized. Accordingly, the demand-to-capacity ratio of lateral load resisting elements in each of the buildings will not be increased by more than 10%; a seismic retrofit of the buildings to withstand full or reduced seismic loads required by the current code will not be required.

No change in use is proposed and live load requirements throughout the buildings are expected to be generally unchanged.

Refer to FBRA's previous, *Existing Conditions Evaluation/Base Repair Structural Report (updated May 4, 1017*) in the Appendix for further information.

1922 Building

Items below apply to the Addition/Renovation Options 2A and 3A, unless noted otherwise.

1. Building Exterior: In general, the existing yellow brick and mortar around the building's exterior are in good condition, with a few exceptions:

    - In a several locations, steel lintels over punched windows are showing signs of distress (lintel is sagging, rust is present, brick above is displaced, etc.); specifically those over the lower level basement windows. *Assume that approximately 10% lintel replacement; the balance of lintels should be cleaned and coated.*
    - There are open joints in the brick and stone in limited areas, were repointing is required. *Assume that less than 10% of the façade area requires repointing.*
    - Concrete spalling/deterioration around the aluminum railing posts at the Auditorium entrance was observed. *Remove and replace the existing railings with properly designed railings and repair the damaged concrete.*
    - Sections of the masonry cornice around the perimeter of the building were damaged or missing in some locations. *Evaluate the condition of the cornice around the building perimeter; repair/reset cornice units as required.*
    - Downspouts from roof gutters discharge directly adjacent to the basement walls of the 1892 building. *All downspouts should be properly piped away from the building (to a drainage structure), to eliminate roof rainwater from being discharged adjacent to basement walls.*

2. Roof: The roof was not accessed during FBRA's site visits. However, per the referenced, 2013 Master Plan Report, the pitched roof of the original 1892 building was recently replaced. Per the same report, the roofing

over the remainder of the facility is in poor condition and likely in need of replacement. Evidence of roof leaks was observed throughout the facility. PE has reviewed the existing roofs; replacement of the flat roofs is required. As part of a separate project, the City has hired Gale Associates, Inc., to prepare roof replacement documents for the 1922 and 1997 additions, refer to the *Roof Replacement and Associated Work* (Drawings and Specifications) dated February 2, 2018, in the appendix for further information. Both additions will be re-roof; masonry parapets will be braced as well. This work is scheduled to be completed in October, 2018; accordingly, there will be no roof repair work required in Addition/Renovation Options 2A and 3A (only that which is required to accommodate the proposed renovations or new rooftop equipment.

3. Masonry Partitions: Interior masonry partitions generally appear to be in satisfactory condition. The anchorage/bracing of interior masonry partitions to the floor and roof construction as well of the height-to-thickness ratios will need to be evaluated. *The preliminary cost estimate should include an allowance to anchor/brace the tops of all (non-structural) interior masonry partitions (approximately 4'-0" o.c. spacing of anchors/braces).*

4. The anchorage of exterior masonry walls to the floor and roof construction will need to be evaluated. *The preliminary cost estimate should include an allowance to anchor all exterior masonry walls (approximately 4'-0" o.c. spacing of anchors).*

5. The centrally located, Attic Level Mezzanine addition in the original 1892 building will be removed. Existing attic floor spaces on the east and west sides of the building may be utilized for MEP/FP purposes. Preliminary cost estimates should carry an allowance to reinforce these areas to support new equipment ($5.00/SF+/-).

6. Efflorescence was observed on the north façade of the 1997 addition. *Clean/restore exterior masonry surfaces.*

7. Terrazzo flooring has cracked in some areas; elsewhere (tile) flooring has failed (potentially due to sub-slab moisture conditions). *Repair areas of damaged and/or deteriorated flooring as required.*

8. The railing at the front of the Auditorium Balcony is only 33"+/- high and does not meet current code requirements. *Remove the existing railing and install a new, code compliant railing system.*

9. Install galvanized steel frames for new rooftop MEP/FP equipment, as required. Provide a galvanized steel frame/architectural panel, visual and acoustic screen around all rooftop units.

10. Core existing slabs for MEP/FP services, as required.

11. Create new openings, chases, etc. in the floor and roof construction, as required to accommodate new MEP/FP services.

12. Create new openings in floor and roof construction, as required to accommodate new light wells, overlooks, skylights, etc. as necessary to achieve the architectural design. Refer to the Preliminary Architectural Drawings for additional information.

13. Miscellaneous structural work relating to accessibility issues (ramps, lifts, etc.)

1980 Building

All items below apply to the Addition/Renovation Options 2A and 3A – Expanded Site, unless otherwise noted. The existing Field House/Natatorium will be demolished and removed in either option.

1. Building Exterior:

    - Horizontal cracks in the masonry supported by the continuous relieving angles provided at each level were observed at the Academic Wing and at the Fieldhouse/Natatorium. *Further evaluation of as-built details/conditions is recommended. These conditions exist throughout each of the buildings and represent a potential hazardous situation. The preliminary cost estimate should include costs to repair the brick and relieving angle system.*
    - Soffit construction (aluminum panel) is sagging/damaged in the area over the exhaust for the below ground Pool Room. *Repair/replacement of aluminum soffit required.*
    - Staining and spalling of the brick façade at the integral downspouts around the perimeter of the Fieldhouse was observed. The integral downspout system does not appear to be functioning as intended. *Further evaluation and design/installation of an alternate downspout detailing recommended. Cleaning and repair of adjacent masonry will also be required.*
    - Cement board panels around the building are in various stages of deterioration (broken, detached, missing, open joints, etc.). *Repair/replacement of panels required.*
    - Some cracks were observed in exposed foundation walls; including one location at the northwest corner of the Academic Wing. *Repair by epoxy injection recommended, to prevent further freeze-thaw deterioration.*

2. Masonry Walls: Interior (stack bond) masonry walls are generally in satisfactory condition. However, cracking was observed in the stair well on the west end of the Fieldhouse. Further review of stairwell masonry construction is recommended. The anchorage/bracing of interior masonry

partitions to the floor and roof construction as well of the height-to-thickness ratios will need to be evaluated. *The preliminary cost estimate should include an allowance to anchor/brace the tops of all (non-structural) interior masonry partitions (approximately 4'-0" o.c. spacing of anchors/braces).*

3. The anchorage of exterior masonry walls to the floor and roof construction will need to be evaluated. *The preliminary cost estimate should include an allowance to anchor all exterior masonry walls (approximately 4'-0" o.c. spacing of anchors).*

4. Roof: The roof was not accessed during FBRA's site visits. However, evidence of roof leaks was observed throughout the building. PE|*DPC has reviewed the existing roofs; replacement of the flat roofs is required. Drainage issues should be evaluated and addressed as part of the new roof design. As the ultimate design wind speed exceeds 115 MPH, roof diaphragms, diaphragm connections, roof to wall connections, etc. will need to be evaluated per Section 707.3.2 of the 2015 IEBC. FBRA does not expect that there will be any significant issues to address in the 1980 Building.*

5. Install galvanized steel frames for new rooftop MEP/FP equipment, as required, Provide a galvanized steel frame/architectural panel, visual and acoustic screen around all rooftop units.

6. Two new openings in the steel framed floor and roof construction are planned in Addition/Renovation Option 3A, to create new light wells down through the building. The openings will be located, sized and configured to minimize the extent of the required structural modifications. Existing slab on steel forms/open web steel joist floor construction will need to be saw cut and removed (between column lines) at each opening at the Second and Third floors of the building. Similarly, the steel deck (1 ½" deep)/ open web steel joist roof construction will also need to be saw cut and removed to accommodate the new light well.

7. Core existing slabs for MEP/FP services, as required.

8. Create new openings, chases, etc. in floor and roof construction, as required to accommodate new MEP/FP services.

9. Create new openings in floor and roof construction, as required to accommodate new light wells, overlooks, skylights, etc. as necessary to achieve the architectural design. Refer to the Preliminary Architectural Drawings for additional information.

10. Miscellaneous structural work relating to accessibility issues (ramps, lifts, etc.)

OUTLINE STRUCTURAL SPECIFICATIONS:

Concrete:

- All concrete shall be normal weight, 4,000 psi at 28 days, except foundation walls and footings, which shall be normal weight, 3,000 psi and exterior (exposed) concrete (paving) which shall be normal weight, 4,500 psi.

- Portland Cement: ASTM C150, Type I or II.

- Fly Ash: ASTM C618, Class F. Replacement of cement content with fly ash is limited to 20% (by weight). Fly ash is not permitted in exterior, exposed concrete, slabs on grade or slabs on steel deck.

- All concrete shall be proportioned with 3/4" maximum aggregate, ASTM C 33, except 3/8" maximum aggregate shall be used at toppings less than 2" thick (e.g. metal pan stairs).

- All reinforcing shall be ASTM A 615 deformed bars, Grade 60.

- All welded wire fabric shall conform to ASTM A 185.

- Reinforcing bars, steel wire, welded wire fabric, and miscellaneous steel accessories shall contain a minimum of 25% (combined) post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with Submittal Requirements.

- Concrete products manufactured within 500 miles (by air) of the project site shall be documented in accordance with Submittal Requirements.

- Cure all concrete by moisture retention methods, approved by Architect; curing compounds shall not be used.

Reinforced Concrete Masonry (New Elevator Shafts):

- Masonry construction shall conform to ACI 530/ASCE 5/TMS 402 "Building Code Requirements for Masonry Structures", latest edition.

- Masonry strength, f'm shall not be less than 1350 psi.

- Requirements for load bearing block strength shall be as required for specified masonry strength (f'm) but shall not be less than 2000 psi on the net area of the block.

- Grout shall conform to ASTM C476, Type Fine, and shall be of strength required for specified masonry strength (F'm) but not less than 3000 psi.

- Mortar for reinforced masonry shall conform to ASTM C 270 Type S and shall be of strength required for specified masonry strength (f'm) but not less than 1800 psi.

- Reinforcing bars shall conform to ASTM A 615 Grade 60 deformed bars. Lap all continuous bars 48 diameters and provide bar positioners. Assume No. 5 bars at 2'-8" o.c. vertically and horizontal bond beams with 2 – No. 5 continuous at 4'-0" o.c.

- Joint reinforcing shall be 9 gauge ladder type conforming to ASTM A 82. Provide prefabricated corners and tees. Walls shall be reinforced horizontally with joint reinforcing at 16 inches on centers unless otherwise noted.

- Reinforcing bars, steel wire and miscellaneous accessories shall contain a minimum of 25% (combined) post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with Submittal Requirements.

- Elevator shaft walls shall be 100% solid grouted (all cores); low lift grouting.

- Masonry products manufactured within 500 miles (by air) of the project site shall be documented in accordance with Submittal Requirements.

Structural Steel:

- Structural steel shapes shall conform to ASTM A 992, Fy = 50 ksi.

- Steel tubes (HSS) shall conform to ASTM A 500, Grade B, Fy=46 ksi.

- Structural steel plates and bars shall conform to ASTM A 36, Fy = 36 ksi.

- Steel members shall contain a minimum of 25% (combined) post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the Submittal Requirements.

- Steel manufactured within 500 miles (by air) of the project site shall be documented in accordance with the Submittal Requirements.

- Anchor Bolts: Anchor bolts at column base plates shall conform to ASTM F1554 – Grade 36 and shall be headed type. Provide a minimum of four (4), ¾" diameter anchor bolts at all columns; additional bolts and/or larger diameter will be required at bracing locations.

- Bolted connections shall be ASTM A 325, Type N (bearing) bolts, except slip-critical bolts shall be used at lateral brace beam connections.

- Shear connectors shall be ¾" diameter, 5" long, headed Nelson studs conforming to ASTM A 108.

- Shop and field welding shall be AWS D1.1 E70XX electrodes.

- Surface treatment for typical structural steel: SSPC Surface Preparation No. 3 (Power Tool Cleaning). Structural steel shall be left unprimed.

- Surface treatment for Exposed to View Structural Steel (E.V.S.S.) in the Gymnasium at the new school on the Cawley site and the pre-engineered Fieldhouse superstructure in Addition/Renovation Options 2 and 3 shall be SSPC Surface Preparation No. 6. All exposed steel shall receive one coat of shop primer that is compatible with the finish paint.

- All exterior, exposed structural steel shall be hot-dipped galvanized.

Steel Deck:

- Typical steel roof deck shall be 3" deep, 18 gauge, Type DR, conforming to ASTM A653, Grade 33 (minimum), galvanized in accordance with ASTM A 653, coating class G-60.

- Acoustic steel roof deck (over the Gymnasium in the new school at Cawley) shall be 3" deep, 20/20 gauge cellular type, conforming to ASTM A653, Grade 33 (minimum), galvanized in accordance with ASTM A 653, coating class G-60. Acoustic steel roof deck shall be shop treated and painted with a primer that is compatible with the finish paint.

- Typical steel floor deck shall be 2" deep, 18 Gauge, composite type, conforming to ASTM A 653, Grade 33, galvanized in accordance with ASTM A 653, coating class G-60. Steel floor deck for the Auditorium floor (over the Gymnasium below) in the new school on the existing site option will be the cellular acoustic composite type (18/20 gauge).

- All steel floor deck and roof deck accessories (pour stops, finish strips, closures, etc.) shall be the same finish as the deck; 18 gauge minimum.

- Steel deck shall contain a minimum of 25% (combined) post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the Submittal Requirements.

- Steel deck manufactured within 500 miles (by air) of the project site shall be documented in accordance with the Submittal Requirements.

- Provide 14 gauge sump pans at roof drains.

Refer to the appendix for further information.

END OF STRUCTURAL

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E. Summary of Utilities

I. INTRODUCTION

The following reports describes the utilities for the proposed Lowell High School Project based upon investigations by Nitsch Engineering.

Addition / Renovation – Option 2A

STORM DRAINAGE

The proposed stormwater system will consist of updating the existing drainage system and installing a new closed drainage system incorporating deep-sump hooded catch basins and as many Low Impact Development (LID) Best Management Practices (BMPs) as possible, such as grassed swales, porous pavement, and biofiltration (if appropriate). A retention/detention storm drain system will be required to be included as part of the proposed stormwater design. This could be in the form of a subsurface infiltration system consisting of pipes/arch chambers. Water Quality will also need to be addressed as part of the stormwater design. Proprietary Units such as Stormceptor or Vortechnics can be used or more site integrated water quality options can be implemented as part of the stormwater design. Discharge points for stormwater will continue to be the existing drainage system in Father Morissette Boulevard, though if needed, the existing Merrimack Canal could also be a viable discharge point.

The existing site offers little to no water quantity or water quality mitigation. The proposed stormwater management system will be designed in accordance with Massachusetts Department of Environmental Protection (MassDEP) Stormwater Standards, which require reductions in both stormwater discharge rates and volumes for the 2-year, 10-year, 25-year, and 100-year 24-hour rainfall events. As such, the proposed work is expected to improve drainage conditions for the high school site, which will result in better drainage and quality of stormwater eventually flowing to the Merrimack River.

WATER

An existing 20-inch water main in Father Morissette Boulevard and French Street and a 6-inch water main in Kirk Street and the former Anne Street will provide water for the new school. (The existing 6-inch water mains may need to be replaced with an 8-inch water main). New cement-lined ductile iron water services will need to be provided as a part of the project to provide for both fire service water (indoor sprinkler systems and outdoor hydrants) as well as domestic water service. Such capacities will be confirmed by hydrant flow tests during Schematic Design.

SEWER

Sanitary sewer service is provided by a 15-inch municipal sewer main in Arcand Drive, an 18-inch municipal sewer main in Father Morissette Boulevard, combined sewer lines in the former Anne Street, Dutton Street, Kirk Street and French Street. The new project will require construction of new PVC sanitary sewer mains (to replace the combined sewer lines in Kirk Street, the former Anne Street and the former Dutton Street) and sanitary services from the site to this main. An exterior grease trap (based on # of seats in cafeterias(s)) will be required for any sanitary sewer connections to kitchen waste lines. Acidic wastes from chemistry labs or other uses such as MEP systems will require neutralization prior to discharge into the main, and any interior floor drains will be directed to this system.

An increase in the number of staff and students over existing conditions and other options may require larger pipe sizing for the new sewer service and will likely result in larger sanitary loads to existing system in this area. Such requirements will be vetted during the design process, though infrastructure demands in the area are expected to remain the same under this option.

NATURAL GAS

Gas service is available and currently supplied from gas mains in Arcand Drive, Father Morissette Boulevard, Kirk Street, French Street, Paige Street and the former Anne Street and the former Dutton Street. A new gas service(s) will be required for the proposed building. National Grid Gas provides service for this area.

UNDERGROUND/ABOVE GROUND FUEL TANKS

No new underground storage tanks are anticipated.

ELECTRICAL, TELEPHONE, AND CABLE

Electrical, Telephone, and Cable service will be provided from underground lines in Arcand Drive, Father Morissette Boulevard, Kirk Street, French Street, Paige Street. A new transformer for electrical service will likely be required, and all services will be provided in underground ductbanks and/or conduit similar to existing conditions.

Addition/Renovation – Option 3A – Expanded Site

STORM DRAINAGE

The proposed stormwater system will consist of updating the existing drainage system and installing a new closed drainage system incorporating deep-sump hooded catch basins and as many Low Impact Development (LID) Best Management Practices (BMPs) as possible, such as grassed swales, porous pavement, and biofiltration (if appropriate). A retention/detention storm drain system will be

required to be included as part of the proposed stormwater design. This could be in the form of a subsurface infiltration system consisting of pipes/arch chambers. Water Quality will also need to be addressed as part of the stormwater design. Proprietary Units such as Stormceptor or Vortechnics can be used or more site integrated water quality options can be implemented as part of the stormwater design. Discharge points for stormwater will continue to be the existing drainage system in Father Morissette Boulevard, though if needed, the existing Merrimack Canal could also be a viable discharge point.

The existing site offers little to no water quantity or water quality mitigation. The proposed stormwater management system will be designed according to Massachusetts Department of Environmental Protection (MassDEP) Stormwater Standards, which require reductions in both stormwater discharge rates and volumes for the 2-year, 10-year, 25-year, and 100-year 24-hour rainfall events. As such, the proposed work is expected to improve drainage conditions for the high school site, which will result in better drainage and quality of stormwater eventually flowing to the Merrimack River.

WATER

An existing 20-inch water main in Father Morissette Boulevard and French Street and a 6-inch water main in Kirk Street and the former Anne Street will provide water for the new school. (The existing 6-inch water mains may need to be replaced with an 8-inch water main). New cement-lined ductile iron water services will be provided for both fire service water (indoor sprinkler systems and outdoor hydrants) as well as domestic water service. Such capacities will be confirmed by hydrant flow tests as design proceeds.

An increase in the number of staff and students over existing conditions and other options may require larger pipe sizing and/or pressure supplementation (such as fire pumps) based on the size of the building. Such requirements will be vetted during the design process; though domestic demands are expected to remain the same under this option.

SEWER

Sanitary sewer service is provided by an 18-inch municipal sewer main in Father Morissette Boulevard, combined sewer lines in the former Anne Street, Dutton Street, Kirk Street and French Street. The new project will require construction of new PVC sanitary sewer mains (to replace the combined sewer lines in Kirk Street, the former Anne Street and the former Dutton Street) and sanitary services from the site to this main. Acidic wastes from chemistry labs or other uses such as MEP systems will require neutralization prior to discharge into the main, and any interior floor drains will be directed to this system.

Depending on the final building location (specifically the new Gymnasium Wing) on the abutting property (existing office building), there is an existing 15-inch sanitary

sewer line from Moody Street that runs under the Masonic Temple and then runs in a westerly direction to Arcand Drive (and south of the existing office building) that may need to be relocated as part of the project.

An increase in the number of staff and students over existing conditions and other options may require larger pipe sizing for the new sewer service and will likely result in larger sanitary loads to existing system in this area. Such requirements will be vetted during the design process, though infrastructure demands in the area are expected to remain the same under this option.

NATURAL GAS

Gas service is available and currently supplied from gas mains in Arcand Drive, Father Morissette Boulevard, Kirk Street, French Street, Paige Street and the former Anne Street and the former Dutton Street. A new gas service(s) will be required for the proposed addition/renovation. National Grid Gas provides service for this area.

UNDERGROUND/ABOVE GROUND FUEL TANKS

No new underground storage tanks are anticipated.

ELECTRICAL, TELEPHONE, AND CABLE

Electrical, Telephone, and Cable service will be provided from underground lines in Arcand Drive, Father Morissette Boulevard, Kirk Street, French Street, Paige Street. A new transformer for electrical service will likely be required, and all services will be provided in underground ductbanks and/or conduit similar to existing conditions.

New Option A – Expanded Site

STORM DRAINAGE

The proposed stormwater system will consist of updating the existing drainage system and installing a new closed drainage system incorporating deep-sump hooded catch basins and as many Low Impact Development (LID) Best Management Practices (BMPs) as possible, such as grassed swales, porous pavement, and biofiltration (if appropriate). A retention/detention storm drain system will be required to be included as part of the proposed stormwater design. This could be in the form of a subsurface infiltration system consisting of pipes/arch chambers. Water Quality will also need to be addressed as part of the stormwater design. Proprietary Units such as Stormceptor or Vortechnics can be used or more site integrated water quality options can be implemented as part of the stormwater design. Discharge points for stormwater will continue to be the existing drainage system in Father Morissette Boulevard, though if needed, the existing Merrimack Canal could also be a viable discharge point.

The existing site offers little to no water quantity or water quality mitigation. The proposed stormwater management system will be designed according to Massachusetts Department of Environmental Protection (MassDEP) Stormwater Standards, which require reductions in both stormwater discharge rates and volumes for the 2-year, 10-year, 25-year, and 100-year 24-hour rainfall events. As such, the proposed work is expected to improve drainage conditions for the high school site, which will result in better drainage and quality of stormwater eventually flowing to the Merrimack River.

WATER

An existing 20-inch water main in Father Morissette Boulevard and French Street and a 6-inch water main in Kirk Street and the former Anne Street and a 16-inch water main in Arcand Drive will provide water for the new school. (The existing 6-inch water mains may need to be replaced with an 8-inch water main). New cement-lined ductile iron water services will be provided for both fire service water (indoor sprinkler systems and outdoor hydrants) as well as domestic water service. Such capacities will be confirmed by hydrant flow tests as design proceeds.

An increase in the number of staff and students over existing conditions and other options may require larger pipe sizing and/or pressure supplementation (such as fire pumps) based on the size of the building. Such requirements will be vetted during the design process; though domestic demands are expected to remain the same under this option.

SEWER

Sanitary sewer service is provided by an 18-inch municipal sewer main in Father Morissette Boulevard, combined sewer lines in the former Anne Street, Dutton Street, Kirk Street and French Street. The new project will require construction of new PVC sanitary sewer mains (to replace the combined sewer lines in Kirk Street, the former Anne Street and the former Dutton Street) and sanitary services from the site to this main. An exterior grease trap (based on # of seats in cafeteria(s)) will be required for any sanitary sewer connections to kitchen waste lines. Acidic wastes from chemistry labs or other uses such as MEP systems will require neutralization prior to discharge into the main, and any interior floor drains will be directed to this system.

Depending on the final building location (specifically the new Gymnasium Wing) on the abutting property (existing office building), there is an existing 15-inch sanitary sewer line from Moody Street that runs under the Masonic Temple and then runs in a westerly direction to Arcand Drive (and south of the existing office building) that may need to be relocated as part of the project.

An increase in the number of staff and students over existing conditions and other options may require larger pipe sizing for the new sewer service and will likely result in larger sanitary loads to existing system in this area. Such requirements will be

vetted during the design process, though infrastructure demands in the area are expected to remain the same under this option.

NATURAL GAS

Gas service is available and currently supplied from gas mains in Arcand Drive, Father Morissette Boulevard, Kirk Street, French Street, Paige Street and the former Anne Street and the former Dutton Street. A new gas service(s) will be required for the proposed addition/renovation. National Grid Gas provides service for this area.

UNDERGROUND/ABOVE GROUND FUEL TANKS

No new underground storage tanks are anticipated.

ELECTRICAL, TELEPHONE, AND CABLE

Electrical, Telephone, and Cable service will be provided from underground lines in Arcand Drive, Father Morissette Boulevard, Kirk Street, French Street, Paige Street. A new transformer for electrical service will likely be required, and all services will be provided in underground ductbanks and/or conduit similar to existing conditions.

END OF UTILITIES

F. Major Building Systems

I. INTRODUCTION

The following reports describes the HVAC systems, Electrical systems, Technology systems, and Plumbing and Fire Protection systems for the proposed Lowell High School Project.

II. SYSTEMS DESCRIPTION(S)

A. HVAC

The following is the HVAC Systems narrative provided by Garcia, Galuska, & Desousa, Inc. which defines the scope of work and capacities of the HVAC Systems, as well as, the Basis of Design. The HVAC Systems shall be designed and constructed for **LEED for Schools v4** where indicated on this narrative.

1. CODES:

   All work installed under Division 230000 shall comply with the State of Massachusetts Building Code and all local, IMC 2015, county, and federal codes, laws, statutes, and authorities having jurisdiction.

2. DESIGN INTENT:

   The work of Division 230000 is described within the narrative report. The HVAC project scope of work shall consist of providing new HVAC equipment and systems as described here within. All new work shall consist of furnishing all materials, equipment, labor, transportation, facilities, and all operations and adjustments required for the complete and operating installation of the Heating, Ventilating, and Air Conditioning work and all items incidental thereto, including commissioning and testing.

3. BASIS OF DESIGN:
   Project weather and Code temperature values are listed herein based on weather data values as determined from ASHRAE weather data tables and the International Energy Conservation Code 2015.

   Outside: Winter 5 deg. F, Summer 88 deg. F DB, 74 deg. F WB

Inside: 70 deg. F +/- 2 deg. F for heating, 75 deg. F +/- 2 deg. F (55% RH) for cooling. Unoccupied temperature setback will be provided (60 deg. F heating (adj.), 85 deg. F cooling (adj.).

Outside air shall be provided at the rate in accordance with the ASHRAE guide 62.1-2013 and the International Mechanical Code 2015 as a minimum. All occupied areas will be designed to maintain 800 PPM carbon dioxide maximum.

4. SYSTEM DESCRIPTION:

Addition/Renovation Option 2A:

"1922 Building":

A. Central Heating Plants: ***LEED of Schools v4 Credit Ep2 & Ec2***

Heating for the 1922 Building will be through the use of a high efficiency gas-fired condensing boiler plant located within the 1922 Building mechanical room.

The new boiler plant shall be provided with (3) 5,800 MBH input (5,200 MBH) output boilers and (2) end suction base mounted primary and standby pumps, each will be located in the mechanical room. Boilers shall each be sized for approximately 50% of the building heating load. In addition to the new boilers and pumps, new hot water accessories including air separators and expansion tanks shall be provided. The boiler plant will supply heating hot water to heating equipment and systems located throughout the building through a two-pipe fiberglass insulated schedule 40 black steel and copper piping system.

The boiler plant shall supply a maximum hot water temperature of 160 deg F on a design heating day and the hot water supply water temperature will be adjusted downward based on an outside temperature reset schedule to improve the overall operating efficiency of the power plant. Primary and standby end suction base mounted pumps will be provided with variable frequency drives for variable volume flow through the water distribution system for improved energy efficiency.

Combustion air for each boiler will be directly ducted to each boiler through a galvanized ductwork distribution system. Venting from each boiler shall be through separate double wall aluminized stainless steel (AL29-4C) vent system and shall discharge approximately 12 feet

above the roof level. Final venting height will be depending on the location of building intake air locations and adjacent roofs.

B. Central Cooling Plant: ***LEED of Schools v4 Credit Ep2 & 4, Ec2***

A high efficiency central chilled water cooling plant consisting of a two (2) 210 ton high efficiency water cooled chillers, roof mounted induced draft cooling tower with filtration system, primary and standby chilled water and condenser water pumps with VFDs, accessories, controls and steel and copper piping distribution system shall be provided to serve chilled water cooling HVAC equipment located throughout the 1922 building. Each chiller shall be sized at approximately 50% of the total cooling load with 85% diversity factor applied. The chilled water system will consist of a 35% propylene glycol solution. A glycol make-up feed unit system shall be provided.

The chiller plant shall serve the air handling units throughout the building and active chilled beam induction units located in the Administration Office areas of the building.

C. Classroom Heating, Ventilation & Air Conditioning (General Classrooms, Learning Commons/Circulation Areas, Art/Music/Drama Rooms, ROTC, Science Classrooms, SPED, ELL & Life Skills): **(Full Air Conditioning VAV Displacement System)** ***LEED of Schools v4 Credit Ep2 & 4, Ec2, IEQp1, IEQc1, 2, 3, & 4***

The Classroom areas are to be served by new air handling units of the recirculation type design providing a fully air conditioned variable volume displacement ventilation air distribution systems.

New air handling units with supply and return fan with VFDs, energy recovery wheels, hot water heating and chilled water cooling with modulating capacity control, and MERV 13 filtration will be provided to serve the new fully air conditioned displacement ventilation system. Supply air will be provided to the space through new insulated, galvanized steel supply duct distribution systems and shall be connected to wall mounted displacement ventilation diffusers located within the classrooms. Return air will be drawn back to the units by ceiling return air registers located within the classroom and will be routed back to the air handling unit by an insulated galvanized sheetmetal return air ductwork distribution system. Supplemental hot water fin tube radiation or ceiling radiant heating will be provided along exterior walls.

Each classroom and support area will be provided with a variable air volume terminal box and CO2 sensor for demand ventilation control.

It is estimated that the following air handling equipment will be

required to serve these Classroom areas:

AHU-1: Air handling unit with a capacity of 9,600 CFM (34 tons cooling, 385 MBH heating output), to serve the ROTC Classroom, Community Health and Office areas.

AHU-2: Air handling unit with a capacity of 9,500 CFM (30 tons cooling, 375 MBH heating output), to serve the Music, Band, Chorus and Dance Classroom, and Scene Shop areas.

AHU-3: Air handling unit with a capacity of 9,000 CFM (6 tons cooling, 115 MBH heating output), to serve the Art Classroom areas.

AHU-4: Air handling unit with a capacity of 13,200 CFM (46 tons cooling, 530 MBH heating output), to serve the Classrooms (Basement & Level 1 South)

AHU-5: Air handling unit with a capacity of 13,300 CFM (46 tons cooling, 530 MBH heating output), to serve Classrooms (Level 2&3 South).

AHU-6: Air handling unit with a capacity of 30,500 CFM (106 tons cooling, 1,120 MBH heating output), to serve the Classrooms (Levels 1, 2 & 3 Central).

AHU-7: Air handling unit with a capacity of 30,600 CFM (107 tons cooling, 1,230 MBH heating output), to serve the Classrooms (Levels 1, 2 & 3 North).

AHU-8: Air handling unit with a capacity of 3,100 CFM (11 tons cooling, 125 MBH heating output), to serve the Makerspace /Engineering /Classrooms.

D. Auditorium and Stage: ***LEED of Schools v4 Credit Ep2 & 4, Ec2, IEQp1, IEQc1, 2, 3, & 4***

The auditorium, stage, and dressing room areas will be provided with new air handling units of the recirculation type design providing a fully air conditioned variable volume displacement ventilation air distribution system.

AHU-9: The Auditorium unit will be approximately 10,600 CFM and will include supply and return fans with VFDs, 450 MBH output hot water heating coil with modulating capacity control, 38 ton chilled water cooling coil with modulating capacity control, energy recovery wheel, and MERV 13 filtration.

AHU-10: The stage and dressing room unit will be approximately 2,500

CFM and will include supply and return fans with VFD's, 100 MBH hot water heating section with modulating capacity control, 9 ton chilled water cooling coil with modulating capacity control, energy recovery wheel, and MERV 13 filtration.

Supply air ventilation to the auditorium will be provided to the space through a galvanized steel supply duct distribution system that will connect to displacement diffusers under the seating. In addition, carbon dioxide controls will be installed which will monitor the overall level of carbon dioxide at a threshold level of 800 ppm. As levels drop generally relating to a reduction in population, the air handling unit outside air damper will modulate to reduce air flow and ventilation while always maintaining a maximum of 800 ppm. Return air will be drawn back to the units by return air registers located high on walls within the space or near the ceiling of the space.

E. Administration and Media Center Areas: ***LEED of Schools v4 Credit Ep2 & 4, Ec2, IEQp1, IEQc1, 2, 3, & 4***

Spatial heating and air-conditioning for the Administration and Media Center areas will be served by horizontal ceiling concealed type ducted 4-pipe heating and cooling active chilled beam induction units with hot water and chilled water for the induction unit system provided by the individual hot water and chilled water central recirculation piping system communicating with the boiler and chilled water power plants.

AHU-11: The ventilation air handling will serve the Administration office areas of the building. The unit capacity will be approximately 2,800 CFM and will include supply and return fan with VFDs, 110 MBH output hot water heating coil with modulating capacity control, MERV 13 filtration, 10 ton capacity chilled water cooling with modulating capacity control, and exhaust air energy recovery wheel. Supply air ventilation will be provided to each space that will satisfy building code requirements based on population.

AHU-12: The ventilation air handling will serve the Media Center area of the building. The unit capacity will be approximately 11,200 CFM and will include supply and return fan with VFDs, 450 MBH output hot water heating section with modulating capacity control, MERV 13 filtration, 39 ton capacity chilled water cooling coil with modulating capacity control, and exhaust air energy recovery wheel. Supply air ventilation will be provided to each space that will satisfy building code requirements based on population.

1980 Building:

F. Central Heating Plants: ***LEED of Schools v4 Credit Ep2 & Ec2***

Heating for the 1980 building, new gymnasium wing addition, and freshman academy addition, will be through the use of a high efficiency gas-fired condensing boiler plant.

The new boiler plant shall be provided with three (3) 5,600 MBH input (5,000 MBH output) boilers and (2) end suction base mounted primary and standby pumps, each will be located in the mechanical room. Boilers shall each be sized for approximately 50% of the building heating load. In addition to the new boilers and pumps, new hot water accessories including air separators and expansion tanks shall be provided. The boiler plant will supply heating hot water to heating equipment and systems located throughout the building through a two-pipe fiberglass insulated schedule 40 black steel and copper piping system.

The boiler plant shall supply a maximum hot water temperature of 160 deg F on a design heating day and the hot water supply water temperature will be adjusted downward based on an outside temperature reset schedule to improve the overall operating efficiency of the power plant. Primary and standby end suction base mounted pumps will be provided with variable frequency drives for variable volume flow through the water distribution system for improved energy efficiency.

Combustion air for each boiler will be directly ducted to each boiler through a galvanized ductwork distribution system. Venting from each boiler shall be through separate double wall aluminized stainless steel (AL29-4C) vent system and shall discharge approximately 12 feet above the roof level. Final venting height will be depending on the location of building intake air locations and adjacent roofs.

G. Central Cooling Plant: ***LEED of Schools v4 Credit Ep2 & 4, Ec2***

Cooling for the 1980 building, new gymnasium wing addition and freshman academy addition shall be provided by a high efficiency central chilled water cooling plant consisting of a two (2) 275 ton high efficiency water cooled chillers, roof mounted induced draft cooling tower with filtration system, primary and standby chilled water and condenser water pumps with VFDs, accessories, controls and steel and copper piping distribution system shall be provided to serve chilled water cooling HVAC equipment located throughout the building. Each chiller shall be sized at approximately 50% of the total cooling load with 85% diversity factor applied. The chilled water system will consist of a 35% propylene glycol solution. A glycol make-up feed unit system shall be provided.

The chiller plant shall serve the air handling units located throughout the building and active chilled beam induction units located in the

Administration and Media Center areas of the building.

H. Classroom Heating, Ventilation & Air Conditioning (General Classrooms, Learning Commons/Circulation Areas, Art/Music/Drama Rooms, ROTC, Science Classrooms, SPED, ELL & Life Skills)**: (Full Air Conditioning VAV Displacement System)** ***LEED of Schools v4 Credit Ep2 & 4, Ec2, IEQp1, IEQc1, 2, 3, & 4***

The Classroom areas are to be served by new air handling units of the recirculation type design providing a fully air conditioned variable volume displacement ventilation air distribution systems.

New air handling units with supply and return fan with VFDs, energy recovery wheels, hot water heating and chilled water cooling with modulating capacity control, and MERV 13 filtration will be provided to serve the new fully air conditioned displacement ventilation system. Supply air will be provided to the space through new insulated, galvanized steel supply duct distribution systems and shall be connected to wall mounted displacement ventilation diffusers located within the classrooms. Return air will be drawn back to the units by ceiling return air registers located within the classroom and will be routed back to the air handling unit by an insulated galvanized sheetmetal return air ductwork distribution system. Supplemental hot water fin tube radiation or ceiling radiant heating will be provided along exterior walls.

Each classroom and support area will be provided with a variable air volume terminal box and CO2 sensor for demand ventilation control.

It is estimated that the following air handling equipment will be required to serve these Classroom areas:

AHU-13: Air handling unit with a capacity of 4,100 CFM (14 tons cooling, 170 MBH heating output), to serve the Seminar (Teacher Planning) areas.

AHU-14: Air handling unit with a capacity of 13,000 CFM (46 tons cooling, 520 MBH heating output), to serve the Classroom areas (Level 3).

AHU-15: Air handling unit with a capacity of 3,200 CFM (14 tons cooling, 170 MBH heating output), to serve the SPED/ELL/Life Skills Classroom areas.

AHU-16: Air handling unit with a capacity of 1,400 CFM (5 tons cooling, 65 MBH heating output), to serve the Clean Energy Lab.

I. Kitchen, Custodial Support, Receiving:

LEED of Schools v4 Credit Ep2 & 4, Ec2, IEQp1, IEQc1, 2, 3, & 4

The Kitchen, Custodial Support, and Receiving areas will be provided with an air handling unit of the recirculation type design with energy recovery.

AHU-17: The unit serving the Kitchen, Custodial Support, and Receiving areas will be approximately 7,100 CFM and will include supply and return fans with VFDs, 285 MBH output hot water heating section with modulating capacity control, 25 ton chilled water cooling coil with modulating capacity control, energy recovery wheel, and MERV 13 filtration.

Supply air ventilation will be provided to each space through new galvanized supply duct which will travel throughout each area to a series of ceiling mounted supply registers. Each space shall be provided with a variable volume (VAV) terminal box with combination temperature/CO2 sensor controls. The controls will reduce outside air as allowed to maintain a maximum of 800 PPM while providing sufficient ventilation to meet the required heating or cooling load of each space. As the VAV boxes modulate, the supply and return air fans associated Variable Frequency Drives (VFD) on the air handling unit will adjust the fan speed based on system static pressure, reducing the energy consumed by the fans. New exhaust air ductwork and air distribution devices shall be installed and shall be routed from each space to the new air handling unit.

MAU-1: The Kitchen area shall be provided with a new kitchen exhaust air fan and make-up air unit. Make-up air shall be provided by a heating and ventilation air handling unit with modulating hot water heating. Kitchen hood and dishwasher exhaust fan systems will be provided.

A variable volume kitchen exhaust hood control system consisting of kitchen exhaust stack temperature and smoke density sensors, supply and exhaust fan variable speed drives and associated controller will be provided by the Kitchen Equipment Vendor. This system installation shall be field installed and coordinated with the ATC and Electrical Contractors.

J. Cafeteria:
LEED of Schools v4 Credit Ep2 & 4, Ec2, IEQp1, IEQc1, 2, 3, & 4

The Cafeteria area will be provided with a new air handling unit of the recirculation type design providing a fully air conditioned variable volume displacement ventilation air distribution system.

AHU-18: The unit serving the Cafeteria area will be approximately 16,800 CFM and will include supply and return fans with VFDs, 650 MBH output hot water heating section with modulating capacity control, 57 ton chilled water cooling coil with modulating capacity control, energy recovery wheel, and MERV 13 filtration. Supply air will be provided to the space through a new insulated, galvanized steel supply duct distribution system and shall be connected to wall mounted displacement ventilation diffusers located within each space. Return air will be drawn back to the unit by ceiling return air registers located within each space and will be routed back to the air handling unit by an insulated galvanized sheetmetal return air ductwork distribution system. Supplemental hot water fin tube radiation or ceiling radiant heating will be provided along exterior walls.

K. Culinary Arts Kitchen:
LEED of Schools v4 Credit Ep2 & 4, Ec2, IEQp1, IEQc1, 2, 3, & 4

MAU-2: The Kitchen area shall be provided with a new kitchen exhaust air fan and make-up air unit. Make-up air shall be provided by a heating, ventilation and air conditioning air handling unit with modulating hot water heating and chilled water cooling. Kitchen hood and dishwasher exhaust fan systems will be provided.

A variable volume kitchen exhaust hood control system consisting of kitchen exhaust stack temperature and smoke density sensors, supply and exhaust fan variable speed drives and associated controller will be provided by the Kitchen Equipment Vendor. This system installation shall be field installed and coordinated with the ATC and Electrical Contractors.

L. Culinary Arts Classrooms, Restaurant:
LEED of Schools v4 Credit Ep2 & 4, Ec2, IEQp1, IEQc1, 2, 3, & 4

The Culinary Arts Classroom and Restaurant areas will be provided with a new air handling unit of the recirculation type design providing a fully air conditioned variable volume displacement ventilation air distribution system.

AHU-19: The unit serving these areas will be approximately 4,800 CFM and will include supply and return fans with VFDs, 190 MBH output hot water heating section with modulating capacity control, 16 ton chilled water cooling coil with modulating capacity control, energy recovery wheel, and MERV 13 filtration. Supply air will be provided to the space through a new insulated, galvanized steel supply duct distribution system and shall be connected to wall mounted displacement ventilation diffusers located within each space. Return air will be drawn back to the unit by ceiling return air registers located within each space and will be routed back to the air handling unit by an

insulated galvanized sheetmetal return air ductwork distribution system. Supplemental hot water fin tube radiation or ceiling radiant heating will be provided along exterior walls.

M. Administration, Business/Bank/Student Activities, and Library (Media Center): ***LEED of Schools v4 Credit Ep2 & 4, Ec2, IEQp1, IEQc1, 2, 3, & 4***

Spatial heating and air-conditioning for the Administration, Business/Bank/Student Activities and Media Center areas will be served by horizontal ceiling concealed type ducted 4-pipe heating and cooling active chilled beam induction units with hot water and chilled water for the induction unit system provided by the individual hot water and chilled water central recirculation piping system communicating with the boiler and chilled water power plants.

AHU-20: The ventilation air handling will serve the Administration/Business/Bank/Student Activities area of the building. The unit capacity will be approximately 3,600 CFM and will include supply and return fan with VFDs, 155 MBH output hot water heating section with modulating capacity control, MERV 13 filtration, 13 ton capacity chilled water cooling coil with modulating capacity control, and exhaust air energy recovery wheel. Supply air ventilation will be provided to each space that will satisfy building code requirements based on population.

N. TV Studio:
LEED for Schools v4 Credit Ep2 & 4, Ec2, IEQp1, IEQc1, 2, 3, & 4

Spatial heating and air-conditioning for the TV Studio areas will be served by horizontal ceiling concealed type ducted 4-pipe heating and cooling active chilled beam induction units with hot water and chilled water for the induction unit system provided by the individual hot water and chilled water central recirculation piping system communicating with the boiler and chilled water power plants.

AHU-21: The ventilation air handling will serve the Media Center area of the building. The unit capacity will be approximately 2,300 CFM and will include supply and return fan with VFDs, 100 MBH output hot water heating section with modulating capacity control, MERV 13 filtration, 8 ton capacity chilled water cooling coil with modulating capacity control, and exhaust air energy recovery wheel. Supply air ventilation will be provided to each space that will satisfy building code requirements based on population.

O. Second and Third Floor Lightwells:

Hot water radiant heating panels shall be provided along the perimeter

of the light wells at the ceiling of each floor.

New Freshman Academy Wing:

P. Freshman Academy

The Classroom areas are to be served by new air handling units of the recirculation type design providing a fully air conditioned variable volume displacement ventilation air distribution systems.

New air handling units with supply and return fan with VFDs, energy recovery wheels, hot water heating and chilled water cooling with modulating capacity control, and MERV 13 filtration will be provided to serve the new fully air conditioned displacement ventilation system. Supply air will be provided to the space through new insulated, galvanized steel supply duct distribution systems and shall be connected to wall mounted displacement ventilation diffusers located within the classrooms. Return air will be drawn back to the units by ceiling return air registers located within the classroom and will be routed back to the air handling unit by an insulated galvanized sheetmetal return air ductwork distribution system. Supplemental hot water fin tube radiation or ceiling radiant heating will be provided along exterior walls.

Each classroom and support area will be provided with a variable air volume terminal box and CO2 sensor for demand ventilation control.

It is estimated that the following air handling equipment will be required to serve these Classroom areas:

AHU-22, 23 & 24: Three (3) air handling units, each with a capacity of 19,500 CFM (65 tons cooling, 750 MBH heating) each to serve the Freshman Academy Addition

Green House: The Green House shall be heated by ceiling suspended hot water unit heaters and ventilated by a combination of wall mounted louvers and exhaust air fans.

New Gymnasium Wing:

Q. Gym: **LEED for Schools v4 Credit Ep2 & 4, Ec2, IEQp1, IEQc1, 2, 3, & 4**

The Gym will be served by two (2) air-handling units of the recirculation type design providing a variable volume fully air conditioned displacement ventilation air distribution system. Each unit will be provided with supply and return fan with VFDs, energy recovery wheels, hot water heating and chilled water cooling with modulating capacity control, MERV 13 filtration, and carbon dioxide controls which will

reduce outside air as allowed maintaining a maximum of 800 PPM. Supply air ventilation will be provided to the space through a galvanized steel supply duct distribution system that will connect to displacement diffusers. In addition, carbon dioxide controls will be installed which will monitor the overall level of carbon dioxide at a threshold level of 800 ppm. As levels drop generally relating to a reduction in population, the air handling unit outside air damper will modulate to reduce air flow and ventilation while always maintaining a maximum of 800 ppm. Return air will be drawn back to the units by return air registers located high on walls within the space or near the ceiling of the space.

It is estimated that the air handling equipment serving the Gymnasium will have the following capacities:

AHU-25: Air handling unit with a capacity of 16,200 CFM (57tons cooling, 660 MBH heating output).

AHU-26: Air handling unit with a capacity of 16,200 CFM (57 tons cooling, 660 MBH heating output).

R. ROTC PE/Wrestling/Functional Strength/Multipurpose: **LEED for Schools v4 Credit Ep2 & 4, Ec2, IEQp1, IEQc1, 2, 3, & 4**

The ROTC PE/Wrestling/Functional Strength/Multipurpose areas will be served by two (2) air-handling units of the recirculation type design providing a variable volume fully air conditioned displacement ventilation air distribution system. Each unit will be provided with supply and return fan with VFDs, energy recovery wheels, hot water heating and chilled water cooling with modulating capacity control, MERV 13 filtration, and carbon dioxide controls which will reduce outside air as allowed maintaining a maximum of 800 PPM. Supply air ventilation will be provided to the space through a galvanized steel supply duct distribution system that will connect to displacement diffusers. In addition, carbon dioxide controls will be installed which will monitor the overall level of carbon dioxide at a threshold level of 800 ppm. As levels drop generally relating to a reduction in population, the air handling unit outside air damper will modulate to reduce air flow and ventilation while always maintaining a maximum of 800 ppm. Return air will be drawn back to the units by return air registers located high on walls within the space or near the ceiling of the space.

It is estimated that the air handling equipment serving these areas will have the following capacities:

AHU-27: Multipurpose - Air handling unit with a capacity of 3,400 CFM (10 tons cooling, 140 MBH heating output).

AHU-28: Wrestling/Func. Strength - Air handling unit with a capacity of 4,600 CFM (12 tons cooling, 185 MBH heating output).

AHU-29: ROTC PE - Air handling unit with a capacity of 2,300 CFM (7.5 tons cooling, 90 MBH heating output).

S. Locker and Team Rooms:
LEED for Schools v4 Credit Ep2 & 4, Ec2, IEQp1, IEQc1, 2, 3, & 4

The Locker Rooms, Team Rooms, and adjacent PE Office areas will be provided with a dedicated outside dehumidification air handling unit of the 100% outside air design with static plate energy recovery.

AHU-30: The unit serving Locker Rooms, Team Rooms, and adjacent PE Office areas will be approximately 13,500 CFM and will include supply and return fans with VFDs, 540 MBH output hot water heating coil with modulating capacity control, 47 ton chilled water cooling coil with modulating capacity control, energy recovery wheel, and MERV 13 filtration.

Supply air ventilation will be provided to each space through new galvanized supply duct which will travel throughout each area to a series of ceiling mounted supply registers. Each space shall be provided with a variable volume (VAV) terminal box with combination temperature/CO2 sensor controls. The controls will reduce outside air as allowed to maintain a maximum of 800 PPM while providing sufficient ventilation to meet the required heating or cooling load of each space. As the VAV boxes modulate, the supply and return air fans associated Variable Frequency Drives (VFD) on the air handling unit will adjust the fan speed based on system static pressure, reducing the energy consumed by the fans. New exhaust air ductwork and air distribution devices shall be installed and shall be routed from each space to the new air handling unit.

T. New Bridge Connectors:

The new bridge connectors shall be heated by hot water fin tube radiation or radiant panel heating systems. The connectors shall be ventilated by adjacent area air handling unit systems.

All Buildings:

U. Lobby, Corridor, and Entry Way Heating:

New hot water ceiling mounted radiant panels, cabinet unit heaters and/or fin tube radiation heating equipment shall be installed to provide heating to these areas. Corridors shall be ventilated from the

adjacent area air handling unit systems.

V. Custodial Support Areas:

Custodial support areas will be heated and ventilated by air handling unit systems. Storage areas will be heated by radiation heating equipment. Horizontal type unit heaters will heat areas adjacent to the loading dock. The loading dock and all custodial closets will be exhausted by dedicated exhaust air fan systems.

W. Utility Areas:

Utility areas will be provided with exhaust air fan systems for ventilation, and will typically be heated with horizontal type ceiling suspended unit heaters.

The Main IDF room will be air conditioned by high efficiency ductless AC cooling units approximately (2) Three Ton units.

X. Science Classrooms: Science Classrooms shall be provided with fume hood exhaust air fan systems and associated exhaust air ductwork which shall terminate above the roof and a minimum of 25 feet away from intake openings fume hood exhaust ductwork shall be constructed of stainless steel.

Y. Specialty Exhaust Systems: Exhaust air systems shall be provided for dust collectors, kilns, science fume hoods (where ductless fume hoods are not provided, 3-D printing/CNC machines, painting and welding stations).

Z. Testing, Adjusting, Balancing & Commissioning:

All new HVAC systems shall be tested, adjusted, balanced, and commissioned as part of the project scope.

AA. Automatic Temperature Controls – Building Energy Management System:

A new DDC (direct digital control) automatic temperature control and building energy management system shall be installed to control and monitor building HVAC systems. Energy metering shall be installed to monitor the energy usage of building HVAC systems and utilities (fuel, gas, water).

Addition/Renovation Option 3A - Expanded Site:

Similar to Option 2A

Option 3A has additional building connector areas between 1980 building and both the new gymnasium and freshman academy addition. These connector areas shall be provided with hot water radiation heating and dehumidified ventilation air from adjacent air handling systems.

New Option A - Expanded Site:

A. Central Heating Plants: **LEED for Schools v4 Credit Ep2 & Ec2**

Heating for the entire building will be through the use of a high efficiency gas-fired condensing boiler plant.

The new boiler plant shall be provided with (6) 4,500 MBH input (4,250 MBH output) high efficiency gas fired condensing boilers and (2) end suction base mounted primary and standby pumps; located in the mechanical room. Boilers shall each be sized for approximately 25% of the building heating load. In addition to the new boilers and pumps, new hot water accessories including air separators and expansion tanks shall be provided. The boiler plant will supply heating hot water to heating equipment and systems located throughout the building through a two-pipe fiberglass insulated schedule 40 black steel and copper piping system. The boiler plant shall supply a maximum hot water temperature of 160 deg F on a design heating day and the hot water supply water temperature will be adjusted downward based on an outside temperature reset schedule to improve the overall operating efficiency of the power plants. Primary and standby end suction base mounted pumps will be provided with variable frequency drives for variable volume flow through the water distribution system for improved energy efficiency.

Combustion air for each boiler will be directly ducted to each boiler through a galvanized ductwork distribution system. Venting from each boiler shall be through separate double wall aluminized stainless steel (AL29-4C) vent system and shall discharge approximately 12 feet above the roof level. Final venting height will be depending on the location of building intake air locations and adjacent roofs.

B. Central Cooling Plant: **LEED for Schools v4 Credit Ep2 & 4, Ec2**

A high efficiency central chilled water cooling plant consisting of a three (3) 305 ton high efficiency water cooled chillers, roof mounted induced draft cooling tower with filtration system, primary and standby chilled water and condenser water pumps with VFDs, accessories, controls and steel and copper piping distribution system shall be provided to serve chilled water cooling HVAC equipment located throughout the building. Each chiller shall be sized at approximately 1/3 of the total cooling load with 80% diversity factor applied. The chilled water system will consist of a 35% propylene glycol solution. A

glycol make-up feed unit system shall be provided.

The chiller plant shall serve the air handling units and active chilled beam induction units located in the Administration and Media Center areas of the building.

C. Classroom Heating, Ventilation & Air Conditioning (General Classrooms, Learning Commons/Circulation Areas, Art/Music/Drama Rooms, ROTC, Science Classrooms, Robotics/Makerspace, SPED, ELL, Health & Life Skills): **(Full Air Conditioning VAV Displacement System) LEED for Schools v4 Credit Ep2 & 4, Ec2, IEQp1, IEQc1, 2, 3, & 4**

The Classroom areas are to be served by new air handling units of the recirculation type design providing a fully air conditioned variable volume displacement ventilation air distribution systems.

New air handling units with supply and return fan with VFDs, energy recovery wheels, hot water heating and chilled water cooling with modulating capacity control, and MERV 13 filtration will be provided to serve the new fully air conditioned displacement ventilation system. Supply air will be provided to the space through new insulated, galvanized steel supply duct distribution systems and shall be connected to wall mounted displacement ventilation diffusers located within the classrooms. Return air will be drawn back to the units by ceiling return air registers located within the classroom and will be routed back to the air handling unit by an insulated galvanized sheetmetal return air ductwork distribution system. Supplemental hot water fin tube radiation or ceiling radiant heating will be provided along exterior walls.

Each classroom and support area will be provided with a variable air volume terminal box and CO2 sensor for demand ventilation control.

It is estimated that the following air handling equipment will be required to serve these Classroom areas:

AHU-4: Air handling unit with a capacity of 9,100 CFM (32 tons cooling, 370 MBH heating output), to serve the ROTC Classroom, PE and Office areas (Level B).

AHU-9: Air handling unit with a capacity of 5,400 CFM (19 tons cooling, 215 MBH heating output), to serve the SPED Classroom areas and adjacent Classrooms and Offices (Level 2-5).

AHU-13: Air handling unit with a capacity of 7,500 CFM (24 tons cooling, 288 MBH heating output), to serve the Music, Band, Chorus Classroom areas (Level 1).

AHU-14: Air handling unit with a capacity of 3,200 CFM (11 tons cooling, 130 MBH heating output), to serve the Dance Classroom and CADD Classroom Areas.

AHU-15: Air handling unit with a capacity of 9,000 CFM (32 tons cooling, 380 MBH heating output), to serve the Art Classroom areas (Level 1).

AHU-16: Air handling unit with a capacity of 9,000 CFM (30 tons cooling, 360 MBH heating output), to serve the Business, Robotics, Clean Energy and Makerspace, Classroom areas (Level 1).

AHU-17: Air handling unit with a capacity of 21,000 CFM (78 tons cooling, 870 MBH heating output), to serve the Classrooms (Level 1-5).

AHU-18: Air handling unit with a capacity of 21,000 CFM (78 tons cooling, 870 MBH heating output), to serve the Classrooms (Level 1-5).

AHU-19: Air handling unit with a capacity of 21,000 CFM (78 tons cooling, 870 MBH heating output), to serve the Classrooms (Level 1-5).

AHU-20: Air handling unit with a capacity of 21,000 CFM (78 tons cooling, 870 MBH heating output), to serve the Classrooms (Level 1-5).

AHU-21: Air handling unit with a capacity of 21,000 CFM (78 tons cooling, 870 MBH heating output), to serve the Classrooms (Level 1-5).

AHU-22: Air handling unit with a capacity of 21,000 CFM (78 tons cooling, 870 MBH heating output), to serve the Classrooms (Level 1-5).

AHU-23: Air handling unit with a capacity of 21,000 CFM (78 tons cooling, 870 MBH heating output), to serve the Classrooms (Level 1-5).

D. Gym and Adaptive PE Gym:
LEED for Schools v4 Credit Ep2 & 4, Ec2, IEQp1, IEQc1, 2, 3, & 4

The Gym will be served by two (2) air-handling units of the recirculation type design providing a variable volume fully air conditioned displacement ventilation air distribution system. Each unit will be provided with supply and return fan with VFDs, energy recovery wheels, hot water heating and chilled water cooling with modulating capacity control, MERV 13 filtration, and carbon dioxide controls which will reduce outside air as allowed maintaining a maximum of 800 PPM. Supply air ventilation will be provided to the space through a galvanized steel supply duct distribution system that will connect to displacement diffusers. In addition, carbon dioxide controls will be installed which will monitor the overall level of carbon dioxide at a threshold level of 800 ppm. As levels drop generally relating to a reduction in population, the air handling unit outside air damper will modulate to reduce air flow and ventilation while always maintaining a maximum of 800 ppm. Return air will

be drawn back to the units by return air registers located high on walls within the space or near the ceiling of the space.

It is estimated that the air handling equipment serving the Gymnasium will have the following capacities:

AHU-5: Air handling unit with a capacity of 13,400 CFM (46 tons cooling, 560 MBH heating output).

AHU-6: Air handling unit with a capacity of 13,400 CFM (46 tons cooling, 560 MBH heating output).

AHU-7: Air handling unit with a capacity of 7,800 CFM (27 tons cooling, 330 MBH heating output).

E. Locker, Team Fitness, Nurses Office and Costume/Scene Shop Areas:
LEED for Schools v4 Credit Ep2 & 4, Ec2, IEQp1, IEQc1, 2, 3, & 4

The Locker Rooms, Team Rooms, and Fitness Room areas will be provided with a dedicated outside dehumidification air handling unit of the 100% outside air design with static plate energy recovery.

AHU-8: The unit serving Locker Rooms, Team Rooms, Fitness Room, Nurses Office and Costume/Scene Shop Areas will be approximately 18,600 CFM and will include supply and return fans with VFDs, 780 MBH output hot water heating coil with modulating capacity control, 65 ton chilled water cooling coil with modulating capacity control, energy recovery wheel, and MERV 13 filtration.

Supply air ventilation will be provided to each space through new galvanized supply duct which will travel throughout each area to a series of ceiling mounted supply registers. Each space shall be provided with a variable volume (VAV) terminal box with combination temperature/CO2 sensor controls. The controls will reduce outside air as allowed to maintain a maximum of 800 PPM while providing sufficient ventilation to meet the required heating or cooling load of each space. As the VAV boxes modulate, the supply and return air fans associated Variable Frequency Drives (VFD) on the air handling unit will adjust the fan speed based on system static pressure, reducing the energy consumed by the fans. New exhaust air ductwork and air distribution devices shall be installed and shall be routed from each space to the new air handling unit.

F. Auditorium and Stage:
LEED for Schools v4 Credit Ep2 & 4, Ec2, IEQp1, IEQc1, 2, 3, & 4

The auditorium and stage will be provided with new roof-mounted air handling units of the recirculation type design providing a fully air conditioned variable

volume displacement ventilation air distribution system.

AHU-12: The stage unit will be approximately3,500 CFM and will include supply and return fans with VFD's, 150 MBH hot water heating section with modulating capacity control, 13 ton chilled water cooling coil with modulating capacity control, energy recovery wheel, and MERV 13 filtration.

AHU-11: The Auditorium unit will be approximately 10,500 CFM and will include supply and return fans with VFDs, 440 MBH output hot water heating coil with modulating capacity control, 38 ton chilled water cooling coil with modulating capacity control, energy recovery wheel, and MERV 13 filtration.

Supply air ventilation to the auditorium will be provided to the space through a galvanized steel supply duct distribution system that will connect to displacement diffusers under the seating. In addition, carbon dioxide controls will be installed which will monitor the overall level of carbon dioxide at a threshold level of 800 ppm. As levels drop generally relating to a reduction in population the air handling unit outside air damper will modulate to reduce air flow and ventilation while always maintaining a maximum of 800 ppm. Return air will be drawn back to the units by return air registers located high on walls within the space or near the ceiling of the space.

G. Administration Areas and Media Center:
LEED for Schools v4 Credit Ep2 & 4, Ec2, IEQp1, IEQc1, 2, 3, & 4

Spatial heating and air-conditioning for the Administration and Media Center areas will be served by horizontal ceiling concealed type ducted 4-pipe heating and cooling active chilled beam induction units with hot water and chilled water for the induction unit system provided by the individual hot water and chilled water central recirculation piping system communicating with the boiler and chilled water power plants.

AHU-24: The ventilation air handling will serve the Media Center (Level 4) area of the building. The unit capacity will be approximately 9,800 CFM and will include supply and return fan with VFDs, 405 MBH output hot water heating section with modulating capacity control, MERV 13 filtration, 35 ton capacity chilled water cooling coil with modulating capacity control, and exhaust air energy recovery wheel. Supply air ventilation will be provided to each space that will satisfy building code requirements based on population.

AHU-1: The ventilation air handling will serve the Administration office areas (Level 1-5) of the building. The unit capacity will be approximately 3,800 CFM and will include supply and return fan with VFDs, 170 MBH output hot water heating coil with modulating capacity control, MERV 13 filtration, 13 ton capacity chilled water cooling with modulating capacity control, and exhaust air energy recovery wheel. Supply air ventilation will be provided to each space that will satisfy building code requirements based on population.

H. Kitchen, Custodial Support, Receiving:
LEED for Schools v4 Credit Ep2 & 4, Ec2, IEQp1, IEQc1, 2, 3, & 4

The Kitchen, Custodial Support, and Receiving areas will be provided with an air handling unit of the recirculation type design with energy recovery.

AHU-10: The unit serving the Kitchen, Custodial Support, and Receiving areas will be approximately 7,100 CFM and will include supply and return fans with VFDs, 285 MBH output hot water heating section with modulating capacity control, 25 ton chilled water cooling coil with modulating capacity control, energy recovery wheel, and MERV 13 filtration.

Supply air ventilation will be provided to each space through new galvanized supply duct which will travel throughout each area to a series of ceiling mounted supply registers. Each space shall be provided with a variable volume (VAV) terminal box with combination temperature/CO2 sensor controls. The controls will reduce outside air as allowed to maintain a maximum of 800 PPM while providing sufficient ventilation to meet the required heating or cooling load of each space. As the VAV boxes modulate, the supply and return air fans associated Variable Frequency Drives (VFD) on the air handling unit will adjust the fan speed based on system static pressure, reducing the energy consumed by the fans. New exhaust air ductwork and air distribution devices shall be installed and shall be routed from each space to the new air handling unit.
MAU-1: The Kitchen area shall be provided with a new kitchen exhaust air fan and make-up air unit. Make-up air shall be provided by a heating and ventilation air handling unit with modulating hot water heating. Kitchen hood and dishwasher exhaust fan systems will be provided.

A variable volume kitchen exhaust hood control system consisting of kitchen exhaust stack temperature and smoke density sensors, supply and exhaust fan variable speed drives and associated controller will be provided by the Kitchen Equipment Vendor. This system installation shall be field installed and coordinated with the ATC and Electrical Contractors.

I. Cafeteria (including Staff Lunch Room/Credit Union/Cafeteria Storage):
LEED for Schools v4 Credit Ep2 & 4, Ec2, IEQp1, IEQc1, 2, 3, & 4

The Cafeteria area will be provided with a new air handling unit of the recirculation type design providing a fully air conditioned variable volume displacement ventilation air distribution system.

AHU-2: The unit serving the Cafeteria area will be approximately 17,700 CFM and will include supply and return fans with VFDs, 690 MBH output hot water heating section with modulating capacity control, 60 ton chilled water cooling coil with modulating capacity control, energy recovery wheel, and MERV 13 filtration. Supply air will be provided to the space through a new insulated, galvanized steel supply duct distribution system and shall be connected to

wall mounted displacement ventilation diffusers located within each space. Return air will be drawn back to the unit by ceiling return air registers located within each space and will be routed back to the air handling unit by an insulated galvanized sheetmetal return air ductwork distribution system. Supplemental hot water fin tube radiation or ceiling radiant heating will be provided along exterior walls.

J. Culinary Arts Kitchen:
LEED for Schools v4 Credit Ep2 & 4, Ec2, IEQp1, IEQc1, 2, 3, & 4

MAU-2: The Kitchen area shall be provided with a new kitchen exhaust air fan and make-up air unit. Make-up air shall be provided by a heating, ventilation and air conditioning air handling unit with modulating hot water heating and chilled water cooling. Kitchen hood and dishwasher exhaust fan systems will be provided.

A variable volume kitchen exhaust hood control system consisting of kitchen exhaust stack temperature and smoke density sensors, supply and exhaust fan variable speed drives and associated controller will be provided by the Kitchen Equipment Vendor. This system installation shall be field installed and coordinated with the ATC and Electrical Contractors.

K. Culinary Arts Classrooms, Restaurant, Business Classrooms:
LEED for Schools v4 Credit Ep2 & 4, Ec2, IEQp1, IEQc1, 2, 3, & 4

The Culinary Arts Classroom and Restaurant areas will be provided with a new air handling unit of the recirculation type design providing a fully air conditioned variable volume displacement ventilation air distribution system.

AHU-3: The unit serving these areas will be approximately 7,200 CFM and will include supply and return fans with VFDs, 200 MBH output hot water heating section with modulating capacity control, 17 ton chilled water cooling coil with modulating capacity control, energy recovery wheel, and MERV 13 filtration. Supply air will be provided to the space through a new insulated, galvanized steel supply duct distribution system and shall be connected to wall mounted displacement ventilation diffusers located within each space. Return air will be drawn back to the unit by ceiling return air registers located within each space and will be routed back to the air handling unit by an insulated galvanized sheetmetal return air ductwork distribution system. Supplemental hot water fin tube radiation or ceiling radiant heating will be provided along exterior walls.

L. TV Studio:
LEED for Schools v4 Credit Ep2 & 4, Ec2, IEQp1, IEQc1, 2, 3, & 4

Spatial heating and air-conditioning for the TV Studio areas will be served by horizontal ceiling concealed type ducted 4-pipe heating and cooling active chilled beam induction units with hot water and chilled water for the induction

unit system provided by the individual hot water and chilled water central recirculation piping system communicating with the boiler and chilled water power plants.

AHU-25: The ventilation air handling will serve the TV Studio (Level 4) area of the building. The unit capacity will be approximately 2,000 CFM and will include supply and return fan with VFDs, 100 MBH output hot water heating section with modulating capacity control, MERV 13 filtration, 7.5 ton capacity chilled water cooling coil with modulating capacity control, and exhaust air energy recovery wheel. Supply air ventilation will be provided to each space that will satisfy building code requirements based on population.

M. Lobby, Corridor, and Entry Way Heating:

New hot water ceiling mounted radiant panels, cabinet unit heaters and/or fin tube radiation heating equipment shall be installed to provide heating to these areas. Corridors shall be ventilated from the common circulation air handling unit systems.

N. Custodial Support Areas:

Custodial support areas will be heated and ventilated by AHU-9. Storage areas will be heated by radiation heating equipment. Horizontal type unit heaters will heat areas adjacent to the loading dock. The loading dock and all custodial closets will be exhausted by dedicated exhaust air fan systems.

O. Utility Areas:

Utility areas will be provided with exhaust air fan systems for ventilation, and will typically be heated with horizontal type ceiling suspended unit heaters.

The Main IDF room will be air conditioned by high efficiency ductless AC cooling units approximately (2) Three Ton units.

P. Specialty Exhaust Systems: Exhaust air systems shall be provided for dust collectors, kilns, science fume hoods (where ductless fume hoods are not provided, 3-D printing/CNC machines, painting and welding stations).

Q. Testing, Adjusting, Balancing & Commissioning:

All new HVAC systems shall be tested, adjusted, balanced, and commissioned as part of the project scope.

R. Automatic Temperature Controls – Building Energy Management System:

A new DDC (direct digital control) automatic temperature control and building energy management system shall be installed to control and monitor building HVAC systems. Energy metering shall be installed to monitor the energy

usage of building HVAC systems and utilities (fuel, gas, water).

5. TESTING REQUIREMENTS:

A. The Mechanical Contractor shall provide testing of the following systems with the Owner and Owner's Representative present:

1. Boiler plant system

2. Chilled water plant system

3. Air handling unit systems including all supply, return and exhaust air systems

4. Terminal heating and cooling devices

5. Automatic temperature control and building energy management system

B. Testing reports shall be submitted to the Engineer for review and approval before providing to the Owner.

6. OPERATION MANUALS AND MAINTENANCE MANUALS: When the project is completed, the Mechanical Contractor shall provide operation and maintenance manuals to the Owner.

7. RECORD DRAWINGS AND CONTROL DOCUMENTS: When the project is completed, an as-built set of drawings, showing all mechanical system requirements from contract and addendum items will be provided to the Owner.

8. COMMISSIONING: The project shall be commissioned per Section 018000 of the specifications.

END OF HVAC

B. ELECTRICAL

The following is the Electrical Systems narrative provided by Garcia, Galuska, & Desousa, Inc., which defines the scope of work and capacities of the Power and Lighting System, as well as, the Basis of Design. The Electrical Systems shall be designed and constructed for ***LEED for Schools V4*** where indicated on this narrative.

1. CODES

   All work installed under Section 260000 shall comply with the Massachusetts State Building Code and all local, county, and federal codes, laws, statutes, and authorities having jurisdiction.

2. DESIGN INTENT

   The work of Section 260000 is as described in this Narrative. All work is new and consists of furnishing all materials, equipment, labor, transportation, facilities, and all operations and adjustments required for the complete and operating installation of the Electrical work and all items incidental thereto, including commissioning and testing.

3. SEQUENCE OF OPERATIONS AND INTERACTIONS

   A. Classroom and Corridor lighting will be controlled via "addressable relays", which is achieved through programming networked controls. The control of the relays will be by automatic means, such as an occupancy sensor in each classroom. The system will have a BacNet gateway and will be interfaced with the DDC control system for scheduled functions. The controllability shall be in conformance with credit ***LEED credit IEQC 6.1.***

   B. Exterior lighting will be controlled by photocell "ON" and "scheduled" for "OFF" operation. The parking area lighting will be controlled by "zones" with dimmable capability.

   C. Emergency and Exit lighting will be run through life safety panels and will be "ON" during normal power conditions, as well as, power outage conditions. The emergency lighting system will have time control so that lights are "ON" only when building is occupied.

4. DESCRIPTION OF THE SYSTEMS

Addition/Renovation Option 2A:

A. Electrical Distribution System:

1. Service ratings are designed for a connected load of 10 watts/s.f. There will be multiple services rated at 277/480V, 3∅, 4 wire with 100% rated main breakers as follows:
   a. "1922 Building" (Original 1892 Coburn/1922 Sullivan Addition/1997 Kouloheras Addition) – New 4,000 ampere
   b. Lord Addition – (2) New 2,500 amperes services

2. New lighting and power panels will be provided to accommodate respective loads. The equipment will be located in dedicated rooms or closets.

B. Interior Lighting System:

1. Classroom lighting fixtures will consist of recessed mounted direct luminaries with LED lamps and electronic dimmable drivers in the 1922 Building. Pendant direct/indirect will be used in Lord/Addition Building. The fixtures will be pre-wired for continuous dimming control where natural daylight is available and also for multi-level switching. Two daylight dimming zones will be provided in each classroom.

2. Office lighting fixtures will consist of recessed mounted direct LED luminaries and electronic drivers for dual-level switching in the 1922 Building. Pendant direct/indirect will be used in Lord/Addition Building. Offices on the perimeter with windows will have daylight dimming controls similar to classrooms.

   In general, lighting power density will be 20% less than IECC-2015. The power density reduction relates to ***LEED credit EAC.1.***

3. Lighting levels will be approximately 30 foot candles in classrooms and offices. The daylight dimming foot-candle level will be in compliance with ***LEED Credit IEQC 6.1.***

4. Gymnasium lighting will be comprised of direct fixtures with LED source and electronic drivers. The fixtures will be provided with clear lens and protective wire guards. The light level will be designed for approximately 50 foot candles. Multi-level switching will be provided.

   Daylight dimming will be provided within 15 feet of skylights or glazing. Daylight dimming controls will be similar in operation to classrooms.

5. Corridor lighting will be comprised of recessed acrylic fixtures with LED lamps and electronic drivers. The Corridor light level will

be designed for approximately 20 foot candles. Corridor lighting will be schedule control and only "ON" during occupied hours. The Corridor lighting will be controlled by schedule, and occupancy sensors

6. Cafeteria lighting will be pendant direct/indirect fixtures with LED source and electronic drivers. The light levels will be designed for approximately 30 foot candles. Daylighting controls will be provided on perimeter light fixtures with 15 feet of glazing

7. Stage and Auditorium theatrical lights:
    - LED-based lighting system consisting of switched power and Ethernet control distributed to devices mounted lighting positions in the house, stage, balcony and side lighting positions
    - Flexible, Ethernet-based control system with either hard-wired DMX or Ethernet port at every position
    - Control of architectural lighting fixtures through entry stations and a portable touch panel
    - Computerized control console with Ethernet connection and touch panel monitors
    - Compliment of LED lighting fixtures including ellipsoidal, PAR and cyclorama fixtures
    - Wireless remote for console
    - Power, data and fixtures accessories
    - Support for moving lights and other DMX-controlled lighting accessories

8. Kitchen and Servery lighting will consist of recessed 2'x4' acrylic lensed gasketed troffers with aluminum frame doors with LED lamps and electronic drivers. Light levels will be approximately 50 foot candles.

9. Library lighting will consist of recessed direct fixtures with LED lamps and electronic drivers. Light levels will be approximately 30 foot candles.

10. Each area will be locally switched and designed for multi-level controls. Each Classroom, Office space, and Toilet room will have occupancy sensors to turn lights off when unoccupied. Manual switching will be provided in each spaces. Classrooms and offices will have manual dimming capability.

11. Daylight dimming sensors will be installed in each room where natural light is available for continuous dimming of light fixtures. The control system will be in accordance with ***LEED credit IEQC 6.1.***

12. The entire school will be controlled with an automatic lighting control system for programming of interior and exterior lights "on and off". Lighting control system will be interfaced with DDC system.

C. Emergency Standby System:

1. Two exterior 350 kW diesel emergency generators with sound attenuated enclosures and a 72 hour base tanks with alarms will be provided at the 1922 Building; the Lord/Addition Building. Light fixtures and LED Exit signs will be installed to serve all egress areas such as Corridors, Intervening Spaces, Toilets, Stairs, and Exit discharge exterior doors. The Administration area lighting will be connected to the emergency generator.

2. The generator loads will include fire safety systems, boilers and Circulating pumps, elevator, kitchen equipment, and communications and security systems.

3. The generator loads will also include for HVAC equipment serving gymnasium, cafeteria, kitchen, main administration offices, and nurse's suite.

D. Site Lighting System: ***LEED Credit SSC8***

1. Fixtures for area lighting will be pole mounted cut-off 'LED' luminaries in the parking area and roadways. Pole heights will be 20 feet. The exterior lighting will be connected to the automatic lighting control system for photocell "ON" and timed "OFF" operation. The site lighting fixtures will be dark sky compliant. The illumination level will be 0.5fc for parking areas in accordance with Illuminating Engineering Society.

2. Building perimeter will be 'LED' wall mounted cut-off fixtures over exterior doors for Exit discharge.

E. Wiring Devices:

1. Each classroom will have a minimum of (2) duplex receptacles per teaching wall and (2) double duplex receptacles on dedicated circuits at classroom computer workstations. The teacher's workstation will have a double duplex receptacle also on a dedicated circuit.

2. Office areas will generally have (1) duplex outlet per wall. At each workstation a double duplex receptacle will be provided.

3. Corridors will have a cleaning receptacle at approximately 25-40 foot intervals.

4. Exterior weatherproof receptacles with lockable enclosures will be installed at exterior doors.

5. A system of computer grade panelboards with double neutrals and surge protective devices will be provided for receptacle circuits.

6. Surface mounted raceways will be provided within renovated areas where raceways cannot be concealed in public spaces.

F. Fire Alarm System:

1. A fire alarm and detection system with networked panels will be provided with battery back-up. The system will be of the addressable type where each device will be identified at the control panel and remote annunciator by device type and location to facilitate search for origin of alarms. The fire command center shall be located in the Lord Building.

2. Smoke detectors will be provided in open areas, corridors, stairwells and other egress ways.

3. The sprinkler system will be supervised for water flow and tampering with valves.

4. Speaker/strobes will be provided in egress ways, classrooms, assembly spaces, open areas, and other large spaces. Strobe only units will be provided in single toilets and conference rooms.

5. Manual pull stations will be provided at Exit discharge doors and at each egress stairwell not located at grade level.

6. The system will be remotely connected to automatically report alarms to fire department via an approved method by the fire department.

7. The generator status panel shall be located at the fire command center.

8. A mass notification system will be provided with separate strobes from fire alarm system. Audible tone shall be through fire alarm speakers. System activation shall be through panic buttons and card readers with dedicated lockdown key fob.

G. Uninterruptible Power Supply (UPS):

1. Two (2) 45 kW, three phase centralized UPS system will be provided with seven minutes of battery back-up, one per building.

2. The system will provide conditioned power to sensitive electronic loads, telecommunication systems, bridge over power interruptions of short duration and allow an orderly shutdown of servers and communication systems during a prolonged power outage.

3. The UPS system will also be connected to the stand-by generator.

H. Lightning Protection System:

1. A system of lightning protection devices will be provided.

2. The lightning protection equipment will include air terminals, roof main conductors and down conductors, conduits, fasteners, connectors, ground rods, etc.

3. The facility will be issued a UL Master Label Certificate.

I. Renewable Energy System Provisions:

1. Electrical provisions will be made for a roof mounted renewable energy system consisting of 100 kw grid per building connected photovoltaic PV system intended to reduce the facilities demand for power.

J. Interior Scoreboard:

1. Two interior scoreboards with six shot clocks will be provided in the gymnasium.

K. Two-Way Communications System:

1. A Two-Way Communications System will be provided at the elevator lobbies that do not have grade access.

L. Distribution Antennae System (DAS):

1. A public safety radio distributed antenna system (DAS) which consists of bi-directional amplifiers (BDA), donor antennas, coverage antennas, coax cable, coax connectors, splitters, combiners and couplers. These devices will be used as part of a system for in-building public safety 2-way radio system communication. Frequencies for Fire, Police, and School shall be included in DAS system headend.

M. Security and Communications System Provisions:

1. Electrical Contractor will provide Integrated Security System and Technology System provisions including outlet boxes, empty raceways, 120 volt power, cable trays, and grounding.

2. Refer to separate TSG Solutions Security Systems Narrative.

N. Phasing

1. The Work will be conducted in phases to provide the least possible interference to the activities of the existing School.

Addition/Renovation Option 3 – Expanded Site:

Similar to Option 2A

New Option A – Expanded Site:

A. Electrical Distribution System:

1. Service ratings are designed for a connected load of 10 watts/s.f. The service capacity will be sized for two (2) services each rated at 4,000 amperes at 277/480 volt, 3∅, 4 wire with 100% rated main breakers. New lighting and power panels will be provided to accommodate respective loads. The equipment will be located in dedicated rooms or closets.

B. Interior Lighting System:

1. Classroom lighting fixtures will consist of pendant mounted indirect luminaries with LED source and electronic dimmable drivers. The fixtures will be pre-wired for continuous dimming control where natural daylight is available and also for multi-level switching. Two daylight dimming zones will be provided in each classroom.

2. Office lighting fixtures will consist of pendant mounted indirect LED luminaries and electronic drivers for dual-level switching. Offices on the perimeter with windows will have daylight dimming controls similar to classrooms.

   In general, lighting power density will be 20% less than IECC 2015. The power density reduction relates to ***LEED Credit EAC.1.***

3. Lighting levels will be approximately 30 foot candles in classrooms and offices. The daylight dimming foot-candle level will be in compliance with ***LEED Credit IEQC 6.1.***

4. Gymnasium lighting will be comprised of direct fixtures with LED sources and electronic drivers. The fixtures will be provided with clear lens and protective wire guards. The light level will be designed for approximately 50 foot candles. Multi-level switching will be provided.

   Daylight dimming will be provided within 15 feet of skylights or glazing. Daylight dimming controls will be similar in operation to classrooms.

5. Corridor lighting will be comprised of recessed acrylic fixtures with LED light engine and electronic drivers. The Corridor light level will be designed for approximately 20 foot candles. Corridor lighting will be on scheduled control and only "ON" during occupied hours. The Corridor lighting will be dual-level controlled by schedule.

6. Cafeteria lighting will be pendant direct/indirect fixtures with LED lamps and electronic drivers. The light levels will be designed for approximately 30 foot candles. Daylighting controls will be provided on perimeter light fixtures with 15 feet of glazing

7. Stage and Auditorium theatrical lights:

   - LED-based lighting system consisting of switched power and Ethernet control distributed to devices mounted lighting positions in the house, stage, balcony and side lighting positions
   - Flexible, Ethernet-based control system with either hard-wired DMX or Ethernet port at every position
   - Control of architectural lighting fixtures through entry stations and a portable touch panel
   - Computerized control console with Ethernet connection and touch panel monitors
   - Compliment of LED lighting fixtures including ellipsoidal, PAR and cyclorama fixtures
   - Wireless remote for console
   - Power, data and fixtures accessories
   - Support for moving lights and other DMX-controlled lighting accessories

8. TV Studio lighting will consist of pipe grid mounted receptacles and pipe mounted LED lights with DMX dimming controls.

9. Kitchen and Servery lighting will consist of recessed 2'x4' acrylic lensed gasketed troffers with aluminum frame doors with LED lamps and electronic drivers. Light levels will be approximately 50 foot candles.

10. Media Center lighting will consist of pendant indirect fixtures with LED source and electronic drivers. Light levels will be approximately 30 foot candles.

11. Each area will be locally switched and designed for multi-level controls. Each Classroom, Office space, and Toilet room will have occupancy sensors to turn lights off when unoccupied.

12. Daylight dimming sensors will be installed in each room where natural light is available for continuous dimming of light fixtures. The control system will be in accordance with ***LEED Credit IEQC 6.1.***

13. The entire school will be controlled with an automatic lighting control system for programming of interior and exterior lights "on and off". Lighting control system will be interfaced with DDC system.

C. Emergency Standby System:

1. An exterior 600 kW diesel emergency generator with sound attenuated enclosure and a 72 hour base tank with alarms will be provided. An integral 3000 kW resistive load bank will be provided for generator testing under load. Light fixtures and LED Exit signs will be installed to serve all egress areas such as Corridors, Intervening Spaces, Toilets, Stairs, and Exit discharge exterior doors. The Administration area lighting will be connected to the emergency generator.

2. The generator loads will be sized to also include fire safety systems, boilers and circulating pumps, (1) elevator, kitchen equipment, and communications and security systems.

3. The generator loads will also include HVAC equipment serving gymnasium, cafeteria, kitchen, main administration offices, and nurse's suite.

D. Site Lighting System: ***LEED Credit SSC8***

1. Fixtures for area lighting will be pole mounted cut-off 'LED' luminaries in the parking area and roadways. Pole heights will be 20 feet. The exterior lighting will be connected to the automatic lighting control system for photocell "ON" and timed "OFF" operation. The site lighting fixtures will be dark sky compliant.

The illumination level will be 0.5fc for parking areas in accordance with Illuminating Engineering Society.

2. Building perimeter fixtures will be 'LED' wall mounted cut-off over exterior doors for Exit discharge.

E. Wiring Devices:

1. Each classroom will have a minimum of (2) duplex receptacles per teaching wall and (2) double duplex receptacles on dedicated circuits at classroom computer workstations. The teacher's workstation will have a double duplex receptacle also on a dedicated circuit.

2. Office areas will generally have (1) duplex outlet per wall. At each workstation a double duplex receptacle will be provided.

3. Corridors will have a cleaning receptacle at approximately 25-40 foot intervals.

4. Exterior weatherproof receptacles with lockable enclosures will be installed at exterior doors.
5. A system of computer grade panelboards with double neutrals and surge protective devices will be provided for receptacle circuits.

F. Fire Alarm System:

1. A fire alarm and detection system will be provided with battery back-up. The system will be of the addressable type where each device will be identified at the control panel and remote annunciator by device type and location to facilitate search for origin of alarms.

2. Smoke detectors will be provided in open areas, corridors, stairwells and other egress ways.

3. The sprinkler system will be supervised for water flow and tampering with valves.

4. Speaker/strobes will be provided in egress ways, classrooms, assembly spaces, open areas, and other large spaces. Strobe only units will be provided in single toilets and conference rooms.

5. Manual pull stations will be provided at Exit discharge doors and at each egress stairwell not located at grade level.

6. The system will be remotely connected to automatically report alarms to fire department via an approved method by the fire department.

7. The generator status panel will be located at the Fire Command Center.

8. The emergency responder radio coverage DAS annunciator will be located at the fire command center.

9. A mass notification system will be provided with separate strobes from a fire alarm system. Audible tone shall be through fire alarm speakers. System activation shall be through panic buttons and card readers with dedicated lockdown key fob.

G. Uninterruptible Power Supply (UPS):

1. Two (2) 45Kw, three (3) phase centralized UPS system will be provided with seven minutes of battery back-up.

2. The system will provide conditioned power to sensitive electronic loads, telecommunication systems, bridge over power interruptions of short duration and allow an orderly shutdown of servers and communication systems during a prolonged power outage.

3. The UPS system will also be connected to the stand-by generator.

H. Lightning Protection System:

1. A system of lightning protection devices will be provided.

2. The lightning protection equipment will include air terminals, roof and down conductors, conduits, fasteners, connectors, ground rods, etc.

3. The facility will be issued a UL Mater Label Certificate.

I. Renewable Energy System Provisions:

1. Electrical provisions will be made for a roof mounted renewable energy system consisting of 300 kW grid connected photovoltaic PV system intended to reduce the facilities demand for power.

J. Interior Scoreboard:

1. Two interior scoreboards with six shot clocks will be provided in the gymnasium.

K. Two-Way Communications System:

1. A Two-Way Communications System will be provided at the

elevator lobbies that do not have grade access.

L. Distributed Antennae System (DAS):

1. A public safety radio distributed antenna system (DAS) which consists of bi-directional amplifiers (BDA), remote annunciator, donor antennas, coverage antennas, coax cable, coax connectors, splitters, combiners and couplers. These devices will be used as part of a system for in-building public safety 2-way radio system communication. Frequencies for Fire, Police, and School shall be included in DAS system headend.

M. Security and Communications System Provisions:

1. Electrical Contractor will provide Integrated Security System and Technology System provisions including outlet boxes, empty raceways, 120 volt power, cable trays, and grounding.

2. Refer to separate TSG Solutions Security Systems Narrative.

N. New Bridge Connectors:

1. The new bridge connectors shall be provided with recessed LED lighting, addressable fire alarm system and general-purpose receptacles for convenience purposes.

5. SITE UTILITIES

The incoming services including electric, fire alarm, telephone, cable TV, and fiber will be underground. Three exterior pad mounted transformers will be provided by the utility company.

6. TESTING REQUIREMENTS

A. The Electrical Contractor shall provide testing of the following systems with the Owner and Owner's Representative present:

- Lighting and power panels for correct phase balance.
- Emergency generator system.
- Lighting control system (interior and exterior).
- Fire alarm system.
- Uninterruptible Power System, UPS.
- Lightning protection system.
- Two-way communication system.
- Distributed Antennae system.

B. Testing reports shall be submitted to the Engineer for review and approval before providing to the Owner.

7. OPERATION MANUALS AND MAINTENANCE MANUALS

When the project is completed, the Electrical Contractor shall provide operation and maintenance manuals to the Owner.

8. RECORD DRAWINGS AND CONTROL DOCUMENTS

When the project is completed, an as-built set of drawings, showing all lighting and power requirements from contract and addendum items, will be provided to the Owner.

9. COMMISSIONING

The project shall be commissioned per Commissioning Section of the specifications.

10. PHASING

The Work will be conducted in phases to provide the least possible interference to the activities of the existing School.

END OF ELECTRICAL

C. TECHNOLOGY

The following is the Technology System narrative provided by Garcia, Galuska, & Desousa, Inc., which defines the scope of work and capacities of the Communications system infrastructure as well as the Basis of Design.

1. CODES

   A. All work installed under Section 270000 shall comply with the Massachusetts Building Code, IBC 2009 and all local, county, and federal codes, laws, statues, and authorities having jurisdiction.

2. DESIGN INTENT

   A. All work is new and consists of furnishing all materials, equipment, labor, transportation, facilities, and all operations and adjustments required for the complete and operating installation of the Technology work and all items incidental thereto, including commissioning and testing.

3. TECHNOLOGY

Addition/Renovation Option 2A:

A. The data system infrastructure will consist of fiber optic backbone cabling horizontal wiring will consist of Category 6A UTP Plenum rated cabling for both data and telephone systems for gigabit connectivity. The telephone infrastructure will accommodate VOIP based voice systems. A new IP telephone system will be used.

B. Each classroom will have four (4) data outlets for student computers. Two data, one voice with video and audio connections to a wall mounted projector will be provided at the teacher's station with interconnectivity to an interactive whiteboard. A wall phone outlet with 2-way ceiling speaker will be provided for communications with administration. Wireless access points will be provided in all classrooms and other spaces with two (2) CAT6A cables with (2) strands of single mode fiber.

C. A central paging system will be provided and integrated with the telephone system.

D. A wireless GPS/LAN based master clock system will be provided with 120V wireless remote clocks that act as transceivers.

E. The Main Distribution Frame (MDF) will contain all core network switching and IP voice switch. Intermediate Distribution Frames (IDFs) will serve each floor/wing of the school. A fiber optic backbone will be provided from each IDF to MDF. The backbone will be designed for 10 Gbps Ethernet.

F. Phasing

1. The existing telephone, internet and cable-TV services will be impacted by phasing. The impact will be minimal as the existing service is present but will need to be relocated to head end room. The temporary services shall be relocated to a new head end room in Phase 1 portion of the building to remain. New 12 strand multi-mode fiber and back bone 50 copper pairs will be run from head end room to each remaining IDF room.

Addition/Renovation Option 3A at Expanded Existing Site:

Similar to Addition/Renovation Option 2A.

New Option A – Expanded Site:

A. The data system infrastructure will consist of fiber optic backbone cabling horizontal wiring will consist of Category 6A UTP Plenum rated cabling for both data and telephone systems for gigabit connectivity. The telephone infrastructure will accommodate VOIP based voice systems. A new IP telephone system will be used.

B. Each classroom will have four (4) data outlets for student computers. Two data, one voice with video and audio connections to a wall mounted projector will be provided at the teacher's station with interconnectivity to an interactive whiteboard. A wall phone outlet with 2-way ceiling speaker will be provided for communications with administration. Wireless access points will be provided in all classrooms and other spaces with two (2) CAT6A cables with (2) strands of single mode fiber.

C. A central paging system will be provided and integrated with the telephone system.

D. A wireless GPS/LAN based master clock system will be provided with 120V wireless remote clocks that act as transceivers.

E. The Main Distribution Frame (MDF) will contain all core network switching and IP voice switch. Intermediate Distribution Frames (IDFs) will serve each floor/wing of the school. A fiber optic backbone will be provided from each IDF to MDF. The backbone will be designed for 10 Gbps Ethernet.

4. TESTING REQUIREMENTS

A. The Technology Contractor shall provide testing of the following systems

with the Owner and Owner's representative present:

- Telephone and data cabling
- Fiber optic backbone cabling
- Paging system
- Wireless clock system
- A/V wiring for classrooms

Testing reports shall be submitted to the engineer for review and approval before providing to the Owner.

5. OPERATION MANUALS AND MAINTENANCE MANUALS:

   A. When the project is completed, the Technology Contractor shall provide operation and maintenance manuals to the Owner.

6. RECORD DRAWINGS AND CONTROL DOCUMENTS:

   A. When the project is completed, an as-built set of drawings, showing all lighting and power requirements from contract and addendum items, will be provided to the Owner.

7. COMMISSIONING

   A. The project shall be commissioned per Commissioning Section of the specifications.

END OF TECHNOLOGY

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D. PLUMBING /FIRE PROTECTION:

The following is the HVAC Systems narrative provided by VAV International, which defines the scope of work and capacities of the HVAC Systems.

Addition/Renovation Option 2A:

1. Plumbing:
   - Per ASHRAE and ASPE, water piping and insulation have a life expectancy of 25-30 years. Piping is past it's useful life. Replace all water, waste and vent piping in all 3 buildings.
   - Replace all bathroom fixtures with new low-flow, sensor or manual operated faucets and flush valves, as determined by facilities preference.
   - Provide new roof drains on all flat roofs being replaced.
   - Replace all existing electric water heaters with high efficiency gas fired water heaters.
   - Grease traps in the kitchens are past their useful life. Should be replaced.
   - Complaints regarding lack of floor drains in teaching kitchen. Floor drains should be added.
   - Emergency gas shut offs should be located by the exit doors of all lab rooms.
   - Emergency eyewashes did not appear to be served with tempered water. Tempered water loop needs to be added per plumbing code.
   - Lab sinks did not appear to have an acid neutralization system. A central neutralization system or local 5-gallon acid neutralization for each sink should be added per plumbing code.
   - Replace gas fired domestic hot water storage tanks in Field House with high efficiency gas water heaters.
   - Add floor drains or modify floor slope of showers in locker rooms to meet 248 CMR 10.10 requirements.
   - Add solid interceptors to all art sinks.
   - Modify drainage system in the Steam Plant Building to prevent future flooding.
   - Add regular and handicapped fountains to all buildings to meet code requirements the code requirement of 1 drinking fountain per 75 people. 248 CRM 10.10 also states that "wherever drinking fountains are provided, a drinking fountain shall be accessible to the physically impaired".
   - Extend plumbing to new additions as required.

Additions:

- Extend cold water, hot water, waste and vent piping to plumbing fixtures in new additions as required.
- Provide roof drains, overflows and storm piping as required.

2. Fire Protection:

- All existing sprinkler piping and heads in the 1922 Building and 1980 building to be demolished. Provide all new fire suppression system throughout the building. Existing services to building can possibly be utilized.
- Since this is considered a major renovation, sprinkler heads should be installed throughout the Field House in accordance to NFPA 13.
- Fire Protection system will need to be extended to all new additions.
- Zoning to be by floor and limited to 50,000 Square feet per zone.
- It is assumed that a fire pump will not be required, however a new flow test will be required at the site to confirm. Flow test will occur during SD.

Addition/Renovation Option 3A @ Expanded Existing Site:

1. Plumbing:

- Per ASHRAE and ASPE, water piping and insulation have a life expectancy of 25-30 years. Piping is past it's useful life. Replace all water, waste and vent piping in 2 buildings.
- Replace all bathroom fixtures with new low-flow, sensor or manual operated faucets and flush valves, as determined by facilities preference.
- Provide new roof drains on all flat roofs being replaced.
- Replace all existing electric water heaters with high efficiency gas fired water heaters.
- Grease traps in the kitchens are past their useful life. Should be replaced.
- Complaints regarding lack of floor drains in teaching kitchen. Floor drains should be added.
- Emergency gas shut offs should be located by the exit doors of all lab rooms.
- Emergency eyewashes did not appear to be served with tempered water. Tempered water loop needs to be added per plumbing code.
- Lab sinks did not appear to have an acid neutralization system. A central neutralization system or local 5-gallon acid neutralization for each sink should be added per plumbing code.
- Replace gas fired domestic hot water storage tanks in Field House with high efficiency gas water heaters.

- Add floor drains or modify floor slope of showers in locker rooms to meet 248 CMR 10.10 requirements.
- Add solid interceptors to all art sinks.
- Modify drainage system in the Steam Plant Building to prevent future flooding.
- Add regular and handicapped fountains to all buildings to meet code requirements the code requirement of 1 drinking fountain per 75 people. 248 CRM 10.10 also states that "wherever drinking fountains are provided, a drinking fountain shall be accessible to the physically impaired".

Additions:

- Extend cold water, hot water, waste and vent piping to plumbing fixtures in new addition as required.
- Provide roof drains, overflows and storm piping as required.

2. Fire Protection:

- All existing sprinkler piping and heads in the 1922 Building and 1980 building to be demolished. Provide all new fire suppression system throughout the building. Existing services to building can possibly be utilized.
- Since this is considered a major renovation, sprinkler heads should be installed throughout the Field House in accordance to NFPA 13.
- Fire Protection system will need to be extended to all new additions.
- Zoning to be by floor and limited to 50,000 Square feet per zone.
- It is assumed that a fire pump will not be required, however a new flow test will be required at the site to confirm. Flow test will occur during SD.

New Option A – Expanded Site:

1. Plumbing:

- New domestic water service will be provided with reduced pressure backflow preventer. Extend cold water piping to all plumbing fixtures as required.
- New sanitary service. Extend waste piping to all plumbing fixtures as required. Refer to Utilities narrative for more information.
- Vent piping from all plumbing fixtures as required to terminate on roof.
- New storm water service. New roof drains and overflow drains as required. If overflow drains are required they will run independently and terminate to daylight with wall scupper, per 248 CMR. Refer to Utilities narrative for more information.

- New high-efficiency gas-fired domestic hot water plant with recirculation system. Extend hot water and hot water recirculation piping to plumbing fixtures as required.
- New tempered water loop to serve emergency shower/eyewash stations in science labs.
- New non-potable hot and cold water loop to serve lab sinks.
- New central acid neutralization system with PH monitoring system to serve all lab sinks in science labs or individual 5- Gallon chip tanks at each sink.
- New Natural gas service to feed new gas-fired domestic hot water plant, science labs, cooking equipment and HVAC equipment as required. If gas piping is required at labs, an emergency gas shut-off shall be provided at each exit door from the science lab. Pressure and capacity will be confirmed with gas company.
- New interior grease trap at pot sinks and dishwashers per 248 CMR. Exterior grease trap may also be required, tank will be provided by Civil Engineer. Waste Piping to grease trap and chamber vent will be by plumber.
- Solids interceptors at all art sinks.
- Provide new low-flow plumbing fixtures in all bathrooms.
  a. Water closets = 1.28 GPF
  b. Urinals = .125 GPF
  c. Lavatories = .5 GPM
  d. Showers = 1.5 GPM
- Provide handicapped plumbing fixtures as required.
- All bathrooms with more than two plumbing fixtures to be provided with floor drains and hose bibs.
- Provide exterior hose bibs as required.
- Cold water stub with backflow preventer for irrigation, if required.

Materials:

- Domestic potable and non-potable cold water, hot water and hot water recirculation water piping shall be Type-K copper with 95-5 soldered joints. Propress fittings is an acceptable alternative.
- Sanitary piping 3” and larger shall be cast iron drainage, waste and vent type with clamp type no-hub fittings. Piping 2” and smaller shall be Type-L copper.
- Rain water piping to be cast iron with clamp type no hub joints.
- All potable and non-potable cold water, hot water, hot water recirculation & rain water piping shall be insulated with 1” thick fiberglass sectional pipe insulation having all service jacket.
- Gas Piping shall be Schedule 40 steel piping with threaded or welded connections or type-L seamless copper with brazed fittings as required by the State Fuel Gas Codes, and installed by a licensed gas fitter in

strict accordance with the State Plumbing and Fuel Gas Code, NFPA 54. Exposed gas piping to be painted.
- Lab Waste Piping shall be Schedule 40 polypropylene with electrical heat fusion type fittings.

2. Fire Protection:
- Proposed new school will be approx. 68 feet. It is assumed that a fire pump will not be required, however a new flow test will be required at the site to confirm. Flow test will occur during SD.
- If a Fire pump is required it will need to be located in a separate 2-hour rated room with direct access to outside or access to outside via a 2-hour rate corridor. Fire Department connection and fire pump test header will need to be provided outside the fire pump room at exterior wall.
- 6" Stand/pipes with fire department valves will be provided at each stairway.
- Building will be zoned per floor with maximum of 50,000 Square feet per zone.
- New fire department connection – Quantity and type per Lowell Fire Department.
- Kitchen hoods will have Ansul Systems.
- Entire building will be fully sprinkler protected per NFPA 13.

Materials:

- All 1" wet sprinkler piping shall be Schedule 40 steel pipe with threaded fittings.
- All 1-1/4" to 2" wet sprinkler piping may be either Schedule 40 steel piping with threaded fittings or Schedule 10 steel piping with grooved couplings.
- All 2-1/2" and larger wet sprinkler piping shall be Schedule 10 steel piping with grooved couplings.
- All sprinkler heads shall be quick-response, glass-bulb type heads.
- Sprinkler heads to be semi-recessed style in areas with suspended ceilings.
- Sprinkler heads in mechanical rooms and other spaces without hung ceilings shall be upright or pendent, as required by location.
- Sprinkler heads in gym to be provided with cages.

END OF PLUMBING / FIRE PROTECTION

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G. Proposed Total Budget

The estimators for Perkins Eastman|DPC and Skanska provided construction cost estimates for the 3 options selected by the SBC (Addition/Renovation Option 2A, Addition/Renovation Option 3A - Expanded Site, New Option A – Expanded Site). The following represents the proposed Total Project Budget based upon the reconciled Design Team estimated as of the writing of this report:

- Base Repair:
  - Construction costs are estimated to be $211,508,509
  - Project Costs are estimated to be $270,770,321

- Addition/Renovation Option 2A:
  - Construction costs are estimated to be $262,135,000
  - Project Costs are estimated to be $333,040,000

- Addition/Renovation Option 3A - Expanded Site:
  - Construction costs are estimated to be $270,456,000
  - Project Costs are estimated to be $345,400,000

- New Option A – Expanded Site:
  - Construction costs are estimated to be $289,153,000
  - Project Costs are estimated to be $361,624,000

See appendix for detailed cost estimates.

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H. Permitting Schedule

Air Rights Easement for Pedestrian Bridges	TBD/in process Refer to Appendix AA
Article 97	TBD/in process Refer to Appendix AA
Certificate of Appropriateness	TBD
ISD Building Demolition Permit	30 Days
ISD Building Permit	30 Days
Construction Stormwater Discharge Permit	2 weeks
LT&TD Construction Management Plan	30 Days
EPA Dewatering Permit	2 weeks
Driveway Permit	2 Days
ISD Electrical Make-safe Permit	2 Days
Electric Utility Shut Off Notice	30 Days
ISD Electrical Permit	30 Days
Eminent Domain	Refer to Appendix Z For detailed Timeline
MA Environmental Notification Form / Determination of Applicability / Environmental Impact Report	6 months
Emergency Responder Review	30 Days/ ongoing during design
LFD Fire Alarm Permit	30 Days
Fire Flow Tests	30 Days
Fire Pipe Shut Off Permit	2 weeks
Food Establish Permit	TBD
Gas Utility Shut Off Notice	30 Days
Health Department	5 Days
Lowell Historic/National Park	2 months
LRWU Hydrant Metering Permit	2 weeks
MADEP/LRWU Infiltration & Inflow (I/I) Removal Program	2-3 months
MA_DEP Notice of Abatement	10 working days
Notice of Intent – Lowell	2 months
Paving/Street Opening Permit – Lowell	2 days
ISD Plumbing Make-safe Permit	2 days
ISD Plumbing Permit	30 Days
LRWWU Sewer Demolition Permit	2 days
LRWWU New Sewer Services Permit	2 weeks
LRWWU Sewer Demolition Permit	2 days
Site Plan Review – Lowell	6 months
Special Permit – Lowell	6 months
LFD Demo Permit	30 days
ISD Sprinkler (Fire Protection) Permit	30 days
LRWU/LDPW Stormwater New Connection Permit	driven by discharge permit

MASSDOT 40_54A Permit	2-3 months
LRWU Water Demolition Permit	2 Days
LRWU Domestic & Fire Protection Water New Service Permit	2 weeks
Zoning Variances – Lowell	6 months

I. Design and Construction Schedule

Design Schedule – is estimated as follows:

Schematic Design	June 28, 2018 – April 10, 2019
Project Funding	April 10, 2019 – August 1, 2019
Design Development	August 2, 2019 – May 14, 2020
Construction Documents	May 15, 2020 – May 13, 2021
Est. Construction Schedule	Addition / Renovation Option 3A - Expanded Site:
Bid/Permit/Award	May 17, 2021 - July 30, 2021
Construction	July 1, 2021 – July 1, 2026
Substantial Completion	June 23, 2026
Occupancy	August 18, 2026

See appendix for complete schedule for all Design Options

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J. Preliminary Design Pricing

Lowell High School
Revised PSR
Revised Preliminary Design Pricing Table

= Formula do not edit

Option (Description)	Total Gross Square Feet	Square Feet of Renovated Space ($*/SF)	Square Feet of New Construction ($*/SF)	Site, Building Takedown, Haz Mat Etc. ($*)	Estimated Total Construction** ($*)	Estimated Total Project Costs ($)
Option 2A	618,700 sf	445,500 sf	173,200 sf	$ 12,423,627	$ 262,134,802	$ 333,040,001
		$ 375.85 $/sf	$ 475.00 $/sf		$ 423.69 $/sf	
Option 3A (expanded site)	622,200 sf	432,600 sf	189,600 sf	$ 15,106,259	$ 270,456,023	$ 345,399,220
		$ 378.14 $/sf	$ 484.00 $/sf		$ 434.68 $/sf	
New Option A (expanded site)	579,400 sf	- sf	579,400 sf	$ 11,440,511	$ 289,152,725	$ 361,624,018
		$ - $/sf	$ 479.31 $/sf		$ 499.06 $/sf	

* Marked Up Construction Costs
** Does not include Construction Contingency
*** **District's Preferred Solution**

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3.3.4 Preferred Solution

A. Educational Program

B. Space Summary

C. Sustainability

D. Building and Site Plans

E. Project Budget

F. Project Schedule

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3.3.4 Preferred Solution

Despite the original divided PSR decision by the City Council and SBC during the summer of 2017 to locate to High School project at the Cawley Site, the City of Lowell has regrouped and rallied behind revisiting the design of the Lowell High School on the existing downtown site.

The Lowell School Building Committee voted (16-1-1) to recommend Option 3A to the Lowell City Council as the Preferred Option (3A, 2A, and New Option A) The Lowell City Council voted (8-1-0) to select Add/Reno Option 3A on expanded site as the preferred solution.

A. Educational Program

The Educational Program has been updated according to the MSBA's PDP, prior PSR review comments and District's response and is included in the Appendix of this report. The updates include architectural responses provided for each section (*in red italics*), to help explain the correlation between the Educational Program and the preferred plan.

Key components of the Educational Program and overall Goals/Objectives include;

- Connected Freshman Academy while also zoned as a separate small learning community. All options accomplish this, except for the full renovation. The preferred option (3A) locates the freshman exclusively on the top floor, with no travel through by other grades.
- Zone for Community Use – this is done in all options, but all Add/Renovation options have the (existing) Auditorium in a separate building and requires a second zone to be created. The New Construction Option also requires community use areas more vertically stacked onto upper floors.
- Create a Heart to the School – both Add/Reno options are set-up do this with the cafeteria connected to the main entry and a main stair open to a media center above, the new construction option creates this "heart" with the entry, Cafeteria, Gym and Auditorium, while the Media Center is on an upper floor.
- Organize for Interdisciplinary Collaboration - STEM and Humanities Clusters have been created in all options. These clusters are organized for faculty collaboration rather than a cohort of students being assigned as a team, but a subtle difference between the Add/Reno and new construction option is the ability for new to create team-like clusters with good visibility between and into shared pull-out/flexible learning spaces. The Add/Reno has some clusters spread out a bit further, but still in proximity to foster teacher planning groups
- House Model for Administrative/Support – due to the overall large number of students, the case load and interaction among support staff, students and families is broken down into smaller suites. The suites are semi-dispersed in all options for adult presence on all floors/buildings, but ideally also near the main lobby to limit visitors from having to navigate deep into the school.

- Daylight and Orientation – new construction is the only certain way to remedy the solar orientation problems that exist. The Add/Reno options improve only the new Freshman Academy (along with light wells) to alleviate windowless space. The Add/Reno Options will seek window treatments to better mitigate low light into the rooms
- Minimize Educational Disruption – Conceptual sequencing plans were developed for all options, attempting to minimize educational impact and maintain clear separation of work and school zones. New construction requires a significant number of modular classrooms as well as gymnasium space, without benefit of adjacent parcels to accommodate them. Option 2A requires only the temporary gym and 3A is least disruptive with no temporary spaces required. In all cases +/-40 classrooms are free'd-up inside the existing building and 64 more created with the new Freshman Academy built first. This total of 104 rooms of swing space allows the large phases of renovation to occur. Each phase is set up to ensure corridor and stairwell buffer space between construction zones and education.

Please refer to the Appendix for the full, updated Educational Program. A summary of the District's responses to the MSBA's PDP comments is as follows (and numbered as such). The updated Program;

1) Provides a more detailed narrative regarding House Offices & who they serve

4c) Explains the current and proposed practices for ELA programs and described the space needs to support them

4d) Same for Mathematics programs

4f) Same for Social Studies programs

11) Same for Visual Arts programs, along with scheduling information.

12) Same for Performing Arts, including a justification description for piano lab, practice, dance and specialized rooms

13) Same for Physical Education, including re-listing the pool space(s) as 'other'

15b) Acknowledges the DESE submission re: Ch.74 programs is provided

17) Provides additional context regarding Spatial Relationships & Adjacencies

18) Lists the date of most recent Medical Emergency Response Plan and the design team confirms first responders will be included in the planning process

Additional responses to MSBA comments include;

- A description of the level of the inclusion of Special Education and the effect on the design/plans is provided.
- A description of the services/support for higher-functioning Special Education
- Confirmed that Special Education classrooms are the same size as Academic
- An explanation of why 9th grade science were proposed as 1k sf classrooms and an update on the intent to increase them to standard lab size (1440sf).
- An explanation that specialized language labs are not intended
- A description of transgender policy (in progress) is described in the response

- A clarification regarding the various Tech and Engineering Labs, their flexibility and inability to be utilized as part of science is explained.
- An explanation of the proposed Auditorium size and use is provided
- The level of separation from Freshman is further described
- The need for a Natatorium is explained
- Special Education programs are described as intentionally dispersed
- The response clarifies the hearing impaired program
- The potential for FM systems is explained.

Since The PDP review, the initial PSR submission and subsequent redirection to the existing site has lead to several additional follow-up items:

- Removal of the Pool
- Clarification of the two programs listed in the 'other' category of the space summary that are still under review (Catie's Closet & the Community Health Center)
- Additional Language on the Special Needs Adaptive PE program and ROTC programs that require large movement areas and space for drills.
-

B. Space Summary

The Proposed Space Summary for the Lowell High School Project is based on the MSBA agreed upon enrollment projection of 3,520 students. The sheer size of this school eclipses the norms and conventional space needs in the MSBA's Space Summary Guidelines, which include many spaces that scale with the school size, but most relevant to this project, some that do not.

The gymnasium is one such space. MSBA Guidelines default to a 12k sf gym + 3k alternative space (the equivalent of 5 PE teaching stations) and although there is consideration for increasing this cap to a maximum 18k gym + 3k (7 PE stations), there are a handful of schools in the State large enough to truly require a bit more. Of Lowell's 3,520 design enrollment, 1,350 are projected to be enrolled in PE regularly (another 1,000+ in Health Ed). At a 26 students class average meeting 5x per cycle, this results in 265 sessions required in a 35 period cycle. 265/35 =7.6 teaching stations if 100% utilized or 9 stations at 85% use. The proposed space summary, therefore justifies the need for 9 stations, or 27k sf (not all of which is gymnasium).

The Space Template has been updated to remove the swimming pool.

In the course of programming we have found less of a need for typical academic classrooms & labs (140 proposed vs 151 in the MSBA space summary) due primarily to larger class average than defaults, but also a greater need in Art & Music (11 vs 8) and PE (9 vs 5). This shift in space needs is based on true programming calculations that use the current master schedule, are prorated for the design enrollment and adjusted for long-term program goals. This shift in space needs results in adds or deducts of square footage among different program categories.

The total net sf proposed is 386,086, which totals 579,400 at a 1.50 grossing factor. The bottom line is about 21.3k net larger than the MSBA defaults, but most of this is justifiable through programming and ultimately balances out, such as Academics & Voc/Tech (-10.2k) vs Arts/Music & PE (+10.4k). Some increase is not subject to programming calculations, but are clear needs due to the sheer size of the school, such as SPED (+4.7k), Admin (+3.5k) & Custodial (+1k) and the Auditorium (+5.1k) and some are important programs that are considered highly valuable in serving the students (+14k of other spaces)

Between the PDP and prior PSR submissions, Freshmen Science Labs were increased along with prep rooms and a Special Education small group room was added, all totaling 5,170 net sf. This increase was offset at the time with modest reductions to some of the peripheral performing arts, workrooms, custodial and 'other' programs. Since the initial PSR, the only change to the Space Summary is removal of the pool. It is also worth noting that the prior submission had an Auditorium that exceeded the MSBA's upper limit as new construction. The current submission includes the similar size, but as an existing-to-remain space.

Please refer to the Appendix for the full, updated Space Summary.

C. Sustainability

Without an early determination of whether the preferred option would be new construction or addition/renovation, a preliminary forum and a follow-up forum were held to discuss high-level strategies and objectives for the project. The forum was run by Perkins Eastman's consultant, Soden Sustainability and included various City, School and Committee representatives along with the Design Team and Engineers.

The discussion included thoughts on the different options, each having some advantages and disadvantages. Opportunities for site design, water efficiency, energy efficiency, materials and indoor air quality were shared. Some of the more emphasized or unique ideas were to create roof top green space, rain water and grey water reuse, use school as teaching tool and take advantage of the uniqueness of site. Gardening, outdoor classrooms and school as teaching tool were highlighted. The hope of enhanced metering and utilizing the DOE Zero Energy School was also expressed. A follow-up workshop will be planned.

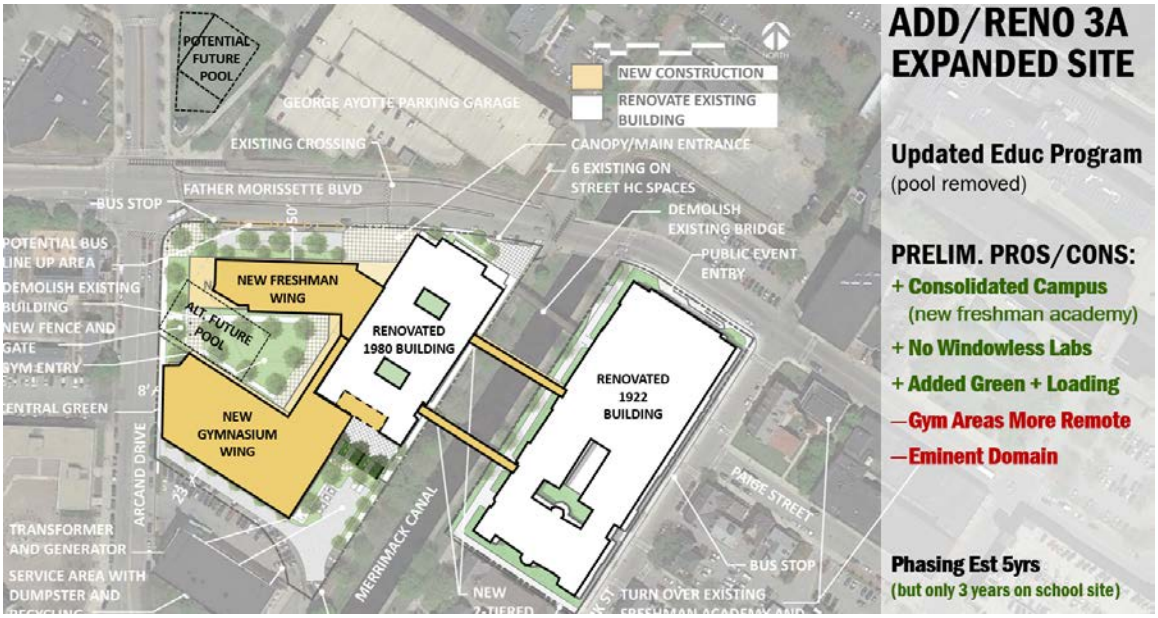
In addition, a preliminary energy analysis was run to determine the relative performance of each of the design options. The goal is to continue to improve the energy performance of the building by exploring additional energy conservation measures which will be evaluated in future phases.

Refer to the Appendix for the Sustainability meeting notes and narrative included as part of the Educational Program, Sustainability Score Card and includes a signed letter from the District regarding the goals. The Appendix also includes the updated preliminary energy analysis.

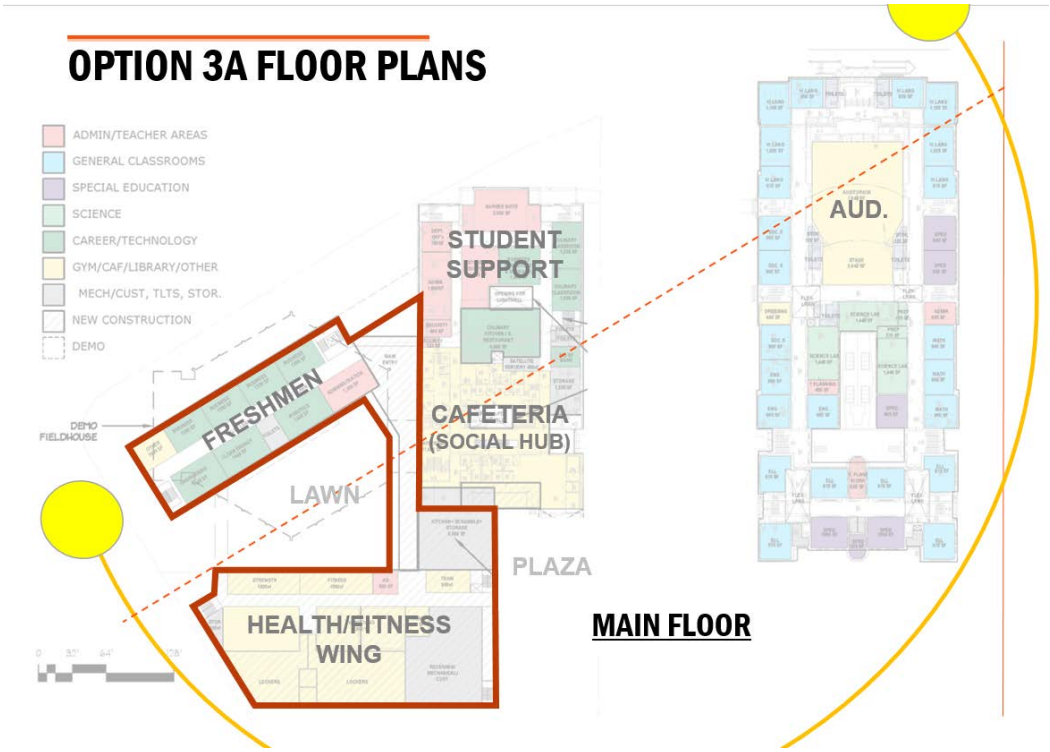
D. Building and Site Plans

Addition/ Renovation Option 3A on Expanded Site:

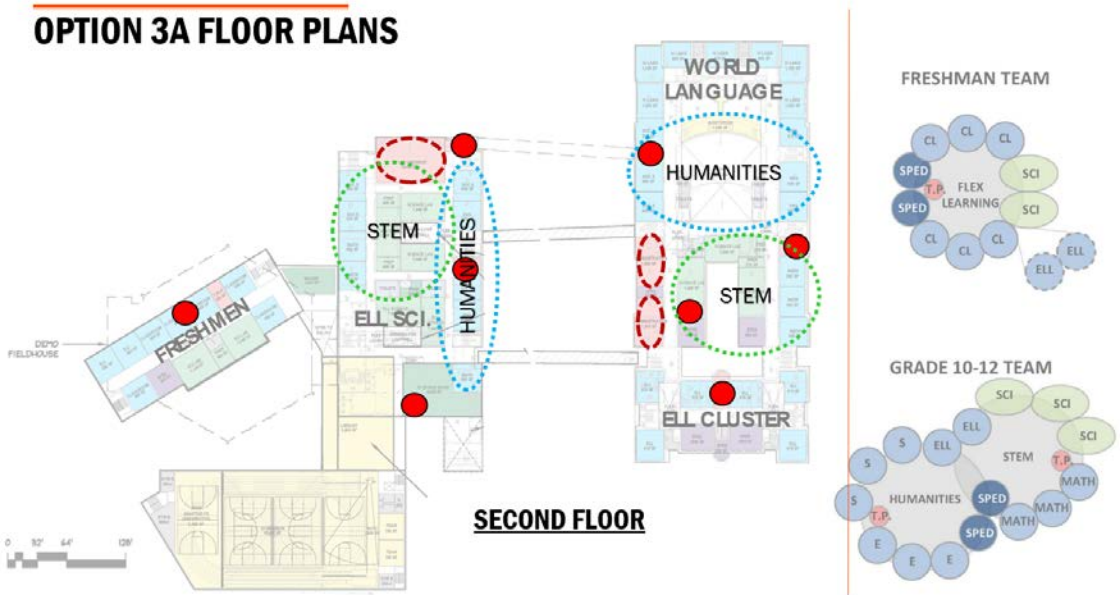
Add/Reno Option 3A on Expanded Site meets the Educational Program, builds a new Freshman Academy (FA) Wing and Gymnasium, provides desired Outdoor Green space and renovates the historic and valuable existing academic buildings, but requires a property taking of the adjacent property to the South, 75 Arcand Drive.



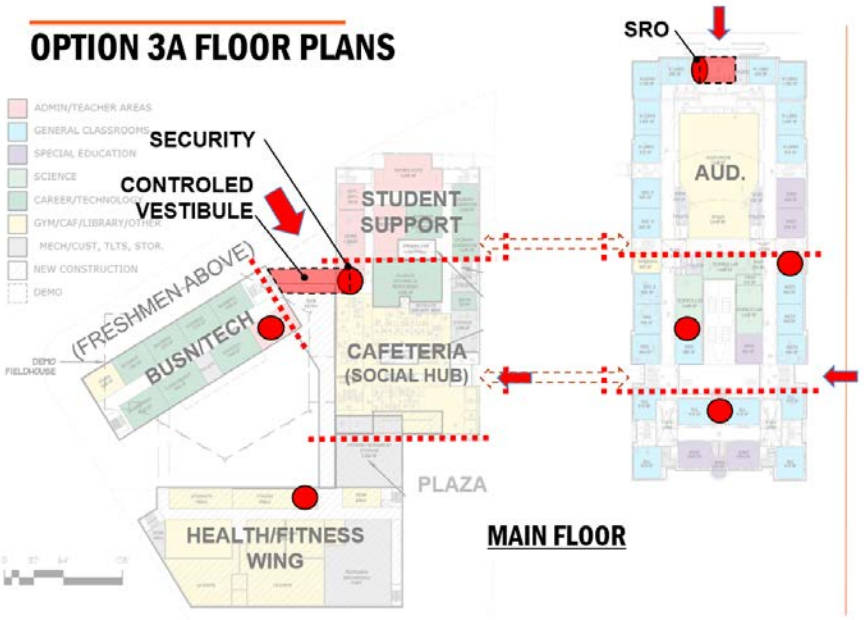
Academically, Option 3A brings the freshman onto campus from the existing building a block away. The new FA Wing has ideal site orientation with classrooms facing North & South providing consistent controllable daylighting throughout the school day. The building design allows team clustering for optimal collaboration amongst the 9th grade core academic teams.



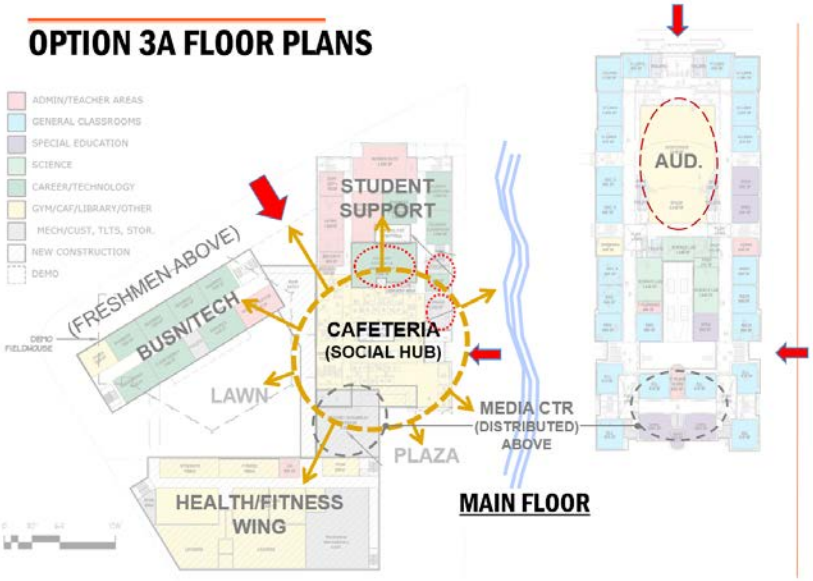
The renovation of the 1980 and 1922 buildings will allow for STEM (3 Science + 3 Math) and Humanities (3 ELA + 3 Social Studies) Planning Clusters with nearby Special Education, ELL and Health classrooms that are dispersed throughout in groups of 2 The FA is new construction and allows for layout of 4 Freshmen Teams of 8 (2 Science, 2 Math, 2 ELA & 2 Social Studies) are the repeated pattern, again with inter-dispersed Special Education and Health classrooms. Grades 10-12 are organized throughout the renovated 1980s and 1922 building therefore creating unique clusters with preferred adjacencies while reusing and renovating existing spaces.



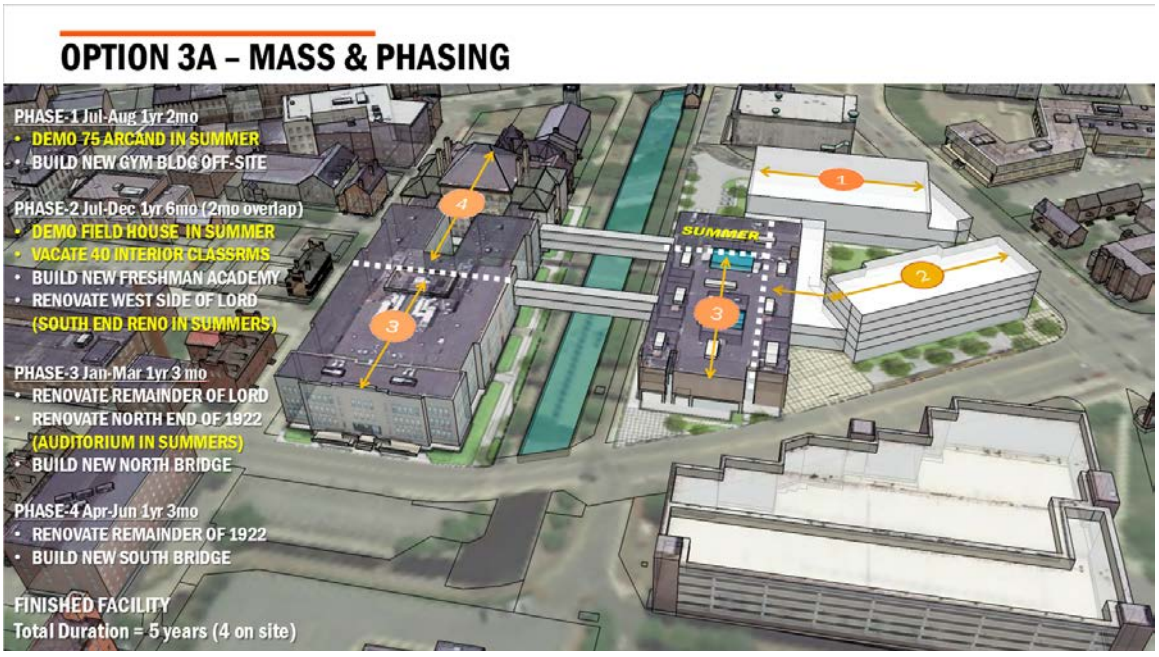
The interior organization, as described, is zoned first and foremost for community use and operational lock-off (incrementally) of academic areas. The ground floor includes the majority of shared program and specialty spaces and the heart of the school is formed by an open cafeteria connected to the main lobby as a social hub and is vertically open to the media center above as the technology hub. House Admin/Support suites are centrally located on each floor near the core.



A key component to the design is the creation of a “heart of the school” a place where students can congregate, socialize, see/be seen and create a positive energy throughout the school. This space will connect major educational and community spaces within the school; like the hub of a bicycle wheel and become the connection through which most students pass through to travel from one part of the building to another.



Phasing on Option 3A is planned to be approximately 5 years, with 4 years on the current school property. The new five-story FA building will be approximately 68'-8" tall and the new two-story gymnasium building will be approximately 58' tall.



Please refer to the appendix of this report for enlarged site and building plans.

The preferred Lowell High School site (LHS) is located along Father Morissette Boulevard and Arcand Drive. The two main high school structures are the 1980 building and the 1922 Building which span a segment of the National Historic Park's Merrimack Canal and Lucy Larcom Park.

In this preferred option on the current site it is understood that transportation and access to the school is a combination of walkers, parent drops-offs, public transportation and special education buses. Due to the urban nature of the site and location of bus stops, pedestrian circulation and drop off locations are spread around the site with students all funneling towards the main entrance. In this preferred plan, these patterns have been considered and a large entrance plaza suitable for use by a student body of this size has been created. This entrance plaza is located directly across from the George Ayotte parking facility and connected to it by a crosswalk. This entrance plaza will be partially covered by building overhangs and will be populated by site furnishings, street trees and lighting. All parking is located off site in the George Ayotte Parking Garage, Joe Downes Garage or on street. HC Parking is created for approximately 6 cars and located to the south of the 1980 Building.

The new building is pulled away from Father Morissette Blvd providing the opportunity to create plaza and streetscape improvements along the northern side of the school. It is understood that though the school does not have dedicated buses during the day in the afternoon approximately 7 buses line up at the main entrance on Father Morissette Boulevard to transport students to practices at Cawley Stadium, the boat

house and Shedd Park. In this preferred option a pull off area has been created directly to the west of the main entrance to accommodate up to 4 buses. Plaza space with new shade trees and space for benches and bike racks has been created abutting this and will provide much needed space for students to wait for buses in the afternoons and spill out space for students getting dropped off by parents or using public transportation. The surrounding sidewalks including the corner of Arcand Drive and Father Morissette are improved with specialty paving and street trees.

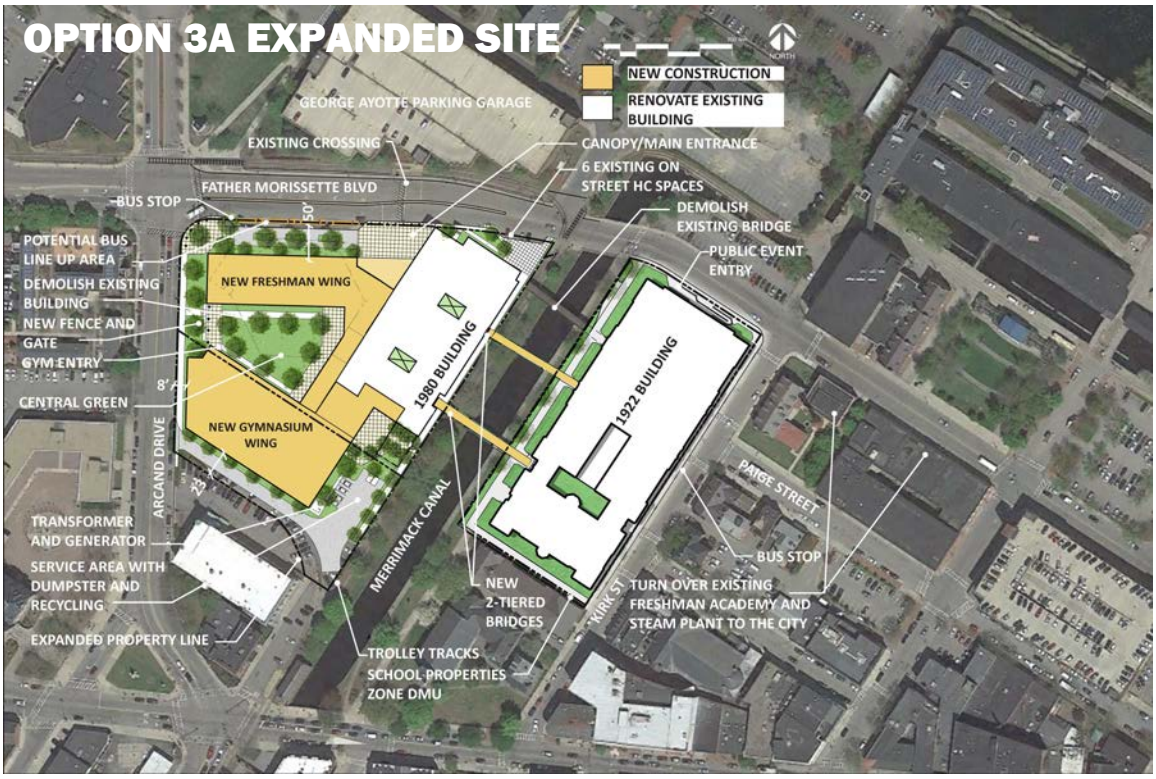
The centerpiece of the new school is a large campus quad surrounded by a combination of hardscape and planting. The green space is approximately 15,000 sf. This area is surrounded on three sides by building and visually opened to Arcand Drive but secured with an ornamental fence and gate. The green quad created in this plan is slightly larger than the space being used now across the street and will be large enough for use by physical education classes, marching band and any number of activities. Creation of this space will eliminate the need for physical education classes to leave the school site. The hardscape area abutting this space will have integrated rain gardens and more intimate spaces for smaller groups with tables, chairs and benches.

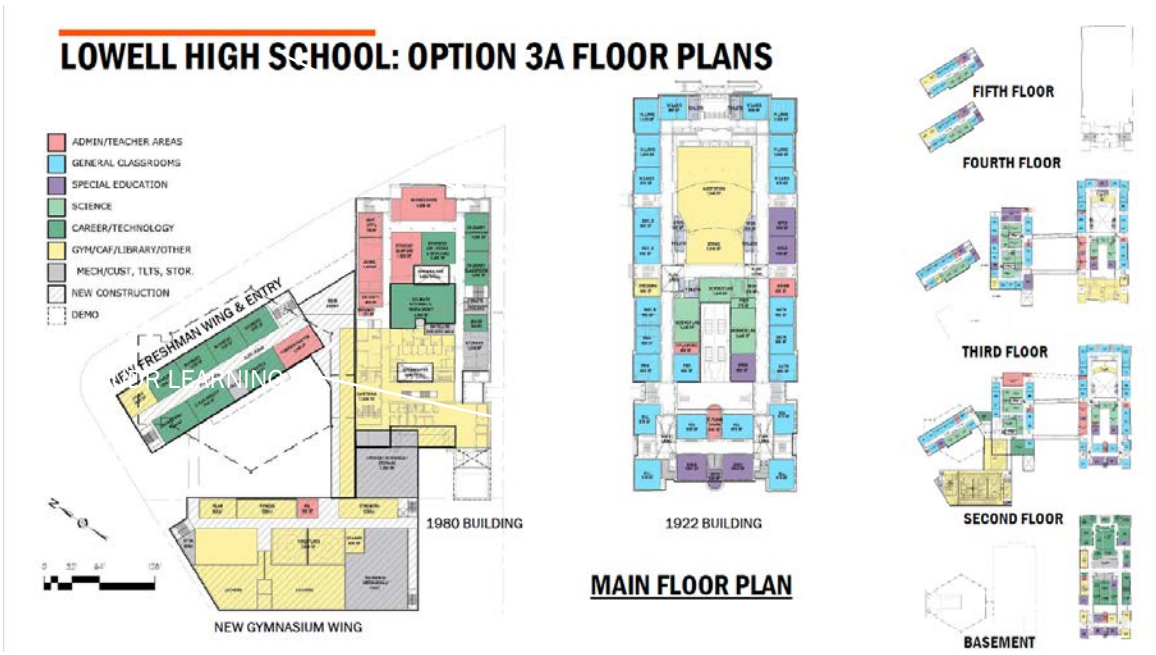
This plan recognizes the history and significance of the location of this school which spans a segment of the National Historic Park's Merrimack Canal and Lucy Larcom Park. The sidewalks abutting the building along the canal on both sides will be improved with site furnishings and new paving. A new plaza area connected to the cafeteria will provide elevated seating with views to the canal.

Emergency Access: Fire and emergency access will be provided around the existing school except for fire truck access along the canal. Fire access is increased in this option along the southern portion of the site to run 200' along the canal. The driveway access is off of Arcand Drive. A turnaround is created that will allow Fire and Emergency vehicles to turn around on site.

In the preferred option a large service area is created that includes additional parking for (6) HC spaces on the south side of the school. Approximately two loading spaces are also provided in the service area. The service area includes one (1) 40 yard dumpster and two (2) 10 yard dumpsters. A turn around is created that allows box trucks and vehicles up to a semi- trailer to turn around on site.

The use of athletic facilities will remain the same as it is today. LHS uses two City-owned facilities- Shedd Park and Martin Cawley Athletic Complex and this will continue. These two complexes accommodate the majority of the high school's athletic programs. The Cawley Complex has a brand new track and a synthetic turf football field (10 years old and in good condition). Both complexes are maintained by the City and students are bused to them. The Cawley complex is about 2 miles from LHS.





E. Project Budget

Refer to Section 3.3.3 G for the Project Budget

F. Project Schedule

Refer to Section 3.3.3 I for the Project Schedule

See the appendix for further information.

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3.3.5 Local Actions and Approvals

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3.3.5 Local Actions and Approvals

The (City of Lowell School District) City Council and School Building Committee ("SBC") has completed its review of the Feasibility Study updated Preferred Schematic Report (PSR) for the Lowell High School project (the "Project").

On May 1, 2018, the City Council approved the Downtown Add/Reno Option 3A as the Preferred Option. A certified copy of the City Council meeting minutes, which includes the specific language of the vote and the number of votes in favor, opposed, and abstained, are attached and is included within the Preferred Schematic Report for the MSBA's consideration. A Summary of Meetings and Agendas:

Since the December 18, 2017 letter from the MSBA asking the City of Lowell its intent on a resubmission of the preferred project option for the City's High School, the City Council has held 7 meetings regarding the proposed project, in compliance with the state Open Meeting Law.

City Council January 2, 2018 at 6:30pm City Hall:
CITY COUNCIL – MOTIONS:
6.2. C. Leahy - Req. City Council take a vote regarding the location of the preferred site of Lowell High School.
6.4. C. Elliott - Req. City Mgr. provide a report on the expenditures to date regarding the feasibility study on Lowell High School and the amount reimbursed to the City from the MSBA.
6.5. C. Kennedy - Req. City Mgr. and the Mayor notify the Massachusetts School Building Authority that the City Council intends to explore changing Lowell's preferred project option for the Lowell High School building project.
6.6. C. Kennedy - Req. School Committee endorse City Council's intent to explore changing Lowell's preferred project option for the Lowell High School building project and direct the Superintendent to notify the Massachusetts School Building Authority of the School Committee's endorsement.

City Council January 23, 2018 at 6:30pm City Hall:
CITY COUNCIL – MOTIONS:
7.1. C. Mercier - Req. City Mgr. review and explore other parcels of land in the downtown that may be available for the extension of Lowell High School.

City Council January 30, 2018 at 6:30pm City Hall:
CITY COUNCIL – MOTIONS:
11.9. C. Milinazzo - Req. City Mgr. take all necessary steps to reinstate the Article 97 restrictions on the parks and open space land which had been removed during the Lowell High School/MSBA site selection process.

City Council February 6, 2018 at 6:30pm City Hall:

CITY COUNCIL – MOTIONS:
7.5. C. Leahy - Req. City Mgr. provide update regarding latest meeting with the Massachusetts School Building Authority.

City Council February 27, 2018 at 6:30pm City Hall:
CITY COUNCIL – MOTIONS:
7.5. C. Kennedy - Req. City Mgr. instruct Perkins Eastman include an active shooter detection system (similar to Methuen High School system) as part of the plans for the new high school and recommend that the Superintendent of Schools consider similar systems for other schools within the City.
7.6. C. Kennedy - Req. City Mgr. instruct the Law Department to begin procedures and preparation necessary for the eminent domain taking of 75 Arcand Drive.

City Council March 6, 2018 at 6:30pm City Hall:
3. UNFINISHED BUSINESS
3.1. C. Kennedy - Req. City Mgr. instruct the Law Department to begin procedures and preparation necessary for the eminent domain taking of 75 Arcand Drive.
5.4. Vote-Transfer 15,000 to fund appraisals for 75 Arcand Drive
10.4. C. Elliott - Req. City Mgr. appoint a public safety personnel/security professional to the School Building Committee to ensure safety issues are addressed at high school.

City Council May 1, 2018 at 6:30pm City Hall:

- Review Design Options
    - Add/Reno 2A
    - Add/Reno 3A Expanded site
    - New Option A Expanded Site
- Cost Update
- Vote on Recommended Preferred Option and authorization for OPM to submit Preferred Schematic Report to the MSBA no later than May 9, 2018.
- Schedule / Next Steps

Summary of Public and Other Participants

Since the City Council took a vote regarding the downtown location of the preferred site of Lowell High School on January 2, 2018, the SBC has held 3 SBC meetings regarding the proposed project, in compliance with the state Open Meeting Law.

SBC Meeting February 12, 2018 City Hall, Mayor's Conference Room at 6:30pm:
- Vote to Approve New Members
- Review of February 1, 2018 MSBA Meeting
- Discussion and Vote Relative to Which Sites to be Reviewed
- Eminent Domain Schedule
- Schedule
- Next Steps

SBC Meeting March 29, 2018 City Hall, City Council Chambers at 6:30pm:

- Review revised Educational Plan Approval
- Eminent Domain Update
- Review Options and Phasing
    - Add/Reno 2A
    - Add/Reno 3A Expanded site
    - New Option A Expanded Site
- Community Outreach
- Schedule
- Next Steps

SBC Meeting April 30, 2018 City Hall, City Council Chambers at 6:30pm:

- Updates Since Last SBC Meeting 3/29
    - Meeting: City Departments, Sustainability, Security, Community Meeting
    - Energy Update
- Overview of Design Options
- Pros/Cons of Options
- Cost Update
- Vote on Recommended Preferred Option
- Next Steps

Educational Leadership Meetings (ELT) at Lowell HS Head Master's Conference Room

- February 26, 2018 – Review Downtown Options, Educational Plan and Space Summary
- April 4, 2018 – Sustainability update:
    - Sustainability/LEED Goals
    - Stretch Code
    - MSBA Requirements
- April 12, 2018 – Security Meeting:
    - General Security Concerns
    - Pro's & Con's for each option
    - Security Design Approach

School Committee Meeting March 21, 2018 at City Hall, City Council Chambers at 6:30pm:

- Review and approve revisions to updated Educational Plan

LHS Approval Process Meeting: Planning Board, Commissions and Department Meeting, Lowell City Hall Mayor's Reception Room April 4, 2018 at 2:30pm: City of Lowell Departments reviewing the Design Options to understand any approvals issues that can inform the PSR and the selection of the Preferred Option.

Additional Community outreach meetings regarding the proposed project:

- April 12, 2018 Public Meeting

- April 30, 2018 Public Meeting

The presentation materials for each meeting, meeting minutes, and summary materials related to the Project are available locally for public review at

https://www.lowellma.gov/963/Lowell-High-School-Project

Lowell High School project website: The District has created a project website linked to the District's High School website. Project information (meeting memos, graphics, reports, etc.) can be viewed and downloaded by the public.

See the appendix for further information including copies of MSBA Appendix 3D Module 3 Local Actions and Approval Certification Template, minutes and presentations.

3.1.6 Appendices Table of Contents

A. MSBA PSR Comments and District Response
B. MHC PNF
    1. PNF Submission
    2. MHC Response
C. Designers Cost Estimate
    1. Estimate Summary
    2. Preliminary Design Pricing Table
    3. Reconciled Conceptual Cost Estimate Summary
    4 PM&C Estimate
    4 PSR Skanska Estimate
D. Capital Budget Statement
E. Project Schedule
F. Educational Program
G. Space Summary
H. Green Letter
I. LEED V4 Scorecard
J. Preferred Schematic Floor Plans
K. Preferred Schematic Site Plan
L. Planning Options Floor Plans
M. Planning Options Site Plans
N. Civil Soils
O. Endangered Species
P. Energy Analysis
Q. Geoenvironmental
    1. Geoenvironmental
    2. Existing High School Phase II Assessment
R. Geotechnical
S. Hazardous Materials
T. Other Updated Reports:
    1. Civil
    2. Code
U. Structural
    1. Structural
    2. Structural Existing Conditions
V. Traffic
    1. Traffic Report w/ no Appendices
    2. Traffic w/ Appendices (electronic file only)
W. Meeting Minutes and Presentations
    1. Community
    2. School Building Committee
    3. City Council
    4. School Committee
    5. Educational Leadership Team

6. Other

X. Local Actions and Approvals Certification
Y. "1922 Building" Reroofing Drawings and Specifications
Z. Eminent Domain Timeline
AA. Air Rights

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ATTACHMENT A
MODULE 3 – PREFERRED SCHEMATIC REPORT REVIEW COMMENTS

Response to Review Comments

District: City of Lowell
School: Lowell High School
Owner's Project Manager: Skanska USA Building, Inc.
Designer Firm: Perkins Eastman
Submittal Due Date: June 29, 2017
Submittal Received Date: June 28, 2017
Review Date: June 29-July 20, 2017
Reviewed by: K. Brown, J. Jumpe

MSBA REVIEW COMMENTS

The following comments[1] on the Preferred Schematic Report ("PSR") submittal are issued pursuant to a review of the project submittal document for the proposed project presented as a part of the Feasibility Study submission in accordance with the MSBA Module 3 Guidelines.

3.3 PREFERRED SCHEMATIC REPORT

Overview of Preferred Schematic Submittal	Complete	Provided; *Refer to comments following each section*	Not Provided; *Refer to comments following each section*	Receipt of District's Response; *To be filled out by MSBA Staff*
OPM Certification of Completeness and Conformity	☒	☐	☐	☐
Table of Contents	☒	☐	☐	☐
3.3.1 Introduction	☐	☒	☐	☐
3.3.2 Evaluation of Existing Conditions	☐	☒	☐	☐
3.3.3 Final Evaluation of Alternatives	☐	☒	☐	☐
3.3.4 Preferred Solution	☐	☒	☐	☐
3.3.5 Local Actions and Approval Certification	☐	☒	☐	☐

[1] The written comments provided by the MSBA are solely for purposes of determining whether the submittal documents, analysis process, proposed planning concept and any other design documents submitted for MSBA review appear consistent with the MSBA's guidelines and requirements, and are not for the purpose of determining whether the proposed design and its process may meet any legal requirements imposed by federal, state or local law, including, but not limited to, local approvals, zoning ordinances and by-laws, environmental regulations, building codes, sanitary codes, safety codes and public procurement laws or for the purpose of determining whether the proposed design and process meet any applicable professional standard of care or any other standard of care. Project designers are obligated to implement detailed planning and technical review procedures to effect coordination of design criteria, buildability, and technical adequacy of project concepts. Each city, town and regional school district shall be solely responsible for ensuring that its project development concepts comply with all applicable provisions of federal, state, and local law and the MSBA recommends that each city, town and regional school district have its legal counsel review its development process and subsequent bid documents to ensure that it is in compliance with all provisions of federal, state and local law. The MSBA shall not be responsible for any legal fees or costs of any kind that may be incurred by a city, town or regional school district in relation to MSBA requirements or the preparation and review of the project's planning process or plans and specifications.

3.3.1 INTRODUCTION

	Provide the following Items	Complete; *No response required*	Provided; *District's response required*	Not Provided; *District's response required*	Receipt of District's Response; *To be filled out by MSBA Staff*
1	Overview of the process undertaken since submittal of the Preliminary Design Program that concludes with submittal of the Preferred Schematic Report, including any new information and changes to previously submitted information	☒	☐	☐	☐
2	Summary of updated project schedule, including				
	a) Projected MSBA Board of Directors Meeting for approval of Project Scope and Budget Agreement	☐	☒	☐	☐
	b) Projected Town/City vote for Project Scope and Budget Agreement	☒	☐	☐	☐
	c) Anticipated start of construction	☒	☐	☐	☐
	d) Target move in date	☒	☐	☐	☐
3	Summary of the final evaluation of existing conditions	☒	☐	☐	☐
4	Summary of final evaluation of alternatives	☒	☐	☐	☐
5	Summary of District's preferred solution	☒	☐	☐	☐
6	A copy of the MSBA Preliminary Design Program project review and corresponding District response	☒	☐	☐	☐

MSBA Review Comments:

2a) The submittal notes a change in the schedule indicating a projected MSBA Board of Directors Meeting for approval of Project Scope and Budget on May 9, 2018. MSBA notes that the tentative meeting schedule includes dates for April 10, 2018 and June 27, 2018, subject to change. MSBA will forward a confirmed 2018 Board of Director's meeting schedule when it is finalized.

In addition, note that the executed Feasibility Study Agreement for the Lowell High School project expires May 19, 2018, approximately three weeks prior to the June MSBA Board approval of the Project Scope and Budget ("PSB"). Refer to Section 2.2 Terms of Agreement. Please acknowledge.

No further review comments for this section.

Response: The City acknowledges that the MSBA 2018 Schedule has not been published and the Lowell High School project schedule for the Schematic Design submission to the MSBA will be adjusted accordingly. The City also acknowledges that the Lowell High School project Feasibility Study Agreement expires on May 19, 2018, approximately three weeks prior to the June MSBA Board approval of the Project Scope and Budget ("PSB").

Based upon the tentative MSBA schedule, the team has determined they will revise the schedule to allow more time for cost estimation and communication within the City, and will target the May 19, 2018 Schematic Design Submission, and the June 27, 2018 MSBA Board Meeting. A revised scheduled based upon these target dates is attached to this submission. The District will file an extension as required in conformance with Section 2.2 Terms of Agreement.

3.3.2 EVALUATION OF EXISTING CONDITIONS

	Provide the following Items	Complete; *No response required*	Provided; *District's response required*	Not Provided; *District's response required*	Receipt of District's Response; *To be filled out by MSBA Staff*
1	A narrative of any changes resulting from new information that informs the conclusions of the evaluation of the existing conditions and its impact on the final evaluation of alternatives	☐	☒	☐	☐
2	If changes are substantive, provide an updated Evaluation of Existing Conditions and identify as final. Identify additional testing that is recommended during future phases of the proposed project and indicate when the investigations and analysis will be completed	☒	☐	☐	☐

MSBA Review Comments:

1) *MSBA notes that, since the Preliminary Design Program ("PDP") submittal, both a Phase 1 and Phase 2 Environmental l Assessment has been completed for the site of the preferred alternative, the Cawley site. These reports note the potential presence of historical fill material (including Polycyclic Aromatic Hydrocarbons) located in the northern portion of the site, and potential ground water contamination in the vicinity of a former filling station adjacent to the southern portion of the Cawley site. MSBA notes that estimated costs associated with abatement of contaminated soil from any source must be itemized in the cost estimates included in the Schematic Design submittal as ineligible for MSBA reimbursement.*

   Response: The District acknowledges that estimated costs associated with abatement of contaminated soil from any source must be itemized in the cost estimates included in the Schematic Design submittal as ineligible for MSBA reimbursement.

No further review comments for this section.

3.3.3 FINAL EVALUATION OF ALTERNATIVES

Include at least three potential alternatives, with at least one renovation and/or addition option. Include the following for each alternative where appropriate:

Provide the following Items		Complete; *No response required*	Provided; *District's response required*	Not Provided; *District's response required*	Receipt of District's Response; *To be filled out by MSBA Staff*
1	An analysis of each prospective site including:				
	a) Natural site limitations	☒	☐	☐	☐
	b) Building footprint(s)	☒	☐	☐	☐
	c) Athletic fields	☒	☐	☐	☐
	d) Parking areas and drives	☒	☐	☐	☐
	e) Bus and parent drop-off areas	☒	☐	☐	☐
	f) Site access and surrounding site features.	☒	☐	☐	☐
2	Evaluation of the potential impact that construction of each option will have on students and measures recommended to mitigate impact	☒	☐	☐	☐
3	Conceptual architectural and site drawings that satisfy the requirements of the education program	☐	☒	☐	☐
4	An outline of the major building structural systems	☒	☐	☐	☐
5	The source, capacities, and method of obtaining all utilities	☒	☐	☐	☐
6	A narrative of the major building systems	☐	☒	☐	☐
7	A proposed total project budget and a construction cost estimate using the Uniformat II Elemental Classification format (to as much detail as the drawings and descriptions permit, but no less than Level 2)	☒	☐	☐	☐
8	Permitting requirements and associated approval schedule	☐	☒	☐	☐
9	Proposed project design and construction schedule including consideration of phasing	☒	☐	☐	☐
10	Completed Table 1 – MSBA Summary of Preliminary Design Pricing spreadsheet	☐	☒	☐	☐

MSBA Review Comments:

2) *MSBA notes that significant community facilities are provided in the existing and proposed building (bank/credit union, TV studio, vocational retail spaces, social worker spaces, pool facility, community health center, Catie's Closet, Latino Connection, DARE office, etc.). Describe how potentially moving these functions out of the City's center will affect public use and access for the communities they serve. Include a description of public transportation, parking, and public access into the proposed new building during the school day.*

Response: Lowell High School serves a diverse population of students who require related services to support their success. The existence of these services helps LHS to support students and families in various ways. The bank, the restaurant, and the store are primarily Internal operations, but also serve the public in some ways: the bank/credit union gives students access to financial services and advice. Our students also have the opportunity for internships in the bank branch. The vocational retail spaces allow students to run a fully functional TV studio, a restaurant and a school store (currently in both a school site and a downtown site). Both stores are fully accessible to the public.

Social workers provide services to our students, and also are part of House Teams, who do home visits all over the city to student homes. The other services mentioned basically offer an array of social services to students in school (Catie's Closet, Lowell Community Health Center, etc.).

Public access to the new LHS building will mimic public access as it exists today in the downtown location. Security procedures will be in place to provide access to the public as required.

The new building at Cawley will have ample visitor parking and access to public transportation via LRTA Bus Routes (Route 2 the designated Belvidere Route, and Route 12, the Tewksbury/Rt. 38 line that runs on Rogers Street).

6) The Plumbing narrative notes that it is assumed that a fire pump will not be required for the Cawley site new building options, and that this will be confirmed during the Design Development phase of the project. MSBA notes that the project budget, including the associated MSBA grant, is determined based on the District's Schematic Design submittal. Therefore any costs associated with this potential fire pump, including space requirements in the proposed building, should be identified prior to MSBA establishing its grant. Unidentified scope of work, additional space requirements in the building, and any costs associated with this fire pump that are not accounted for in the total project budget will not be eligible for MSBA reimbursement.

Response: The need for a Fire Pump will be determined during the Schematic Design phase. Any associated space requirements and costs will be included in the Schematic Design submission.

8) In order for the MSBA to better understand the requirements and associated timeline to secure all required State and local approvals, please provide a description and work plan that clearly outlines the work involved in satisfying all requirements including any impact to land disposition per Massachusetts Article 97. Provide any updates regarding site approval / permit requirements for the preferred option relating to the Manning Field replication site in Chelmsford, and the proposed Cawley site parking lot in Tewksbury. Note that MSBA will not execute a Project Funding Agreement with the District until all land use issues and related project approvals have been completed.

The submittal notes that the entire 43.24 acres indicated as the Cawley site, including the 5.14 acres in Tewksbury, is owned and controlled by the City of Lowell. Please provide documentation of same.

Response: The City of Lowell will begin the approval/permit process with the towns of Tewksbury, in relation to the parking lot at the Cawley site, and Chelmsford for the Manning field replication

pending MSBA Board of Directors vote on August 23, 2017. Both towns will require the City of Lowell to appear at the Conservation Commission and Planning Board for appropriate permits.

The Property Survey included in Appendix T of the PSR submission, indicates that the property is owned by the City of Lowell, Total Acres = 43.24 acres, including the area w/in Lowell = 38.10 acres, and the area w/in Tewksbury = 5.14 acres. Also, see attached letter from the City dated August 11, 2017, "Article 97 Land Ownerership", and PSR Appendix Y2, Article 97 – City of Lowell Ownership of Land at Cawley Stadium Complex letter dated April 25, 2017.

10) As noted in the submittal, the District selected four potential alternatives at the existing campus including a base repair, a full renovation and two addition/renovation options ranging from approximately $271m to $353m in project costs, and two potential new construction alternatives at the Cawley site ranging from approximately $336m to $339m in project costs. Construction costs for these six alternatives range from $337 to $461 per sf.

No response required.

No further review comments for this section.

3.3.4 PREFERRED SOLUTION

	Provide the following Items	Complete; *No response required*	Provided; *District's response required*	Not Provided; *District's response required*	Receipt of District's Response; *To be filled out by MSBA Staff*
1	Educational Program				
	a) Summary of key components and how the preferred solution fulfills the educational program	☒	☐	☐	☐
	b) Design responses including desired features and/or layout considerations	☒	☐	☐	☐
	c) Proposed variances to, and benefits of, any changes to the current grade configuration (if any) and a related transition plan – *NA*	☒	☐	☐	☐
2	Preferred Solution Space Summary				
	a) Updated MSBA Space Summary spreadsheet	☐	☒	☐	☐
	b) Itemization and explanation of variations from the initial space summary (and MSBA review) included in the Preliminary Design Program	☒	☐	☐	☐
3	Preliminary NE-CHPS or LEED-S scorecard	☐	☒	☐	☐

Provide the following Items		Complete; *No response required*	Provided; *District's response required*	Not Provided; *District's response required*	Receipt of District's Response; *To be filled out by MSBA Staff*
4	Conceptual floor plans of the preferred solution, in color that are clearly labeled to identify educational spaces	☒	☐	☐	☐
5	Clearly labeled site plans of the preferred solution including, but not limited to:				
	a) Structures and boundaries	☒	☐	☐	☐
	b) Site access and circulation	☐	☒	☐	☐
	c) Parking and paving	☐	☒	☐	☐
	d) Zoning setbacks and limitations	☒	☐	☐	☐
	e) Easements and environmental buffers	☒	☐	☐	☐
	f) Emergency vehicle access	☒	☐	☐	☐
	g) Safety and security features	☒	☐	☐	☐
	h) Utilities	☒	☐	☐	☐
	i) Athletic fields and outdoor educational spaces (existing and proposed)	☐	☒	☐	☐
	j) Site orientation	☒	☐	☐	☐
6	An overview of the Total Project Budget and local funding including the following:				
	a) Estimated total construction cost	☒	☐	☐	☐
	b) Estimated total project cost	☒	☐	☐	☐
	c) Estimated funding capacity	☐	☒	☐	☐
	d) List of other municipal projects currently planned or in progress	☒	☐	☐	☐
	e) District's not-to-exceed Total Project Budget	☒	☐	☐	☐
	f) Brief description of the local process for authorization and funding of the proposed project	☐	☐	☒	☐
	g) Estimated impact to local property tax, if applicable	☐	☒	☐	☐
	h) Completed MSBA Budget Statement	☒	☐	☐	☐
7	Updated Project Schedule including the following projected dates:				
	a) Massachusetts Historical Commission Project Notification Form	☐	☒	☐	☐

Provide the following Items		Complete; *No response required*	Provided; *District's response required*	Not Provided; *District's response required*	Receipt of District's Response; *To be filled out by MSBA Staff*
	b) MSBA Board of Directors meeting for approval to proceed into Schematic Design	☒	☐	☐	☐
	c) MSBA Board of Directors meeting for approval of project scope and budget agreement and project funding agreement	☒	☐	☐	☐
	d) Town/City vote for project scope and budget agreement	☐	☐	☒	☐
	e) Design Development submittal date	☒	☐	☐	☐
	f) MSBA Design Development Submittal Review (include required 21-day duration)	☒	☐	☐	☐
	g) 60% Construction Documents submittal date	☒	☐	☐	☐
	h) MSBA 60% Construction Documents Submittal Review (include required 21-day duration)	☒	☐	☐	☐
	i) 90% Construction Documents submittal date	☒	☐	☐	☐
	j) MSBA 90% Construction Documents Submittal Review (include required 21-day duration)	☒	☐	☐	☐
	k) Anticipated bid date/GMP execution date	☒	☐	☐	☐
	l) Construction start	☒	☐	☐	☐
	m) Move-in date	☒	☐	☐	☐
	n) Substantial completion	☒	☐	☐	☐

MSBA Review Comments:

2a) Refer to Attachment B for MSBA space summary review comments.

3) The District has indicated intent to achieve the 2% additional reimbursement through the MSBA Green School Program. The submittal indicates a total goal of 63 points using USGBC LEED-V4, including 11 points in Energy & Atmosphere "Optimize Energy Performance" category. In the District's response to this review, confirm that the levels of energy performance indicated meet or exceed the current Massachusetts (base) energy code by 20% (refer to the February 15, 2017 MSBA Board Memo regarding Sustainable Design Policy, and MSBA Project Advisory #41 for additional information).

Response: The proposed levels of energy performance for the project will meet or exceed the current Massachusetts (base) energy code by 20%, in accordance with the MSBA Board Memo dated February 15, 2017 regarding Sustainable Design Policy, and MSBA Project Advisory #41.

5) The submittal indicates extensive potential offsite scope of work for the preferred Cawley site option including addition or extension of utilities, road widening and/or added turning lanes, added or improved traffic signaling, removal of existing trees and rock walls, and an additional 12,000 linear feet of sidewalks, curbing and crosswalks. The submittal also notes that this offsite work includes potential for related eminent domain taking of private property associated with widening this right of way. As a part of the Schematic Design submittal, all offsite work required for this project must be itemized in the Total Project Budget spreadsheet as ineligible for MSBA funding. Provide any updates regarding acquisition of private property through purchase and/or eminent domain. Note that work associated with Article 97 replication scope not directly related to the functioning of the proposed school is not to be included in the Total Project Budget. Please acknowledge in the District's response to these review comments.

Response: The City will itemize any offsite work required for the project in the Total Project Budget spreadsheet and acknowledges these costs are ineligible for reimbursement. The City also acknowledges that any work associated with Article 97 replication will not be included in the Total Project Budget. Pending MSBA Board of Directors approval on August 23, 2017, the City will begin engineering evaluations of both City-owned and State-owned roadways and infrastructure in order to determine necessary improvements. Initial investigations are geared towards finding solutions to mitigate any potential eminent domain matters.

5b) Describe public outreach efforts regarding the stated potential for school site access from the residential areas on Douglas road, both for limited emergency use and, if applicable, for the general public.

Response: The City held over 60 community meetings during the PDP and PSR phases that included significant public input. Pending MSBA Board of Directors approval on August 23, the City will begin holding additional community meetings at both a neighborhood and city-wide level to engage the residents on topics such as site access via Douglas Road and other traffic pattern concerns.

The submittal notes that for the Cawley site options, bus transportation for students requires a total of 46 dedicated full-size buses and 11 special education vans. In the District's response to this review, describe the following:

- *How the proposed bus drop off lane design will function for 46 full-sized buses and 11 vans;*
- *How the design will mitigate or prevent visitors and student drivers from entering or conflicting with the bus drop off lanes;*
- *How the parent drop off lane will be designed so that 38 cars will stack without conflicting with other car traffic*

Response: The initial investigations to bus students to Cawley Stadium yielded a number of 46 buses for transportation costs. The school administration and the City officials are currently working together to explore options to reduce that number of 46 buses needed to transport students to Cawley Stadium. The team is planning for a maximum number of 46 buses.

The diagram below which represents recent explorations undertaken after the submission of the PSR, indicates a potential revised traffic pattern that responds to MSBA comments above, and also

helps to mitigate community traffic concerns. This diagram shows the ability to completely separate cars (dark blue arrows), busses (red arrows) and vans (light blue) on site. Cars are also able to use separate secondary roadways (Village & Douglas) approaching the site verses vans and busses (Clark Rd). Vans enter the site further up Clark Rd utilizing the staff entrance where they circulate to a separate drop off suitable for 11 vans. This drop off is located with close proximity to the entrance and adjacent to the bus drop off so all students being transported by bus or van enter through the same pedestrian plaza. Staff will be parked prior to morning drop off and do not pose a circulation conflict with vans.





More than 46 busses fit in a deliberate double-stacked loop that has an additional interior lane for passing. Bus lane will be a minimum of 40' that will provide an access aisle between busses as well as an outside passing lane suitable for emergency vehicles. Students exit each bus onto a large sidewalk along the outside loop that leads into the main entry. More than 11 vans fit along the opposite side of the North sidewalk shared by bussed students. The car drop-off loop holds 32 cars on the site proper, but allows a more substantial queue of up to 75 cars to occur within the site.

5c) The submittal notes that the five story new construction option for the Cawley site can accommodate 850 parking spaces (500 for staff and visitors, 350 for students), which is the identified number of required spaces for the Cawley site. The four story option, with a larger building footprint, reportedly cannot provide this amount of parking. In the District's response to this review, if the number of required spaces is determined by local zoning requirements, describe the extent that the Lowell High School project is required to comply with this, or any other zoning requirement. If the number of parking spaces is determined by anticipated need, describe school policy regarding students driving to school, and how the 500 staff/visitor spaces number was determined (the submitted budget statement indicates 338 anticipated staff for this project).

Response: The number of parking spaces was determined by evaluating both the zoning requirements and the projected need for staff, students, and visitors. Based upon initial discussions with Eric Slagle, the Lowell Director of Development Services, it was acknowledged during the approvals process, they will consider the actual parking need, and space available on the site in addition to the zoning requirement of 6 parking spaces / instructional room. There are 140 academic classrooms & science labs x 6 = 840 spaces. If other instructional rooms are included i.e. Special

Education, Arts/Music/Business Tech Rooms, Physical Education, the strict definition of the zoning would require additional spaces. However, it was also acknowledged that the zoning requirement does not take concurrent use into consideration (i.e., the same students occupy multiple instructional rooms), and that a parking variance would likely be required.

The projected number of staff, students and visitors were determined by using current parking needs survey data from a study in the spring of 2017 with a 77% response rate which was prorated for projected enrollment: staff 440 x 1.13 = **497** (most park) + 210 students that drive prorated to 100% (response rate adjustment) x 1.13 = **307** spaces + **46 avg.** visitors / day approximately = 850 parking spaces.

Accordingly, the targeted 850 parking spaces represents the number of parking spaces required for academic classrooms as well as the projected need for students/staff/visitors, and also allows for the 2 playing fields to remain on the site as required by Article 97.

Based upon initial discussions with the Town of Tewksbury, there may also be a variance required if the Town considers parking for the School to be a Commercial instead of an Institutional use. The team will discuss possible parking variances with the City of Lowell and the Town of Tewksbury during the Schematic Design Phase and will clarify the timeframe for approvals in the Schematic Design submission.

The school currently has no policy on student driving because the current location is next to a municipal parking garage with ample spaces for student parking. The municipal garage prioritizes requests for monthly student passes based on their capacity. The estimates (based on 500 staff/visitors +10% of the students driving) were based off of surveys given to the students and staff/faculty, and information gathered from LPS data.

The difference in figures from the staff listing included in the budget statement versus the number for anticipated parking needs is caused by two factors. First, the capital budget statement is not prorated to design enrollment. In addition, the 338 in the budget statement does not include those who would need parking in addition to full-time staff such as: volunteers, student teachers, aides, contractors, cafeteria employees, etc.

5i) The Cawley site includes existing field hockey and softball fields that are proposed to be relocated elsewhere onsite, and remaining athletic facilities that are proposed to be relocated offsite per the Article 97 Land disposition policy agreement. MSBA notes that no offsite work for this project related to Article 97 replication will be eligible for MSBA funding, and must not be included in the costs for the Schematic Design submittal. Onsite site work, including replication of athletic facilities eligible for MSBA funding, will be capped at the MSBA standard site cap 8% of direct building costs. Please acknowledge in the District's response to these review comments.

Response: The City acknowledges that no offsite work for this project related to Article 97 replication will be eligible for MSBA funding and will not be included in the costs for the Schematic Design

submittal. The City further acknowledges onsite site work, including replication of athletic facilities eligible for MSBA funding, will be capped at the MSBA standard site cap 8% of direct building costs.

Clarify the extent that the Cawley Memorial Stadium and other existing Cawley site facilities are to remain in the proposed design. In the following Schematic Design submittal, provide a site plan diagram for the preferred option that clearly identifies proposed new and "existing to remain" structures. Clearly differentiate new structures and site elements that are included in the scope of this project, existing features that are to remain (specifically athletic track and fields, stadium seating, the skating rink, support buildings, paved areas, etc.), and features that will be removed.

Response: The Schematic Design site plan will include a diagram that clearly identifies proposed new and "existing to remain" structures and elements, and which elements are included and excluded from the scope of this project.

6a, b) The submittal indicates a construction cost for the preferred option is currently estimated to be $269,659,408, and a project cost of $336,138,724.

No response required.

6c, f, g) The Capital Budget Statement notes that the City has excess levy capacity and should be able to fund this project via a combination of general fund operating revenues and additional bond proceeds that fit within excess levy capacity. The Estimated impact to local property tax is indicated as an increase of 7.5%. Verify if a municipal override or debt exclusion of prop 2 1/2 is required for this project, and provide a description and anticipated schedule of the local process for authorization and funding of the proposed project.

Response: The City of Lowell will finance the local share of the project cost through the sale of general obligation bonds. The City Manager's office has worked with our outside financial advisory firm to determine projected debt service schedule s. The debt service on the bonds, of approximately $9.6 million per year, will be incorporated into the City of Lowell's existing operating budget via increases to the property tax levy. Because the City currently has excess levy capacity well of approximately $16.7 million as of FY17 no override or debt exclusion will be required to fund the project.

7a) The submittal notes that a Massachusetts Historical Commission Project Notification Form ("PNF") was submitted for the preferred Cawley site option, with a response from Massachusetts Historical Commission ("MHC") that required 1) a description of proposed re-use for the existing High School campus (1892/1922 building and the 1900/1939 Freshman Academy building), and 2) additional information for the Cawley site. In the District's response to these review comments, please provide any further updates regarding the MHC approval (if any) and an anticipated timeline for approval. The District should keep the MSBA informed of any decisions and/or proposed actions and should confirm that the proposed project is in conformance with Massachusetts General Law 950, CRM 71.00. Please acknowledge.

Response: There is no additional update regarding the MHC approval at this time. The anticipated timeline for the historical review will be reviewed with the Historic commission during Schematic Design and included in the Schematic Design submission. It is noted that the Cawley site is not in any historic district and is being reviewed by the MHC because of state agency approval.

In addition, provide a schedule and process to be undertaken by the City to determine future plans for the existing High School campus, Freshman Academy, and steam plant buildings. Provide any updates regarding the re-use of these buildings in the District's response to this review (see comments below regarding past MSBA funded projects).

Response: The City anticipates maintaining control of the Freshman Academy for educational purposes and will work with the school department regarding the 1922 and 1980 sites in terms of educational needs. The Department of Planning and Development (DPD) has explored potential uses for the current Lowell High School site. The site is located in a Downtown Mixed Use (DMU) zone and this designation allows a wide variety of commercial, retail, hotel, business, laboratory and institutional uses as of right. The lot shape and dimensions do not appear to pose unusual constraints to development and much of the site is relatively level and at grade and would support many types of development. The physical characteristics of the property will allow most types of commercial, retail, or industrial uses.

7d) Not included; provide a timeline for local vote for project scope and budget agreement.

Response: The project funding appropriation vote by the Lowell City Council will be taken between April 2018 and July 2018.

No further review comments for this section.

3.3.5 LOCAL ACTIONS AND APPROVALS

	Provide the following Items	Complete; *No response required*	Provided; *District's response required*	Not Provided; *District's response required*	Receipt of District's Response; *To be filled out by MSBA Staff*
1	Certified copies of the School Building Committee meeting notes showing specific submittal approval vote language and voting results, and a list of associated School Building Committee meeting dates, agenda, attendees and description of the presentation materials.	☒	☐	☐	☐
2	Signed Local Actions and Approvals Certification(s):				
	a) Submittal approval certificate	☒	☐	☐	☐

	b) Grade reconfiguration and/or redistricting approval certificate (if applicable) - *NA*	☐	☐	☐	☐
3	Provide the following to document approval and public notification of school configuration changes associated with the proposed project: - *NA*				
	a) A description of the local process required to authorize a change to the existing grade configuration or redistricting in the district- *NA*	☐	☐	☐	☐
	b) A list of associated public meeting dates, agenda, attendees and description of the presentation materials- *NA*	☐	☐	☐	☐
	c) Certified copies of the governing body (e.g. School Building Committee) meeting notes showing specific grade reconfiguration and/or redistricting, vote language, and voting results if required locally- *NA*	☐	☐	☐	☐
	d) A certification from the Superintendent stating the District's intent to implement a grade configuration or consolidate schools, as applicable. The certification must be signed by the Chief Executive Officer, Superintendent of Schools, & Chair of the School Committee.-*NA*	☐	☐	☐	☐

MSBA Review Comments:

2a) The Local Actions and Approvals Certification provided in the original submittal on June 28, 2017 was revised & resent to MSBA on July 12, 2017.

No response required.

No further review comments for this section.

Additional Comments:

July 27, 2017 Facilities Assessment Subcommittee ("FAS") meeting:

The District and design team clarified their selection of the New 5 story building at the Cawley Site, and advantages of that option over the other options, as follows:

- *Base Repair of the existing building - does not address educational needs*
- *Full Renovation of the existing building – limited access to green space, freshman academy is remote, extensive phasing & modular swing space required, high operating costs*
- *Add/ Reno Option 2 - limited to the existing site - limited access to green space, extensive phasing required, high operating costs*
- *Add/ Reno Option 3 – existing and expanded site – same as option 2 and, land acquisition & eminent domain required*
- *New 4 story building at the Cawley Site – does not provide adequate parking*
- *New 5 story building at the Cawley Site – District's preferred option*

Additional comments and action items from the Subcommittee regarding the District's Preferred Solution were discussed, and will be forwarded to the District for response to MSBA under a separate cover.

Response: See MSBA FAS comments, (referred to as attachment "C") email dated August 4th.

Regarding past projects:

Both the MSBA's enabling legislation, M.G.L. c. 70B, and the MSBA's regulations, 963 CMR 2.00 et seq. specifically address the issue of past projects. MSBA records show a total MSBA payment $733,509 for a Roof repair (project #201101600505G) completed October 1, 2012 (1922 "Coburn Hall" building) which is 5 years old as of 2017. Pursuant to these requirements and based on the City's selection of a preferred option to relocate the Lowell High School, the MSBA will recover a pro-rated portion of the financial assistance that the City has received for this grant, based on anticipated 20 year life expectancy and occupancy date. The exact amount that will be recovered will be established at the conclusion of the PSB phase. Please see the MSBA website to view the MSBA's regulations, statute and closed school bulletin for additional information.

MSBA also notes a $28,407,509 grant from the state for an addition/renovation project at the Lowell High School completed in 1998, anticipated to be beyond the 20 year recovery limitation date for this MSBA project per the submitted project schedule.

Response: It is anticipated by the City, that with a New School option at Cawley, the 20 year use period for the Roof Repair would be at 10 years in October, 2022. The MSBA's reimbursement was $733,509. The MSBA will want to recover approximately 50% of the pro-rated value which is approximately $367,000 depending on date of Substantial Completion or Occupancy, whichever comes first. If Occupancy in the new school occurred in 2022 it would be 50%.

End (A)

ATTACHMENT B
MODULE 3 – PREFERRED SCHEMATIC SPACE SUMMARY REVIEW

District: City of Lowell
School: Lowell High School
Owner's Project Manager: Skanska USA Building, Inc.
Designer Firm: Perkins Eastman
Submittal Due Date: June 29, 2017
Submittal Received Date: June 28, 2017
Review Date: June 29-July 20, 2017
Reviewed by: A. Waldron, K. Brown, J. Jumpe

The Massachusetts School Building Authority (the "MSBA") has completed its review of the proposed space summary of the preferred alternative as produced by Perkins Eastman and its consultants. This review involved evaluating the extent to which the Lowell High School's proposed space summary conforms to the MSBA guidelines and regulations.

The MSBA considers it critical that the Districts and their Designers aggressively pursue design strategies to achieve compliance with the MSBA guidelines for all proposed projects in the new program and strive to meet the gross square footage allowed per student and the core classroom space standards, as outlined in the guidelines. The MSBA also considers its stance on core classroom space critical to its mission of supporting the construction of successful school projects throughout the Commonwealth that meet current and future educational demands. The MSBA does not want to see this critical component of education suffer at the expense of larger or grander spaces that are not directly involved in the education of students.

The following review is based on the submitted new construction project option with an agreed upon design enrollment of 3,520 students in grades 9-12.

The MSBA review comments are as follows:

- **Core Academic** – The District is proposing a total of 161,620 net square feet (nsf) which is 7,420 nsf below the MSBA guidelines. The proposed area in this category has increased by 4,120 nsf since the Preliminary Design Program ("PDP") submittal. *The proposed spaces in this category include five science labs in excess of MSBA standards, eight general classrooms below MSBA standards, and two small group seminar rooms below MSBA standards. The category also includes six 125 nsf Department offices and a 3,600 nsf Teachers' Development Training room, both described in the District's response to the MSBA PDP review as Teacher Planning functions. The shortage of area in the Core Academic category is partially offset by a total 1,840 nsf overage in the Art/Music and Vocations/Technology categories. MSBA accepts these variations from guideline with no further comment.*

  No response required.

- **Special Education** – The District is proposing a total of 38,950 net square feet (nsf) which exceeds the MSBA guidelines by 4,710 nsf. The proposed area in this category has increased by 450 nsf since the PDP submittal. *Please note that the Special Education program is subject to approval by the Department of Elementary and Secondary Education ("DESE"). The District should provide this information for this submittal with the Schematic Design Submittal. Formal approval of the District's proposed Special Education program by the DESE is a prerequisite for executing a Project Funding Agreement with the MSBA.*

  Response: The District and Design Team acknowledge that the Project Funding Agreement is subject to DESE approval of the proposed Special Education programs (and plans). The DESE submittal is indicated on the attached schedule.

- **Art and Music / Voc-Tech** – The District is proposing a combined total of 53,315 nsf which exceeds the MSBA guidelines by 1,840 nsf. The proposed area in this category has decreased by 1,100 nsf since the PDP submittal. *As noted above in the Core Academic category, the overage in Art and Music / Voc-Tech is offset by a shortage of area in the Core Academic category. DESE reviewed and approved the proposed Chapter 74 Marketing program in a letter dated March 22, 2017.*
  The proposed Vocations & Technology category includes a 4,000 nsf TV studio. Describe the anticipated utilization of this space, the extent that it contributes to delivery of the educational curriculum, and detail any non-academic commercial access or commercial operation of this program. If the curriculum offerings and utilization of the TV Studio does not match the rate of other capacity generating spaces, this associated net area may be categorized as a non-educational community space and ineligible for MSBA funding.
  The category also includes a 400 nsf Bank/Credit Union and a 200 nsf Retail/Store Storage space. The MSBA does not object to the District including these spaces to the proposed project, however, the associated area will be deemed ineligible for reimbursement.

  Response: The overall utilization of Graphic/TV Production labs is 71%. The TV Studio is a suite of rooms that functions as pull-out space in the same way a prep room or the media center functions, not assigned/scheduled per se.

  Many students are assigned independent projects and studies in the TV Production lab and need the time in the small rooms to produce and edit their independent or small group projects (not assigned a class in their schedule, but time during lunches, before and after school). Both the bank and retail store space are assigned classes that work in these spaces. The bank is a very small space that houses both the banking staff (JDCU credit union staff, not LHS staff) and the students working in that space. The retail store space has a front-end store space and a backroom where students learn inventory, product marketing design and other retail marketing tools.

- **Health and Physical Education** – The District is proposing a total of 41,700 nsf which exceeds the MSBA guidelines by 5,788 nsf. The proposed area in this category has decreased by 8,250

nsf since the PDP submittal due to the relocation of the pool spaces to the 'Other' category per the MSBA's request*. The educational program describes a need for nine physical education stations for each class period. These stations include a six station, 18,000 nsf gymnasium, a 3,500 nsf PE alternatives station, a 3,000 nsf weights & strength station, and a 3,000 nsf multi-purpose yoga/cheering station. This overage is offset by locker rooms under MSBA guidelines by 10,112 nsf. Based on the student design enrollment and class schedule, the MSBA accepts four additional 3,000 nsf PE stations totaling 12,000 nsf for an adjusted allowable area of 47,912 nsf. As a result, the proposed area for this category is 6,212 nsf below the adjusted MSBA guidelines.*
This category includes three 150 nsf spaces titled "AD Secr. Bursor Conf (Lord 1st flr – South)". MSBA notes that the Lord building is on the existing campus. Describe these spaces, and verify if the District intends to replicate this function in the proposed new building. Based on the response and in the subsequent phase of the study, the MSBA will review the programmatic need for these spaces, and associated eligibility for funding.

Response: These spaces exist in the school today and are part of the administrative functioning for Health & Physical Education and Athletics. The District intends to replicate these spaces in the new facility as all of the PE and Athletic programs will be located there. The scale of programs requires an Athletic Director and an Assistant that provides bursar functions and a room for small conferences.

- **Media Center** – The District is proposing a total of 21,900 nsf which meets the MSBA guidelines. The proposed area in this category has not changed since the PDP submittal. *No further action necessary.*

  No response required.

- **Auditorium/ Drama** - The District is proposing a total of 15,516 nsf which exceeds the MSBA guidelines by 5,116 nsf and the MSBA upper limit by 2,216 nsf. The proposed area in this category has not changed since the PDP submittal. *The submitted space summary proposes an 11,616 nsf auditorium and a 2,600 nsf stage. As noted in the PDP review, and the November 2, 2016 Board Memo attached with that review, the District will be responsible for funding all costs of the Auditorium/Drama category that is beyond 10,400 nsf. Reduce the area by 2,216 nsf to conform with the MSBA upper limit of 13,300 nsf as described in the attached memorandum dated November 2, 2016.*

  Response: The District wishes to reinforce the request to preserve an auditorium of relatively modest size for its student body. We respectfully requests the MSBA reconsider its stated position relative to this space.

  The MSBA's auditorium space summary defaults to seating for 2/3 the enrollment, but no more than 750. The new Advisory is more generous, allowing up to 1000 seats, which would be 2/3 enrollment for 1500 students, but still seems appropriate for the many schools across

the commonwealth that are around 2000 students. There are approximately 40 schools within the 1500 to 2500 school size per niche.com, but only two that are substantially larger, and none in-between (Brockton at 4174 and Lowell being designed for 3520 students). The cap at 1000, effectively imposes a restriction on Lowell as an exceptionally large community commitment to a single school model vs district's that split into multiple high schools. The proposed program request by the District is for a modest 1/3 of the design enrollment, matching its existing auditorium size, which has been filled regularly for in-school and after school events, including; Academic Honors Nights, Scholarship Nights, and Open House Nights (needing to accommodate an entire grade and parents for these events) and, Guest speakers who address large groups of students (College & Career speakers for seniors, Cultural Competency training for students, or other academic presentations that gather 1-2 grades of students at a time.

- **Dining and Food Service** – The District is proposing a total of 25,180 nsf which meets the MSBA guidelines. The proposed area in this category has not changed since the PDP submittal. *No further action necessary.*

  No response required.

- **Medical** – The District is proposing a total of 2,610 nsf which meets the MSBA guidelines. The proposed area in this category has not changed since the PDP submittal. *No further action necessary.*

  No response required.

- **Administration and Guidance** – The District is proposing a total of 13,205 nsf which exceeds the MSBA guidelines by 2,520 nsf. The proposed area in this category has decreased by 500 nsf since the PDP submittal. *The submittal notes that this overage is due to additional administrative support needs of a large population high school, including house offices, additional assistant principals, Social Workers, and a Student Support Office. The District provided clarification regarding anticipated utilization of these spaces in the response to the MSBA PDP review comments, and reduced the area in this category as noted. MSBA will continue to review the proposed project in the following phase of the feasibility study for programmatic needs that vary from the MSBA guidelines, areas that exceed programmatic needs, and associated eligibility for funding.*

  Response: The District and Design Team would only like to highlight the fact that the MSBA Space Summary template does not scale many program elements under this category, including spaces such as the mail room. This space defaults to 100sf, regardless of having 50 or 500 teachers. In total 4 of the 16 spaces under this category scale with the enrollment; only 6 of 27 scale if including nurse and custodial areas.

- **Custodial and Maintenance** – The District is proposing a total of 5,440 nsf which exceeds the MSBA guidelines by 1,175 nsf. The proposed area in this category has decreased by 1,000 nsf

since the PDP submittal. *The submittal notes that this is due to the guidelines not scaling with the size of the school except the storeroom and receiving and supply. The District notes that a school of this size will require multiple network rooms, which accounts for 1,000 nsf of this overage. As noted in the PDP review, the MSBA will continue to evaluate the need for spaces in this category in the subsequent project Scope and Budget submittal review. No further preliminary comments.*

No response required.

- **Other** - The District is proposing a total of 13,950 nsf. *As noted above, all area associated with the proposed pool (currently 7,150 nsf) has been reallocated to this category per the MSBA's request. This added area is partially offset by a total 900 nsf of various reductions in this category. This category is made up of the following spaces:*

    - *Lowell Community Health Center (1,500 nsf) - As previously noted, the MSBA does not object to the inclusion of this space, however, this square footage will be considered ineligible for reimbursement.*
    - *Catie's Closet (700 nsf) – Described in the updated Educational Program as a nonprofit space within the school. The MSBA does not object to the District adding this area to the proposed project, however, the associated area will be deemed ineligible for reimbursement.*
    - *Trio (1,500 nsf) - Described in the updated Educational Program as an academic support space for college/career support. MSBA accepts this variation from guideline with no further comment.*
    - *Various offices (totaling 3,100 nsf)- including the following: In School Suspension, Score Mediation, Latino Connection, Student Activities, Substitute Teacher Office, DARE Office/Security, and SRO Office & Entry – these spaces are described in the updated Educational Program as academic, emotional and mental support spaces for students, or school resource / security spaces. MSBA accepts this variation from guideline with no further comment.*
    - *Pool, associated storage & laundry (7,150 nsf) - As noted in the April 5, 2017 MSBA PDP submittal review, per 963 CMR 2.16(5) and based on current practice the MSBA would not support a project that includes a newly constructed swimming pool.*

      Response: The District wishes to reinforce the need to preserve a pool, but in no way intends to jeopardize funding for the project itself. We respectfully request the MSBA reconsider its stated position relative to this space, citing the proposed programs are integral to Lowell's educational objectives, unique size/context and community needs.

      The city of Lowell contains two major rivers and multiple canal systems. It is essential For the safety of our citizens that all students have the opportunity to learn to swim. It is considered a vital part of the educational and community needs given the ubiquitous waterways within the city, and the limited means by which many students and families can attain these life-saving skills and abilities, especially students in our

Newcomer population and those from underprivileged homes. The existing pool is not merely an athletic amenity, but supports currently health & physical education curriculum on water safety and instruction, allows special education students to participate in aquatic activities, fosters participation in lifetime fitness and adult/senior education programs. The swimming programs continue also address unique needs of diversity, such as Muslim girls being afforded the ability to darn swim wear and receive lessons in a private setting.

In addition, the pool is used by many community groups, not only in Lowell, but also the surrounding communities. New Wave Swim Club uses the current pool as one of their practice facilities throughout the year. Also, the City / School has a proven track record of operating and maintaining a pool for the past nearly 40 years. The city is committed financially to operating and maintaining a natatorium in the future.

We are aware that the MSBA does not want to set precedent of co-mingling pools with state funded schools, but has participated in such projects, including a recent new pool at West Springfield HS completed in 2014. We believe Lowell, if anything, has very unique needs and circumstances that warrant maintaining its pool and building it concurrently, even if separately estimated and bid. Any further separation on site or in sequence of construction would cost the community more and impact school programs. The City believes these requests are in the best interest of the community.

- **Total Building Net Floor Area** – The District is proposing a total of 393,386 nsf which exceeds the MSBA guidelines by 27,679 nsf. The proposed area has decreased by 30 nsf since the PDP submittal. *Refer to the comments in each space category above. MSBA will continue to evaluate eligibility of area in the subsequent Project Scope and Budget submittal.*

  No response required.

- **Total Building Gross Floor Area** – The District is proposing a total of 590,079 gsf which exceeds the MSBA guidelines by 37,439 gsf. The proposed area has decreased by 45 gsf since the PDP submittal. *Eligibility of gross square feet will be determined by the eligible net square feet determined in the Project Scope and Budget phase multiplied by a grossing factor of 1.5 (in no case shall the grossing factor for new construction exceed a grossing factor of 1.5).*

  No response required.

Please note that upon moving forward into subsequent phases of the proposed project, the Designer will be required to provide, with each submission, a signed, updated space summary that reflects the design and demonstrates that the design remains, except as agreed to in writing by the MSBA, in accordance with the guidelines, rules, regulations and policies of the MSBA. Should the updated space summary demonstrate changes to the previous space summary include a narrative description of the change(s) and the reason for the proposed changes to the project. **End (B)**

ATTACHMENT (C)

MSBA 8/4/17 Email Requiring Response

The following items were topics of discussion at the FAS meeting:

- Details related to the educational program and its resulting proposed design;
- Proposed swimming pool facility within the new building;
- City plans for the existing high school facilities following relocation of the new school;
- Continuing efforts regarding City, school & community selection and outreach for the new building option on the Cawley site;
- Potential to limit paving in the immediate area around the building;
- Appropriate cover for handicapped individuals;
- Number and locations of elevators;
- Locations of Robotics, CADD & Maker Spaces;
- Seating capacity within the auditorium, and the potential to include a variety of performance spaces rather than added auditorium capacity, such as black box theater; and
- Ongoing development of the floor plans.

As a follow up, please provide a response to the following within 14 days of receipt of this email:

1. Where noted above, the District and the Design team should review and comment regarding the spaces and adjacencies in the proposed floor plan and site plan.
2. The MSBA requires the District and design team to resubmit the Preferred Schematic Report Section 3.3.4 Preferred Solution in its entirety, revised to incorporate the updated floor plan and site plan, and revisions based on the MSBA Preferred Schematic Report review comments (as noted in the review comments Attachment B, the pool, associated storage and laundry must be removed from the proposed project). Please indicate when the District could provide this supplemental information.

Response: Resubmission of PSR Section 3.3.4, including refined site and floor plans is planned for October 13th 2017.

Since the FAS meeting the Design Team has been working on the next iteration of the preferred schematic plan, continuing to build on the educational objectives and responding to the MSBA's comments. The design team notes that the elements of the plans were shown diagrammatically in the FAS, such as stairs/elevators, but were intended to be more actualized in this next phase. Further definition of the 'heart of the school,' including the stairwells, elevator locations and refined thoughts on maker space will be illustrated in the resubmission. The plans will also show isolation of the pool facility (for cost purposes), while maintaining a location to ensure it can continue to function as required for the Health & Physical Education and Special Education programs. Other plan refinements being made include an attempt to better the already good classroom wing orientation, provide green space buffers around the building perimeter and show covered access on both sides of the building.

The District wishes to reinforce the need to preserve a pool and auditorium of relatively modest size for its student body, but in no way intends to jeopardize funding for the project itself. We respectfully requests the MSBA reconsider its stated position relative to these two spaces, citing the proposed programs are integral to Lowell's educational objectives, unique size/context and community needs.

The MSBA's auditorium space summary defaults to seating for 2/3 the enrollment, but no more than 750. The new Advisory is more generous, allowing up to 1000 seats, which would be 2/3 enrollment for 1500 students, but still seems appropriate for the many schools across the commonwealth that are around 2000 students. There are approximately 40 schools within the 1500 to 2500 school size per niche.com, but only two that are substantially larger, and none in-between (Brockton at 4174 and Lowell being designed for 3520 students). The cap at 1000, effectively imposes a restriction on Lowell as an exceptionally large community commitment to a single school model vs district's that split into multiple high schools. The proposed program request by the District is for a modest 1/3 of the design enrollment, matching its existing auditorium size, which has been filled regularly for in-school and after school events, including; Academic Honors Nights, Scholarship Nights, and Open House Nights (needing to accommodate an entire grade and parents for these events) and, Guest speakers who address large groups of students (College & Career speakers for seniors, Cultural Competency training for students, or other academic presentations that gather 1-2 grades of students at a time.

Regarding the Pool; the city of Lowell contains two major rivers and multiple canal systems. It is essential for the safety of our citizens that all students have the opportunity to learn to swim. It is considered a vital part of the educational and community needs given the ubiquitous waterways within the city, and the limited means by which many students and families can attain these life-saving skills and abilities, especially students in our Newcomer population and those from underprivileged homes. The existing pool is not merely an athletic amenity, but supports currently health & physical education curriculum on water safety and instruction, allows special education students to participate in aquatic activities, fosters participation in lifetime fitness and adult/senior education programs. The swimming programs continue also address unique needs of diversity, such as Muslim girls being afforded the ability to darn swim wear and receive lessons in a private setting.

In addition, the pool is used by many community groups, not only in Lowell, but also the surrounding communities. New Wave Swim Club uses the current pool as one of their practice facilities throughout the year. Also, the City / School has a proven track record of operating and maintaining a pool for the past nearly 40 years. The city is committed financially to operating and maintaining a natatorium in the future.

We are aware that the MSBA does not want to set precedent of co-mingling pools with state funded schools, but has participated in such projects, including a recent new pool at West Springfield HS completed in 2014. We believe Lowell, if anything, has very unique needs and circumstances that warrant maintaining its pool and building it concurrently, even if separately estimated and bid. Any further separation on site or in sequence of construction would cost the community more and impact

school programs. The City believes these requests are in the best interest of the community; please refer to the detailed responses in Attachment B of the PSR, Auditorium and Other Spaces.

Finally, as for the City plans for the existing high school facilities following relocation of the new school, the City anticipates maintaining control of the Freshman Academy for educational purposes and will work with the school department regarding the 1922 and 1980 sites in terms of educational needs. The Department of Planning and Development (DPD) has explored potential uses for the current Lowell High School site. The site is located in a Downtown Mixed Use (DMU) zone and this designation allows a wide variety of commercial, retail, hotel, business, laboratory and institutional uses as of right. The lot shape and dimensions do not appear to pose unusual constraints to development and much of the site is relatively level and at grade and would sup port many types of development. The physical characteristics of the property will allow most types of commercial, retail, or industrial uses.

End (C)

BCA
BUILDING CONSERVATION ASSOCIATES INC

March 26, 2018

Secretary of the Commonwealth
Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, MA 02125-3314

Re: Lowell High School Feasibility Study Project Notification Forms

Lowell High School has re-started the process of a feasibility study with the Massachusetts School Board Authority (MSBA) to explore options for renovations, additions and new construction. During the previous feasibility study a Project Notification Form (PNF) was submitted to the Massachusetts Historical Commission (MHC) for review on in April 2017. The PNF described the options for the high school being considered by the City of Lowell prior to producing a "Preferred Schematic Report" for the MSBA and sought input from the MHC regarding their preferred site. A letter requesting additional information on the proposed sites was received from the MHC on May 19, 2017. The high school project was put on hold in August 2017.

The three design options for the high school submitted to the MHC for review and comment in the April 2017 included two options for additions/renovations at the existing downtown high school site and one option for a new building at the Cawley Stadium site. Since that time, the City of Lowell has decided to keep the high school in the downtown location. The three design options currently under consideration in the revised Preferred Schematic Report to the MSBA include two addition/renovation options and one new building option (to meet the requirements of the MSBA). The design options are as follows (with the name they are referred to in the MSBA report provided in parentheses):

Design Option A (New Option A on Expanded Site)
To meet MSBA requirements a complete new school building on a portion of the existing high school site is being investigated. This is a new option that was not present in the April 2017 PNF. A description of the proposed design can be found within this PNF submittal.

Design Option B (Addition/Renovation Option 2A)
This is substantially similar to Design Option B – Addition/Renovation Option 2 submitted in April 2017. Further description of the proposed design can be found within this PNF submittal.

BUILDING CONSERVATION ASSOCIATES INC
10 Langley Road, Suite 202 Newton Centre, MA 02459
TEL 617.916.5661 FAX 617.477.2350
www.bcausa.com

Design Option C (Addition/Renovation Option 3A on Expanded Site)
This is substantially similar to Design Option C – Addition/Renovation Option 3 submitted in April 2017. Further description of the proposed design can be found within this PNF submittal.

The additional information requested by the MHC in their May 19, 2017 letter in response to the April 2017 PNF has been provided in this new PNF to the extent possible. This includes additional exterior photographs keyed to a sketch map. Because this stage of the MSBA feasibility study module is performed at a rough schematic level, the requested elevations and perspective views of the existing and proposed conditions of the school do not yet exist. These elevations and perspective views will be generated as part of schematic design for the selected solution and will be submitted to the MHC as part of the PNF for the design solution ultimately selected for the high school.

The forms have been signed by Alicia Caritano, the project manager for the work at Perkins Eastman, who will be the primary contact for any comments or questions you may have.

Sincerely,

Building Conservation Associates, Inc.
Alicia Svenson
Senior Architectural Conservator

cc: Alicia Caritano, Senior Associate - Perkins Eastman
Kevin J. Murphy, City Manager, Mike McGovern, Assistant City Manager
Jim Dowd, Senior Project Manager - Skanska USA Building Consulting
Steve Stowell, Administrator – Lowell Historic Board

APPENDIX A

MASSACHUSETTS HISTORICAL COMMISSION
220 MORRISSEY BOULEVARD
BOSTON, MASS. 02125
617-727-8470, FAX: 617-727-5128

PROJECT NOTIFICATION FORM

Project Name: Lowell High School (Existing High School Downtown Site Design Options: Full Renovation, Addition/Renovation Option 2, and Addition/Renovation Option 3)

Location/Address: 50 Father Morissette Blvd, 75 Arcand Dr.*(*Option A & C only)

City / Town: Lowell, MA 01852

Project Proponent:

Name: City of Lowell: Kevin J. Murphy, City Manager

Address: Lowell City Hall, 375 Merrimack St.

City/Town/Zip/Telephone: Lowell, MA 01852 978-674-1000

Agency license or funding for the project (list all licenses, permits, approvals, grants or other entitlements being sought from state and federal agencies).

Agency Name	Type of License or funding (specify)
Massachusetts School Building Authority (MSBA)	963 CMR 2: Partial reimbursement grant for construction and renovation of K-12 schools in the Commonwealth of Massachusetts.

Project Description (narrative): See attachment.

Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition. Yes, see attachment.

Does the project include rehabilitation of any existing buildings? If so, specify nature of rehabilitation and describe the building(s) which are proposed for rehabilitation. Yes, see attachment.

Does the project include new construction? If so, describe (attach plans and elevations if necessary).
Yes, see attached conceptual site plans, conceptual floor plans, and exterior photographs for more information. In accordance with the MHC's comment in their May 19, 2017 letter, the team is providing additional photographs which are keyed to a site plan which are attached. Additional information including elevations and perspective views will be provided in the forthcoming Schematic Design phase once the Preferred Option has been selected and the design has been developed.

To the best of your knowledge, are any historic or archaeological properties known to exist within the project's area of potential impact? If so, specify. No

What is the total acreage of the project area?

Woodland	*0 Acres*
Wetland	*0 Acres*
Floodplain	*0 Acres*
Open Space	*Design Option A: 1.64 +/-Acres (.29 greenspace)* *Design Option B: 1.9±Acres (.2 greenspace)* *Design Option C: 3.27+/Acres (.47 greenspace)*
Developed	See project acreage below.
Agricultural	*0 Acres*
Forestry	*0 Acres*
Mining/ Extraction	*0 Acres*
NHESP	*0 Acres*
Total Project area	**Design Option A: 4.7+/- Acres** **Design Option B: 6.0± Acres** **Design Option C: 7.4+/- Acres**

Note: These approximate areas are based on large scale GIS Maps and FEMA Maps and are not the result of an on the ground survey. Some of this data is a few years old and could have changed (wetlands, etc.) since then. A survey should be performed to confirm these areas.

What is the acreage of the proposed new construction?

Design Option A (New Building Footprint):	136,000 GSF	+/- 3.03 acres
Design Option B (Add Renovation Opt 2A Building Footprint):	179,000 GSF	+/- 4.10 acres
Design Option C (Add Renovation Opt 3A Building Footprint):	180,000 GSF	+/- 4.13 acres

What is the present land use of the project area?
The current use of the project area is the existing Lowell High School. Design Option A and Design Option C include an adjacent lot that is currently used as a medical office building and parking lot.

Please attach a copy of the section of the USGA quadrangle map which clearly marks the project location. See attachment.

This Project Notification Form has been submitted to the MHC in compliance with 950 CMR 71.00.

Signature of Person submitting this form: Alicia T. Caritano Date: 3/22/18

Name: Alicia T. Caritano, Senior Associate Perkins Eastman

Address: 20 Ashburton Place, Floor 8

City/Town/Zip: Boston, MA 02108

Telephone: 617-449-4000

REGULATORY AUTHORITY950 CMR 71.00: M.G.L. c. 9, §§ 26-27C as amended by St. 1988, c. 254.

PERKINS EASTMAN

Project Notification Form
Appendix A: Descriptions Attachment
Lowell High School: Existing High School Site Design Options
Revised March 22, 2018

Project Description (narrative):
Lowell High School is undergoing a feasibility study to explore options for renovations, additions, and new construction with the Massachusetts School Building Authority (MSBA). The primary reason for the study is that the age and condition of the existing school buildings have exceeded their useful life, and the prevention of severe overcrowding expected to result from increased enrollments. All options will include: building and accessibility code upgrades, installation of more energy efficient systems, envelope upgrades, and interior renovations to accommodate the educational program. The Preliminary Design Program investigated numerous options for renovations to the existing high school complex as well as new sites for construction of a new building. The three design options for the high school that were under consideration for the Preferred Option presented to the MHC for review and comment in the April 2017 PSR (Preferred Schematic Report) included two options for addition/renovation at the existing downtown high school site and one option for a new building at the Cawley Stadium site. Since that time, the City of Lowell has decided to keep the High School in the downtown location. The three design options currently under consideration in the Revised PSR include two addition/ renovation options and one new building option. These options are presented below as Design Options A, B, and C with the name they are referred to in the MSBA report provided in parentheses. All options do not include reuse of the Freshman Academy building or the Steam Plant, currently used by Lowell High School, which will be turned over to the City of Lowell for a use to be determined.

The existing Lowell High School complex consists of the following components: The original high school building of 1892 with additions from 1922 and 1997 (hereafter referred to as the 1922 Building) and two structures added to the complex in 1980 (the Lord and Field House buildings) located across the canal from the original high school and connected to the 1922 Building with pedestrian bridges.

Design Option A (New Option A - Expanded Site):
New Option A would entail the construction of a new High School Building on the west side of the Canal. The existing 1980 Field House, Lord Building and the Medical Office Building at the adjacent lot at 75 Arcand Drive would be demolished. The existing 1922 Building, Freshmen Academy and Steam Plant would not be included in the scope of the project and would be turned over to the City of Lowell.

Design Option B (Addition/ Renovation Option 2A):
Addition/ Renovation Option 2A would entail exterior and interior renovations of the existing 1922 Building and the Lord building, as well as the demolition of the existing one-story bridges, and the construction of two new two-story bridges to connect the Lord and 1922 Buildings. The existing Field House would be fully demolished and a new Field House and a new Academic Wing added to the west side of the Lord Building, as well as a small addition to the south of the building. The existing Freshmen Academy and Steam Plant would not be included in the scope of the project and would be turned over to the City of Lowell.

Perkins Eastman
Architects DPC

20 Ashburton Place
Floor 8
Boston, MA 02108
+1.617.449.4000

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Design Option C (Addition/ Renovation Option 3A on Expanded Site):
Addition/ Renovation Option 3A would entail exterior and interior renovations to the existing 1922 Building and the Lord building, as well as the demolition of the existing one-story bridges, and construction of two new two-story bridges to connect the Lord and 1922 Buildings. An adjacent lot, 75 Arcand Drive, would be added to the High School site. The existing Field House and the building at 75 Arcand Drive (construction date 1970) would be fully demolished and new Gymnasium Wing and new Academic Wing added to the west side of the Lord Building. The existing Freshmen Academy and Steam Plant would not be included in the scope of the project and would be turned over to the City of Lowell.

Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition.

Design Option A (New Option A on Expanded Site):
The existing Field House and Lord Building from 1980, the connecting bridges, and the Medical Office Building at 75 Arcand would be completely demolished under this option.

Design Option B (Addition/ Renovation Option 2A):
The existing Field House from 1980 would be completely demolished under this option as well as the connecting bridges over the canal between the Lord and the 1922 Building. There would be partial demolition of the exterior of the Lord and the 1922 School Building, as well as the demolition of the existing connecting bridges over the canal. Reconfiguration of interior spaces would involve partial interior demolition the 1922 and Lord buildings.

Design Option C (Addition/ Renovation Option 3 - Expanded Site):
The existing Field House from 1980 and an adjacent medical office building at 75 Arcand Drive from 1970, and the existing connecting bridges over the canal between the Lord and 1922 Building would be completely demolished under this option. There would be partial exterior demolition of the Lord and the 1922 School Building. Reconfiguration of interior spaces would involve partial interior demolition the 1922 and Lord buildings.

Does the project include rehabilitation of any existing buildings? If so, specify nature of rehabilitation and describe the building(s) which are proposed for rehabilitation.
Design Options B and C all propose interior and exterior rehabilitation of the 1922 Building and Lord Building. Options B and C include interior and exterior rehabilitation of the 1922 Building and Lord Building. The exterior appearance of the existing structures will be retained and work will follow the Lowell Historic Board's *Downtown Historic District Design Review Standards*.

Does the project include new construction? If so, describe (attach plans and elevations if necessary).
Design Options B and C propose building new additions to the Lord Building including: a five-story academic wing, a new two level gymnasium wing, and a small infill addition at the south. Options A&B also include new two-story bridges that span the canal connecting the 1922 Building and Lord Building. Design Option A includes the construction of a completely new five-story High School on the west side of the Canal.

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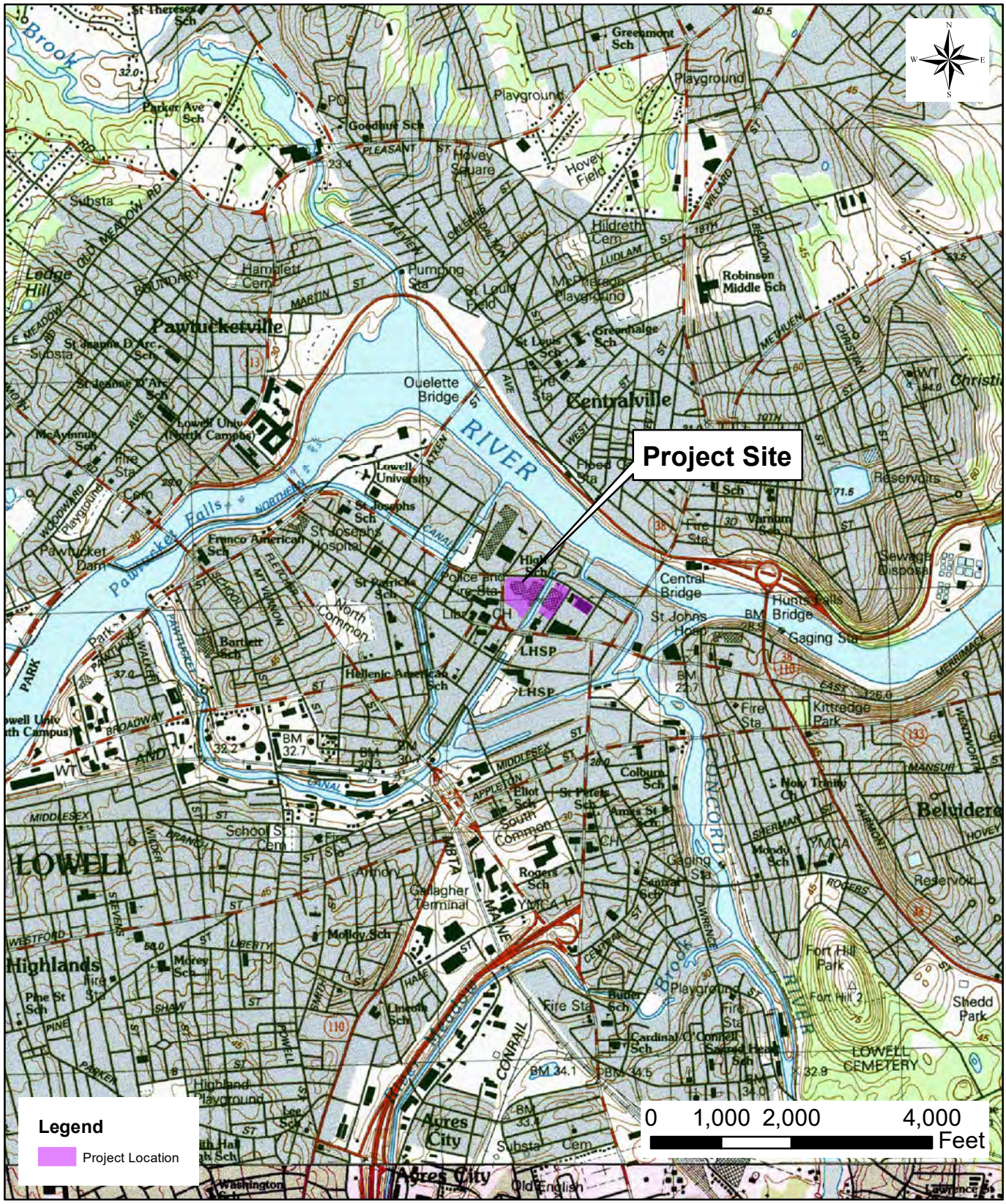


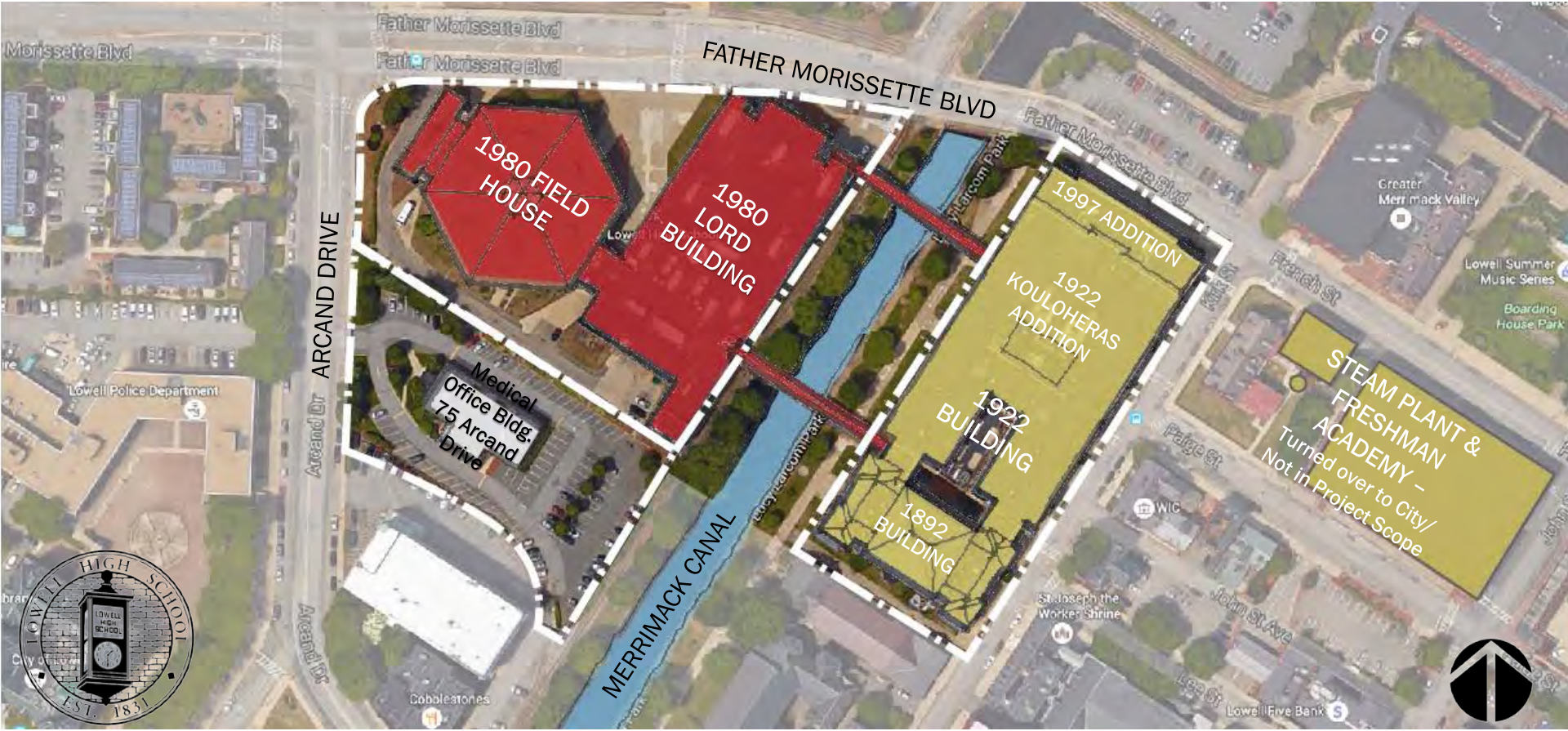
USGS Locus - Existing Site

Lowell High School
Lowell, Massachusetts

Data Source: MassGIS
Nitsch Project #11601

Nitsch Engineering

EXISTING CONDITIONS SITE PLAN





PARKING SPACES
- GEORGE AYOTTE GARAGE (1200 SPACE CAPACITY)
- 6 HC SPACES ON SITE

BUS DROP OFF: CLOSEST STOPS NOTED ON PLANS
SITE ACREAGE=4.7

NOTES:
1. SITE IS IN ZONE DMU THERE ARE NO DIMENSIONAL SETBACK REQUIREMENTS
2.LOWELL LANDSCAPE REQ. 5% LANDSCAPE IN PARKING AREAS + ONE SHADE TREE FOR EVERY 2,000SF OF PAVING.

TURN OVER EXISTING FRESHMAN ACADEMY, 1922 BUILDING AND STEAM PLANT TO THE CITY

NEW CONSTRUCTION

PNF DESIGN OPTION A

LOWELL HIGH SCHOOL NEW OPTION A

MARCH 22, 2018

SCALE IN FEET
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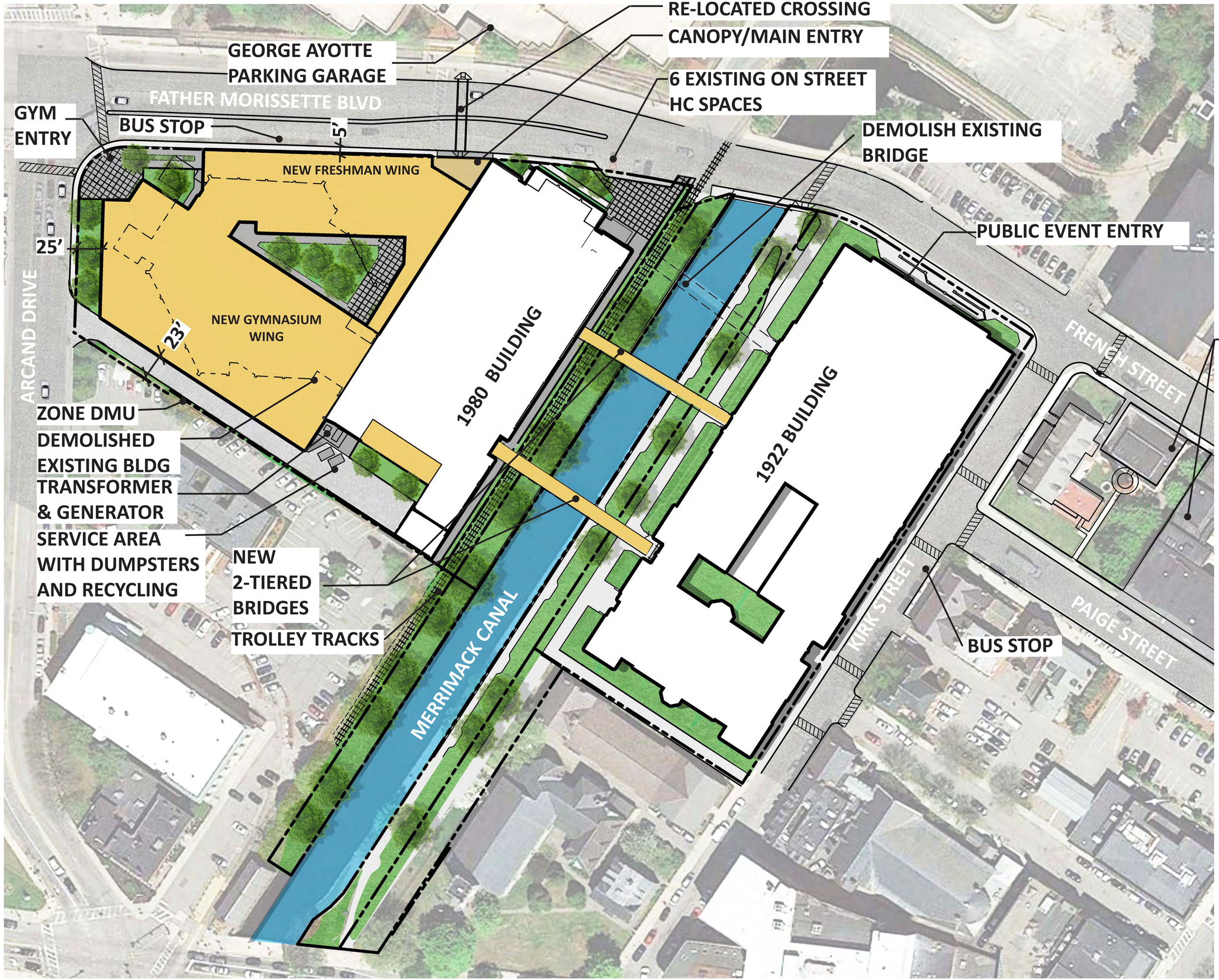

PARKING SPACES
- GEORGE AYOTTE GARAGE (1200 SPACE CAPACITY)
- NO ON SITE PARKING SPACES

BUS DROP OFF: CLOSEST STOPS NOTED ON PLANS
SITE ACREAGE=6

NOTES:
1. SITE IS IN ZONE DMU THERE ARE NO DIMENSIONAL SETBACK REQUIREMENTS
2.LOWELL LANDSCAPE REQ. 5% LANDSCAPE IN PARKING AREAS + ONE SHADE TREE FOR EVERY 2,000SF OF PAVING.

NEW CONSTRUCTION

RENOVATE EXISTING BUILDING

PNF DESIGN OPTION B

LOWELL HIGH SCHOOL ADD/ RENO OPTION 2A

MARCH 22, 2018

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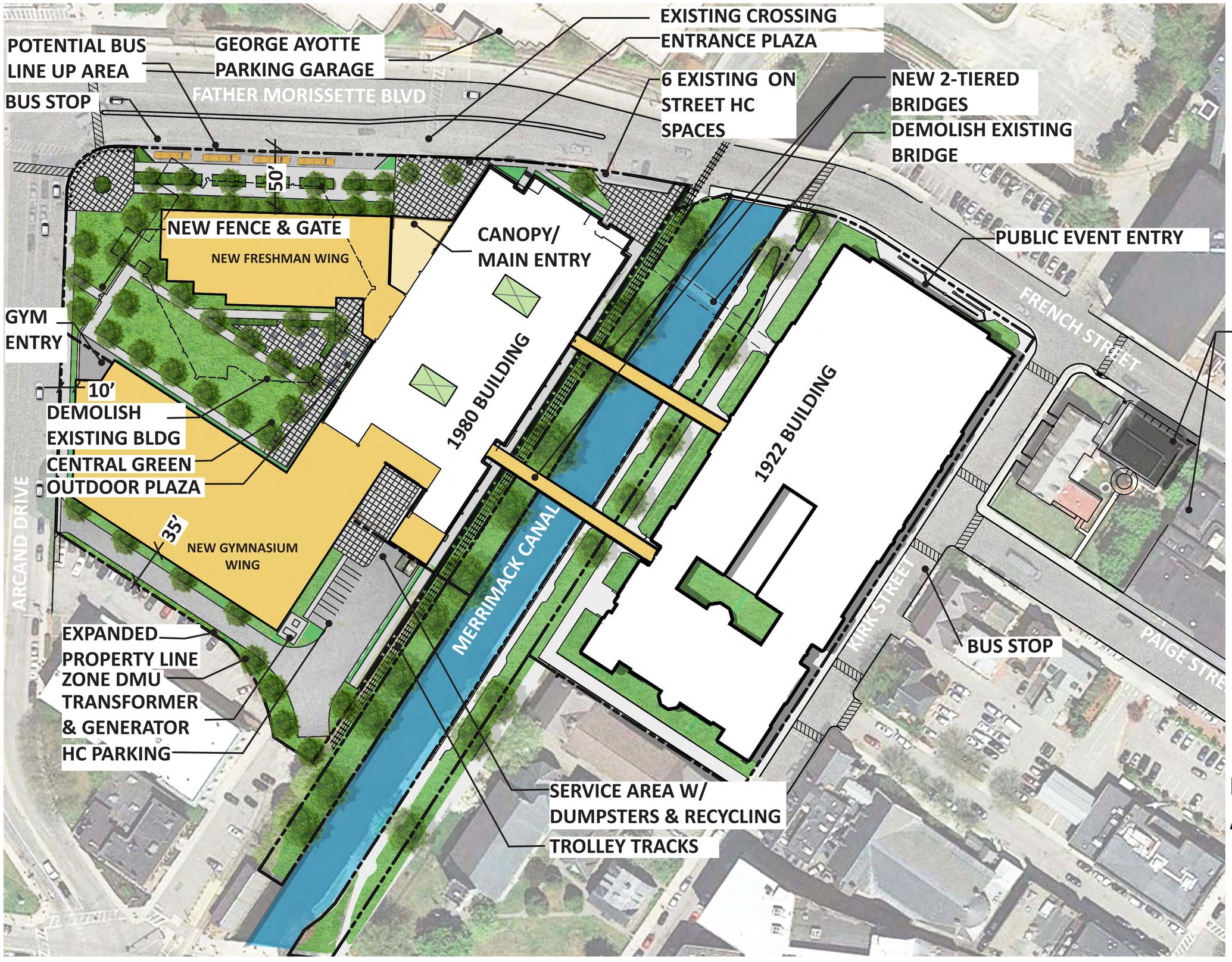
SCALE:1"= 40'-0



PARKING SPACES
- GEORGE AYOTTE GARAGE (1200 SPACE CAPACITY)
- 6 HC SPACES ON SITE

BUS DROP OFF: CLOSEST STOPS NOTED ON PLANS
POTENTIAL PULL OFF FOR 4 BUSES
SITE ACREAGE= 7.4

NOTES:
1. SITE IS IN ZONE DMU THERE ARE NO DIMENSIONAL SETBACK REQUIREMENTS
2. LOWELL LANDSCAPE REQ. 5% LANDSCAPE IN PARKING AREAS + ONE SHADE TREE FOR EVERY 2,000SF OF PAVING.

RENOVATE EXISTING BUILDING

NEW CONSTRUCTION

PNF DESIGN OPTION C

LOWELL HIGH SCHOOL ADD/ RENO OPTION 3A

MARCH 22, 2018

SCALE IN FEET

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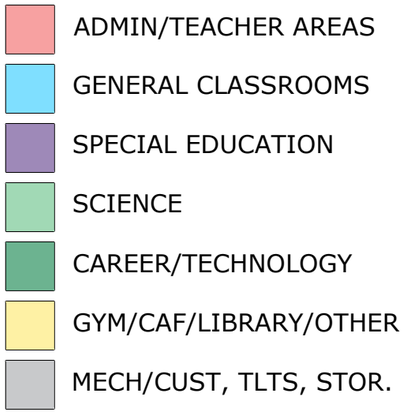
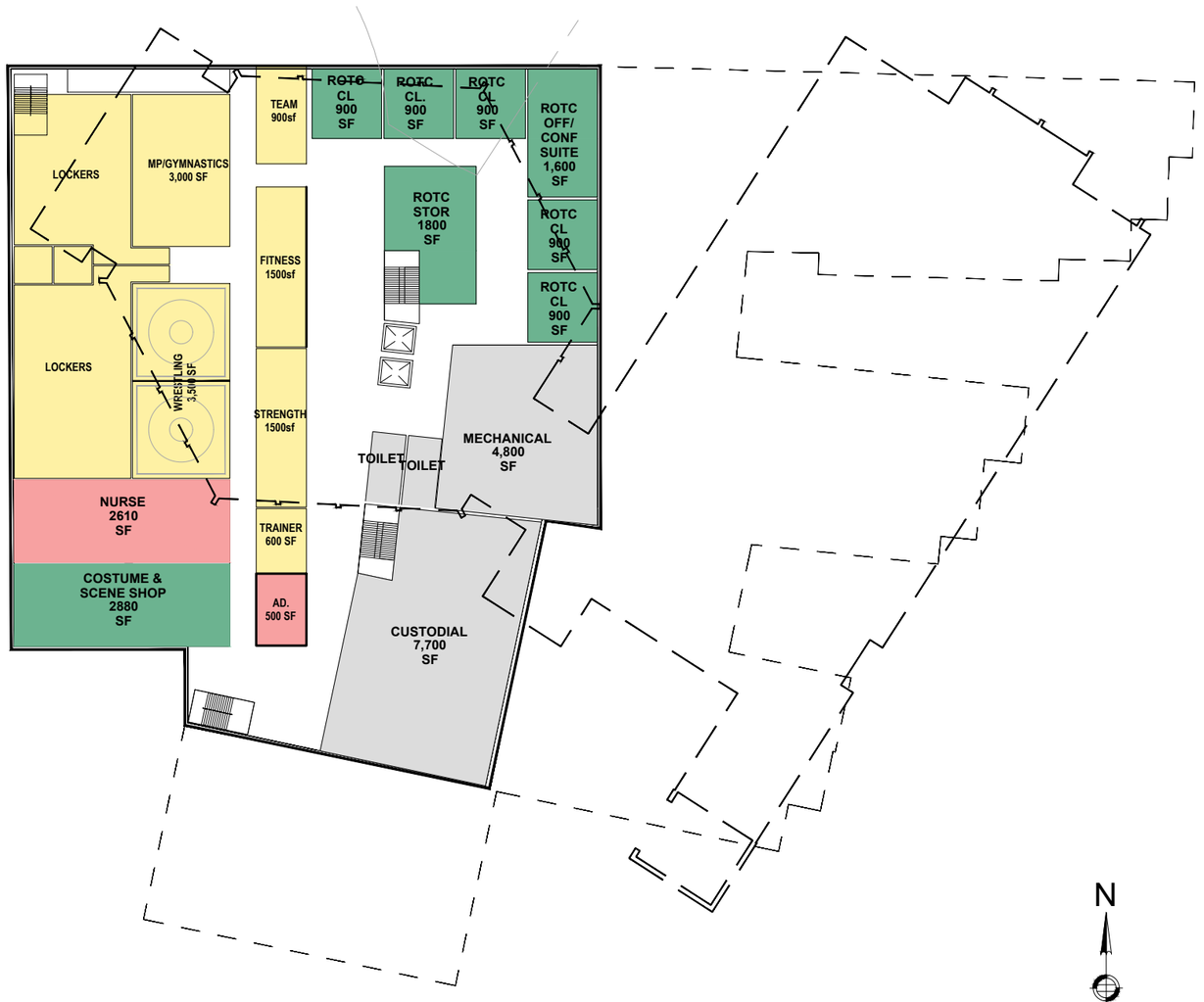
SCALE:1"= 40'-0

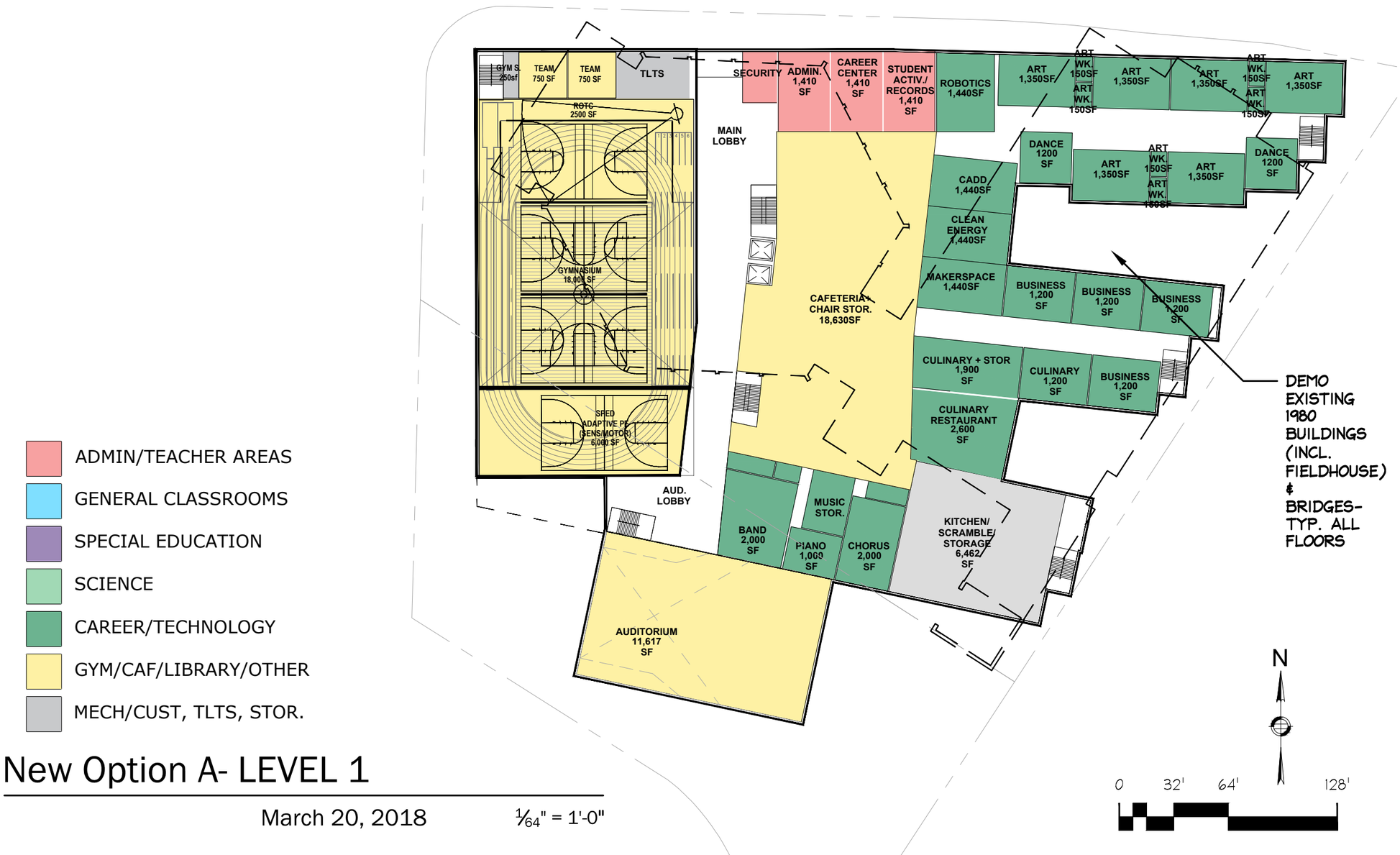




New Option A- BASEMENT

March 20, 2018 1/64" = 1'-0"

PNF DESIGN OPTION A 3/22/18

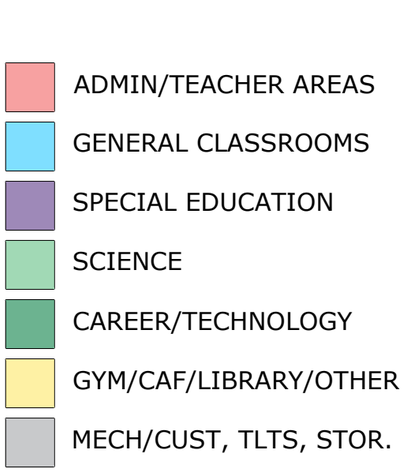


- ADMIN/TEACHER AREAS
- GENERAL CLASSROOMS
- SPECIAL EDUCATION
- SCIENCE
- CAREER/TECHNOLOGY
- GYM/CAF/LIBRARY/OTHER
- MECH/CUST, TLTS, STOR.

New Option A- LEVEL 1

March 20, 2018 $\frac{1}{64}$" = 1'-0"

PNF DESIGN OPTION A 3/22/18





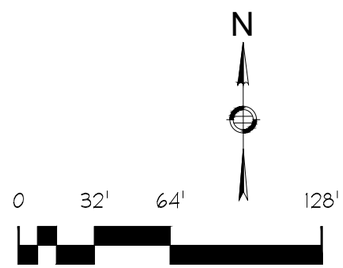
New Option A- LEVEL 2

March 20, 2018 $\frac{1}{64}$" = 1'-0"

PNF DESIGN OPTION A 3/22/18







New Option A- LEVEL 3

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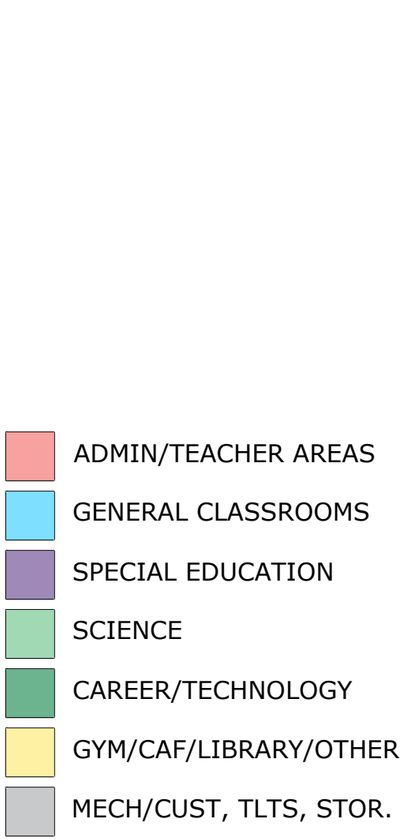
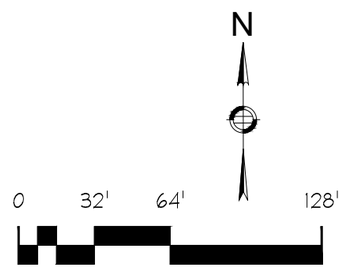
PNF DESIGN OPTION A 3/22/18



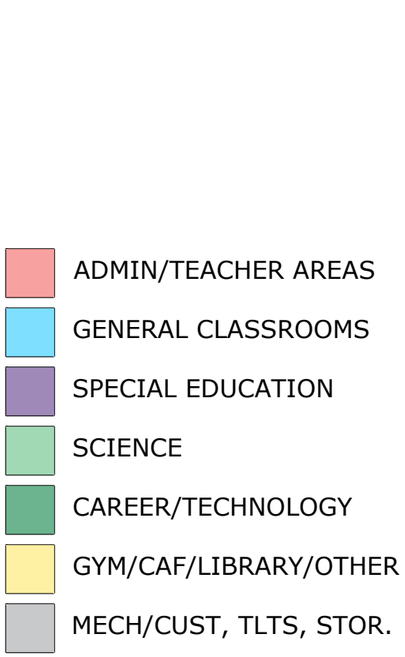




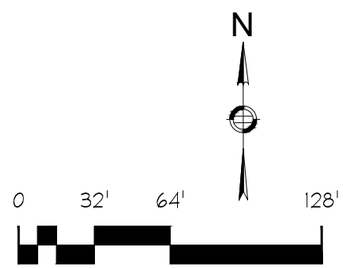
New Option A- LEVEL 4

March 20, 2018 $\frac{1}{64}$" = 1'-0"

PNF DESIGN OPTION A 3/22/18







New Option A- LEVEL 5

March 20, 2018 1/64" = 1'-0"

PNF DESIGN OPTION A 3/22/18

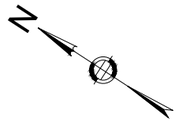
PNF DESIGN OPTION B

Add/Reno - Opt. 2A

BASMT

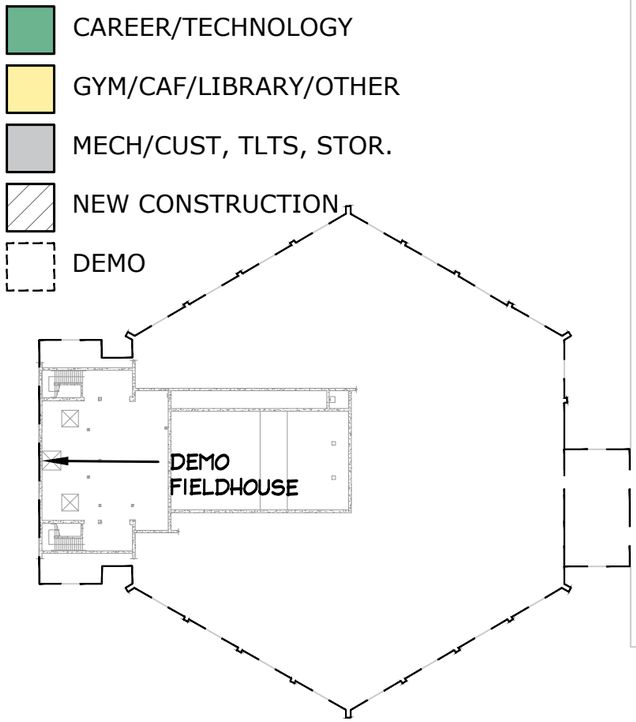
March 30, 2018

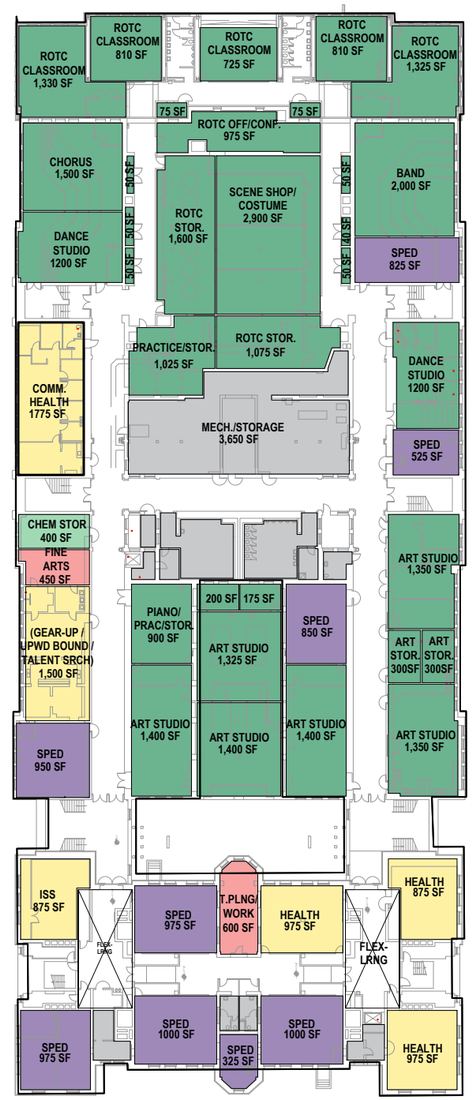
1/64" = 1'-0"





- ADMIN/TEACHER AREAS
- GENERAL CLASSROOMS
- SPECIAL EDUCATION
- SCIENCE
- CAREER/TECHNOLOGY
- GYM/CAF/LIBRARY/OTHER
- MECH/CUST, TLTS, STOR.
- NEW CONSTRUCTION
- DEMO





EXISTING FIELDHOUSE

1980 BUILDING

1922 BUILDING

PNF DESIGN OPTION B 3/22/18

Add/Reno - Opt. 2A — Level 1

March 30, 2018 — 1/64" = 1'-0"



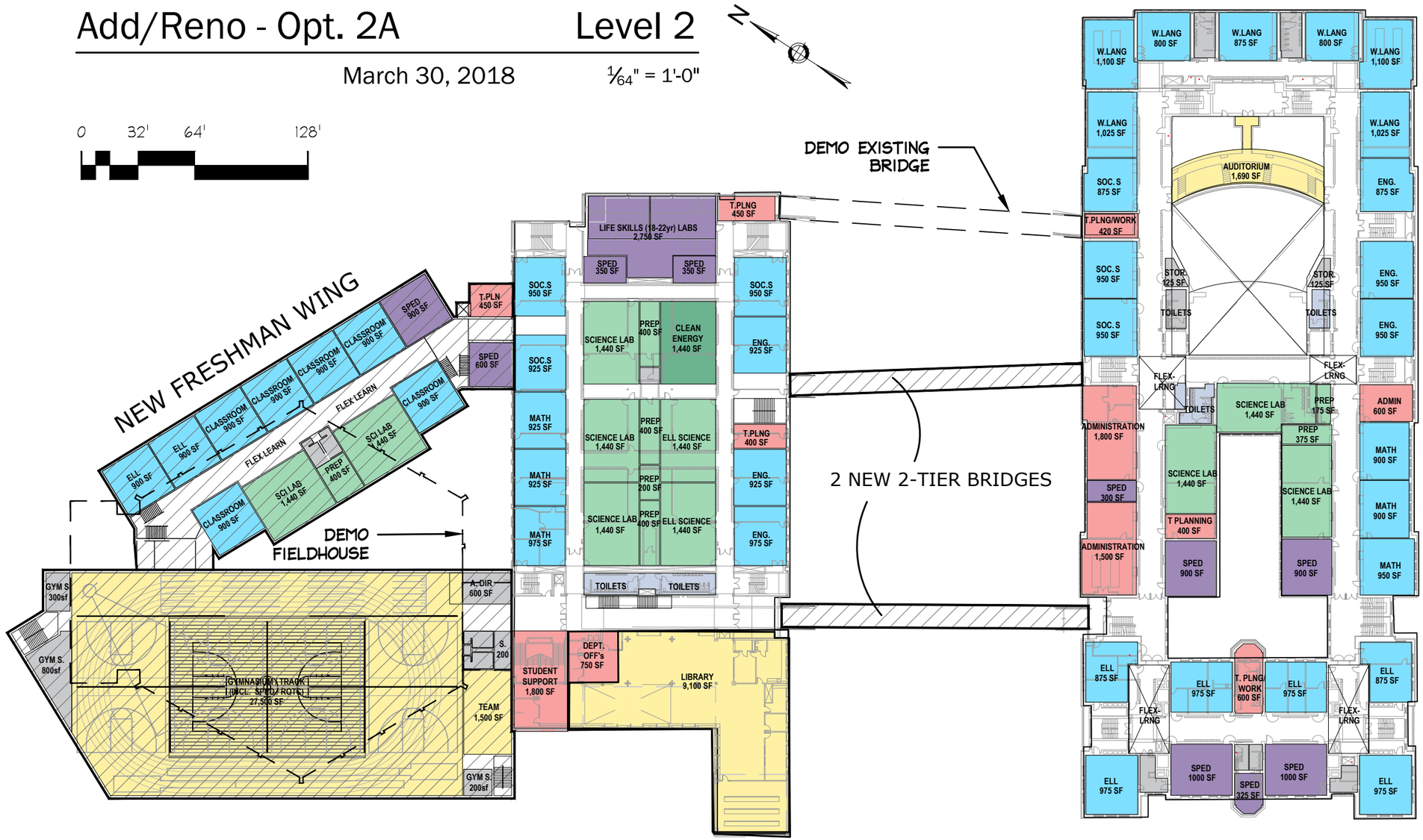


NEW GYMNASIUM BUILDING 1980 BUILDING 1922 BUILDING

PNF DESIGN OTPION B 3/22/18

Add/Reno - Opt. 2A — Level 2

March 30, 2018 — 1/64" = 1'-0"



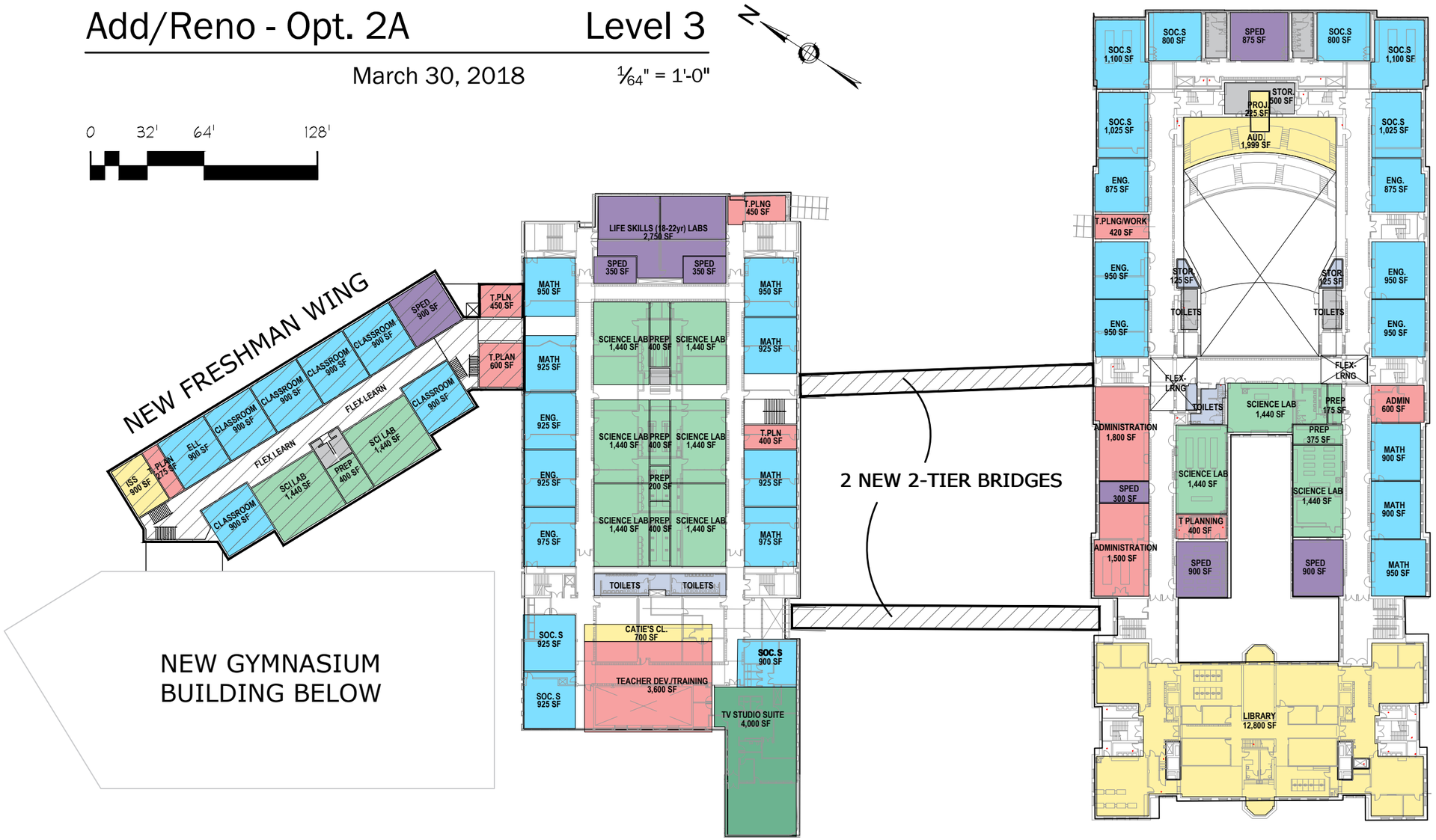
NEW GYMNASIUM BUILDING 1980 BUILDING 1922 BUILDING

PNF DESIGN OPTION B 3/22/18

Add/Reno - Opt. 2A — Level 3

March 30, 2018 — 1/64" = 1'-0"

0 32' 64' 128'



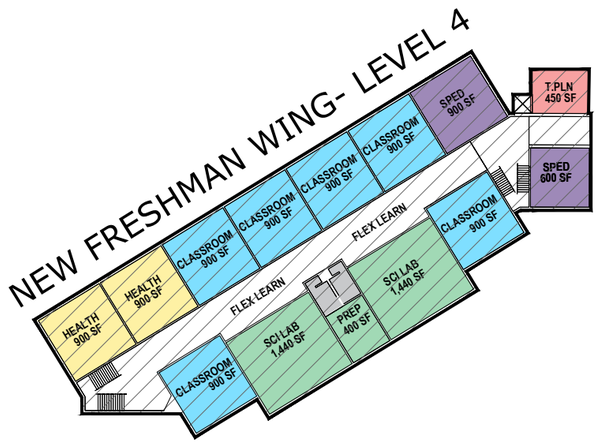
1980 BUILDING

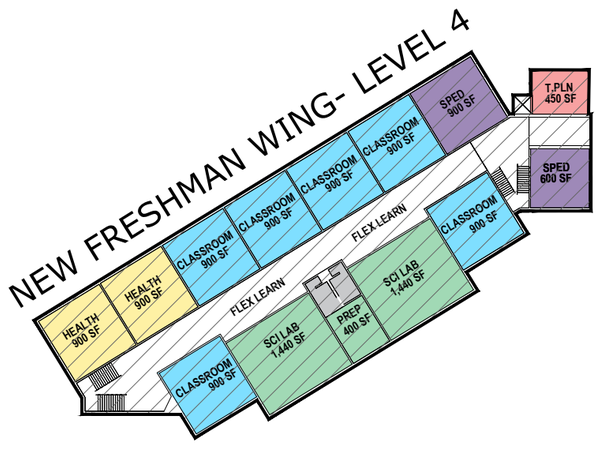
1922 BUILDING

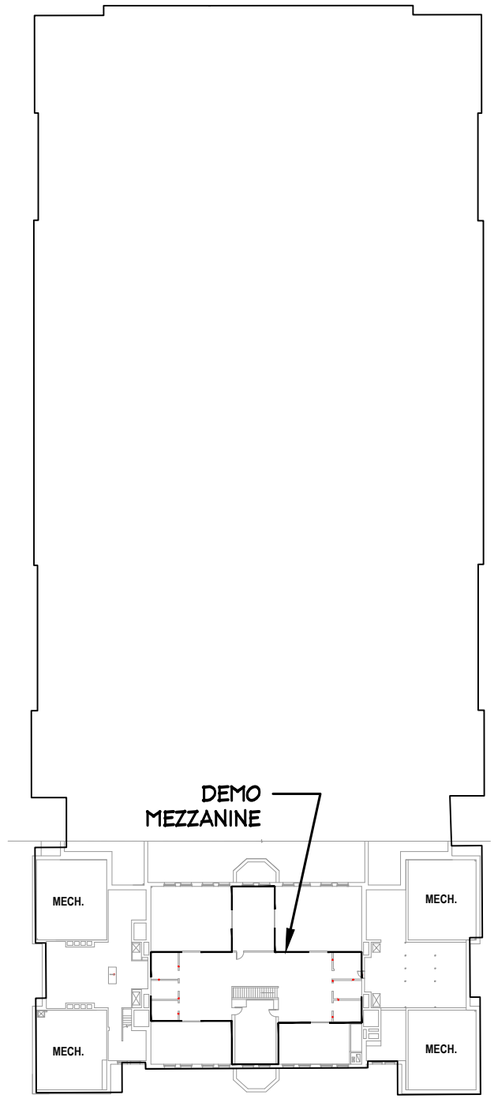
PNF DESIGN OPTION B 3/22/18

Add/Reno - Opt. 2A — Level 4/5

March 30, 2018 — 1/64" = 1'-0"







1922 BUILDING

PNF DESIGN OPTION C 3/22/18

Add/Reno - Opt. 3A

BASMT

March 30, 2018

1/64" = 1'-0"

- ADMIN/TEACHER AREAS
- GENERAL CLASSROOMS
- SPECIAL EDUCATION
- SCIENCE
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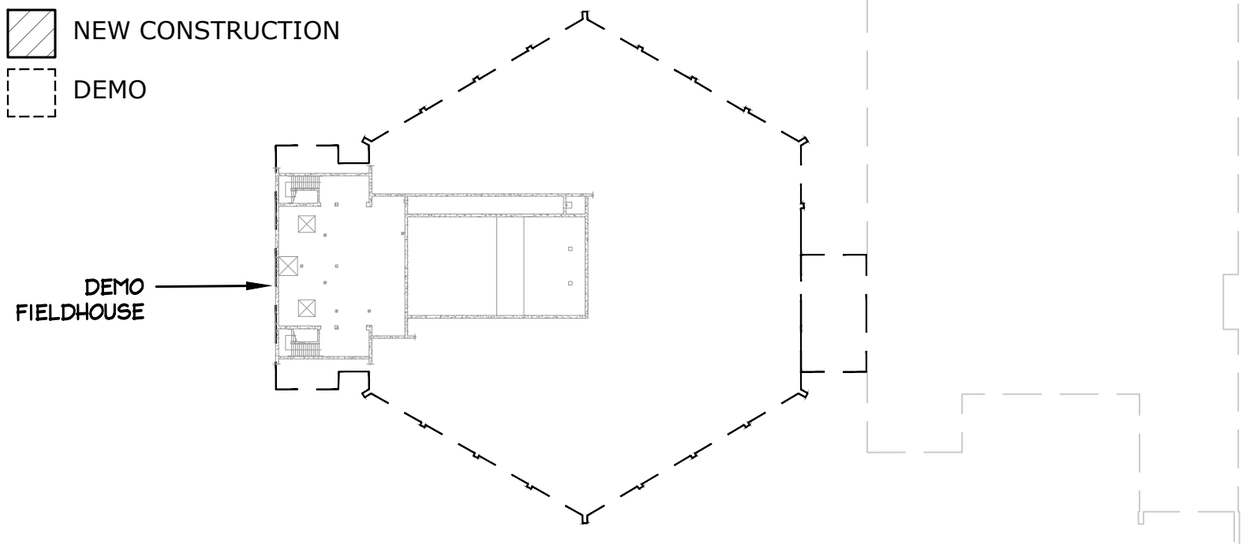
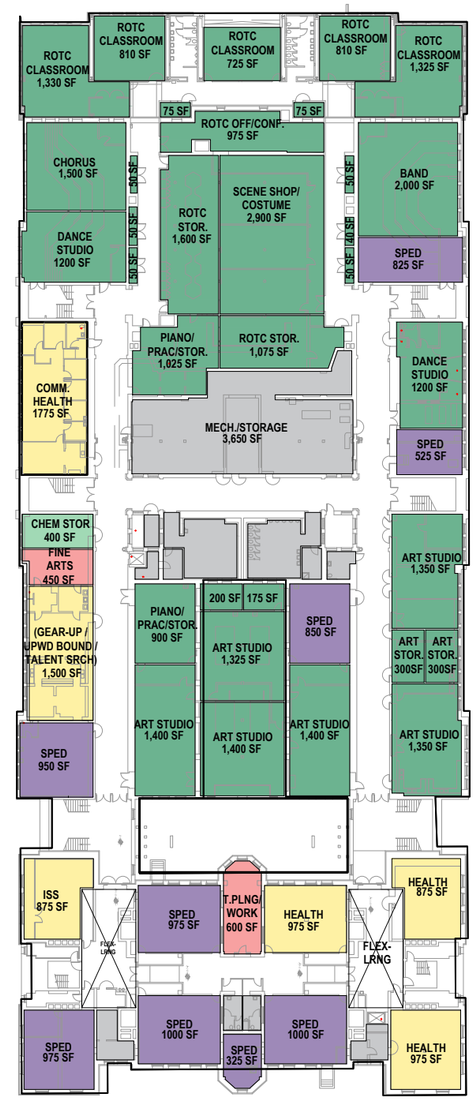
- GYM/CAF/LIBRARY/OTHER
- MECH/CUST, TLTS, STOR.
- NEW CONSTRUCTION
- DEMO



EXISTING FIELDHOUSE

1980 BUILDING



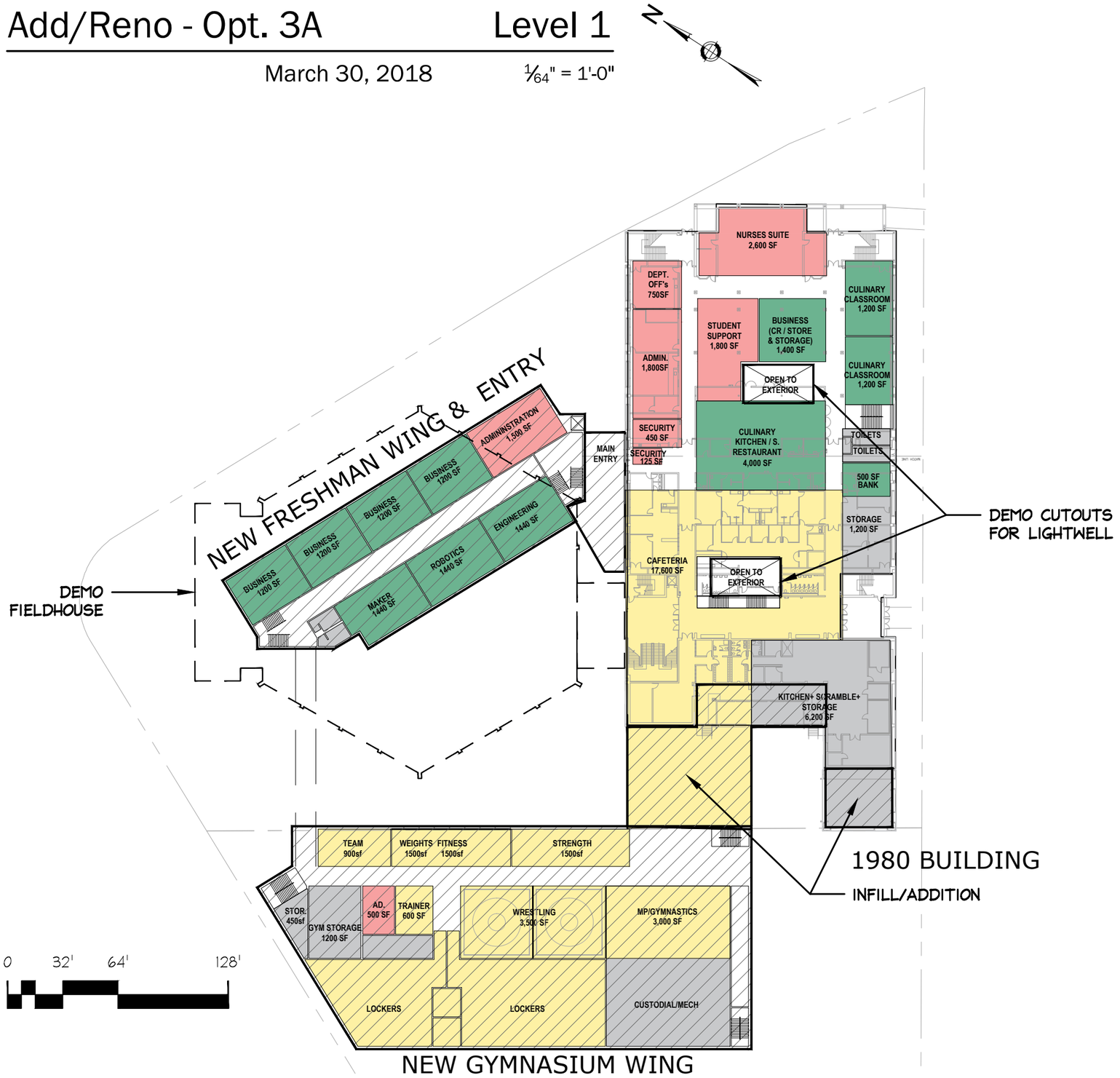
1922 BUILDING

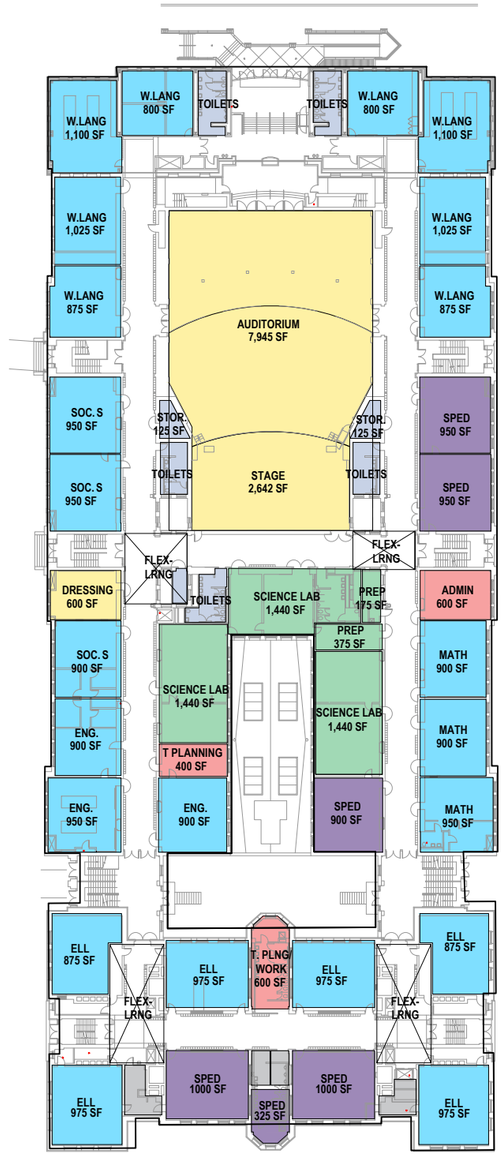
0 32' 64' 128'

PNF DESIGN OPTION C 3/22/18

Add/Reno - Opt. 3A — Level 1

March 30, 2018 — 1/64" = 1'-0"



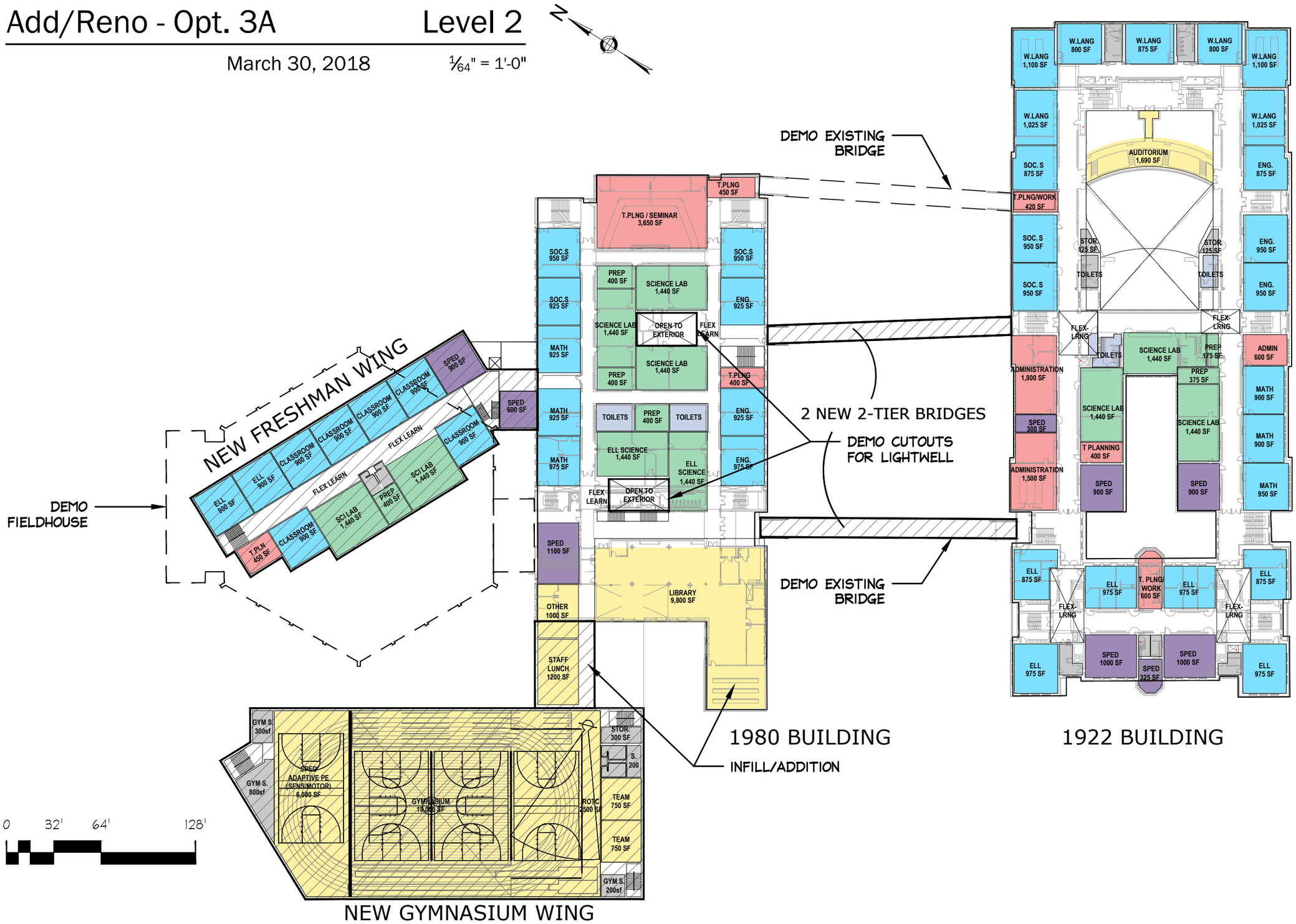


1922 BUILDING

PNF DESIGN OPTION C 3/22/18

Add/Reno - Opt. 3A — Level 2

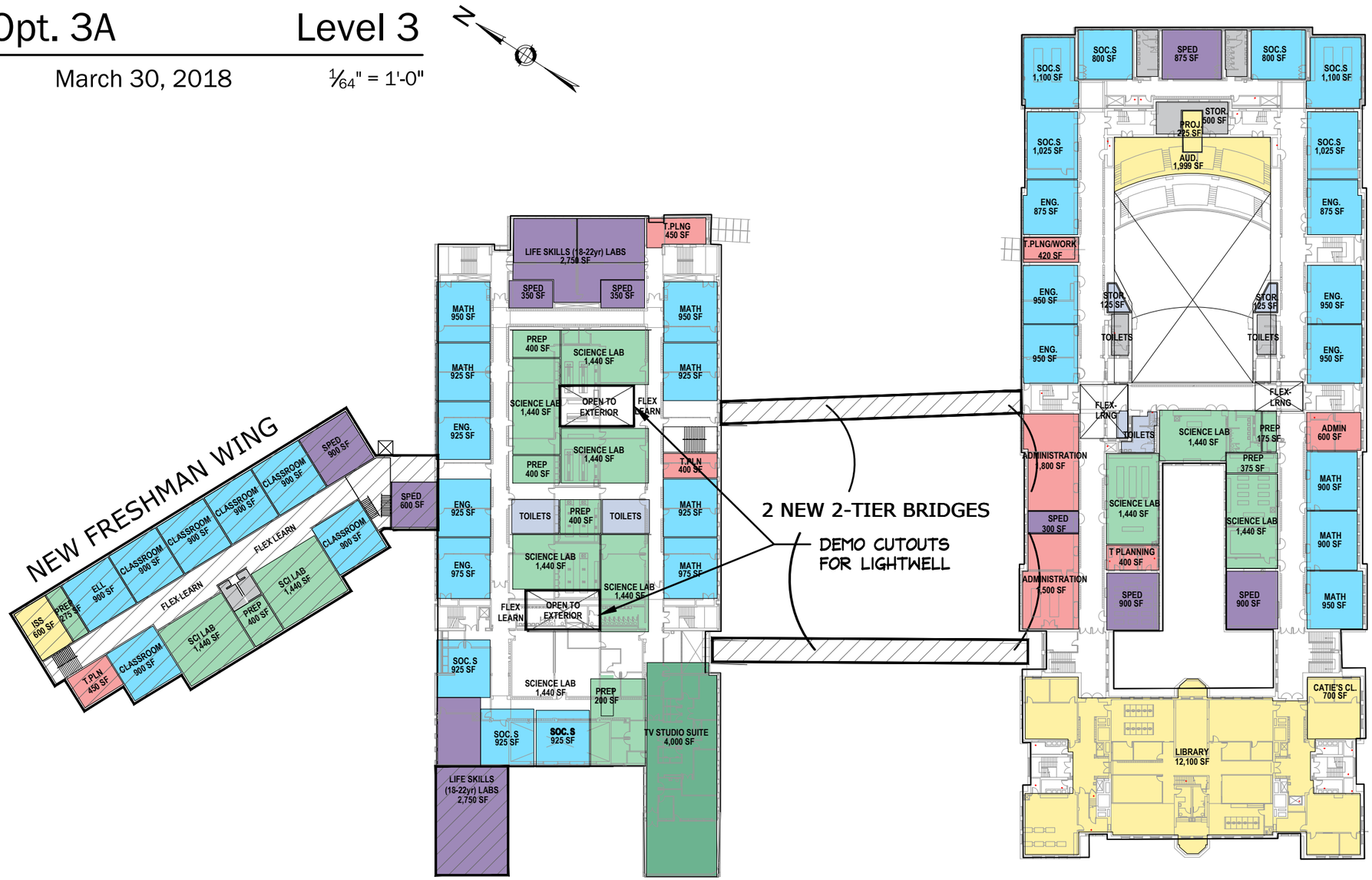
March 30, 2018 — 1/64" = 1'-0"



PNF DESIGN OPTION C 3/22/18

Add/Reno - Opt. 3A — Level 3

March 30, 2018 — 1/64" = 1'-0"



1980 BUILDING

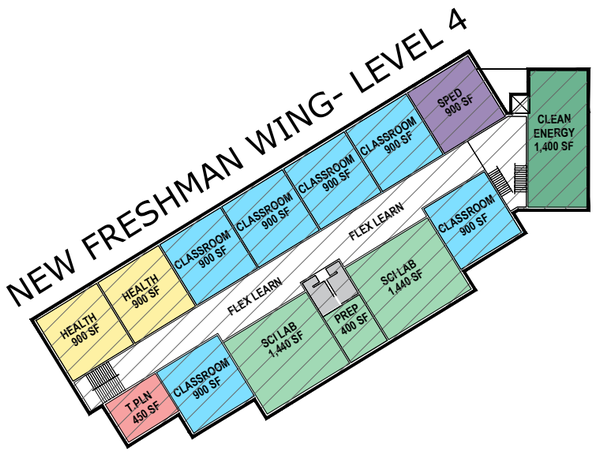
1922 BUILDING

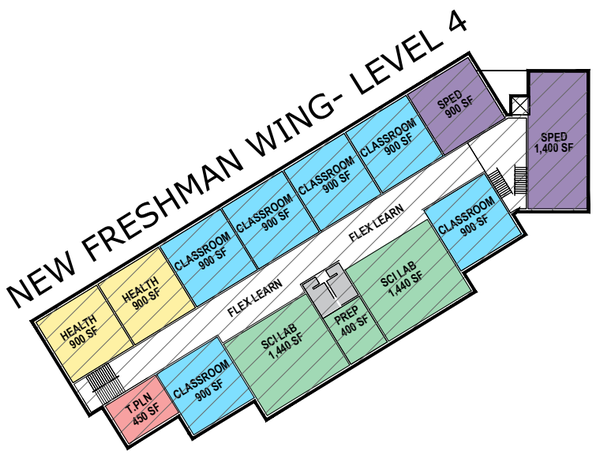
0 32' 64' 128'

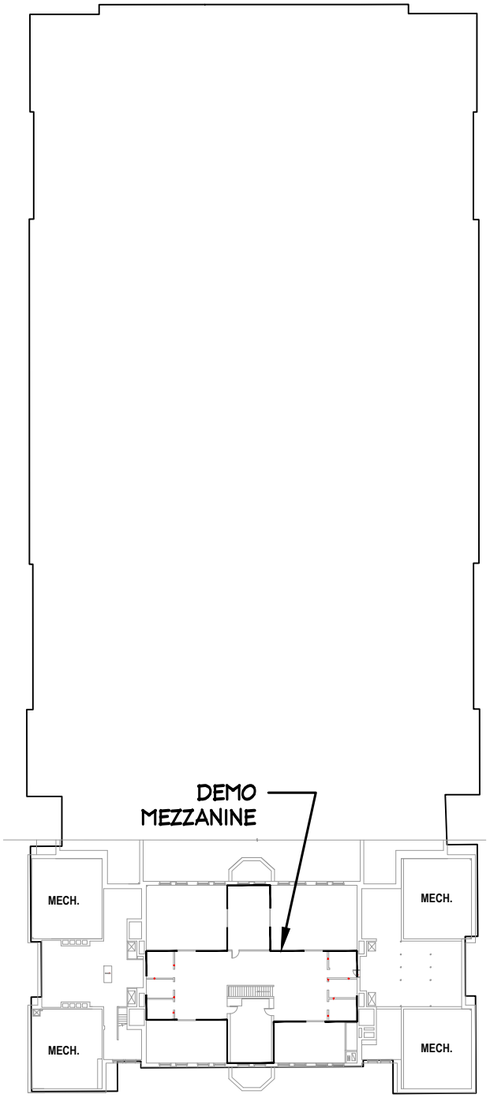
PNF DESIGN OPTION C 3/22/18

Add/Reno - Opt. 3A — Level 4/5

March 30, 2018 — 1/64" = 1'-0"







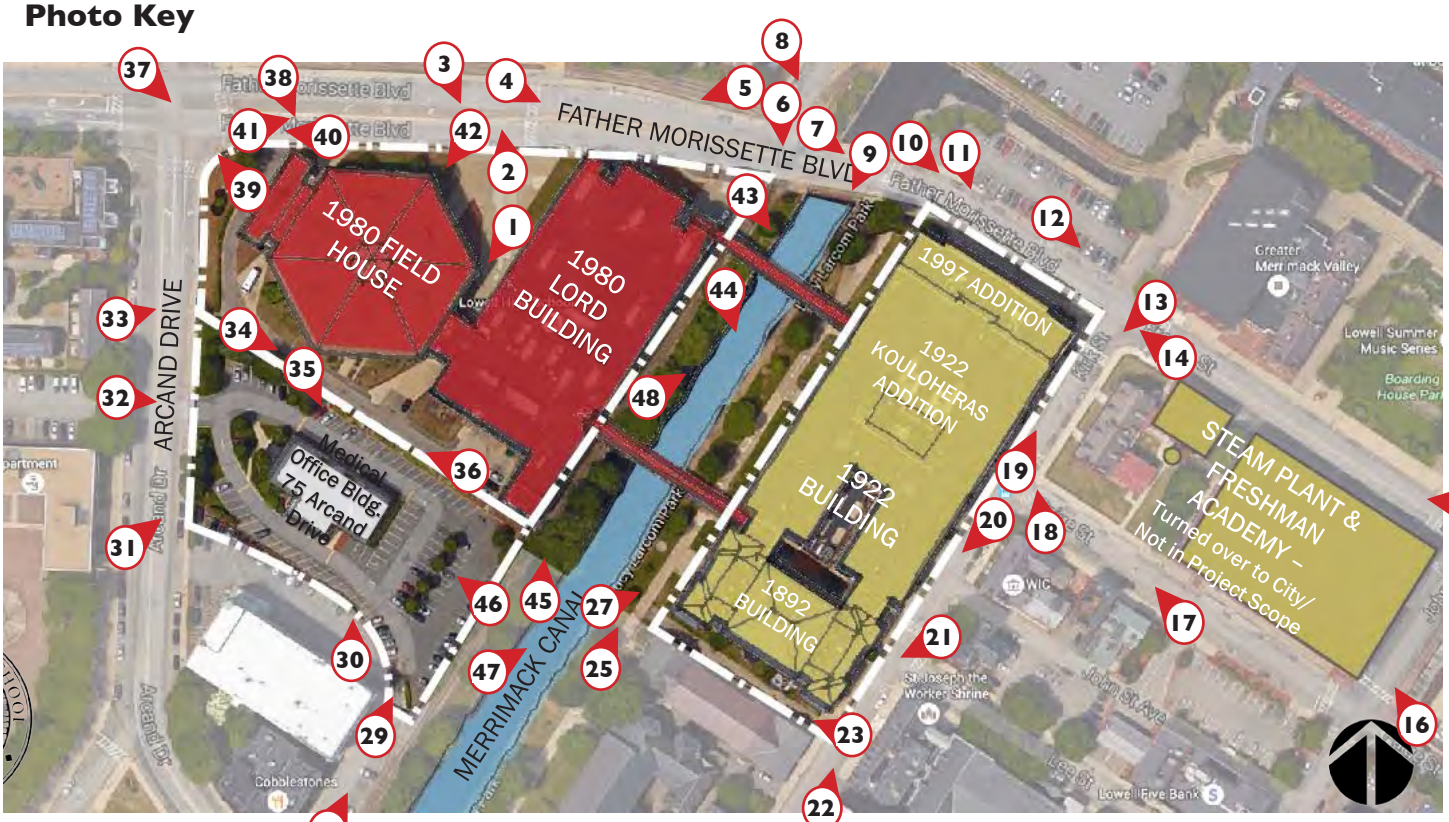
1922 BUILDING

0 32' 64' 128'

Lowell High School

Existing Conditions Photographs

Photo Key



Perkins Eastman | DPC



Photo 1. Lowell High School main entrance at 1980 Field House, north elevation.



Photo 2. George Ayotte parking garage across Father Morissette Boulevard from High School main entrance.



Photo 3. West elevation of 1980 Lord Building and partial north elevation of 1980 Field House.



Photo 4. North elevation of 1980 Lord building and partial west elevation of 1922 building from Father Morissette Boulevard.



Photo 5. View down Father Morissette Boulevard showing partial north elevation of 1980 Lord Building and 1980 Field House.



Photo 6. View from Father Morissette Boulevard of partial west elevation of 1922 building, partial north elevation of 1980 Lord building and north canal pedestrian bridge.



Photo 7. Northwest corner of 1922 building showing addition added in 1997 (north side of building) adjacent to 1922 construction.



Photo 8. Photo from upper level of George Ayotte parking garage showing partial west elevation of 1922 building, partial north elevation of 1980 Lord building and north canal pedestrian bridge.



Photo 9. View looking south down Merrimack Canal showing 1922 building, Lord building, and canal pedestrian bridges.



Photo 10. View of 1997 addition to north side of 1922 building.



Photo 11. North elevation of 1922 building (added in 1997).



Photo 12. View down French Street showing steam plant and Freshmen Academy.



Photo 13. View down Kirk Street from French Street showing northeast corner of 1922 building.



Photo 14. View down French Street looking west.



Photo 15. View down French Street looking west showing Freshmen Academy and steam plant.



Photo 16. View at corner of John Street and Paige Street showing southeast corner of Freshmen Academy with 1922 building in background.



Photo 17. View down Paige Street looking west.



Photo 18. Northeast corner of 1922 building from Paige Street.



Photo 19. View down Kirk Street, looking north.



Photo 20. View down Kirk Street, looking south. East elevation of 1922 building.



Photo 21. East elevation of original 1892 portion of 1922 building and connection to 1922 addition.



Photo 22. Southeast corner of 1922 building. View shows original 1982 portion and 1922 addition.



Photo 23. South elevation of 1922 building (part of the original 1892 construction).



Photo 24. View down Kirk Street from Merrimack Street



Photo 25. View down Merrimack Canal looking north from canal pathway.



Photo 26. View down Merrimack Canal looking north.



Photo 27. View of west elevation of 1922 building and south canal pedestrian bridge from canal pathway.



Photo 28. View of partial south elevation of 1980 Lord building from Merrimack Street.



Photo 29. View of west elevation of 1922 building and partial south elevation of 1980 Lord building from canal-side parking lot.



Photo 30. Southeast corner of 75 Arcand Drive and partial south elevation of 1980 Lord building and 1980 Field House from canal-side parking lot.



Photo 31. Southwest corner of 75 Arcand Drive



Photo 32. West elevation of 75 Arcand Drive



Photo 33. West elevation of 1980 Field House with 1980 Lord Building behind.



Photo 34. West elevation of 1980 Field House and partial west elevation of 1980 Lord building.



Photo 35. North elevation of 75 Arcand Drive, looking east.



Photo 36. North elevation of 1980 Field House and 75 Arcand Drive, looking west.



Photo 37. Northwest corner of 1980 Field House from across Father Morissette Boulevard.



Photo 38. Northwest corner of 1980 Field House.



Photo 39. View from 1980 Field House across Father Morissette Boulevard, looking west.



Photo 40. View down Father Morissette Boulevard, looking west.



Photo 41. View looking east down Father Morissette Boulevard showing partial west elevation of 1980 Lord Building and George Ayotte Parking Garage.



Photo 42. Partial east elevation of 1980 Field House.



Photo 43. View of north canal pedestrian bridge from canal pathway.



Photo 44. View of south canal pedestrian bridge from canal pathway.



Photo 45. South elevation of 1980 Lord Building from canal pathway.



Photo 46. East elevation of 75 Arcand Drive from canal pathway.



Photo 47. View of west elevation of 1922 building, east elevation of 1980 Lord building, and south canal pedestrian bridge from canal pathway.



Photo 48. View of north canal pedestrian bridge from canal pathway.

The Commonwealth of Massachusetts

William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

April 26, 2018

Eileen Donoghue
City Manager
City of Lowell
Lowell City Hall
375 Merrimack Street
Lowell, MA 01852

RE: Lowell High School Feasibility Study; 50 Father Morisette Boulevard, 55 French Street, and 75 Arcand Avenue, Lowell, MA; MHC# RC.62218

Dear Ms. Donoghue:

The Massachusetts Historical Commission (MHC) is in receipt of an updated Project Notification Form (PNF) submitted by Perkins Eastman and Building Conservation Association, Inc., which was received at this office March 27, 2018. The staff of the MHC have reviewed the information submitted and have the following comments.

Review of the MHC's *Inventory of Historic and Archaeological Assets of the Commonwealth* indicates that the following properties, among others, are listed in the State and National Registers of Historic Places as contributing elements to the Lowell National Historical Park (LOW.BC). The properties are also located within the Downtown Lowell Historic District (LOW.BE) which is listed in the State Register of Historic Places.

Lowell High School (LOW.44)
Lowell High School Annex (LOW.1143), referred to in the PNF as the Freshman Academy
Lowell High School Powerhouse (LOW.2580), referred to in the PNF the Steam Plant
Lowell High School Annex (LOW.1774), referred to in the PNF the 1980 Lord Building
Professional Park (LOW.1116), referred to in the PNF as the Medical Office Building

The project also includes pedestrian bridges over the Merrimack Canal (LOW.933) which is listed in the State and National Registers of Historic Places as a contributing element to the Lowell National Historical Park and the Locks and Canals District (LOW.C). The Locks and Canals District is also a National Historic Landmark.

The Lowell High School, Lowell High School Powerhouse, Merrimack Canal, and Professional Park are also within the City Hall District (LOW.A), which is listed in the State and National Registers of Historic Places.

The 1980 Field House is not included in MHC's *Inventory of Historic and Archaeological Assets of the Commonwealth*, and the Lowell High School Annex and Professional Park appear to be outside of the period of significance for both the Lowell National Historical Park and the City Hall District.

The City Hall District and the Downtown Lowell Historic District are Local Historic Districts, and as such the proponent may need to seek a Certificate of Appropriateness from the Lowell Historic Board for

The MHC has been in contact with staff of the Lowell National Historical Park and understands that the proposed reconstruction of the pedestrian bridge closest to Father Morissette Boulevard over the Merrimack Canal in a different location would require a land exchange between the Lowell National Historical Park and the City of Lowell. This transfer of federal land would trigger the review of the project under Section 106 of the National Historic Preservation Act of 1966 (36 CFR 800).

However, at this time, the MHC is unable to fully determine what effects the proposed project options will have on the historic properties listed above. The MHC understands that project is in the early planning stages and project elevations and perspective views do not yet exist. However, in order to fully review the project, the MHC would need existing and proposed project elevations for each of the proposed design options, renderings illustrating the proposed two-story pedestrian bridges, and thorough written descriptions detailing any proposed exterior renovation or demolition at historic properties.

These comments are offered to assist in compliance with M.G.L. Chapter 9, sections 26-27C, (950 CMR 71.00). Please do not hesitate to contact Linda Santoro of my staff if you have any questions.

Sincerely,

Brona Simon

Brona Simon
State Historic Preservation Officer
Executive Director
Massachusetts Historical Commission

xc: John McCarthy, MSBA
Peter Aucella, NPS Lowell NHP
Steve Stowell, Lowell Historic Board
Alicia Svenson, Building Conservation Association, Inc
Alicia Caritano, Perkins Eastman

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CITY OF LOWELL
LOWELL HIGH SCHOOL
PSR Estimate Summary

(Summary of PSR Estimates by Perkins Eastman dated April 20, 2018)

Description	Add/Reno Option 2A Existing Site	Preferred Solution Add/Reno Option 3A Expanded Site	New Option A Expanded Site
TOTAL PROJECT BUDGET	$333,040,000	**$345,400,000**	$361,624,000
Construction Budget	$262,135,000	**$270,456,000**	$289,153,000
Maximum Total Facilities Grant	$208,758,000	**$209,440,000**	$200,669,000
District Share	$124,282,000	**$135,960,000**	$160,955,000

NOTE: Estimates, district share and reimbursement are conceptual

Lowell High School
Revised PSR
Revised Preliminary Design Pricing Table

= Formula do not edit

Option (Description)	Total Gross Square Feet	Square Feet of Renovated Space ($*/SF)	Square Feet of New Construction ($*/SF)	Site, Building Takedown, Haz Mat Etc. ($*)	Estimated Total Construction** ($*)	Estimated Total Project Costs ($)
Option 2A	618,700 sf	445,500 sf	173,200 sf	$ 12,423,627	$ 262,134,802	$ 333,040,001
		$ 375.85 $/sf	$ 475.00 $/sf		$ 423.69 $/sf	
Option 3A (expanded site)	622,200 sf	432,600 sf	189,600 sf	$ 15,106,259	$ 270,456,023	$ 345,399,220
		$ 378.14 $/sf	$ 484.00 $/sf		$ 434.68 $/sf	
New Option A (expanded site)	579,400 sf	- sf	579,400 sf	$ 11,440,511	$ 289,152,725	$ 361,624,018
		$ - $/sf	$ 479.31 $/sf		$ 499.06 $/sf	

* Marked Up Construction Costs

** Does not include Construction Contingency

***** District's Preferred Solution**

DESIGN OPTIONS

		Add/Reno Opt 2 A Existing Site		4/20/2018		Delta	Add/Reno Opt. 3A Expanded Existing Site		4/20/2018		Delta	New School Option A 5 Story + Bsmt.		4/20/2018		Delta
Gross Floor Area (sf) =				618,700					622,200					579,400		
		PM&C		SKANSKA			PM&C		SKANSKA			PM&C		SKANSKA		
		Element ($)	$/sf	Element ($)	$/sf		Element ($)	$/sf	Element ($)	$/sf		Element ($)	$/sf	Element ($)	$/sf	
A10 Foundations		4,996,953	8.08	4,232,250	6.84	764,703	5,593,602	8.99	4,869,275	7.83	724,327	15,011,774	25.91	13,945,270	24.07	1,066,504
A20 Basement Excavation							0		0			2,339,769	4.04	4,884,590	8.43	-2,544,821
B10 Superstructure		8,725,693	14.10	6,903,935	11.16	1,821,758	9,736,505	15.65	7,728,225	12.42	2,008,280	24,907,268	42.99	23,762,640	41.01	1,144,628
B20 Exterior Closure		20,182,381	32.62	19,232,197	31.08	950,184	20,924,498	33.63	20,938,968	33.65	-14,470	18,420,595	31.79	16,859,465	29.10	1,561,130
B30 Roofing		2,378,010	3.84	3,337,600	5.39	-959,590	2,873,460	4.62	3,282,850	5.28	-409,390	3,661,100	6.32	3,938,300	6.80	-277,200
C10 Interior Construction		19,284,561	31.17	19,842,555	32.07	-557,994	19,167,592	30.81	19,983,090	32.12	-815,498	20,311,678	35.06	21,003,250	36.25	-691,572
C20 Staircases		2,230,000	3.60	1,155,500	1.87	1,074,500	2,272,000	3.65	1,155,500	1.86	1,116,500	1,746,000	3.01	1,255,500	2.17	490,500
C30 Interior Finishes		13,845,511	22.38	12,897,550	20.85	947,961	14,034,019	22.56	12,977,300	20.86	1,056,719	13,609,930	23.49	11,877,700	20.50	1,732,230
D Services		64,394,610	104.08	67,752,500	109.51	-3,357,890	64,790,265	104.13	68,211,500	109.63	-3,421,235	60,249,780	103.99	63,125,500	108.95	-2,875,720
D10 Conveying Systems		935,000	1.51	775,000	1.25	160,000	935,000	1.50	775,000	1.25	160,000	1,045,000	1.80	840,000	1.45	205,000
D20 Plumbing		8,814,365	14.25	8,043,100	13.00	771,265	8,761,680	14.08	8,088,600	13.00	673,080	7,532,200	13.00	7,242,500	12.50	289,700
D30 HVAC		30,451,755	49.22	30,935,000	50.00	-483,245	30,772,300	49.46	31,160,000	50.08	-387,700	29,188,200	50.38	28,970,000	50.00	218,200
D40 Fire Protection Systems		3,002,690	4.85	3,251,400	5.26	-248,710	3,019,140	4.85	3,299,900	5.30	-280,760	2,723,180	4.70	2,897,000	5.00	-173,820
D 50 Electrical Systems		21,190,800	34.25	24,748,000	40.00	-3,557,200	21,302,145	34.24	24,888,000	40.00	-3,585,855	19,761,200	34.11	23,176,000	40.00	-3,414,800
E Equipment and Furnishings		12,802,798	20.69	11,922,775	19.27	880,023	13,069,463.00	21.01	12,003,650	19.29	1,065,813	12,238,173	21.12	11,163,750	19.27	1,074,423
E10 Equipment		3,732,600	6.03	2,957,150	4.78	775,450	3,762,400	6.05	2,978,650	4.79	783,750	3,691,500	6.37	3,052,150	5.27	639,350
E 20 Fixed Furnishings		9,070,198	14.66	8,965,625	14.49	104,573	9,307,063	14.96	9,025,000	14.50	282,063	8,546,673	14.75	8,111,600	14.00	435,073
F10 Special Construction		2,022,000	3.27	2,022,000		0	2,022,000	3.25	2,022,000		0	0	0.00			
F10 Special Construction		2,022,000	3.27	2,022,000		0	2,022,000	3.25	2,022,000		0		0.00			
F20 Selective Building Demolition		8,200,795	13.25	7,663,610	12.39	537,185	8,563,305	13.76	7,965,210	12.80	598,095	4,415,510	4.19	4,904,000	8.46	-488,490
F2010 Selective/Building Demolition		4,269,685	6.90			4,269,685	4,158,995	6.68			4,158,995		0.00			
F2020 Bulk Demo		764,000	1.23	4,496,500	7.27	-3,732,500	987,200	1.59	4,548,100	7.31	-3,560,900	1,985,600		2,229,000	3.85	-243,400
F20 Hazardous Abatement		3,167,110	5.12	3,167,110	5.12	0	3,417,110	5.49	3,417,110	5.49	0	2,429,910	4.19	2,675,000	4.62	-245,090
Sub Total Building Cost		**159,063,312**	**257.09**	**156,962,472**	**253.70**	**2,100,840**	**163,046,709**	**262.05**	**161,137,568**	**258.98**	**1,909,141**	**176,911,577**	**305.34**	**176,719,965**	**305.01**	191,612
G05 Geoenvironmental Soils Remediation		0					0					0				
G10 Site Preparation		480,700				480,700	649,800				649,800	619,500		0		619,500
G20 Site Improvements		1,779,030		2,474,800		-695,770	2,899,400		4,355,400		-1,456,000	2,038,500		2,027,900		10,600
G30 Site Civil/Mechanical Utilities		959,500		618,700		340,800	959,500		622,200		337,300	959,500		579,400		380,100
G 40 Site Electrical		397,000		773,375		-376,375	401,500		777,750		-376,250	412,500		579,400		-166,900
Sub Total Construction		**162,679,542**	**262.94**	**160,829,347**	**259.95**	**1,850,195**	**167,956,909**	**269.94**	**166,892,918**	**268.23**	**1,063,991**	**180,941,577**	**312.29**	**179,906,665**	**310.51**	**1,034,912**
Design Contingency 15%		24,401,931	39.44	24,124,402	38.99		25,193,536	40.49	25,033,938	40.23		27,141,237	46.84	26,986,000	46.58	
General Conditions $300k/mo. (new) 250k/mo. (reno)																
	60 mo.						15,000,000		15,000,000							
	51 mo.	12,750,000		12,750,000								15,300,000		15,300,000		
Phasing	6.00%	13,989,675		13,839,268			14,553,687		14,467,193			3% 7,813,624		7,771,558		
Sub Total		213,821,149	345.60	211,543,017	341.92		222,704,133	357.93	221,394,048			231,196,437	399.03	229,964,223		
General Requirements	4.00%	8,329,193	13.46	8,234,463	13.31		8,599,394	13.82	8,544,917			9,264,209	15.99	9,211,221		
Sub Total		222,150,341	359.06	219,777,480	355.22		231,303,527	371.75	229,938,966			240,460,646	415.02	239,175,444	412.80	
Bonds	0.75%	1,561,724	2.52	1,543,962	2.50		1,612,386	2.59	1,602,172			1,737,039	3.00	1,727,104	2.98	
CDI / Subguard	0.00%	0	0.00				0	0.00				0	0.00			
Insurance	1.10%	2,290,528	3.70	2,264,477	3.66		2,364,833	3.80	2,349,852			2,547,657	4.40	2,533,086	4.37	

DESIGN OPTIONS

			Add/Reno Opt 2 A Existing Site		4/20/2018		Delta	Add/Reno Opt. 3A Expanded Existing Site		4/20/2018		Delta	New School Option A 5 Story + Bsmt.		4/20/2018		Delta
Gross Floor Area (sf) =					618,700					622,200					579,400		
			PM&C		SKANSKA			PM&C		SKANSKA			PM&C		SKANSKA		
			Element ($)	$/sf	Element ($)	$/sf		Element ($)	$/sf	Element ($)	$/sf		Element ($)	$/sf	Element ($)	$/sf	
Permits (Assumes Limited Fees)	0.00%		0	0.00				0	0.00				0	0.00			
Sub Total			226,002,593	365.29				235,280,746	378.14	233,890,990			244,745,343	422.41	2,533,086	4.37	
GMP Contingency	3.00%		6,994,838	11.31	6,919,634	11.18		7,276,844	11.70	7,233,596			7,813,624	13.49	7,771,558	13.41	
CM Fee & OH	2.50%		5,829,031	9.42	5,766,362	9.32		6,064,036	9.75	6,027,997			6,511,353	11.24	6,476,299	11.18	
Sub Total			238,826,462	386.01				248,621,626	399.58	247,152,583			259,070,319	447.14	16,780,943	28.96	
Escalation til mid point construction	13.00%		21,148,340	34.18	20,907,815	33.79		21,834,398	35.09	21,696,079			23,522,405	40.60	23,387,866	40.37	
Sub Total Construction Cost			**259,974,803**	**420.20**	**257,179,729**	**415.68**	**2,795,073**	**270,456,024**	**434.68**	**268,848,663**	**432.09**	**1,607,362**	**282,592,724**	**487.73**	**281,071,357**	485.11	1,521,367
Temp Facilities 24 Classroom Allowance													2,160,000		2,160,000		
Temp Facilities Gym Allowance			2,160,000	24 mo.	2,160,000	24 mo.							2,700,000		2,700,000		
Temp Bridge over Pawtucket Canal													1,200,000		1,200,000		
Temp Café Fit Out													500,000		500,000		
Total Construction Cost			**262,134,803**	**423.69**	**259,339,729**	**419.17**	**2,795,073**	**270,456,024**	**434.68**	**268,848,663**	**432.09**	**1,607,362**	**289,152,724**	**499.06**	**287,631,357**	496.43	1,521,367
Project Soft Costs			**48,565,108**	**78.50**	**48,187,773**	**77.886**	**377,335**	**51,718,473**	**83.12**	**49,501,479**	**79.56**	**2,216,994**	**53,842,528**	**92.93**	**53,637,143**	92.57	205,385
Reimbursable soft cost allowance per (15% PSR)	20%	(PDP)	38,552,638	62.31	38,175,303	61.70		39,706,003	63.82	39,489,009	63.47		41,830,058	72.20	41,624,673		
A/E Fee included above																	
OPM Fee included above																	
Owner / Architect Consultants included above																	
Legal included above																	
Utility Allowance included above																	
FF&E Allowance $1200 per Student	$1,200	3520	4,224,000		4,224,000			4,224,000		4,224,000			4,224,000		4,224,000		
FF&E Allowance over MSBA			443,520		443,520			443,520		443,520			443,520		443,520		
IT Allowance over MSBA			356,950		356,950			356,950		356,950			356,950		356,950		
Moving Allowance			764,000		764,000			764,000		764,000			764,000		764,000		
Land Acquisition			0					2,000,000		2,000,000			2,000,000		2,000,000		
Total Project Cost			**310,699,911**	**502.18**	**307,527,503**	**497.05**	**3,172,408**	**322,174,498**	**517.80**	**318,350,142**	**511.65**	**3,824,356**	**342,995,252**	**591.98**	**341,268,501**	589.00	1,726,752
Const. Contingency (6% new, 8% reno - PSR)			20,797,984		20,574,378			21,636,482		21,507,893			16,955,563		16,864,281		
Owner Soft Cost Contingency	4%		1,542,106		1,527,012			1,588,240		1,579,560			1,673,202		1,664,987		
Total Project Budget			**333,040,001**	**538.29**	**329,628,893**	**532.78**	**3,411,107**	**345,399,220**	**555.13**	**341,437,595**	**548.76**	**3,961,624**	**361,624,018**	**624.14**	**359,797,769**	620.98	1,826,249

Notes

1. Add / Reno schemes excludes the cost of decommissioning the steam plant.
2. New schemes exclude the cost of decommissioning the existing high school and steam plant.
3. New schemes do not include off site improvements.
4. Site acquisition cost of $2,000,000 recommended by city.

PSR Pricing Options

Lowell High School

Lowell, MA

PM&C LLC
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Hingham, MA 02043
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Prepared for:

Perkins Eastman

April 20, 2018

Lowell High School 20-Apr-18
Lowell, MA

PSR Pricing Options

INTRODUCTION

This cost estimate was produced from sketches and narratives, dated March 29th, 2018 prepared by Perkins Eastman and their design team.

This estimate includes all direct construction costs, construction managers overhead and profit and design contingency. Cost escalation assumes start dates indicated.

Bidding conditions are expected to be public bidding under 149a of the Massachusetts General Laws to pre-qualified construction managers, and pre-qualified sub-contractors, open specifications for materials and manufacturers.

The estimate is based on prevailing wage rates for construction in this market and represents a reasonable opinion of cost. It is not a prediction of the successful bid from a contractor as bids will vary due to fluctuating market conditions, errors and omissions, proprietary specifications, lack or surplus of bidders, perception of risk, etc. Consequently the estimate is expected to fall within the range of bids from a number of competitive contractors or subcontractors, however we do not warrant that bids or negotiated prices will not vary from the final construction cost estimate.

ITEMS NOT CONSIDERED IN THIS ESTIMATE

Items not included in this estimate are:

- All professional fees and insurance
- Building Permit costs
- Rock excavation
- Land acquisition, feasibility, and financing costs
- All Furnishings, Fixtures and Equipment
- Items identified in the design as Not In Contract (NIC)
- Items identified in the design as by others
- Owner supplied and/or installed items (e.g. draperies, furniture and equipment)
- Rock excavation; special foundations (unless indicated by design engineers)
- Utility company back charges, including work required off-site
- Work to City streets and sidewalks, (except as noted in this estimate)
- No work included at Boiler Building - turned over to School
- No work included at Freshman Academy- turned over to School
- No work included at 1922 Building in New Option scenario - turned over to School

Notes per Summary sheets

[1] Costs from UEC report (excludes design and monitoring services)

[2] Based on C. 149a CMr

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Lowell High School
Lowell, MA

20-Apr-18

PSR Pricing Options

MAIN CONSTRUCTION COST SUMMARY

			Gross Floor Area	$/sf	Estimated Construction Cost
ADD/RENO 2A ON EXISTING SITE					
1922 BUILDING RENOVATION			304,300	$225.98	$68,767,198
1980 BUILDING RENOVATION 2A			141,200	$249.57	$35,239,973
1980 BUILDING 2A SOUTH ADDITIONS			5,100	$354.43	$1,807,612
NEW FRESHMAN WING 2A			92,100	$308.05	$28,371,253
NEW GYMNASIUM WING 2A			67,400	$244.90	$16,506,494
NEW BRIDGES (2 QTY)			8,600	$516.24	$4,439,672
REMOVE HAZARDOUS MATERIALS [1]					$3,167,110
DEMOLISH EXISTING WINGS			83,000	$8.00	$664,000
PREMIUM FOR BRIDGE DEMOLITION					$100,000
SITEWORK					$3,616,230
SUB-TOTAL			618,700	$262.94	$162,679,542
DESIGN AND PRICING CONTINGENCY	15%				$24,401,931
ESCALATION - July 1, 2021 Start	13%				$21,148,340
SUB-TOTAL					$208,229,813
GENERAL CONDITIONS [2]		51	MTHS	$250,000	$12,750,000
GENERAL REQUIREMENTS [2]	4%				$8,329,193
BONDS	0.75%				$1,561,724
INSURANCE	1.10%				$2,290,528
PERMIT					NIC
SUB-TOTAL					$233,161,258
OVERHEAD AND FEE	2.50%				$5,829,031
GMP CONTINGENCY	3%				$6,994,838
PHASING - 4 YRS, 3 MTHS	6%				$13,989,675
TEMPORARY GYM - TENT STRUCTURE ON SLAB ON GRADE			18,000	$120.00	$2,160,000
TEMPORARY CLASSROOMS					NR
TOTAL OF ALL CONSTRUCTION			618,700	$423.69	**$262,134,802**

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Lowell High School
Lowell, MA

20-Apr-18

PSR Pricing Options

MAIN CONSTRUCTION COST SUMMARY

			Gross Floor Area	$/sf	Estimated Construction Cost
ADD/RENO 3A ON EXPANDED SITE					
1922 BUILDING RENOVATION			304,300	$225.98	$68,767,198
1980 BUILDING RENOVATION 3A			128,300	$255.95	$32,837,914
1980 BUILDING 3A SOUTH ADDITIONS			20,000	$348.68	$6,973,535
NEW FRESHMAN WING 3A			93,600	$310.81	$29,091,697
NEW GYMNASIUM WING 3A			67,400	$245.29	$16,532,383
NEW BRIDGES (2 QTY)			8,600	$516.24	$4,439,672
REMOVE HAZARDOUS MATERIALS INCLUDING 75 ARCAND DRIVE					$3,417,110
DEMOLISH EXISTING WINGS			95,900	$8.00	$767,200
PREMIUM FOR BRIDGE DEMOLITION					$100,000
DEMOLISH 75 ARCAND DRIVE			15,000	$8.00	$120,000
SITEWORK					$4,910,200
SUB-TOTAL			622,200	$269.94	$167,956,909
DESIGN AND PRICING CONTINGENCY	15%				$25,193,536
ESCALATION - July 1, 2021 Start	13%				$21,834,398
SUB-TOTAL					$214,984,843
GENERAL CONDITIONS [2]		60	MTHS	$250,000	$15,000,000
GENERAL REQUIREMENTS [2]	4%				$8,599,394
BONDS	0.75%				$1,612,386
INSURANCE	1.10%				$2,364,833
PERMIT					NIC
SUB-TOTAL					$242,561,456
OVERHEAD AND FEE	2.50%				$6,064,036
GMP CONTINGENCY	3%				$7,276,844
PHASING - 5 YRS (4YRS ON SCHOOL SITE)	6%				$14,553,687
TEMPORARY GYMNASIUM					NR
TEMPORARY CLASSROOMS					NR
TOTAL OF ALL CONSTRUCTION			622,200	$434.68	**$270,456,023**

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Lowell High School
Lowell, MA

20-Apr-18

PSR Pricing Options

MAIN CONSTRUCTION COST SUMMARY

			Gross Floor Area	$/sf	Estimated Construction Cost
NEW OPTION A ON EXPANDED SITE					
NEW SCHOOL			579,400	$297.71	$172,496,067
REMOVE HAZARDOUS MATERIALS; BRIDGES, 1980 BUILDING & 75 ARCAND DRIVE ONLY (EXCLUDES 1922 BUILDING ABATEMENT) [1]					$2,429,910
DEMOLISH OTHER BUILDING WINGS			220,700	$8.00	$1,765,600
PREMIUM FOR BRIDGE DEMOLITION					$100,000
DEMOLISH 75 ARCAND DRIVE			15,000	$8.00	$120,000
SITEWORK					$4,030,000
SUB-TOTAL			579,400	$312.29	$180,941,577
DESIGN AND PRICING CONTINGENCY	15%				$27,141,237
ESCALATION - July 1, 2021 Start	13%				$23,522,405
SUB-TOTAL					$231,605,219
GENERAL CONDITIONS [2]		51	MTHS	$300,000	$15,300,000
GENERAL REQUIREMENTS [2]	4%				$9,264,209
BONDS	0.75%				$1,737,039
INSURANCE	1.10%				$2,547,657
PERMIT					NIC
SUB-TOTAL					$260,454,124
OVERHEAD AND FEE	2.50%				$6,511,353
GMP CONTINGENCY	3%				$7,813,624
PHASING - 4 YRS, 3 MTHS (2YRS ON SCHOOL SITE)	3%				$7,813,624
TEMPORARY GYM - TENT STRUCTURE ON SLAB ON GRADE			18,000	$150.00	$2,700,000
TEMPORARY CONNECTION - Freshman Wing to 1922 Building; 250' Span temporary elevated bridge over Pawtucket canal					$1,200,000
TEMPORARY CAFÉ FITOUT					$500,000
TEMPORARY CLASSROOMS - QTY 24					$2,160,000
TOTAL OF ALL CONSTRUCTION			579,400	$499.06	**$289,152,725**

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Lowell High School
Lowell, MA

PSR Pricing Options

CONSTRUCTION COST SUMMARY

BUILDING SYSTEM		*SUB-TOTAL*	*OPTION 2A*			*GSF*		*610,100*		*OPTION 3A*						*GSF*	*613,600*	*OPTION A NEW*	*579,400*
		1922 RENO	1980 RENO	1980 ADDITION	FRESHMAN ADDITION	GYM WING	BRIDGE	TOTAL	COST/GSF	1922 RENO	1980 RENO	1980 ADDITION	GYM WING	FRESHMAN ADDITION	BRIDGE	TOTAL	COST/GSF		COST/GSF
A10	**FOUNDATIONS**																		
A1010	Standard Foundations		$25,000	$93,507	$348,865	$457,182	$52,683	**$977,237**	**$1.60**		$25,000	$175,721	$491,316	$383,727	$52,683	**$1,128,447**	**$1.84**	**$3,475,163**	**$6.00**
A1020	Special Foundations			$98,600	$935,000	$760,600	$178,000	**$1,972,200**	**$3.23**			$274,800	$793,900	$942,500	$178,000	**$2,189,200**	**$3.57**	**$6,765,600**	**$11.68**
A1030	Lowest Floor Construction	$279,050	$212,390	$157,278	$474,304	$924,494		**$2,047,516**	**$3.36**	$279,050	$204,400	$356,826	$929,486	$506,193		**$2,275,955**	**$3.71**	**$4,771,011**	**$8.23**
A20	**BASEMENT EXCAVATION**																		
A2010	Basement Excavation																	**$2,339,769**	**$4.04**
A2030	Basement Walls																		
B10	**SUPERSTRUCTURE**																		
B1010	Upper Floor Construction	$1,069,650	$431,543		$3,354,560	$1,304,575	$1,069,060	**$7,229,388**	**$11.85**	$1,069,650	$610,700	$362,150	$1,351,825	$3,351,265	$1,069,060	**$7,814,650**	**$12.74**	**$19,818,820**	**$34.21**
B1020	Roof Construction	$156,080	$467,800	$106,200	$738,100		$28,125	**$1,496,305**	**$2.45**	$156,080	$495,000	$513,725		$728,925	$28,125	**$1,921,855**	**$3.13**	**$5,088,448**	**$8.78**
B20	**EXTERIOR CLOSURE**																		
B2010	Exterior Walls	$597,324	$1,381,100	$455,225	$3,274,094	$1,258,037	$1,164,200	**$8,129,980**	**$13.33**	$597,324	$1,411,170	$1,093,801	$1,258,037	$3,346,176	$1,164,200	**$8,870,708**	**$14.46**	**$12,888,728**	**$22.24**
B2020	Windows/Curtainwall	$7,228,100	$1,673,710	$123,246	$1,437,007	$312,144	$753,254	**$11,527,461**	**$18.89**	$7,228,100	$1,453,710	$333,256	$312,144	$1,467,006	$753,254	**$11,547,470**	**$18.82**	**$5,309,067**	**$9.16**
B2030	Exterior Doors	$303,900	$57,560	$40,200	$68,840	$54,440		**$524,940**	**$0.86**	$303,900	$40,040	$39,700	$53,840	$68,840		**$506,320**	**$0.83**	**$222,800**	**$0.38**
B30	**ROOFING**																		
B3010	Roof Coverings	$332,500	$1,120,200	$78,500	$453,450		$129,960	**$2,114,610**	**$3.47**	$332,500	$1,013,200	$370,750		$446,850	$129,960	**$2,293,260**	**$3.74**	**$3,131,100**	**$5.40**
B3020	Roof Openings	$233,400	$20,000	$5,000	$5,000			**$263,400**	**$0.43**	$233,400	$336,800	$5,000		$5,000		**$580,200**	**$0.95**	**$530,000**	**$0.91**
C10	**INTERIOR CONSTRUCTION**																		
C1010	Partitions	$5,000,100	$3,056,210	$40,800	$2,026,200	$808,800		**$10,932,110**	**$17.92**	$5,000,100	$2,823,620	$160,000	$808,800	$2,059,200		**$10,851,720**	**$17.69**	**$12,702,400**	**$21.92**
C1020	Interior Doors	$1,633,640	$734,980	$25,500	$503,340	$337,000	$68,000	**$3,302,460**	**$5.41**	$1,633,640	$679,300	$100,000	$337,000	$509,580	$68,000	**$3,327,520**	**$5.42**	**$3,093,560**	**$5.34**
C1030	Specialties/Millwork	$2,574,222	$972,898	$14,857	$884,004	$433,370	$170,640	**$5,049,991**	**$8.28**	$2,574,222	$895,262	$50,132	$375,920	$922,176	$170,640	**$4,988,352**	**$8.13**	**$4,515,718**	**$7.79**
C20	**STAIRCASES**																		
C2010	Stair Construction	$1,107,500	$427,500		$376,000	$74,000		**$1,985,000**	**$3.25**	$1,107,500	$427,500		$111,000	$376,000		**$2,022,000**	**$3.30**	**$1,556,000**	**$2.69**
C2020	Stair Finishes	$140,000	$55,000		$40,000	$10,000		**$245,000**	**$0.40**	$140,000	$55,000		$15,000	$40,000		**$250,000**	**$0.41**	**$190,000**	**$0.33**
C30	**INTERIOR FINISHES**																		
C3010	Wall Finishes	$1,318,732	$582,222	$12,750	$290,826	$251,074	$25,800	**$2,481,404**	**$4.07**	$1,318,732	$557,444	$82,400	$263,740	$296,400	$25,800	**$2,544,516**	**$4.15**	**$2,252,336**	**$3.89**
C3020	Floor Finishes	$2,767,775	$1,406,482	$81,642	$894,845	$872,752	$172,000	**$6,195,496**	**$10.15**	$2,767,775	$1,280,695	$211,305	$833,614	$921,711	$172,000	**$6,187,100**	**$10.08**	**$5,350,306**	**$9.23**
C3030	Ceiling Finishes	$2,379,940	$1,278,843	$32,497	$974,323	$374,008	$129,000	**$5,168,611**	**$8.47**	$2,379,940	$1,279,063	$118,744	$388,343	$1,007,313	$129,000	**$5,302,403**	**$8.64**	**$6,007,288**	**$10.37**
D10	**CONVEYING SYSTEMS**																		
D1010	Elevator	$435,000	$150,000		$250,000	$100,000		**$935,000**	**$1.53**	$435,000	$150,000		$100,000	$250,000		**$935,000**	**$1.52**	**$1,045,000**	**$1.80**
D20	**PLUMBING**																		
D20	Plumbing	$4,390,630	$2,169,160	$61,965	$1,328,610	$842,500	$21,500	**$8,814,365**	**$14.45**	$4,390,630	$1,914,690	$310,000	$775,100	$1,349,760	$21,500	**$8,761,680**	**$14.28**	**$7,532,200**	**$13.00**
D30	**HVAC**																		
D30	HVAC	$15,306,600	$8,076,200	$183,855	$3,971,800	$2,713,350	$199,950	**$30,451,755**	**$49.91**	$15,306,600	$7,700,100	$831,000	$2,713,350	$4,021,300	$199,950	**$30,772,300**	**$50.15**	**$29,188,200**	**$50.38**
D40	**FIRE PROTECTION**																		
D40	Fire Protection	$1,490,210	$693,640	$23,970	$452,870	$303,300	$38,700	**$3,002,690**	**$4.92**	$1,490,210	$633,010	$94,000	$303,300	$459,920	$38,700	**$3,019,140**	**$4.92**	**$2,723,180**	**$4.70**
D50	**ELECTRICAL**																		
D5010	Electrical Systems	$11,094,250	$4,963,545	$165,020	$2,996,765	$1,792,420	$178,800	**$21,190,800**	**$34.73**	$11,094,250	$4,572,185	$623,250	$1,792,420	$3,041,240	$178,800	**$21,302,145**	**$34.72**	**$19,761,200**	**$34.11**
E10	**EQUIPMENT**																		
E10	Equipment	$1,177,000	$1,822,000		$256,000	$477,600		**$3,732,600**	**$6.12**	$1,177,000	$982,000	$840,000	$479,400	$284,000		**$3,762,400**	**$6.13**	**$3,691,500**	**$6.37**
E20	**FURNISHINGS**																		
E2010	Fixed Furnishings	$4,672,540	$2,331,360	$7,000	$2,036,450	$22,848		**$9,070,198**	**$14.87**	$4,672,540	$2,278,085	$26,975	$22,848	$2,306,615		**$9,307,063**	**$15.17**	**$8,546,673**	**$14.75**
E2020	Movable Furnishings																	**NIC**	
F10	**SPECIAL CONSTRUCTION**																		
F10	Special Construction					$2,022,000		**$2,022,000**	**$3.31**				$2,022,000			**$2,022,000**	**$3.30**		
F20	**SELECTIVE BUILDING DEMOLITION**																		
F2010	Building Elements Demo	$3,079,055	$1,130,630				$60,000	**$4,269,685**	**$7.00**	$3,079,055	$1,019,940				$60,000	**$4,158,995**	**$6.78**		
TOTAL DIRECT COST (Trade Costs)		$68,767,198	$35,239,973	$1,807,612	$28,371,253	$16,506,494	$4,439,672	**$155,132,202**	**$254**	$68,767,198	$32,837,914	$6,973,535	$16,532,383	$29,091,697	$4,439,672	**$158,642,399**	**$259**	**$172,496,067**	**$298**

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Lowell High School
Lowell, MA

20-Apr-18

PSR Pricing Options

GFA 304,300

CONSTRUCTION COST SUMMARY

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
1922 BUILDING RENOVATION						
A10	**FOUNDATIONS**					
	A1010	Standard Foundations	$0			
	A1020	Special Foundations	$0			
	A1030	Lowest Floor Construction	$279,050	**$279,050**	$0.92	0.4%
B10	**SUPERSTRUCTURE**					
	B1010	Upper Floor Construction	$1,069,650			
	B1020	Roof Construction	$156,080	**$1,225,730**	$4.03	1.8%
B20	**EXTERIOR CLOSURE**					
	B2010	Exterior Walls	$597,324			
	B2020	Windows/Curtainwall	$7,228,100			
	B2030	Exterior Doors	$303,900	**$8,129,324**	$26.71	11.8%
B30	**ROOFING**					
	B3010	Roof Coverings	$332,500			
	B3020	Roof Openings	$233,400	**$565,900**	$1.86	0.8%
C10	**INTERIOR CONSTRUCTION**					
	C1010	Partitions	$5,000,100			
	C1020	Interior Doors	$1,633,640			
	C1030	Specialties/Millwork	$2,574,222	**$9,207,962**	$30.26	13.4%
C20	**STAIRCASES**					
	C2010	Stair Construction	$1,107,500			
	C2020	Stair Finishes	$140,000	**$1,247,500**	$4.10	1.8%
C30	**INTERIOR FINISHES**					
	C3010	Wall Finishes	$1,318,732			
	C3020	Floor Finishes	$2,767,775			
	C3030	Ceiling Finishes	$2,379,940	**$6,466,447**	$21.25	9.4%
D10	**CONVEYING SYSTEMS**					
	D1010	Elevator	$435,000	**$435,000**	$1.43	0.6%
D20	**PLUMBING**					
	D20	Plumbing	$4,390,630	**$4,390,630**	$14.43	6.4%
D30	**HVAC**					
	D30	HVAC	$15,306,600	**$15,306,600**	$50.30	22.3%
D40	**FIRE PROTECTION**					
	D40	Fire Protection	$1,490,210	**$1,490,210**	$4.90	2.2%
D50	**ELECTRICAL**					
	D5010	Electrical Systems	$11,094,250	**$11,094,250**	$36.46	16.1%
E10	**EQUIPMENT**					
	E10	Equipment	$1,177,000	**$1,177,000**	$3.87	1.7%

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Lowell High School
Lowell, MA

20-Apr-18

PSR Pricing Options

GFA 304,300

CONSTRUCTION COST SUMMARY

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
1922 BUILDING RENOVATION						
E20	**FURNISHINGS**					
	E2010	Fixed Furnishings	$4,672,540			
	E2020	Movable Furnishings	NIC	**$4,672,540**	$15.36	6.8%
F10	**SPECIAL CONSTRUCTION**					
	F10	Special Construction	$0	**$0**	$0.00	0.0%
F20	**SELECTIVE BUILDING DEMOLITION**					
	F2010	Building Elements Demolition	$3,079,055			
	F2020	Hazardous Components Abatement	$0	**$3,079,055**	$10.12	4.5%
TOTAL DIRECT COST (Trade Costs)				***$68,767,198***	*$225.98*	*100.0%*

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1922 BUILDING RENOVATION							
	GROSS FLOOR AREA CALCULATION						
	Basement				82,000		
	First Floor				78,000		
	Second Floor				71,100		
	Third Floor				68,700		
	Fourth Floor				4,500		
	TOTAL GROSS FLOOR AREA (GFA)				**304,300**	***sf***	
A10	***FOUNDATIONS***						
A1010	**STANDARD FOUNDATIONS**						
	No items in this section						
	SUBTOTAL					-	
A1020	**SPECIAL FOUNDATIONS**						
	No items in this section						
	SUBTOTAL					-	
A1030	**LOWEST FLOOR CONSTRUCTION**						
	Repair damaged concrete at Auditorium entrance ramp cheek walls; approx 30" high	**150**	lf	75.00	11,250		
	Cutting and patching for MEP	**77,900**	sf	2.00	155,800		
	General slab replacement at damaged/ deteriorated areas, replacement at reconfigured areas for ADA improvement	**4,100**	sf	20.00	82,000		
	Elevator pit				ETR		
	Equipment pads for new MEP equipment	**1**	ls	30,000.00	30,000		
	SUBTOTAL					279,050	
	TOTAL - FOUNDATIONS						**$279,050**
B10	***SUPERSTRUCTURE***						
B1010	**FLOOR CONSTRUCTION**						
	Openings in existing structure for new MEP systems	**222,300**	sf	1.50	333,450		
	Infill at demolished corridor walls at MEP shaft	**7,020**	sf	35.00	245,700		
	Allowance to demo and overframe Auditorium floor for accessibility	**7,945**	sf	30.00	238,350		
	Allowance for spray fireproofing	**1**	ls	100,000.00	100,000		
	Allowance for additional modifications for accessibility compliance for ramps/ stairs etc	**1**	ls	152,150.00	152,150		
	SUBTOTAL					1,069,650	
B1020	**ROOF CONSTRUCTION**						
	Cut opening & reframe at infilled glass skylights, prepare for new skylights	**512**	sf	90.00	46,080		
	Allowance per Structural engineer; Existing attic floor spaces on East & West sides of 1892 Addition to be reinforced to support new MEP equipment (removal of Attic level mezzanine included with demo)	**3,000**	sf	5.00	15,000		
	Allowance for roof screen framing	**10**	tns	4,500.00	45,000		
	Support framing for new MEP systems	**1**	ls	50,000.00	50,000		
	SUBTOTAL					156,080	
	TOTAL - SUPERSTRUCTURE						**$1,225,730**
B20	***EXTERIOR CLOSURE***						

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1922 BUILDING RENOVATION							
B2010	**EXTERIOR WALLS**	*63,000*	*sf*				
	Repair and repoint exterior walls- brick; 10%	**6,300**	sf	35.00	220,500		
	Replace lintels at significantly deteriorated locations w/ new hot dipped galvanized angles; allow 10% per structural report	**400**	lf	250.00	100,000		
	Clean/restore exterior masonry surfaces at North elevation of 1997 Addition	**6,478**	sf	8.00	51,824		
	Repair/ reset cornice units at building perimeter; allow 20%	**240**	lf	250.00	60,000		
	Roof screens at new MEP equipment; allow 200 lf	**2,000**	sf	55.00	110,000		
	Downspouts from roof gutters to be piped away from the building			included w/ sitework			
	Replace railings at Auditorium entry ramp/stairs	**250**	lf	220.00	55,000		
	SUBTOTAL					597,324	
B2020	**WINDOWS/CURTAINWALL**	*42,000*	*sf*				
	Replace existing windows w/ enhanced historical mullions & profiles	**37,000**	sf	160.00	5,920,000		
	Replace existing double height (25') windows w/ enhanced historical mullions & profiles; curved top	**5,000**	sf	200.00	1,000,000		
	Replace louvers - allow	**300**	sf	65.00	19,500		
	Backer rod & double sealant	**22,200**	lf	10.00	222,000		
	Wood blocking at openings	**22,200**	lf	3.00	66,600		
	SUBTOTAL					7,228,100	
B2030	**EXTERIOR DOORS**						
	Replace exterior wood doors at main entrances w/ historic replica type doors, double leaf	**15**	pr	20,000.00	300,000		
	Backer rod & double sealant	**300**	lf	10.00	3,000		
	Wood blocking at openings	**300**	lf	3.00	900		
	SUBTOTAL					303,900	
	TOTAL - EXTERIOR CLOSURE						**$8,129,324**
B30	***ROOFING***						
B3010	**ROOF COVERINGS**						
	Existing roof to remain - ***separate City project scheduled to be complete 10.28.2018***	**66,250**	sf		ETR		
	Repair ETR roof for MEP penetrations; including maintaining warranty	**66,250**	sf	2.00	132,500		
	Allowance for modest repairs/ patching at recently replaced 1890's slate roof (16,000sf on plan; high pitch)	**1**	ls	200,000.00	200,000		
	SUBTOTAL					332,500	
B3020	**ROOF OPENINGS**						
	Remove & replace translucent panel skylights (4qty)	**648**	sf	125.00	81,000		
	Restore 2 of 4 infilled glass skylights	**512**	sf	200.00	102,400		
	Stage smoke vents; 8'x12'	**2**	ea	25,000.00	50,000		
	SUBTOTAL					233,400	
	TOTAL - ROOFING						**$565,900**
C10	***INTERIOR CONSTRUCTION***						
C1010	**PARTITIONS**						
	Allowance to anchor/brace tops of all non structural interior masonry partitions	**2,516**	loc	200.00	503,200		

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Lowell High School 20-Apr-18

Lowell, MA

PSR Pricing Options **GFA** 304,300

	CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
	1922 BUILDING RENOVATION							
103		Seismic clips at exterior masonry partitions	**1,563**	loc	450.00	703,350		
104		Repair existing interior partitions disturbed by new work/ at ACM demo/ at ADA new access locations	**291,800**	gsf	11.00	3,209,800		
105		New walls in media center	**12,500**	sf	22.00	275,000		
106		Operable partitions for use between adjoining classrooms; assumed 25'-0" long x 10'-0" high	**11**	loc	16,250.00	178,750		
107		Elevator shaft				ETR		
108		Allowance for interior storefront	**1**	ls	30,000.00	30,000		
109		Borrowed lights/sidelights allowance	**1**	ls	100,000.00	100,000		
110		SUBTOTAL					5,000,100	
111								
112	**C1020**	**INTERIOR DOORS**						
113		3'-0" wide sidelight at classroom entry	**89**	ea	1,260.00	112,140		
114		New doors, frame & hardware throughout	**304,300**	gsf	5.00	1,521,500		
115		SUBTOTAL					1,633,640	
116								
117	**C1030**	**SPECIALTIES / MILLWORK**						
118		Single bathroom accessories	**6**	rms	500.00	3,000		
119		Gang bathroom accessories including electric handryers	**25**	rms	3,150.00	78,750		
120		Allowance to protect/preserve historic detailing	**304,300**	gsf	1.00	304,300		
121		Miscellaneous millwork	**304,300**	gsf	0.50	152,150		
122		Custom millwork at proscenium for auditorium	**1**	ls	50,000.00	50,000		
123		Janitors closet accessories	**5**	rms	300.00	1,500		
124		HDPE Toilet Partitions at gang bathrooms; per bathroom	**25**	rms	10,000.00	250,000		
125		2-tier metal student lockers 18" x 15" x 48" h	**1,725**	opes	190.00	327,750		
126		Staff lockers	**50**	ea	350.00	17,500		
127		Markerboards	**15,376**	sf	22.00	338,272		
128		Tackboards	**8,528**	sf	20.00	170,560		
129		New rails at Auditorium aisles	**250**	lf	175.00	43,750		
130		Brushed aluminum standoff signage at ROTC wing, Performing arts wing, Visual arts wing and administration	**4**	loc	5,000.00	20,000		
131		Stainless steel plaque 18 x 24	**1**	loc	2,500.00	2,500		
132		Display cases	**941**	sf	90.00	84,690		
133		Allowance for miscellaneous specialties; wall protection, fire extinguishers	**291,800**	sf	0.50	145,900		
134		Miscellaneous metals throughout building	**291,800**	gsf	0.50	145,900		
135		Rough blocking	**291,800**	gsf	0.15	43,770		
136		Miscellaneous sealants throughout building	**291,800**	gsf	1.00	291,800		
137		Code compliant signage	**291,800**	gsf	0.35	102,130		
138		SUBTOTAL					2,574,222	
139								
140		***TOTAL - INTERIOR CONSTRUCTION***						**$9,207,962**
141								
142								
143	***C20***	***STAIRCASES***						
144								
145	**C2010**	**STAIR CONSTRUCTION**						
146		Wood frame stairs with maple finish and stainless steel handrails both sides of stage	**2**	loc	10,000.00	20,000		
147		Concrete fill to stairs	**29**	flt	2,500.00	72,500		
148		Egress stairs - metal pan	**29**	flt	35,000.00	1,015,000		
149		SUBTOTAL					1,107,500	
150								
151	**C2020**	**STAIR FINISHES**						
152		New stair finishes; rubber treads/risers/landing and painting	**28**	flt	5,000.00	140,000		
153		SUBTOTAL					140,000	

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1922 BUILDING RENOVATION							
	TOTAL - STAIRCASES						**$1,247,500**
C30	***INTERIOR FINISHES***						
C3010	**WALL FINISHES**						
	Painting throughout	**304,300**	gsf	2.50	760,750		
	New tile in single bathroom wet walls	**1,515**	sf	22.00	33,330		
	24x12 Porcelain tile wainscot at corridor - classroom wing; 4' high	**12,692**	sf	24.00	304,608		
	Tectum panels in music rooms	**858**	sf	18.00	15,444		
	Wood wainscot at auditorium walls, 3'-6" high	**910**	sf	60.00	54,600		
	Custom tectum wall panels and reflectors at Auditorium	**1**	ls	150,000.00	150,000		
	SUBTOTAL					1,318,732	
C3020	**FLOOR FINISHES**	*279,212*	*sf*				
	Assumed no repairs to Terrazzo Flooring						
	Allowance for floor prep/ leveling/ wood sub-floor repairs	**279,212**	sf	3.00	837,636		
	2 layers 3/4" plywood at stage	**2,642**	sf	8.00	21,136		
	Stage flooring - Maple	**2,642**	sf	24.00	63,408		
	Linoleum tile flooring	**206,150**	sf	7.00	1,443,050		
	Sealed concrete	**17,235**	sf	2.00	34,470		
	Poured epoxy at bathrooms	**7,350**	sf	12.00	88,200		
	Carpet in Admin areas, Auditorium aisles, Music rooms etc	**4,705**	sy	45.00	211,725		
	Concrete sealer at Auditorium seating	**3,490**	sf	2.00	6,980		
	New resilient bases	**20,390**	lf	3.00	61,170		
	SUBTOTAL					2,767,775	
C3030	**CEILING FINISHES**						
	2' x 2' ACT	**14,125**	sf	5.50	77,688		
	2' x 4' ACT	**100,370**	sf	5.00	501,850		
	Sloped ACT ceiling 2x4 at music rooms, teacher planning, science rooms, visual art rooms, SPED and typical classrooms	**134,460**	sf	5.75	773,145		
	Moisture resistant GWB ceilings in bathrooms	**7,350**	sf	14.00	102,900		
	GWB ceiling with wood trim at Auditorium and Stage	**14,280**	sf	45.00	642,600		
	Custom acoustical ceiling panels at Auditorium	**1**	ls	250,000.00	250,000		
	Paint exposed ceiling	**9,635**	sf	1.50	14,453		
	Paint GWB ceilings	**21,630**	sf	0.80	17,304		
	SUBTOTAL					2,379,940	
	TOTAL - INTERIOR FINISHES						**$6,466,447**
D10	***CONVEYING SYSTEMS***						
	New 4-stop elevator; 3500# in existing shaft	**2**	ea	200,000.00	400,000		
	Lift at Auditorium stage	**1**	ea	35,000.00	35,000		
	SUBTOTAL					435,000	
	TOTAL - CONVEYING SYSTEMS						**$435,000**
D20	***PLUMBING***						
D20	**PLUMBING, GENERALLY**						

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1922 BUILDING RENOVATION							
	1922 Building contains science rooms, classrooms, auditorium & art studios. Hot water via gas fired heaters						
	Plumbing equipment	**304,300**	gsf	1.75	532,525		
	Plumbing fixtures	**304,300**	gsf	2.55	775,965		
	Domestic water pipe with fittings & hangers	**304,300**	gsf	2.75	836,825		
	Domestic water pipe insulation	**304,300**	gsf	1.55	471,665		
	Sanitary waste pipe with fittings & hangers	**304,300**	gsf	2.50	760,750		
	Tempered water pipe with fittings & hangers	**304,300**	gsf	0.25	76,075		
	Acid waste pipe with fittings & hangers	**304,300**	gsf	0.35	106,505		
	Storm water pipe with fittings & hangers	**304,300**	gsf	1.00	304,300		
	Gas pipe with fittings & hangers	**304,300**	gsf	0.75	228,225		
	Demolition/phasing	**1**	ls	100,000.00	100,000		
	Miscellaneous	**304,300**	gsf	0.65	197,795		
	SUBTOTAL					4,390,630	
	TOTAL - PLUMBING						**$4,390,630**
D30	***HVAC***						
D30	**HVAC, GENERALLY**						
	1922 Building HVAC system contains HW boilers, water cooled chillers & cooling tower, RTU's with ERW, VAV systems, partial 4 pipe chilled beam system in selective areas & displacement diffuser system						
	HVAC Equipment						
	Gas fired HW boiler 5800 MBH	**3**	ea	174,000.00	522,000		
	Hot water pumps with VFD	**2**	ea	20,000.00	40,000		
	Water cooled chiller 210 ton	**2**	ea	420,000.00	840,000		
	Cooling tower with filtration 420 ton	**1**	ea	147,000.00	147,000		
	Chilled water pump with VFD	**2**	ea	25,000.00	50,000		
	Condenser water pump with VFD	**2**	ea	30,000.00	60,000		
	Heating and cooling devices throughout including active chilled beams to admin area, CUH's, fintube...	**304,300**	sf	2.50	760,750		
	Air Distribution Equipment						
	AHU with HW, CHW coil & ERW classrooms	**118,800**	cfm	15.00	1,782,000		
	AHU with HW, CHW coil & ERW Aud & stage	**13,100**	cfm	15.00	196,500		
	AHU with HW, CHW coil & ERW add & media	**14,000**	cfm	15.00	210,000		
	Miscellaneous air distribution equipment	**304,300**	gsf	2.50	760,750		
	Hot water piping with fittings & hangers	**304,300**	gsf	4.00	1,217,200		
	Chilled water piping with fittings & hangers	**304,300**	gsf	2.50	760,750		
	Condenser water piping with fittings & hangers	**304,300**	gsf	0.50	152,150		
	Pipe insulation	**304,300**	gsf	2.50	760,750		
	Sheet metal & accessories	**304,300**	gsf	12.00	3,651,600		
	Automatic temperature controls DDC	**304,300**	gsf	7.50	2,282,250		
	System testing & balancing	**304,300**	gsf	1.00	304,300		
	Demolition/phasing	**1**	ls	200,000.00	200,000		
	Miscellaneous	**304,300**	gsf	2.00	608,600		
	SUBTOTAL					15,306,600	
	TOTAL - HVAC						**$15,306,600**
D40	***FIRE PROTECTION***						
D40	**FIRE PROTECTION, GENERALLY**						
	New sprinkler system to replace existing system to bring building up to code	**304,300**	gsf	4.70	1,430,210		

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1922 BUILDING RENOVATION							
	Demolition/phasing	**1**	ls	60,000.00	60,000		
	SUBTOTAL					1,490,210	
	TOTAL - FIRE PROTECTION						**$1,490,210**
D50	***ELECTRICAL***						
D5010	**SERVICE & DISTRIBUTION**						
	Gear & Distribution						
	Normal						
	4000A main switchboard	**2**	ea	110,000.00	220,000		
	Associated panelboards and feeders	**304,300**	sf	2.00	608,600		
	Emergency						
	350KW diesel generator with sound atten. cover	**2**	ea	95,000.00	190,000		
	Associated ATS's, panelboards and feeders	**304,300**	gsf	1.50	456,450		
	45KW UPS	**2**	ea	30,000.00	60,000		
	Provisions for PV system (Rough-in only)	**1**	ls	5,000.00	5,000		
	Grounding	**1**	ls	25,000.00	25,000		
	Equipment Wiring						
	Equipment wiring feed and connections	**304,300**	gsf	2.00	608,600		
	Chiller unit feed and connection	**2**	ea	10,500.00	21,000		
	Cooling tower feed and connection	**1**	ea	6,500.00	6,500		
	AHU feed and connection	**3**	ea	4,500.00	13,500		
	Pump feed and connection	**6**	ea	1,500.00	9,000		
	Boiler feed and connection	**1**	ea	1,500.00	1,500		
	VFD's feed and connection only	**6**	ea	950.00	5,700		
	Kitchen equipment feed and connections				See 1980 Bldg.		
	SUBTOTAL					2,230,850	
D5020	**LIGHTING & POWER**						
	LED lighting allowance	**304,300**	gsf	6.00	1,825,800		
	Emergency/egress lighting	**304,300**	gsf	0.50	152,150		
	Lighting to exterior	**1**	ls	20,000.00	20,000		
	Lighting controls						
	Automated lighting controls system	**304,300**	gsf	1.75	532,525		
	Branch devices						
	Branch devices	**304,300**	gsf	0.60	182,580		
	Lighting and branch circuitry						
	Branch circuitry	**304,300**	gsf	6.00	1,825,800		
	SUBTOTAL					4,538,855	
D5030	**COMMUNICATION & SECURITY SYSTEMS**						
	Fire Alarm						
	Control panel	**1**	ls	12,000.00	12,000		
	Annunciator	**1**	ea	1,500.00	1,500		
	Beacon	**1**	ea	225.00	225		
	Knox box	**1**	ea	600.00	600		
	Devices and cabling (Including Mass. Notification)	**304,300**	gsf	3.00	912,900		
	Testing and programming	**1**	ls	4,500.00	4,500		
	BDA/DAS system	**1**	ls	175,000.00	175,000		
	Telephone/Data/CATV						
	MDF/IDF closets	**1**	ls	30,000.00	30,000		
	Devices and cabling	**304,300**	sf	2.00	608,600		
	Backbone cabling (allow)	**300**	lf	20.00	6,000		
	Rough-in	**304,300**	gsf	0.75	228,225		
	Clock/PA System						
	Head end	**1**	ls	45,000.00	45,000		
	Devices and cabling	**304,300**	gsf	0.60	182,580		
	Rough-in	**304,300**	gsf	0.30	91,290		
	Sound systems						
	Cafeteria sound system				See 1980 Bldg.		

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1922	**BUILDING RENOVATION**						
	Two Way Communications System						
	Elevator lobby two way communication system	**1**	ls	15,000.00	15,000		
	Auditorium						
	Stage lighting and dimming system	**1**	ls	150,000.00	150,000		
	Auditorium sound system	**1**	ls	50,000.00	50,000		
	Rough-in with 120V power	**1**	ls	25,000.00	25,000		
	Audio/visual systems rough-in with 120V power	**1**	ls	50,000.00	50,000		
	AV General Building						
	AV equipment provided by others				By Others		
	Rough-in and power	**304,300**	gsf	0.25	76,075		
	Security System						
	Head end	**1**	ls	25,000.00	25,000		
	Devices and cabling	**304,300**	gsf	2.50	760,750		
	Rough-in	**304,300**	gsf	1.00	304,300		
	SUBTOTAL					3,754,545	
D5040	**OTHER ELECTRICAL SYSTEMS**						
	Lightning protection	**1**	ls	125,000.00	125,000		
	Seismic	**1**	ls	10,000.00	10,000		
	Testing	**1**	ls	5,000.00	5,000		
	Miscellaneous						
	Demolition/phasing	**1**	ls	150,000.00	150,000		
	Temp power & lights	**1**	ls	150,000.00	150,000		
	Permits and fees	**1**	ls	130,000.00	130,000		
	SUBTOTAL					570,000	
	TOTAL - ELECTRICAL						**$11,094,250**
E10	***EQUIPMENT***						
E10	**EQUIPMENT, GENERALLY**						
	Theatrical stage curtains, rigging, lighting and controls	**1**	ls	450,000.00	450,000		
	Auditorium AV equipment, allow	**1**	ls	200,000.00	200,000		
	Thru wall fume hood at science prep	**6**	ea	14,000.00	84,000		
	Auditorium seating (1200 seats)	**1**	ls	420,000.00	420,000		
	Allowance for miscellaneous equipment; projection screens, residential appliances etc	**1**	ls	20,000.00	20,000		
	Kiln	**1**	ls	3,000.00	3,000		
	SUBTOTAL					1,177,000	
	TOTAL - EQUIPMENT						**$1,177,000**
E20	***FURNISHINGS***						
E2010	**FIXED FURNISHINGS**						
	Rolling mesh shades at exterior windows in non circulation spaces	**25,200**	sf	7.00	176,400		
	Solid roller shades at all interior storefront and borrowed lights	**3,380**	sf	7.00	23,660		
	Recessed walk off carpet at vestibule entries	**2,970**	sf	45.00	133,650		
	Student science tables, allowance of 12 per room	**9**	rms	30,000.00	270,000		
	Base cabinets with solid surface countertop	**3,854**	lf	425.00	1,637,950		
	Base cabinet with phenolic countertop	**960**	lf	500.00	480,000		
	Upper cabinets	**1,024**	lf	220.00	225,280		
	Upper cabinets with marker board doors	**3,790**	lf	250.00	947,500		
	Teachers wardrobe	**145**	ea	1,400.00	203,000		
	Tall storage	**322**	ea	1,400.00	450,800		
	Music storage cabinets	**113**	lf	1,100.00	124,300		
	SUBTOTAL					4,672,540	

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1922 BUILDING RENOVATION							
E2020	**MOVABLE FURNISHINGS**						
	All movable furnishings to be provided and installed by owner						
	SUBTOTAL					NIC	
	TOTAL - FURNISHINGS						**$4,672,540**
F10	***SPECIAL CONSTRUCTION***						
F10	**SPECIAL CONSTRUCTION**						
	No items in this section						
	SUBTOTAL					-	
	TOTAL - SPECIAL CONSTRUCTION						
F20	***SELECTIVE BUILDING DEMOLITION***						
F2010	**BUILDING ELEMENTS DEMOLITION**						
	Remove exterior glazing	**42,000**	sf	6.00	252,000		
	Roof membrane demo				Separate contract		
	1892 Attic mezzanine demolition	**3,500**	sf	30.00	105,000		
	Demolish one face of chase wall at corridor; including patching	**52,650**	sf	15.00	789,750		
	Interior demolition	**304,300**	gsf	6.00	1,825,800		
	Temporary enclosures/protection	**304,300**	sf	0.35	106,505		
	SUBTOTAL					3,079,055	
F2020	**HAZARDOUS COMPONENTS ABATEMENT**						
	See summary						
	SUBTOTAL						
	TOTAL - SELECTIVE BUILDING DEMOLITION						**$3,079,055**

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Lowell High School 20-Apr-18
Lowell, MA

PSR Pricing Options GFA 141,200

CONSTRUCTION COST SUMMARY

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
1980 BUILDING RENOVATION 2A						
A10	**FOUNDATIONS**					
	A1010	Standard Foundations	$25,000			
	A1020	Special Foundations	$0			
	A1030	Lowest Floor Construction	$212,390	**$237,390**	$1.68	0.7%
B10	**SUPERSTRUCTURE**					
	B1010	Upper Floor Construction	$431,543			
	B1020	Roof Construction	$467,800	**$899,343**	$6.37	2.6%
B20	**EXTERIOR CLOSURE**					
	B2010	Exterior Walls	$1,381,100			
	B2020	Windows/Curtainwall	$1,673,710			
	B2030	Exterior Doors	$57,560	**$3,112,370**	$22.04	8.8%
B30	**ROOFING**					
	B3010	Roof Coverings	$1,120,200			
	B3020	Roof Openings	$20,000	**$1,140,200**	$8.08	3.2%
C10	**INTERIOR CONSTRUCTION**					
	C1010	Partitions	$3,056,210			
	C1020	Interior Doors	$734,980			
	C1030	Specialties/Millwork	$972,898	**$4,764,088**	$33.74	13.5%
C20	**STAIRCASES**					
	C2010	Stair Construction	$427,500			
	C2020	Stair Finishes	$55,000	**$482,500**	$3.42	1.4%
C30	**INTERIOR FINISHES**					
	C3010	Wall Finishes	$582,222			
	C3020	Floor Finishes	$1,406,482			
	C3030	Ceiling Finishes	$1,278,843	**$3,267,547**	$23.14	9.3%
D10	**CONVEYING SYSTEMS**					
	D1010	Elevator	$150,000	**$150,000**	$1.06	0.4%
D20	**PLUMBING**					
	D20	Plumbing	$2,169,160	**$2,169,160**	$15.36	6.2%
D30	**HVAC**					
	D30	HVAC	$8,076,200	**$8,076,200**	$57.20	22.9%
D40	**FIRE PROTECTION**					
	D40	Fire Protection	$693,640	**$693,640**	$4.91	2.0%
D50	**ELECTRICAL**					
	D5010	Electrical Systems	$4,963,545	**$4,963,545**	$35.15	14.1%
E10	**EQUIPMENT**					
	E10	Equipment	$1,822,000	**$1,822,000**	$12.90	5.2%

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Lowell High School 20-Apr-18
Lowell, MA

PSR Pricing Options GFA 141,200

CONSTRUCTION COST SUMMARY

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
1980 BUILDING RENOVATION 2A						
E20	**FURNISHINGS**					
	E2010	Fixed Furnishings	$2,331,360			
	E2020	Movable Furnishings	NIC	**$2,331,360**	$16.51	6.6%
F10	**SPECIAL CONSTRUCTION**					
	F10	Special Construction	$0	**$0**	$0.00	0.0%
F20	**SELECTIVE BUILDING DEMOLITION**					
	F2010	Building Elements Demolition	$1,130,630			
	F2020	Hazardous Components Abatement	$0	**$1,130,630**	$8.01	3.2%
TOTAL DIRECT COST (Trade Costs)				***$35,239,973***	*$249.57*	*100.0%*

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Lowell High School 20-Apr-18

Lowell, MA

PSR Pricing Options **GFA** 141,200

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING RENOVATION 2A							
	GROSS FLOOR AREA CALCULATION						
	First Floor				44,500		
	Second Floor				49,100		
	Third Floor				47,600		
	TOTAL GROSS FLOOR AREA (GFA)				**141,200** ***sf***		
	A10 FOUNDATIONS						
A1010	**STANDARD FOUNDATIONS**						
	Miscellaneous repairs/ resurfacing of cracks at exposed concrete foundations at NE corner	**1**	ls	25,000.00	25,000		
	SUBTOTAL					25,000	
A1020	**SPECIAL FOUNDATIONS**						
	No items in this section						
	SUBTOTAL					-	
A1030	**LOWEST FLOOR CONSTRUCTION**						
	Cutting and patching for MEP	**46,645**	sf	2.00	93,290		
	General slab replacement at damaged/ deteriorated areas, replacement at reconfigured areas for ADA improvement	**2,455**	sf	20.00	49,100		
	New elevator pit including temporary protection of existing adjacent foundations	**1**	ea	50,000.00	50,000		
	Equipment pads for new MEP equipment	**1**	ls	20,000.00	20,000		
	SUBTOTAL					212,390	
	TOTAL - FOUNDATIONS						**$237,390**
	B10 SUPERSTRUCTURE						
B1010	**FLOOR CONSTRUCTION**						
	Openings in existing structure for new MEP systems	**94,555**	sf	1.00	94,555		
	Spray firefroofing	**94,555**	sf	2.50	236,388		
	Opening in existing structure for new elevator	**3**	opes	10,000.00	30,000		
	Allowance for additional modifications for accessibility compliance for ramps/ stairs etc	**1**	ls	70,600.00	70,600		
	SUBTOTAL					431,543	
B1020	**ROOF CONSTRUCTION**						
	Allowance for roof screen framing	**10**	tns	4,500.00	45,000		
	Support framing for new MEP systems	**1**	ls	30,000.00	30,000		
	Spray firefroofing	**49,100**	sf	3.00	147,300		
	Allowance for PV Array reinforcement (roof not yet evaluated by Engineer - allowance)	**49,100**	sf	5.00	245,500		
	SUBTOTAL					467,800	
	TOTAL - SUPERSTRUCTURE						**$899,343**
	B20 EXTERIOR CLOSURE						
B2010	**EXTERIOR WALLS**	*24,000*	*sf*				
	New brick closure system at demolished area infills, match existing	**1,260**	sf	85.00	107,100		
	Allowance to repair relieving angle system; includes for removal & reinstallation of existing brick	**3,080**	lf	300.00	924,000		
	Miscellaneous repairs of existing closure - minimal	**24,000**	sf	10.00	240,000		

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING RENOVATION 2A							
	Roof screens at new MEP equipment; allow 200 lf	**2,000**	sf	55.00	110,000		
	SUBTOTAL					1,381,100	
B2020	**WINDOWS/CURTAINWALL**	*16,000*	*sf*				
	Replace existing operable windows/ storefront (non-historic)	**16,000**	sf	100.00	1,600,000		
	Replace louvers - allow	**150**	sf	65.00	9,750		
	Backer rod & double sealant	**4,920**	lf	10.00	49,200		
	Wood blocking at openings	**4,920**	lf	3.00	14,760		
	SUBTOTAL					1,673,710	
B2030	**EXTERIOR DOORS**						
	Replace exterior glazed door, double	**6**	pr	8,500.00	51,000		
	Overhead doors; allowance	**1**	ea	5,000.00	5,000		
	Backer rod & double sealant	**120**	lf	10.00	1,200		
	Wood blocking at openings	**120**	lf	3.00	360		
	SUBTOTAL					57,560	
	TOTAL - EXTERIOR CLOSURE						**$3,112,370**
B30	***ROOFING***						
B3010	**ROOF COVERINGS**						
	EPDM roof system replacement including removal of existing down to existing deck	**49,100**	sf	22.00	1,080,200		
	Replace all edge flashings/copings	**1,000**	lf	40.00	40,000		
	SUBTOTAL					1,120,200	
B3020	**ROOF OPENINGS**						
	Replace roof ladders/hatches etc.	**1**	ls	20,000.00	20,000		
	SUBTOTAL					20,000	
	TOTAL - ROOFING						**$1,140,200**
C10	***INTERIOR CONSTRUCTION***						
C1010	**PARTITIONS**						
	Allowance to anchor/brace tops of all non structural interior masonry partitions	**934**	loc	120.00	112,080		
	Seismic clips at exterior masonry partitions	**615**	loc	450.00	276,750		
	Repair existing interior partitions disturbed by new work/ at ACM demo/ at ADA new access locations	**141,200**	gsf	18.00	2,541,600		
	New elevator shaft	**2,026**	sf	30.00	60,780		
	Allowance for interior storefront	**1**	ls	15,000.00	15,000		
	Borrowed lights/sidelights allowance	**1**	ls	50,000.00	50,000		
	SUBTOTAL					3,056,210	
C1020	**INTERIOR DOORS**						
	3'-0" wide sidelight at classroom entry	**23**	ea	1,260.00	28,980		
	New doors, frame & hardware throughout	**141,200**	gsf	5.00	706,000		
	SUBTOTAL					734,980	
C1030	**SPECIALTIES / MILLWORK**						
	Gang bathroom accessories including electric handryers	**8**	rms	3,150.00	25,200		
	Janitors closet accessories	**3**	rms	300.00	900		
	HDPE Toilet Partitions at gang bathrooms	**8**	loc	10,000.00	80,000		
	2-tier metal student lockers 18" x 15" x 48" h	**810**	opes	190.00	153,900		
	Markerboards	**7,679**	sf	22.00	168,938		

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING RENOVATION 2A							
	Tackboards	**4,259**	sf	20.00	85,180		
	Allowance for miscellaneous specialties; wall protection, fire extinguishers	**141,200**	gsf	0.50	70,600		
	Allowance for circulation desk at media center	**1**	ls	14,000.00	14,000		
	Allowance for admin desks at main office and bank	**2**	loc	6,000.00	12,000		
	Display cases	**442**	sf	90.00	39,780		
	Brushed aluminum standoff signage at bank, cafeteria, media center, nurses suite, store and main office	**8**	loc	5,000.00	40,000		
	Miscellaneous metals throughout building	**141,200**	gsf	0.50	70,600		
	Rough blocking	**141,200**	gsf	0.15	21,180		
	Miscellaneous sealants throughout building	**141,200**	gsf	1.00	141,200		
	Code compliant signage	**141,200**	gsf	0.35	49,420		
	SUBTOTAL					972,898	
	TOTAL - INTERIOR CONSTRUCTION						**$4,764,088**
C20	***STAIRCASES***						
C2010	**STAIR CONSTRUCTION**						
	Concrete fill to stairs	**11**	flt	2,500.00	27,500		
	Egress stairs - metal pan	**10**	flt	35,000.00	350,000		
	Monumental stairs at library lobby	**1**	flt	50,000.00	50,000		
	SUBTOTAL					427,500	
C2020	**STAIR FINISHES**						
	New stair finishes; rubber treads/risers/landing and painting	**11**	flt	5,000.00	55,000		
	SUBTOTAL					55,000	
	TOTAL - STAIRCASES						**$482,500**
C30	***INTERIOR FINISHES***						
C3010	**WALL FINISHES**						
	Painting throughout	**141,200**	gsf	2.50	353,000		
	24x12 Porcelain tile wainscot at corridor - classroom wing; assumed 4' high	**6,972**	sf	24.00	167,328		
	Tectum wall panels at cafetorium	**1**	ls	40,000.00	40,000		
	Hardwood trim at tectum panels in cafetorium	**1**	ls	15,000.00	15,000		
	Tectum wall panels at TV studio	**383**	sf	18.00	6,894		
	SUBTOTAL					582,222	
C3020	**FLOOR FINISHES**	*125,854*	*sf*				
	Allowance for floor prep/ leveling/ wood sub-floor repairs	**125,854**	sf	3.00	377,562		
	Linoleum tile flooring	**93,540**	sf	7.00	654,780		
	Sealed concrete	**2,600**	sf	2.00	5,200		
	Quarry tile	**7,650**	sf	26.00	198,900		
	Quarry tile base	**574**	lf	18.00	10,332		
	Poured epoxy at bathrooms	**3,110**	sf	12.00	37,320		
	Carpet	**2,106**	sy	45.00	94,770		
	New resilient bases	**9,206**	lf	3.00	27,618		
	SUBTOTAL					1,406,482	
C3030	**CEILING FINISHES**						
	2' x 2' ACT	**8,600**	sf	5.50	47,300		
	2' x 4' ACT	**36,950**	sf	5.00	184,750		

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING RENOVATION 2A							
	2' x 4' ACT, health zone	**7,650**	sf	6.00	45,900		
	2' x 6' ACT	**13,300**	sf	8.00	106,400		
	Sloped ACT ceiling 2x4 at music rooms, teacher planning, science rooms, visual art rooms, SPED and typical classrooms	**50,565**	sf	5.75	290,749		
	Moisture resistant GWB ceilings in bathrooms	**3,110**	sf	14.00	43,540		
	Acoustic ceiling panels at cafetorium	**1**	ls	20,000.00	20,000		
	GWB soffit	**23,413**	sf	22.00	515,086		
	Paint exposed ceiling	**2,600**	sf	1.50	3,900		
	Paint GWB ceilings	**26,523**	sf	0.80	21,218		
	SUBTOTAL					1,278,843	
	TOTAL - INTERIOR FINISHES						**$3,267,547**
D10	***CONVEYING SYSTEMS***						
	New 3-stop elevator; 3500#	**1**	ea	150,000.00	150,000		
	SUBTOTAL					150,000	
	TOTAL - CONVEYING SYSTEMS						**$150,000**
D20	***PLUMBING***						
D20	**PLUMBING, GENERALLY**						
	1980 Building contains science rooms, classrooms, culinary kitchen & restaurant. Hot water by gas fired heaters						
	Plumbing equipment	**141,200**	gsf	1.75	247,100		
	Plumbing fixtures	**141,200**	gsf	2.75	388,300		
	Domestic water pipe with fittings & hangers	**141,200**	gsf	2.75	388,300		
	Domestic water pipe insulation	**141,200**	gsf	1.55	218,860		
	Sanitary waste pipe with fittings & hangers	**141,200**	gsf	2.50	353,000		
	Tempered water pipe with fittings & hangers	**141,200**	gsf	0.25	35,300		
	Acid waste pipe with fittings & hangers	**141,200**	gsf	0.35	49,420		
	Storm water pipe with fittings & hangers	**141,200**	gsf	1.00	141,200		
	Gas pipe with fittings & hangers	**141,200**	gsf	0.75	105,900		
	Culinary rough-in	**1**	ls	30,000.00	30,000		
	Kitchen rough-in	**1**	ls	70,000.00	70,000		
	Demolition/phasing	**1**	ls	50,000.00	50,000		
	Miscellaneous	**141,200**	gsf	0.65	91,780		
	SUBTOTAL					2,169,160	
	TOTAL - PLUMBING						**$2,169,160**
D30	***HVAC***						
D30	**HVAC, GENERALLY**						
	1980 Building contains science rooms, classrooms, culinary kitchen & restaurant						
	1980 Building HVAC system contains HW boilers, water cooled chillers & cooling tower, RTU's with ERW, VAV systems, partial 4 pipe chilled beam system in selective areas & displacement diffuser system						
	Gas fired HW boiler 5600 MBH	**3**	ea	168,000.00	504,000		
	Hot water pumps with VFD	**2**	ea	25,000.00	50,000		
	Water cooled chiller 275 ton	**2**	ea	550,000.00	1,100,000		
	Cooling tower with filtration 550 ton	**1**	ea	192,500.00	192,500		

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING RENOVATION 2A							
	Chilled water pump with VFD	**2**	ea	30,000.00	60,000		
	Condenser water pump with VFD	**2**	ea	35,000.00	70,000		
	Heating and cooling devices throughout including	**141,200**	sf	2.00	282,400		
	AHU with HW, CHW coil & ERW classrooms	**21,700**	cfm	15.00	325,500		
	AHU with HW, CHW coil & ERW kitchen & support	**7,100**	cfm	15.00	106,500		
	AHU with HW, CHW coil & ERW cafeteria	**16,800**	cfm	15.00	252,000		
	AHU with HW, CHW coil & ERW culinary arts & rest	**4,800**	cfm	15.00	72,000		
	AHU with HW, CHW coil & ERW admin, student act	**3,600**	cfm	15.00	54,000		
	AHU with HW, CHW coil & ERW tv studios	**2,300**	cfm	15.00	34,500		
	Make up air unit kitchen	**1**	ls	40,000.00	40,000		
	Make up air unit culinary	**1**	ls	32,000.00	32,000		
	Miscellaneous air distribution equipment	**141,200**	gsf	2.50	353,000		
	Hot water piping with fittings & hangers	**141,200**	gsf	4.00	564,800		
	Chilled water piping with fittings & hangers	**141,200**	gsf	2.50	353,000		
	Condenser water piping with fittings & hangers	**141,200**	gsf	0.50	70,600		
	Pipe insulation	**141,200**	gsf	2.50	353,000		
	Sheet metal & accessories	**141,200**	gsf	12.00	1,694,400		
	Automatic temperature controls DDC	**141,200**	gsf	7.50	1,059,000		
	System testing & balancing	**141,200**	gsf	1.00	141,200		
	Demolition/phasing	**1**	ls	100,000.00	100,000		
	Miscellaneous	**141,200**	gsf	1.50	211,800		
	SUBTOTAL					8,076,200	
	TOTAL - HVAC						**$8,076,200**
D40	***FIRE PROTECTION***						
D40	**FIRE PROTECTION, GENERALLY**						
	New sprinkler system to replace existing system.	**141,200**	gsf	4.70	663,640		
	Demolition/phasing	**1**	ls	30,000.00	30,000		
	SUBTOTAL					693,640	
	TOTAL - FIRE PROTECTION						**$693,640**
D50	***ELECTRICAL***						
D5010	**SERVICE & DISTRIBUTION**						
	Gear & Distribution						
	Normal						
	2500A main switchboard				See 1922 Bldg		
	Associated panelboards and feeders	**141,200**	sf	2.00	282,400		
	Emergency						
	350KW diesel generator with sound atten. cover				See 1922 Bldg		
	Associated ATS's, panelboards and feeders	**141,200**	gsf	1.50	211,800		
	45KW UPS	**2**	ea	30,000.00	60,000		
	Provisions for PV system (Rough-in only)	**1**	ls	5,000.00	5,000		
	Grounding	**1**	ls	5,000.00	5,000		
	Equipment Wiring						
	Equipment wiring feed and connections	**141,200**	gsf	2.00	282,400		
	Chiller unit feed and connection	**2**	ea	10,500.00	21,000		
	Cooling tower feed and connection	**1**	ea	6,500.00	6,500		
	AHU feed and connection	**3**	ea	4,500.00	13,500		
	Pump feed and connection	**6**	ea	1,500.00	9,000		
	Boiler feed and connection	**1**	ea	1,500.00	1,500		
	MAU feed and connection	**2**	ea	3,520.00	7,040		
	VFD's feed and connection only	**6**	ea	950.00	5,700		
	Kitchen equipment feed and connections	**1**	ls	25,000.00	25,000		
	Culinary kitchen equipment feed and connections	**1**	ls	5,000.00	5,000		

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING RENOVATION 2A							
	SUBTOTAL					940,840	
D5020	**LIGHTING & POWER**						
	LED lighting allowance	**141,200**	gsf	6.00	847,200		
	Emergency/egress lighting	**141,200**	gsf	0.50	70,600		
	Lighting to exterior	**1**	ls	8,500.00	8,500		
	Lighting controls						
	Automated lighting controls system	**141,200**	gsf	1.75	247,100		
	Branch devices						
	Branch devices	**141,200**	sf	0.60	84,720		
	Lighting and branch circuitry						
	Branch circuitry	**141,200**	gsf	5.50	776,600		
	SUBTOTAL					2,034,720	
D5030	**COMMUNICATION & SECURITY SYSTEMS**						
	Fire Alarm						
	Control panel	**1**	ls	12,000.00	12,000		
	Annunciator	**1**	ea	1,500.00	1,500		
	Beacon	**1**	ea	225.00	225		
	Knox box	**1**	ea	600.00	600		
	Devices and cabling (Including Mass. notification)	**141,200**	gsf	3.00	423,600		
	Testing and programming	**1**	ls	4,500.00	4,500		
	BDA/DAS system	**1**	ls	85,000.00	85,000		
	Telephone/Data/CATV						
	MDF/IDF closets	**1**	ls	10,000.00	10,000		
	Devices and cabling	**141,200**	sf	2.00	282,400		
	Backbone cabling (allow)	**300**	lf	15.00	4,500		
	Rough-in	**141,200**	sf	1.00	141,200		
	Clock/PA System						
	Head end	**1**	ls	20,000.00	20,000		
	Devices and cabling	**141,200**	gsf	0.60	84,720		
	Rough-in	**141,200**	gsf	0.20	28,240		
	Sound systems						
	Cafeteria sound system	**1**	ls	20,000.00	20,000		
	Two Way Communications System						
	Elevator lobby two way communication system	**1**	ls	15,000.00	15,000		
	TV Studio						
	Electrical to TV Studio	**1**	ls	30,000.00	30,000		
	Auditorium						
	Stage lighting and dimming system				See 1922 Bldg		
	Auditorium sound system				See 1922 Bldg		
	Rough-in with 120V power				See 1922 Bldg		
	AV						
	AV equipment provided by others				By Others		
	Rough-in and power	**141,200**	gsf	0.25	35,300		
	Security System						
	Head end	**1**	ls	25,000.00	25,000		
	Devices and cabling	**141,200**	gsf	2.50	353,000		
	Rough-in	**141,200**	gsf	1.00	141,200		
	SUBTOTAL					1,717,985	
D5040	**OTHER ELECTRICAL SYSTEMS**						
	Lightning protection	**1**	ls	60,000.00	60,000		
	Seismic	**1**	ls	10,000.00	10,000		
	Testing	**1**	ls	5,000.00	5,000		
	Miscellaneous						
	Demolition/phasing	**1**	ls	75,000.00	75,000		
	Temp power & lights	**1**	ls	80,000.00	80,000		
	Permits and fees	**1**	ls	40,000.00	40,000		

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING RENOVATION 2A							
	SUBTOTAL					270,000	
	TOTAL - ELECTRICAL						**$4,963,545**
E10	***EQUIPMENT***						
E10	**EQUIPMENT, GENERALLY**						
	Thru wall fume hood at science prep	**8**	ea	14,000.00	112,000		
	Allowance for miscellaneous equipment; projection screens, residential appliances etc	**1**	ls	8,000.00	8,000		
	Allowance for residential equipment at life skills labs	**4**	loc	11,500.00	46,000		
	Kitchen equipment	**1**	ls	840,000.00	840,000		
	Culinary arts equipment	**1**	ls	816,000.00	816,000		
	SUBTOTAL					1,822,000	
	TOTAL - EQUIPMENT						**$1,822,000**
E20	***FURNISHINGS***						
E2010	**FIXED FURNISHINGS**						
	Rolling mesh shades at exterior windows in non circulation spaces	**16,000**	sf	7.00	112,000		
	Solid roller shades at all interior storefront and borrowed lights; allowance	**2,000**	sf	7.00	14,000		
	Base cabinets with solid surface countertop	**968**	lf	425.00	411,400		
	Base cabinet with phenolic countertop	**1,280**	lf	500.00	640,000		
	Upper cabinets	**1,318**	lf	220.00	289,960		
	Upper cabinets with marker board doors	**930**	lf	250.00	232,500		
	Student science tables, allowance of 12 per room	**12**	rms	30,000.00	360,000		
	Teachers wardrobe	**52**	ea	1,400.00	72,800		
	Tall storage	**106**	ea	1,400.00	148,400		
	Bookcase allowance at media center	**1**	ls	15,000.00	15,000		
	Allowance for miscellaneous casework in support spaces	**141,200**	gsf	0.25	35,300		
	SUBTOTAL					2,331,360	
E2020	**MOVABLE FURNISHINGS**						
	All movable furnishings to be provided and installed by owner						
	SUBTOTAL					NIC	
	TOTAL - FURNISHINGS						**$2,331,360**
F10	***SPECIAL CONSTRUCTION***						
F10	**SPECIAL CONSTRUCTION**						
	No items in this section						
	SUBTOTAL					-	
	TOTAL - SPECIAL CONSTRUCTION						
F20	***SELECTIVE BUILDING DEMOLITION***						
F2010	**BUILDING ELEMENTS DEMOLITION**						
	Remove exterior glazing	**16,000**	sf	7.00	112,000		
	Roof membrane demo	**49,100**	demo included in roof replacement				
	Allowance for selective exterior wall demolition at connection to new addition	**10,083**	sf	10.00	100,830		

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	CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
	1980	**BUILDING RENOVATION 2A**						
390		Interior demolition; some demolition included in abatement costs	**141,200**	gsf	6.00	847,200		
391		Temporary enclosures/protection	**141,200**	sf	0.50	70,600		
392		SUBTOTAL					1,130,630	
393								
394	**F2020**	**HAZARDOUS COMPONENTS ABATEMENT**						
395		See summary						
396		SUBTOTAL						
397								
398		***TOTAL - SELECTIVE BUILDING DEMOLITION***						**$1,130,630**
399								

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PSR Pricing Options

GFA 5,100

CONSTRUCTION COST SUMMARY

1980 BUILDING 2A SOUTH ADDITIONS

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
A10	**FOUNDATIONS**					
	A1010	Standard Foundations	$93,507			
	A1020	Special Foundations	$98,600			
	A1030	Lowest Floor Construction	$157,278	**$349,385**	$68.51	19.3%
B10	**SUPERSTRUCTURE**					
	B1010	Upper Floor Construction	$0			
	B1020	Roof Construction	$106,200	**$106,200**	$20.82	5.9%
B20	**EXTERIOR CLOSURE**					
	B2010	Exterior Walls	$455,225			
	B2020	Windows/Curtainwall	$123,246			
	B2030	Exterior Doors	$40,200	**$618,671**	$121.31	34.2%
B30	**ROOFING**					
	B3010	Roof Coverings	$78,500			
	B3020	Roof Openings	$5,000	**$83,500**	$16.37	4.6%
C10	**INTERIOR CONSTRUCTION**					
	C1010	Partitions	$40,800			
	C1020	Interior Doors	$25,500			
	C1030	Specialties/Millwork	$14,857	**$81,157**	$15.91	4.5%
C20	**STAIRCASES**					
	C2010	Stair Construction	$0			
	C2020	Stair Finishes	$0	**$0**	$0.00	0.0%
C30	**INTERIOR FINISHES**					
	C3010	Wall Finishes	$12,750			
	C3020	Floor Finishes	$81,642			
	C3030	Ceiling Finishes	$32,497	**$126,889**	$24.88	7.0%
D10	**CONVEYING SYSTEMS**					
	D1010	Elevator	$0	**$0**	$0.00	0.0%
D20	**PLUMBING**					
	D20	Plumbing	$61,965	**$61,965**	$12.15	3.4%
D30	**HVAC**					
	D30	HVAC	$183,855	**$183,855**	$36.05	10.2%
D40	**FIRE PROTECTION**					
	D40	Fire Protection	$23,970	**$23,970**	$4.70	1.3%
D50	**ELECTRICAL**					
	D5010	Electrical Systems	$165,020	**$165,020**	$32.36	9.1%
E10	**EQUIPMENT**					
	E10	Equipment	$0	**$0**	$0.00	0.0%
E20	**FURNISHINGS**					
	E2010	Fixed Furnishings	$7,000			
	E2020	Movable Furnishings	NIC	**$7,000**	$1.37	0.4%

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GFA 5,100

CONSTRUCTION COST SUMMARY

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
1980 BUILDING 2A SOUTH ADDITIONS						
F10	**SPECIAL CONSTRUCTION**					
	F10	Special Construction	$0	**$0**	$0.00	0.0%
F20	**SELECTIVE BUILDING DEMOLITION**					
	F2010	Building Elements Demolition	$0			
	F2020	Hazardous Components Abatement	$0	**$0**	$0.00	0.0%
TOTAL DIRECT COST (Trade Costs)				***$1,807,612***	*$354.43*	*100.0%*

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST

1980 BUILDING 2A SOUTH ADDITIONS

GROSS FLOOR AREA CALCULATION

	First Floor			5,100			
	TOTAL GROSS FLOOR AREA (GFA)				**5,100**	***sf***	
A10	***FOUNDATIONS***						
A1010	**STANDARD FOUNDATIONS**						
033000	*CONCRETE*						
	Grade Beams	*65*	*CY*	*$977*			
	Pile Caps	*20*	*CY*	*$673*			
	Pilasters	*5*	*CY*	*$750*			
	Total Foundation Concrete	*90*	*CY*				
	Perimeter Grade Beams; 18"x4'-6"						
	Formwork	**1,800**	sf	20.00	36,000		
	Re-bar, 90#/LF	**4,770**	lbs.	1.20	5,724		
	Concrete material	**53**	cy	135.00	7,155		
	Placing concrete	**53**	cy	60.00	3,180		
	Form shelf	**200**	lf	10.00	2,000		
	Grade Beam at braced frames; 24"x2'-6"						
	Formwork	**300**	sf	20.00	6,000		
	Re-bar, 75#/LF	**900**	lbs.	1.20	1,080		
	Concrete material	**12**	cy	135.00	1,620		
	Placing concrete	**12**	cy	60.00	720		
	Pile caps, 5' x 5' x 2'-6" Pile cap	**7**	ea				
	Formwork	**350**	sf	22.00	7,700		
	Re-bar	**1,530**	lbs.	1.20	1,836		
	Concrete material	**17**	cy	135.00	2,295		
	Placing concrete	**17**	cy	60.00	1,020		
	Slab thickening at individual piles						
	Intermediate slab support pile	**3**	cy	200.00	600		
	Pilaster at perimeter columns; 24" x24"						
	Pilasters, 24"x24", complete	**5**	cy	750.00	3,750		
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Troweled-on bituminous mastic at perimeter grade beam	**900**	sf	3.00	2,700		
072100	*THERMAL INSULATION*						
	2" Insulation to grade beams	**900**	sf	3.00	2,700		
312000	*EARTHWORK*						
	Grade Beams						
	Excavation	**114**	cy	15.00	1,710		
	Remove off site	**114**	cy	16.00	1,824		
	Backfill with existing material	**49**	cy	12.00	588		
	Pile caps						
	Excavation	**35**	cy	15.00	525		
	Remove off site	**35**	cy	16.00	560		
	Backfill with imported material	**15**	cy	12.00	180		
	Soil disposal premiums						
	Premium for disposal of contaminated soil; assume 25% of volume	**34**	tns	60.00	2,040		
	Miscellaneous						
	Dewatering				NR		
	SUBTOTAL					93,507	
A1020	**SPECIAL FOUNDATIONS**	Average pile length 30'-50' long per FBR Report dated 3.28.18 (page 4)					
	Mobilization	**1**	ls	50,000.00	Included Elsewhere		
	Load test	**1**	ls	30,000.00	Included Elsewhere		
	(2) 95 Ton, Conical point pile	**667**	vlf	100.00	66,700		
	(1) 95 Ton, Conical point pile at intermediate slab supports (every 800sf of lowest slab)	**319**	vlf	100.00	31,900		
	SUBTOTAL					98,600	

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PSR Pricing Options

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING 2A SOUTH ADDITIONS							
A1030	**LOWEST FLOOR CONSTRUCTION**						
	Excavation at level 1 slab						
	Slab excavation	**378**	cy	15.00	5,670		
	Remove off site	**378**	cy	16.00	6,048		
	Soil disposal premiums						
	Premium for disposal of contaminated soil; assume 25% of volume	**151**	tns	60.00	9,060		
	Structural; Slab on grade, 10" thick						
	Gravel fill, assume 12"	**189**	cy	40.00	7,560		
	4" Rigid insulation	**5,100**	sf	4.00	20,400		
	Vapor barrier	**5,100**	sf	1.00	5,100		
	Compact existing sub-grade	**5,100**	sf	0.50	2,550		
	Formwork	**620**	sf	12.00	7,440		
	Rebar; 7 lbs/sf	**35,700**	lbs	1.20	42,840		
	Concrete - 10" thick	**165**	cy	125.00	20,625		
	Placing concrete	**165**	cy	45.00	7,425		
	Finishing and curing concrete	**5,100**	sf	1.50	7,650		
	Barrier I	**165**	cy	60.00	NR		
	Control joints - saw cut	**5,100**	sf	0.10	510		
	Perimeter drain	**200**	lf	22.00	4,400		
	Miscellaneous						
	Equipment pads	**1**	ls	10,000.00	10,000		
	SUBTOTAL					157,278	
	TOTAL - FOUNDATIONS						**$349,385**
A20	***BASEMENT CONSTRUCTION***						
A2010	**BASEMENT EXCAVATION**						
	No items in this section						
	SUBTOTAL					0	
A2020	**BASEMENT WALLS**						
	No items in this section						
	SUBTOTAL					0	
	TOTAL - BASEMENT CONSTRUCTION						**$0**
B10	***SUPERSTRUCTURE***						
		5.49	lbs/sf				
B1010	**FLOOR CONSTRUCTION**	14	tns				
	No upper floor structure						
	SUBTOTAL					0	
B1020	**ROOF CONSTRUCTION**						
	Roof Structure - Steel:						
	Steel beams/Joists; 14#/SF	**14**	tns	3,500.00	49,000		
	Premium for HSS	**4**	tns	300.00	1,200		
	Canopy framing	**1,200**	sf	35.00	42,000		
	Roof Structure						
	3" 18 Ga. galvanized Metal Roof Deck (remaining portion of roof is with Freshman Wing)	**2,000**	sf	4.00	8,000		
	Miscellaneous						
	Concrete under RTU's	**500**	sf	12.00	6,000		
	2hr Fire proofing to columns and beams (at Type IB Construction)				NR		
	SUBTOTAL					106,200	
	TOTAL - SUPERSTRUCTURE						**$106,200**

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING 2A SOUTH ADDITIONS							
B20	***EXTERIOR CLOSURE***						
B2010	**EXTERIOR WALLS**						
	Exterior Wall Area - Solid 75%	*3,000*	sf				
042000	*MASONRY*						
	Brick veneer, running bond (25%)	**1,000**	sf	40.00	40,000		
	Staging to exterior wall	**4,000**	sf	4.00	Included		
055000	*MISC. METALS*						
	Signage at entrances	**1**	ls	10,000.00	10,000		
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Air barrier	**3,000**	sf	6.50	19,500		
	Air barrier/flashing at windows	**588**	lf	6.25	3,675		
	Miscellaneous sealants to closure	**3,000**	sf	1.00	3,000		
072100	*THERMAL INSULATION*						
	4" Mineral wool insulation	**3,000**	sf	4.00	12,000		
	4" Spray insulation	**3,000**	sf	5.00	15,000		
076400	*CLADDING*						
	Alucobond composite metal panels (50%)	**2,000**	sf	75.00	150,000		
	Wood-look linear plastic soffit system at canopy	**1,200**	sf	62.00	74,400		
	Corrugated aluminum panel roof screen, Morin or similar	**1,500**	sf	55.00	82,500		
092900	*GYPSUM BOARD ASSEMBLIES*						
	6" metal stud backup	**3,000**	sf	9.00	27,000		
	Gypsum Sheathing	**3,000**	sf	2.75	8,250		
	Drywall lining to interior face of stud backup	**3,000**	sf	3.30	9,900		
	SUBTOTAL					455,225	
B2020	**WINDOWS**						
	Exterior Wall Area - Glazed Assume 25%	*1,000*	sf				
061000	*ROUGH CARPENTRY*						
	Wood blocking at openings	**588**	lf	8.00	4,704		
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Backer rod & double sealant	**588**	lf	9.00	5,292		
080001	*METAL WINDOWS*						
	Windows/Storefront, double glazed; 20% of glazed area	**200**	sf	90.00	18,000		
	Curtainwall, Kawneer 1600 or equal, double glazed; 80% of glazed area	**800**	sf	115.00	92,000		
	Sunshades; horizontal				NR		
089000	*LOUVERS*						
	Louvers	**50**	sf	65.00	3,250		
	SUBTOTAL					123,246	
B2030	**EXTERIOR DOORS**						
	Glazed entrance doors including frame and hardware; double door	**4**	pr	8,500.00	34,000		
	HM doors, frames and hardware- single	**1**	ea	2,000.00	2,000		
	HM doors, frames and hardware- double	**1**	pr	3,000.00	3,000		
	Backer rod & double sealant	**100**	lf	9.00	900		
	Wood blocking at openings	**100**	lf	3.00	300		
	SUBTOTAL					40,200	
	TOTAL - EXTERIOR CLOSURE						**$618,671**

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PSR Pricing Options

GFA 5,100

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING 2A SOUTH ADDITIONS							
	B30 ROOFING						
B3010	**ROOF COVERINGS**						
	Membrane roofing, complete	**2,000**	sf	22.00	44,000		
	Coping system	**100**	lf	45.00	4,500		
	Green roof tray system on membrane roof at canopy	**1,200**	sf	25.00	30,000		
	SUBTOTAL					78,500	
B3020	**ROOF OPENINGS**						
	Skylights, allow				NR		
	Roof hatch & ladders	**1**	loc	5,000.00	5,000		
	SUBTOTAL					5,000	
	TOTAL - ROOFING						**$83,500**
	C10 INTERIOR CONSTRUCTION						
C1010	**PARTITIONS**						
	Miscellaneous partitions/glazed partitions/sidelights/blocking etc.	**5,100**	gsf	8.00	40,800		
	SUBTOTAL					40,800	
C1020	**INTERIOR DOORS**						
	Interior doors, frames and hardware	**5,100**	gsf	5.00	25,500		
	SUBTOTAL					25,500	
C1030	**SPECIALTIES / MILLWORK**						
	Markerboards	**81**	sf	22.00	1,782		
	Tackboards	**45**	sf	20.00	900		
	Fire extinguisher cabinets	**2**	ea	350.00	700		
	Miscellaneous metals throughout building	**5,100**	sf	1.50	7,650		
	Miscellaneous sealants throughout building	**5,100**	sf	0.75	3,825		
	SUBTOTAL					14,857	
	TOTAL - INTERIOR CONSTRUCTION						**$81,157**
	C20 STAIRCASES						
C2010	**STAIR CONSTRUCTION**						
	No items in this section						
	SUBTOTAL						
C2020	**STAIR FINISHES**						
	No items in this section						
	SUBTOTAL						
	TOTAL - STAIRCASES						**$0**
	C30 INTERIOR FINISHES						
C3010	**WALL FINISHES**						
	Paint to walls	**5,100**	gsf	2.50	12,750		
	SUBTOTAL					12,750	
C3020	**FLOOR FINISHES**						
	Quarry tile	**2,295**	sf	26.00	59,670		
	Quarry tile base	**172**	lf	18.00	3,096		
	Carpet	**255**	sy	45.00	11,475		
	New resilient bases	**172**	lf	3.00	516		
	Moisture mitigation	**2,295**	sf	3.00	6,885		
	SUBTOTAL					81,642	
C3030	**CEILING FINISHES**						
	2' x 4' ACT, health zone	**2,295**	sf	6.00	13,770		
	2' x 4' ACT	**1,836**	sf	5.00	9,180		

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PSR Pricing Options

GFA 5,100

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING 2A SOUTH ADDITIONS							
	GWB soffit	**459**	sf	20.00	9,180		
	Paint GWB ceilings	**459**	sf	0.80	367		
	SUBTOTAL					32,497	
	TOTAL - INTERIOR FINISHES						**$126,889**
D10	***CONVEYING SYSTEMS***						
D1010	**ELEVATOR**						
	No items in this section						
	SUBTOTAL					0	
	TOTAL - CONVEYING SYSTEMS						**$0**
D20	***PLUMBING***						
D20	**PLUMBING, GENERALLY**						
	Plumbing equipment	**5,100**	gsf	1.75	8,925		
	Plumbing fixtures	**5,100**	gsf	2.00	10,200		
	Domestic water pipe with fittings & hangers	**5,100**	gsf	2.50	12,750		
	Domestic water pipe insulation	**5,100**	gsf	1.50	7,650		
	Sanitary waste pipe with fittings & hangers	**5,100**	gsf	2.00	10,200		
	Storm water pipe with fittings & hangers	**5,100**	gsf	1.00	5,100		
	Gas pipe with fittings & hangers	**5,100**	gsf	0.75	3,825		
	Miscellaneous	**5,100**	gsf	0.65	3,315		
	SUBTOTAL					61,965	
	TOTAL - PLUMBING						**$61,965**
D30	***HVAC***						
D30	**HVAC, GENERALLY**						
	Heating and cooling devices throughout including active chilled beams , CUH's, fintube...	**5,100**	sf	2.00	10,200		
	Air distribution equipment	**5,100**	gsf	8.00	40,800		
	Hot water piping with fittings & hangers	**5,100**	gsf	3.55	18,105		
	Chilled water piping with fittings & hangers	**5,100**	gsf	1.50	7,650		
	Pipe insulation	**5,100**	gsf	2.50	12,750		
	Sheet metal & accessories	**5,100**	gsf	10.00	51,000		
	Automatic temperature controls DDC	**5,100**	gsf	6.00	30,600		
	System testing & balancing	**5,100**	gsf	1.00	5,100		
	Miscellaneous	**5,100**	gsf	1.50	7,650		
	SUBTOTAL					183,855	
	TOTAL - HVAC						**$183,855**
D40	***FIRE PROTECTION***						
D40	**FIRE PROTECTION, GENERALLY**						
	New sprinkler system	**5,100**	gsf	4.70	23,970		
	SUBTOTAL					23,970	
	TOTAL - FIRE PROTECTION						**$23,970**
D50	***ELECTRICAL***						
D50	**ELECTRICAL, GENERALLY**						
	Gear & Distribution						
	Normal						
	Associated panelboards and feeders	**5,100**	gsf	2.00	10,200		
	Emergency						
	Associated ATS's, panelboards and feeders	**5,100**	gsf	1.00	5,100		
	Equipment Wiring						
	Equipment wiring feed and connections	**5,100**	gsf	2.00	10,200		
	SUBTOTAL					25,500	

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING 2A SOUTH ADDITIONS							
D5020	**LIGHTING & POWER**						
	LED lighting allowance	**5,100**	gsf	6.00	30,600		
	Emergency/egress lighting	**5,100**	gsf	0.50	2,550		
	Lighting to exterior	**1**	ls	750.00	750		
	Lighting controls						
	Automated lighting controls system	**5,100**	gsf	1.75	8,925		
	Branch devices						
	Branch devices	**5,100**	gsf	0.40	2,040		
	Lighting and branch circuitry						
	Branch circuitry	**5,100**	gsf	5.00	25,500		
	SUBTOTAL					70,365	
D5030	**COMMUNICATION & SECURITY SYSTEMS**						
	Fire Alarm						
	Make connections at new control panel	**1**	ls	3,500.00	3,500		
	Devices and cabling (Including Mass. notification)	**5,100**	gsf	3.00	15,300		
	BDA/DAS system	**1**	ls	4,000.00	4,000		
	Telephone/Data/CATV						
	Make connection at IDF closet	**1**	ls	1,500.00	1,500		
	Devices and cabling	**5,100**	gsf	1.50	7,650		
	Rough-in	**5,100**	gsf	0.50	2,550		
	Clock/PA System						
	Make connections at existing Head end	**1**	ls	1,500.00	1,500		
	Devices and cabling	**5,100**	gsf	0.60	3,060		
	Rough-in	**5,100**	gsf	0.20	1,020		
	AV						
	AV equipment provided by others				By Others		
	Rough-in only	**5,100**	gsf	0.25	1,275		
	Security System (Rough-in only)						
	Head end	**1**	ls	2,500.00	2,500		
	Devices and cabling	**5,100**	gsf	2.00	10,200		
	Rough-in	**5,100**	gsf	1.00	5,100		
	SUBTOTAL					59,155	
D5040	**OTHER ELECTRICAL SYSTEMS**						
	Lightning protection	**1**	ls	2,500.00	2,500		
	Miscellaneous						
	Temp power & lights	**1**	ls	3,000.00	3,000		
	Permits and fees	**1**	ls	4,500.00	4,500		
	SUBTOTAL					10,000	
	TOTAL - ELECTRICAL						**$165,020**
E10	***EQUIPMENT***						
E10	**EQUIPMENT, GENERALLY**						
	Kitchen equipment				w/ 1980 renovation		
	SUBTOTAL					0	
	TOTAL - EQUIPMENT						**$0**
E20	***FURNISHINGS***						
E2010	**FIXED FURNISHINGS**						
	Window blinds	**1,000**	sf	7.00	7,000		
	Bookcase allowance at media center	**1**	ls	5,000.00	F,F+E		
	SUBTOTAL					7,000	
E2020	**MOVABLE FURNISHINGS**						
	All movable furnishings to be provided and installed by owner						
	SUBTOTAL					NIC	
	TOTAL - FURNISHINGS						**$7,000**

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING 2A SOUTH ADDITIONS							
F10	***SPECIAL CONSTRUCTION***						
F10	**SPECIAL CONSTRUCTION**						
	No items in this section						
	SUBTOTAL					0	
	TOTAL - SPECIAL CONSTRUCTION						**$0**
F20	***SELECTIVE BUILDING DEMOLITION***						
F2010	**BUILDING ELEMENTS DEMOLITION**						
	See main summary for demolition of existing buildings				See Summary		
	SUBTOTAL					0	
F2020	**HAZARDOUS COMPONENTS ABATEMENT**						
	See main summary for HazMat allowance				See Summary		
	SUBTOTAL					$0	
	TOTAL - SELECTIVE BUILDING DEMOLITION						**$0**

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GFA 92,100

CONSTRUCTION COST SUMMARY

NEW FRESHMAN WING 2A

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
A10	**FOUNDATIONS**					
	A1010	Standard Foundations	$348,865			
	A1020	Special Foundations	$935,000			
	A1030	Lowest Floor Construction	$474,304	**$1,758,169**	$19.09	6.2%
B10	**SUPERSTRUCTURE**					
	B1010	Upper Floor Construction	$3,354,560			
	B1020	Roof Construction	$738,100	**$4,092,660**	$44.44	14.4%
B20	**EXTERIOR CLOSURE**					
	B2010	Exterior Walls	$3,274,094			
	B2020	Windows/Curtainwall	$1,437,007			
	B2030	Exterior Doors	$68,840	**$4,779,941**	$51.90	16.8%
B30	**ROOFING**					
	B3010	Roof Coverings	$453,450			
	B3020	Roof Openings	$5,000	**$458,450**	$4.98	1.6%
C10	**INTERIOR CONSTRUCTION**					
	C1010	Partitions	$2,026,200			
	C1020	Interior Doors	$503,340			
	C1030	Specialties/Millwork	$884,004	**$3,413,544**	$37.06	12.0%
C20	**STAIRCASES**					
	C2010	Stair Construction	$376,000			
	C2020	Stair Finishes	$40,000	**$416,000**	$4.52	1.5%
C30	**INTERIOR FINISHES**					
	C3010	Wall Finishes	$290,826			
	C3020	Floor Finishes	$894,845			
	C3030	Ceiling Finishes	$974,323	**$2,159,994**	$23.45	7.6%
D10	**CONVEYING SYSTEMS**					
	D1010	Elevator	$250,000	**$250,000**	$2.71	0.9%
D20	**PLUMBING**					
	D20	Plumbing	$1,328,610	**$1,328,610**	$14.43	4.7%
D30	**HVAC**					
	D30	HVAC	$3,971,800	**$3,971,800**	$43.12	14.0%
D40	**FIRE PROTECTION**					
	D40	Fire Protection	$452,870	**$452,870**	$4.92	1.6%
D50	**ELECTRICAL**					
	D5010	Electrical Systems	$2,996,765	**$2,996,765**	$32.54	10.6%
E10	**EQUIPMENT**					
	E10	Equipment	$256,000	**$256,000**	$2.78	0.9%
E20	**FURNISHINGS**					
	E2010	Fixed Furnishings	$2,036,450			
	E2020	Movable Furnishings	NIC	**$2,036,450**	$22.11	7.2%

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GFA 92,100

CONSTRUCTION COST SUMMARY

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
NEW FRESHMAN WING 2A						
F10	**SPECIAL CONSTRUCTION**					
	F10	Special Construction	$0	**$0**	$0.00	0.0%
F20	**SELECTIVE BUILDING DEMOLITION**					
	F2010	Building Elements Demolition	$0			
	F2020	Hazardous Components Abatement	$0	**$0**	$0.00	0.0%
TOTAL DIRECT COST (Trade Costs)				***$28,371,253***	*$308.05*	*100.0%*

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GFA 92,100

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST

NEW FRESHMAN WING 2A

GROSS FLOOR AREA CALCULATION

First Floor	16,800
Second Floor	19,200
Third floor	18,700
Fourth floor	18,700
Fifth floor	18,700

TOTAL GROSS FLOOR AREA (GFA) **92,100** ***sf***

A10 FOUNDATIONS

A1010 STANDARD FOUNDATIONS

	Grade Beams	*166*	*CY*	*$980*			
	Pile Caps	*158*	*CY*	*$604*			
	Pilasters	*12*	*CY*	*$750*			
	Total Foundation Concrete	*336*	*CY*				
	Perimeter Grade Beams; 18"x4'-6"						
	Formwork	**4,500**	sf	20.00	90,000		
	Re-bar, 90#/LF	**11,790**	lbs.	1.20	14,148		
	Concrete material	**131**	cy	135.00	17,685		
	Placing concrete	**131**	cy	60.00	7,860		
	Form shelf	**500**	lf	10.00	5,000		
	Grade Beam at braced frames; 24"x2'-6"						
	Formwork	**900**	sf	20.00	18,000		
	Re-bar, 75#/LF	**2,625**	lbs.	1.20	3,150		
	Concrete material	**35**	cy	135.00	4,725		
	Placing concrete	**35**	cy	60.00	2,100		
	Pile caps, 5' x 5' x 2'-6" Pile cap	**17**	ea				
	Formwork	**850**	sf	22.00	18,700		
	Re-bar	**3,690**	lbs.	1.20	4,428		
	Concrete material	**41**	cy	135.00	5,535		
	Placing concrete	**41**	cy	60.00	2,460		
	Pile caps, 8' x 8' x 2'-6" Pile cap	**17**	ea				
	Formwork	**1,360**	sf	22.00	29,920		
	Re-bar	**9,540**	lbs.	1.20	11,448		
	Concrete material	**106**	cy	135.00	14,310		
	Placing concrete	**106**	cy	60.00	6,360		
	Slab thickening at individual piles						
	Intermediate slab support pile	**11**	cy	200.00	2,200		
	Pilaster at perimeter columns; 24" x24"						
	Pilasters, 24"x24", complete	**12**	cy	750.00	9,000		
	Miscellaneous						
	Elevator pits, 24" slab w/ 12" walls	**1**	ea	40,000.00	40,000		
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Troweled-on bituminous mastic at perimeter grade beam	**2,250**	sf	3.00	6,750		
072100	*THERMAL INSULATION*						
	2" Insulation to grade beams	**2,250**	sf	3.00	6,750		
312000	*EARTHWORK*						
	Grade Beams						
	Excavation	**291**	cy	15.00	4,365		
	Remove off site	**291**	cy	16.00	4,656		
	Backfill with existing material	**125**	cy	12.00	1,500		
	Pile caps						
	Excavation	**277**	cy	15.00	4,155		
	Remove off site	**277**	cy	16.00	4,432		
	Backfill with existing material	**119**	cy	12.00	1,428		
	Soil disposal premiums						
	Premium for disposal of contaminated soil; assume 25% of volume	**130**	tns	60.00	7,800		
	Miscellaneous						
	Dewatering				NR		

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GFA 92,100

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
	NEW FRESHMAN WING 2A						
	SUBTOTAL					348,865	
A1020	**SPECIAL FOUNDATIONS**	Average pile length 30'-50' long per FBR Report dated 3.28.18 (page 4)					
	Mobilization	**1**	ls	50,000.00	50,000		
	Load test	**1**	ls	30,000.00	30,000		
	(3) 95 Ton, Conical point pile at perimeter	**2,500**	vlf	100.00	250,000		
	(6) 95 Ton, Conical point pile at interior columns	**5,000**	vlf	100.00	500,000		
	(1) 95 Ton, Conical point pile at intermediate slab supports (every 800sf of lowest slab)	**1,050**	vlf	100.00	105,000		
	SUBTOTAL					935,000	
A1030	**LOWEST FLOOR CONSTRUCTION**						
	Excavation at level 1 slab						
	Slab excavation	**1,244**	cy	15.00	18,660		
	Remove off site	**1,244**	cy	16.00	19,904		
	Soil disposal premiums						
	Premium for disposal of contaminated soil; assume 25% of volume	**498**	tns	60.00	29,880		
	Structural; Slab on grade, 10" thick						
	Gravel fill, assume 12"	**622**	cy	40.00	24,880		
	4" Rigid insulation	**16,800**	sf	4.00	67,200		
	Vapor barrier	**16,800**	sf	1.00	16,800		
	Compact existing sub-grade	**16,800**	sf	0.50	8,400		
	Formwork	**620**	sf	12.00	7,440		
	Rebar; 7 lbs/sf	**117,600**	lbs	1.20	141,120		
	Concrete - 10" thick	**542**	cy	125.00	67,750		
	Placing concrete	**542**	cy	45.00	24,390		
	Finishing and curing concrete	**16,800**	sf	1.50	25,200		
	Barrier I	**542**	cy	60.00	NR		
	Control joints - saw cut	**16,800**	sf	0.10	1,680		
	Perimeter drain	**500**	lf	22.00	11,000		
	Miscellaneous						
	Equipment pads	**1**	ls	10,000.00	10,000		
	SUBTOTAL					474,304	
	TOTAL - FOUNDATIONS						**$1,758,169**
A20	***BASEMENT CONSTRUCTION***						
A2010	**BASEMENT EXCAVATION**						
	No items in this section						
	SUBTOTAL					0	
A2020	**BASEMENT WALLS**						
	No items in this section						
	SUBTOTAL					0	
	TOTAL - BASEMENT CONSTRUCTION						**$0**
B10	***SUPERSTRUCTURE***						
		15.64	lbs/sf				
B1010	**FLOOR CONSTRUCTION**	720	tns				
	Floor Structure - Steel:						
	Steel beams and columns; 15.25#/SF including relieving angles at exterior walls	**574**	tns	3,500.00	2,009,000		
	Premium for HSS	**144**	tns	300.00	43,200		
	Shear studs	**15,060**	ea	2.50	37,650		
	Floor Structure						
	2" 18 Ga. Metal galvanized floor deck	**75,300**	sf	3.75	282,375		
	4 1/2" Normal weight concrete fill at upper floor decks	**86,595**	sf	8.00	692,760		

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW FRESHMAN WING 2A							
	Barrier I	**1,315**	cy	60.00	NR		
	Miscellaneous						
	Allowance for expansion/ seismic joints	**1**	ls	30,000.00	30,000		
	3hr Firewall between Freshman Wing and 1980 Building	**2,290**	sf	35.00	80,150		
	2hr Fire proofing to columns and beams (at Type IB Construction)	**75,300**	sf	2.25	169,425		
	Intumescent paint	**1**	ls	50,000.00	NR		
	Fire stopping floors	**1**	ls	10,000.00	10,000		
	SUBTOTAL					3,354,560	
B1020	**ROOF CONSTRUCTION**						
	Roof Structure - Steel:						
	Steel beams/Joists; 15.25#/SF	**146**	tns	3,500.00	511,000		
	Premium for HSS	**37**	tns	300.00	11,100		
	Canopy framing				w/ 1980 Addition		
	Roof Structure						
	3" 18 Ga. galvanized Metal Roof Deck	**19,200**	sf	4.00	76,800		
	Miscellaneous						
	Framing at rooftop screens - allow 150 lf	**8**	tns	4,500.00	36,000		
	Concrete under RTU's	**5,000**	sf	12.00	60,000		
	2hr Fire proofing to columns and beams (at Type IB Construction)	**19,200**	sf	2.25	43,200		
	SUBTOTAL					738,100	
	TOTAL - SUPERSTRUCTURE						**$4,092,660**
B20	***EXTERIOR CLOSURE***						
B2010	**EXTERIOR WALLS**						
	Exterior Wall Area - Solid 75%	*33,000*	sf				
042000	*MASONRY*						
	Brick veneer, running bond (25%)	**11,000**	sf	40.00	440,000		
	Staging to exterior wall	**44,000**	sf	4.00	Included		
055000	*MISC. METALS*						
	Signage at entrances	**1**	ls	20,000.00	20,000		
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Air barrier	**33,000**	sf	6.50	214,500		
	Air barrier/flashing at windows	**6,471**	lf	6.25	40,444		
	Miscellaneous sealants to closure	**33,000**	sf	1.00	33,000		
072100	*THERMAL INSULATION*						
	4" Mineral wool insulation	**33,000**	sf	4.00	132,000		
	4" Spray insulation	**33,000**	sf	5.00	165,000		
076400	*CLADDING*						
	Alucobond composite metal panels (50%)	**22,000**	sf	75.00	1,650,000		
	Wood-look linear plastic soffit system at canopy				w/ 1980 Addition		
	Corrugated aluminum panel roof screen, Morin or similar	**1,500**	sf	55.00	82,500		
092900	*GYPSUM BOARD ASSEMBLIES*						
	6" metal stud backup	**33,000**	sf	9.00	297,000		
	Gypsum Sheathing	**33,000**	sf	2.75	90,750		
	Drywall lining to interior face of stud backup	**33,000**	sf	3.30	108,900		
	SUBTOTAL					3,274,094	
B2020	**WINDOWS**						
	Exterior Wall Area - Glazed Assume 25%	*11,000*	sf				

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW FRESHMAN WING 2A							
061000	*ROUGH CARPENTRY*						
	Wood blocking at openings	**6,471**	lf	8.00	51,768		
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Backer rod & double sealant	**6,471**	lf	9.00	58,239		
080001	*METAL WINDOWS*						
	Windows/Storefront, double glazed; 20% of glazed area	**2,200**	sf	90.00	198,000		
	Curtainwall, Kawneer 1600 or equal, double glazed; 80% of glazed area	**8,800**	sf	115.00	1,012,000		
	Sunshades; horizontal	**800**	lf	130.00	104,000		
089000	*LOUVERS*						
	Louvers	**200**	sf	65.00	13,000		
	SUBTOTAL					1,437,007	
B2030	**EXTERIOR DOORS**						
	Glazed entrance doors including frame and hardware; double door	**4**	pr	8,500.00	34,000		
	Premium for school guard at vestibule	**1**	ls	20,000.00	20,000		
	HM doors, frames and hardware- single	**4**	ea	2,000.00	8,000		
	HM doors, frames and hardware- double	**2**	pr	3,000.00	6,000		
	Backer rod & double sealant	**120**	lf	4.00	480		
	Wood blocking at openings	**120**	lf	3.00	360		
	SUBTOTAL					68,840	
	TOTAL - EXTERIOR CLOSURE						**$4,779,941**
B30	***ROOFING***						
B3010	**ROOF COVERINGS**						
	Membrane roofing, complete	**19,200**	sf	22.00	422,400		
	Coping system	**690**	lf	45.00	31,050		
	Green roof tray system on membrane roof at canopy				w/ 1980 Addition		
	SUBTOTAL					453,450	
B3020	**ROOF OPENINGS**						
	Skylights, allow				NR		
	Roof hatch & ladders	**1**	loc	5,000.00	5,000		
	SUBTOTAL					5,000	
	TOTAL - ROOFING						**$458,450**
C10	***INTERIOR CONSTRUCTION***						
C1010	**PARTITIONS**						
	Miscellaneous partitions/glazed partitions/borrowed lights/blocking etc.	**92,100**	gsf	22.00	2,026,200		
	SUBTOTAL					2,026,200	
C1020	**INTERIOR DOORS**						
	3'-0" wide sidelight at classroom entry	**34**	ea	1,260.00	42,840		
	New doors, frame & hardware throughout	**92,100**	gsf	5.00	460,500		
	SUBTOTAL					503,340	
C1030	**SPECIALTIES / MILLWORK**						
	Backer panels in electrical closets	**1**	ls	2,000.00	2,000		
	Window sills	**1,941**	lf	40.00	77,640		
	Allowance for single bathroom accessories	**2**	rms	500.00	1,000		
	Gang bathroom accessories including electric handryers	**10**	rms	3,150.00	31,500		
	Janitors closet accessories	**5**	rms	300.00	1,500		
	HDPE Toilet Partitions at gang bathrooms; per bathroom	**10**	loc	10,000.00	100,000		

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PSR Pricing Options

GFA 92,100

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW FRESHMAN WING 2A							
	2-tier metal student lockers 18" x 15" x 48" h	**528**	opes	190.00	100,320		
	Markerboards	**7,792**	sf	22.00	171,424		
	Tackboards	**4,320**	sf	20.00	86,400		
	Brushed aluminum standoff signage	**2**	loc	5,000.00	10,000		
	Display cases	**288**	sf	90.00	25,920		
	Allowance for miscellaneous specialties; wall protection, fire extinguishers	**92,100**	gsf	0.50	46,050		
	Miscellaneous metals throughout building	**92,100**	gsf	1.25	115,125		
	Rough blocking	**92,100**	gsf	0.15	13,815		
	Miscellaneous sealants throughout building	**92,100**	gsf	0.75	69,075		
	Code compliant signage	**92,100**	gsf	0.35	32,235		
	SUBTOTAL					884,004	
	TOTAL - INTERIOR CONSTRUCTION						**$3,413,544**
C20	***STAIRCASES***						
C2010	**STAIR CONSTRUCTION**						
	Metal pan stair; egress stair	**8**	flt	45,000.00	360,000		
	Concrete fill to stairs	**8**	flt	2,000.00	16,000		
	SUBTOTAL					376,000	
C2020	**STAIR FINISHES**						
	High performance coating to stairs including all railings etc.	**8**	flt	3,000.00	24,000		
	Concrete sealer at stairs - landings	**800**	sf	2.00	1,600		
	Norament treads at stairs - treads & risers	**960**	lft	15.00	14,400		
	SUBTOTAL					40,000	
	TOTAL - STAIRCASES						**$416,000**
C30	***INTERIOR FINISHES***						
C3010	**WALL FINISHES**						
	Painting throughout	**92,100**	gsf	2.50	230,250		
	24x12 Porcelain tile wainscot at corridor - classroom wing; 4' high	**2,524**	sf	24.00	60,576		
	SUBTOTAL					290,826	
C3020	**FLOOR FINISHES**						
	Linoleum tile flooring	**84,785**	sf	7.00	593,495		
	Poured epoxy at bathrooms	**1,210**	sf	12.00	14,520		
	Carpet in Admin areas	**181**	sy	45.00	8,145		
	New resilient bases	**6,481**	lf	3.00	19,443		
	Moisture mitigation	**86,414**	sf	3.00	259,242		
	SUBTOTAL					894,845	
C3030	**CEILING FINISHES**						
	2' x 2' ACT	**6,125**	sf	5.50	33,688		
	Sloped ACT ceiling 2x4 at music rooms, teacher planning, science rooms, visual art rooms, SPED and typical classrooms	**83,000**	sf	5.75	477,250		
	GWB soffit	**17,825**	sf	25.00	445,625		
	Moisture resistant GWB ceilings	**1,200**	sf	14.00	16,800		
	Paint GWB ceilings	**1,200**	sf	0.80	960		
	SUBTOTAL					974,323	
	TOTAL - INTERIOR FINISHES						**$2,159,994**
D10	***CONVEYING SYSTEMS***						
D1010	**ELEVATOR**						
	Elevators; 5 stop	**1**	ea	250,000.00	250,000		
	SUBTOTAL					250,000	
	TOTAL - CONVEYING SYSTEMS						**$250,000**

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW FRESHMAN WING 2A							
	D20 PLUMBING						
D20	**PLUMBING, GENERALLY**						
	Freshman building contains science rooms & classrooms						
	Plumbing equipment	**92,100**	gsf	1.75	161,175		
	Plumbing fixtures	**92,100**	gsf	2.55	234,855		
	Domestic water pipe with fittings & hangers	**92,100**	gsf	2.75	253,275		
	Domestic water pipe insulation	**92,100**	gsf	1.55	142,755		
	Sanitary waste pipe with fittings & hangers	**92,100**	gsf	2.50	230,250		
	Tempered water pipe with fittings & hangers	**92,100**	gsf	0.25	23,025		
	Acid waste pipe with fittings & hangers	**92,100**	gsf	0.35	32,235		
	Storm water pipe with fittings & hangers	**92,100**	gsf	1.00	92,100		
	Gas pipe with fittings & hangers	**92,100**	gsf	0.75	69,075		
	Demolition/phasing	**1**	ls	30,000.00	30,000		
	Miscellaneous	**92,100**	gsf	0.65	59,865		
	SUBTOTAL					1,328,610	
	TOTAL - PLUMBING						**$1,328,610**
	D30 HVAC						
D30	**HVAC, GENERALLY**						
	Freshman building contains science rooms & classrooms						
	Green house heating & ventilation	**1**	ls	10,000.00	10,000		
	AHU with HW, CHW coil & ERW classrooms	**58,500**	cfm	15.00	877,500		
	Miscellaneous air distribution equipment	**92,100**	gsf	2.50	230,250		
	Hot water piping with fittings & hangers	**92,100**	gsf	3.50	322,350		
	Chilled water piping with fittings & hangers	**92,100**	gsf	2.00	184,200		
	Condenser water piping with fittings & hangers	**92,100**	gsf	0.50	46,050		
	Pipe insulation	**92,100**	gsf	2.50	230,250		
	Sheet metal & accessories	**92,100**	gsf	12.00	1,105,200		
	Automatic temperature controls DDC	**92,100**	gsf	7.50	690,750		
	System testing & balancing	**92,100**	gsf	1.00	92,100		
	Demolition/phasing	**1**	ls	45,000.00	45,000		
	Miscellaneous	**92,100**	gsf	1.50	138,150		
	SUBTOTAL					3,971,800	
	TOTAL - HVAC						**$3,971,800**
	D40 FIRE PROTECTION						
D40	**FIRE PROTECTION, GENERALLY**						
	Fire protection system	**92,100**	sf	4.70	432,870		
	Demolition/phasing	**1**	ls	20,000.00	20,000		
	SUBTOTAL					452,870	
	TOTAL - FIRE PROTECTION						**$452,870**
	D50 ELECTRICAL						
D50	**ELECTRICAL, GENERALLY**						
	Gear & Distribution						
	Normal						
	Associated panelboards and feeders	**92,100**	gsf	2.50	230,250		
	Emergency						
	Associated ATS's, panelboards and feeders	**92,100**	gsf	1.00	92,100		
	Equipment Wiring						
	Equipment wiring feed and connections	**92,100**	gsf	2.00	184,200		
	AHU feed and connection	**1**	ea	4,500.00	4,500		
	SUBTOTAL					$511,050	
D5020	**LIGHTING & POWER**						
	LED lighting allowance	**92,100**	gsf	6.00	552,600		
	Emergency/egress lighting	**92,100**	gsf	0.50	46,050		
	Lighting to exterior	**1**	ls	5,000.00	5,000		

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW FRESHMAN WING 2A							
	Lighting controls						
	Automated lighting controls system	**92,100**	gsf	1.75	161,175		
	Branch devices						
	Branch devices	**92,100**	gsf	0.60	55,260		
	Lighting and branch circuitry						
	Branch circuitry	**92,100**	gsf	5.50	506,550		
	SUBTOTAL					$1,326,635	
D5030	**COMMUNICATION & SECURITY SYSTEMS**						
	Fire Alarm						
	Make connections at new control panel	**1**	ls	3,500.00	3,500		
	Devices and cabling (Including Mass. notification)	**92,100**	gsf	3.00	276,300		
	BDA/DAS system	**1**	ls	45,000.00	45,000		
	Telephone/Data/CATV						
	Make connection at IDF closet	**1**	ls	4,500.00	4,500		
	Devices and cabling	**92,100**	gsf	2.00	184,200		
	Rough-in	**92,100**	gsf	0.75	69,075		
	Two Way Communications System						
	Elevator lobby two way communication system	**1**	ls	15,000.00	15,000		
	Clock/PA System						
	Make connections at existing Head end	**1**	ls	3,500.00	3,500		
	Devices and cabling	**92,100**	gsf	0.60	55,260		
	Rough-in	**92,100**	gsf	0.20	18,420		
	AV						
	AV equipment provided by others				By Others		
	Rough-in only	**92,100**	gsf	0.25	23,025		
	Security System (Rough-in only)						
	Head end	**1**	ls	5,000.00	5,000		
	Devices and cabling	**92,100**	gsf	2.00	184,200		
	Rough-in	**92,100**	gsf	1.00	92,100		
	SUBTOTAL					979,080	
D5040	**OTHER ELECTRICAL SYSTEMS**						
	Lightning protection	**1**	ls	40,000.00	40,000		
	Miscellaneous						
	Demolition/phasing	**1**	ls	60,000.00	60,000		
	Temp power & lights	**1**	ls	50,000.00	50,000		
	Permits and fees	**1**	ls	30,000.00	30,000		
	SUBTOTAL					$180,000	
	TOTAL - ELECTRICAL						**$2,996,765**
E10	***EQUIPMENT***						
E10	**EQUIPMENT, GENERALLY**						
	Fume Hoods	**4**	ea	14,000.00	56,000		
	Vocation and technology equipment	**1**	ls	200,000.00	200,000		
	SUBTOTAL					256,000	
	TOTAL - EQUIPMENT						**$256,000**
E20	***FURNISHINGS***						
E2010	**FIXED FURNISHINGS**						
	Rolling mesh shades at exterior windows in non circulation spaces	**7,700**	sf	7.00	53,900		
	Solid roller shades at all interior storefront and borrowed lights	**1**	ls	20,000.00	20,000		
	Recessed walk off carpet at vestibule entries	**380**	sf	45.00	17,100		
	Student science tables, allowance of 12 per room	**8**	rms	30,000.00	240,000		
	Base cabinets with solid surface countertop	**1,560**	lf	425.00	663,000		
	Base cabinet with phenolic countertop	**800**	lf	500.00	400,000		
	Upper cabinets	**540**	lf	220.00	118,800		
	Upper cabinets with marker board doors	**1,020**	lf	250.00	255,000		

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GFA 92,100

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
	NEW FRESHMAN WING 2A						
	Teachers wardrobe	**53**	ea	1,400.00	74,200		
	Tall storage	**106**	ea	1,400.00	148,400		
	Allowance for miscellaneous casework in support spaces	**92,100**	gsf	0.50	46,050		
	SUBTOTAL					2,036,450	
E2020	**MOVABLE FURNISHINGS**						
	All movable furnishings to be provided and installed by owner						
	SUBTOTAL					NIC	
	TOTAL - FURNISHINGS						**$2,036,450**
F10	***SPECIAL CONSTRUCTION***						
F10	**SPECIAL CONSTRUCTION**						
	No items in this section						
	SUBTOTAL					0	
	TOTAL - SPECIAL CONSTRUCTION						**$0**
F20	***SELECTIVE BUILDING DEMOLITION***						
F2010	**BUILDING ELEMENTS DEMOLITION**						
	See main summary for demolition of existing buildings				See Summary		
	SUBTOTAL					0	
F2020	**HAZARDOUS COMPONENTS ABATEMENT**						
	See main summary for HazMat allowance				See Summary		
	SUBTOTAL					$0	
	TOTAL - SELECTIVE BUILDING DEMOLITION						**$0**

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PSR Pricing Options GFA 67,400

CONSTRUCTION COST SUMMARY

NEW GYMNASIUM WING 2A

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
A10	**FOUNDATIONS**					
	A1010	Standard Foundations	$457,182			
	A1020	Special Foundations	$760,600			
	A1030	Lowest Floor Construction	$924,494	**$2,142,276**	$31.78	13.0%
B10	**SUPERSTRUCTURE**					
	B1010	Upper Floor Construction	$1,304,575			
	B1020	Roof Construction	$0	**$1,304,575**	$19.36	7.9%
B20	**EXTERIOR CLOSURE**					
	B2010	Exterior Walls	$1,258,037			
	B2020	Windows/Curtainwall	$312,144			
	B2030	Exterior Doors	$54,440	**$1,624,621**	$24.10	9.8%
B30	**ROOFING**					
	B3010	Roof Coverings	$0			
	B3020	Roof Openings	$0	**$0**	$0.00	0.0%
C10	**INTERIOR CONSTRUCTION**					
	C1010	Partitions	$808,800			
	C1020	Interior Doors	$337,000			
	C1030	Specialties/Millwork	$433,370	**$1,579,170**	$23.43	9.6%
C20	**STAIRCASES**					
	C2010	Stair Construction	$74,000			
	C2020	Stair Finishes	$10,000	**$84,000**	$1.25	0.5%
C30	**INTERIOR FINISHES**					
	C3010	Wall Finishes	$251,074			
	C3020	Floor Finishes	$872,752			
	C3030	Ceiling Finishes	$374,008	**$1,497,834**	$22.22	9.1%
D10	**CONVEYING SYSTEMS**					
	D1010	Elevator	$100,000	**$100,000**	$1.48	0.6%
D20	**PLUMBING**					
	D20	Plumbing	$842,500	**$842,500**	$12.50	5.1%
D30	**HVAC**					
	D30	HVAC	$2,713,350	**$2,713,350**	$40.26	16.4%
D40	**FIRE PROTECTION**					
	D40	Fire Protection	$303,300	**$303,300**	$4.50	1.8%
D50	**ELECTRICAL**					
	D5010	Electrical Systems	$1,792,420	**$1,792,420**	$26.59	10.9%
E10	**EQUIPMENT**					
	E10	Equipment	$477,600	**$477,600**	$7.09	2.9%
E20	**FURNISHINGS**					
	E2010	Fixed Furnishings	$22,848			
	E2020	Movable Furnishings	NIC	**$22,848**	$0.34	0.1%

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PSR Pricing Options

GFA 67,400

CONSTRUCTION COST SUMMARY

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
NEW GYMNASIUM WING 2A						
F10	**SPECIAL CONSTRUCTION**					
	F10	Special Construction	$2,022,000	**$2,022,000**	$30.00	12.2%
F20	**SELECTIVE BUILDING DEMOLITION**					
	F2010	Building Elements Demolition	$0			
	F2020	Hazardous Components Abatement	$0	**$0**	$0.00	0.0%
TOTAL DIRECT COST (Trade Costs)				***$16,506,494***	*$244.90*	*100.0%*

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GFA 67,400

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST

NEW GYMNASIUM WING 2A

GROSS FLOOR AREA CALCULATION

	First Floor			33,700			
	Second Floor			33,700			
	TOTAL GROSS FLOOR AREA (GFA)				**67,400**	***sf***	
A10	***FOUNDATIONS***						
A1010	**STANDARD FOUNDATIONS**						
033000	*CONCRETE*						
	Grade Beams	*266*	*CY*	*$955*			
	Pile Caps	*144*	*CY*	*$669*			
	Pilasters	*16*	*CY*	*$750*			
	Total Foundation Concrete	*426*	*CY*				
	Perimeter Grade Beams; 18"x4'-6"						
	Formwork	**6,300**	sf	20.00	126,000		
	Re-bar, 90#/LF	**16,560**	lbs.	1.20	19,872		
	Concrete material	**184**	cy	135.00	24,840		
	Placing concrete	**184**	cy	60.00	11,040		
	Form shelf	**700**	lf	10.00	7,000		
	Grade Beam at braced frames; 24"x2'-6"						
	Formwork	**2,100**	sf	20.00	42,000		
	Re-bar, 75#/LF	**6,150**	lbs.	1.20	7,380		
	Concrete material	**82**	cy	135.00	11,070		
	Placing concrete	**82**	cy	60.00	4,920		
	Pile caps, 5' x 5' x 2'-6" Pile cap	**50**	ea				
	Formwork	**2,500**	sf	22.00	55,000		
	Re-bar	**10,980**	lbs.	1.20	13,176		
	Concrete material	**122**	cy	135.00	16,470		
	Placing concrete	**122**	cy	60.00	7,320		
	Slab thickening at individual piles						
	Intermediate slab support pile	**22**	cy	200.00	4,400		
	Pilaster at perimeter columns; 24" x24"						
	Pilasters, 24"x24", complete	**16**	cy	750.00	12,000		
	Elevator pit, 24" slab w/ 12" walls	**1**	ea	40,000.00	40,000		
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Troweled-on bituminous mastic at perimeter grade beam	**3,150**	sf	3.00	9,450		
072100	*THERMAL INSULATION*						
	2" Insulation to grade beams	**3,150**	sf	3.00	9,450		
312000	*EARTHWORK*						
	Grade Beams						
	Excavation	**466**	cy	15.00	6,990		
	Remove off site	**466**	cy	16.00	7,456		
	Backfill with existing material	**200**	cy	12.00	2,400		
	Pile caps						
	Excavation	**252**	cy	15.00	3,780		
	Remove off site	**252**	cy	16.00	4,032		
	Backfill with existing material	**108**	cy	12.00	1,296		
	Soil disposal premiums						
	Premium for disposal of contaminated soil; assume 25% of volume	**164**	tns	60.00	9,840		
	Miscellaneous						
	Dewatering				NR		
	SUBTOTAL					457,182	
A1020	**SPECIAL FOUNDATIONS**	Average pile length 30'-50' long per FBR Report dated 3.28.18 (page 4)					
	Mobilization	**1**	ls	50,000.00	50,000		
	Load test	**1**	ls	30,000.00	Included elsewhere		
	(2) 95 Ton, Conical point pile	**5,000**	vlf	100.00	500,000		

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW GYMNASIUM WING 2A							
	(1) 95 Ton, Conical point pile at intermediate slab supports (every 800sf of lowest slab)	**2,106**	vlf	100.00	210,600		
	SUBTOTAL					760,600	
A1030	**LOWEST FLOOR CONSTRUCTION**						
	Excavation at level 1 slab						
	Slab excavation	**2,496**	cy	15.00	37,440		
	Remove off site	**2,496**	cy	16.00	39,936		
	Soil disposal premiums						
	Premium for disposal of contaminated soil; assume 25% of volume	**998**	tns	60.00	59,880		
	Structural; Slab on grade, 10" thick						
	Gravel fill, assume 12"	**1,248**	cy	36.00	44,928		
	4" Rigid insulation	**33,700**	sf	4.00	134,800		
	Vapor barrier	**33,700**	sf	1.00	33,700		
	Compact existing sub-grade	**33,700**	sf	0.50	16,850		
	Formwork	**800**	sf	12.00	9,600		
	Rebar; 7 lbs/sf	**235,900**	lbs	1.20	283,080		
	Concrete - 10" thick	**1,088**	cy	125.00	136,000		
	Placing concrete	**1,088**	cy	45.00	48,960		
	Finishing and curing concrete	**33,700**	sf	1.50	50,550		
	Barrier I	**1,088**	cy	60.00	NR		
	Control joints - saw cut	**33,700**	sf	0.10	3,370		
	Perimeter drain	**700**	lf	22.00	15,400		
	Miscellaneous						
	Equipment pads	**1**	ls	10,000.00	10,000		
	SUBTOTAL					924,494	
	TOTAL - FOUNDATIONS						**$2,142,276**
A20	***BASEMENT CONSTRUCTION***						
A2010	**BASEMENT EXCAVATION**						
	No items in this section						
	SUBTOTAL					0	
A2020	**BASEMENT WALLS**						
	No items in this section						
	SUBTOTAL					0	
	TOTAL - BASEMENT CONSTRUCTION						**$0**
B10	***SUPERSTRUCTURE***						
		12.5	lbs/sf				
B1010	**FLOOR CONSTRUCTION**	211	tns				
	Floor Structure - Steel:						
	Steel beams and columns at level 2; 12.5#/SF	**211**	tns	3,500.00	738,500		
	Premium for HSS	**53**	tns	300.00	15,900		
	Shear studs	**6,740**	ea	2.50	16,850		
	Floor Structure						
	2" 18 Ga. Metal galvanized floor deck	**33,700**	sf	3.75	126,375		
	4 1/2" Normal weight concrete fill at upper floor decks	**38,755**	sf	8.00	310,040		
	Barrier I	**589**	cy	60.00	NR		
	Miscellaneous						
	3hr Firewall between Freshman Wing, 1980 Building and Gymnasium wing	**1,626**	sf	35.00	56,910		
	Allowance for expansion/ seismic joints	**1**	ls	30,000.00	30,000		
	2hr Fire proofing to columns and beams (at Type IIB Construction)				NR		

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW GYMNASIUM WING 2A							
	Intumescent paint				NR		
	Fire stopping floors	**1**	ls	10,000.00	10,000		
	SUBTOTAL					1,304,575	
B1020	**ROOF CONSTRUCTION**						
	Roof Structure	Included in Special Construction - Pre-engineered building					
	SUBTOTAL					0	
	TOTAL - SUPERSTRUCTURE						**$1,304,575**
B20	***EXTERIOR CLOSURE***						
B2010	**EXTERIOR WALLS**						
	Exterior Wall Area - Solid 80%	*10,080*	sf				
042000	*MASONRY*						
	Brick veneer, running bond (25%)	**3,150**	sf	40.00	126,000		
	Staging to exterior wall	**12,600**	sf	4.00	Including		
055000	*MISC. METALS*						
	Signage at entrances	**1**	ls	10,000.00	10,000		
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Air barrier	**10,080**	sf	6.50	65,520		
	Air barrier/flashing at windows	**1,482**	lf	6.25	9,263		
	Miscellaneous sealants to closure	**10,080**	sf	1.00	10,080		
072100	*THERMAL INSULATION*						
	4" Mineral wool insulation	**10,080**	sf	4.00	40,320		
	4" Spray insulation	**10,080**	sf	5.00	50,400		
076400	*CLADDING*						
	Alucobond composite metal panels (55%)	**6,930**	sf	75.00	519,750		
	Corrugated aluminum panel roof screen, Morin or similar	**5,000**	sf	55.00	275,000		
092900	*GYPSUM BOARD ASSEMBLIES*						
	6" metal stud backup	**10,080**	sf	9.00	90,720		
	Gypsum Sheathing	**10,080**	sf	2.75	27,720		
	Drywall lining to interior face of stud backup	**10,080**	sf	3.30	33,264		
	SUBTOTAL					1,258,037	
B2020	**WINDOWS**						
	Exterior Wall Area - Glazed Assume 20%	*2,520*	sf				
061000	*ROUGH CARPENTRY*						
	Wood blocking at openings	**1,482**	lf	8.00	11,856		
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Backer rod & double sealant	**1,482**	lf	9.00	13,338		
080001	*METAL WINDOWS*						
	Windows/Storefront, double glazed; 20% of glazed area	**504**	sf	90.00	45,360		
	Curtainwall, Kawneer 1600 or equal, double glazed; 80% of glazed area	**2,016**	sf	115.00	231,840		
	Sunshades; horizontal				NR		
089000	*LOUVERS*						
	Louvers	**150**	sf	65.00	9,750		
	SUBTOTAL					312,144	
B2030	**EXTERIOR DOORS**						

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW GYMNASIUM WING 2A							
	Glazed entrance doors including frame and hardware; double door	**4**	pr	8,500.00	34,000		
	HM doors, frames and hardware- single	**4**	ea	2,000.00	8,000		
	HM doors, frames and hardware- double	**2**	pr	3,000.00	6,000		
	Overhead doors; allowance	**1**	ea	5,000.00	5,000		
	Backer rod & double sealant	**120**	lf	9.00	1,080		
	Wood blocking at openings	**120**	lf	3.00	360		
	SUBTOTAL					54,440	
	TOTAL - EXTERIOR CLOSURE						**$1,624,621**
B30	***ROOFING***						
B3010	**ROOF COVERINGS**						
	Roofing	Included in Special Construction - Pre-engineered building					
	SUBTOTAL					0	
B3020	**ROOF OPENINGS**						
	No items in this section						
	SUBTOTAL					0	
	TOTAL - ROOFING						**$0**
C10	***INTERIOR CONSTRUCTION***						
C1010	**PARTITIONS**						
	Miscellaneous partitions/glazed partitions/borrowed lights/blocking etc.	**67,400**	gsf	12.00	808,800		
	SUBTOTAL					808,800	
C1020	**INTERIOR DOORS**						
	Interior doors, frames and hardware	**67,400**	gsf	5.00	337,000		
	SUBTOTAL					337,000	
C1030	**SPECIALTIES / MILLWORK**						
	Backer panels in electrical closets	**1**	ls	2,000.00	2,000		
	Window sills	**445**	lf	40.00	17,800		
	Gang bathroom accessories including electric handryers	**4**	rms	3,150.00	12,600		
	Janitors closet accessories	**2**	rms	300.00	600		
	HDPE Toilet Partitions at gang bathrooms	**4**	loc	10,000.00	40,000		
	2-tier metal student lockers 18" x 15" x 48" h	**387**	opes	190.00	73,530		
	Athletic lockers at gym locker rooms	**7,760**	sf	5.00	38,800		
	Allowance for miscellaneous specialties; wall protection, fire extinguishers	**67,400**	gsf	0.50	33,700		
	Brushed aluminum standoff signage	**2**	loc	5,000.00	10,000		
	Display cases	**211**	sf	90.00	18,990		
	Miscellaneous metals throughout building	**67,400**	gsf	1.25	84,250		
	Rough blocking	**67,400**	gsf	0.15	10,110		
	Miscellaneous sealants throughout building	**67,400**	gsf	1.00	67,400		
	Code compliant signage	**67,400**	gsf	0.35	23,590		
	SUBTOTAL					433,370	
	TOTAL - INTERIOR CONSTRUCTION						**$1,579,170**
C20	***STAIRCASES***						
C2010	**STAIR CONSTRUCTION**						
	Metal pan stair; egress stair	**2**	flt	35,000.00	70,000		
	Concrete fill to stairs	**2**	flt	2,000.00	4,000		
	SUBTOTAL					74,000	
C2020	**STAIR FINISHES**						
	High performance coating to stairs including all railings etc.	**2**	flt	3,000.00	6,000		
	Concrete sealer at stairs - landings	**200**	sf	2.00	400		

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NEW GYMNASIUM WING 2A							
	Norament treads at stairs - treads & risers	**240**	lft	15.00	3,600		
	SUBTOTAL					10,000	
	TOTAL - STAIRCASES						**$84,000**
C30	***INTERIOR FINISHES***						
C3010	**WALL FINISHES**						
	Painting throughout	**67,400**	gsf	2.50	168,500		
	24x12 Porcelain tile wainscot at corridor - classroom wing; 4' high	**1,736**	sf	24.00	41,664		
	Tectum wall panels at gym	**1,995**	sf	18.00	35,910		
	Hardwood trim at tectum panels in gym	**1**	ls	5,000.00	5,000		
	SUBTOTAL					251,074	
C3020	**FLOOR FINISHES**						
	Linoleum tile flooring	**9,480**	sf	7.00	66,360		
	Sealed concrete	**11,150**	sf	2.00	22,300		
	Poured epoxy	**8,620**	sf	12.00	103,440		
	Carpet	**56**	sy	45.00	2,520		
	New resilient bases	**4,330**	lf	3.00	12,990		
	Wood athletic floor in Gymnasium	**12,990**	sf	18.00	233,820		
	Athletic flooring in Exercise rooms & Running track	**23,610**	sf	14.00	330,540		
	Moisture mitigation	**33,594**	sf	3.00	100,782		
	SUBTOTAL					872,752	
C3030	**CEILING FINISHES**						
	2' x 2' ACT	**13,500**	sf	5.50	74,250		
	2' x 4' ACT	**7,371**	sf	5.00	36,855		
	Moisture resistant GWB ceilings	**7,760**	sf	14.00	108,640		
	GWB soffit	**2,106**	sf	20.00	42,120		
	Paint exposed ceiling	**34,750**	sf	3.00	104,250		
	Paint GWB ceilings	**9,866**	sf	0.80	7,893		
	SUBTOTAL					374,008	
	TOTAL - INTERIOR FINISHES						**$1,497,834**
D10	***CONVEYING SYSTEMS***						
D1010	**ELEVATOR**						
	Elevators; 2 stop	**1**	ea	100,000.00	100,000		
	SUBTOTAL					100,000	
	TOTAL - CONVEYING SYSTEMS						**$100,000**
D20	***PLUMBING***						
D20	**PLUMBING, GENERALLY**						
	Gym wing contains gym, locker rm, training rms's & fitness rm's						
	Plumbing equipment	**67,400**	gsf	1.50	101,100		
	Plumbing fixtures	**67,400**	gsf	3.00	202,200		
	Domestic water pipe with fittings & hangers	**67,400**	gsf	2.50	168,500		
	Domestic water pipe insulation	**67,400**	gsf	1.50	101,100		
	Sanitary waste pipe with fittings & hangers	**67,400**	gsf	2.50	168,500		
	Storm water pipe with fittings & hangers	**67,400**	gsf	1.00	67,400		
	Miscellaneous	**67,400**	gsf	0.50	33,700		
	SUBTOTAL					842,500	
	TOTAL - PLUMBING						**$842,500**
D30	***HVAC***						
D30	**HVAC, GENERALLY**						
	Gym wing contains gym, locker rm, training rms's & fitness rm's						

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW GYMNASIUM WING 2A							
	AHU with HW, CHW coil & ERW gym	**32,400**	cfm	15.00	486,000		
	AHU with HW, CHW coil & ERW ROTC, multi & fit	**23,800**	cfm	15.00	357,000		
	Miscellaneous air distribution equipment	**67,400**	gsf	1.00	67,400		
	Hot water piping with fittings & hangers	**67,400**	gsf	3.50	235,900		
	Chilled water piping with fittings & hangers	**67,400**	gsf	1.00	67,400		
	Pipe insulation	**67,400**	gsf	2.25	151,650		
	Sheet metal & accessories	**67,400**	gsf	10.00	674,000		
	Automatic temperature controls DDC	**67,400**	gsf	7.50	505,500		
	System testing & balancing	**67,400**	gsf	1.00	67,400		
	Miscellaneous	**67,400**	gsf	1.50	101,100		
	SUBTOTAL					2,713,350	
	TOTAL - HVAC						**$2,713,350**
D40	***FIRE PROTECTION***						
D40	**FIRE PROTECTION, GENERALLY**						
	Fire protection system	**67,400**	gsf	4.50	303,300		
	SUBTOTAL					303,300	
	TOTAL - FIRE PROTECTION						**$303,300**
D50	***ELECTRICAL***						
D50	**ELECTRICAL, GENERALLY**						
	Gear & Distribution						
	Normal						
	Associated panelboards and feeders	**67,400**	gsf	2.00	134,800		
	Equipment Wiring						
	Equipment wiring feed and connections	**67,400**	gsf	1.50	101,100		
	AHU feed and connection	**2**	ea	4,500.00	9,000		
	SUBTOTAL					244,900	
D5020	**LIGHTING & POWER**						
	Gymnasium lighting	**67,400**	ea	3.00	202,200		
	Emergency/egress lighting	**67,400**	gsf	0.25	16,850		
	Lighting to exterior	**1**	ls	3,500.00	3,500		
	Lighting controls						
	Automated lighting controls system	**67,400**	gsf	1.75	117,950		
	Branch devices						
	Branch devices	**67,400**	gsf	0.40	26,960		
	Lighting and branch circuitry						
	Branch circuitry	**67,400**	gsf	5.50	370,700		
	SUBTOTAL					738,160	
D5030	**COMMUNICATION & SECURITY SYSTEMS**						
	Fire Alarm						
	Make connections at new control panel	**1**	ls	1,500.00	1,500		
	Devices and cabling (Including Mass. notification)	**67,400**	gsf	3.00	202,200		
	BDA/DAS system	**1**	ls	35,000.00	35,000		
	Telephone/Data/CATV						
	MDF/IDF closets	**1**	ls	2,500.00	2,500		
	Devices and cabling	**67,400**	gsf	1.00	67,400		
	Backbone cabling (allow)	**300**	lf	15.00	4,500		
	Rough-in	**67,400**	gsf	0.50	33,700		
	Two Way Communications System						
	Elevator lobby two way communication system	**1**	ls	15,000.00	15,000		
	Clock/PA System						
	Make connections at head end	**1**	ls	3,500.00	3,500		
	Devices and cabling	**67,400**	gsf	0.60	40,440		
	Rough-in	**67,400**	gsf	0.20	13,480		
	Scoreboard						
	Scoreboard shot clocks and circuitry	**2**	ls	13,500.00	27,000		
	Gym equipment feed and connections	**1**	ls	15,000.00	15,000		

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GFA 67,400

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW GYMNASIUM WING 2A							
	Gymnasium sound system	**1**	ls	15,000.00	15,000		
	AV						
	AV equipment provided by others				By Others		
	Rough-in only	**67,400**	gsf	0.10	6,740		
	Security System						
	Make connections at head end	**1**	ls	3,500.00	3,500		
	Devices and cabling	**67,400**	gsf	2.50	168,500		
	Rough-in	**67,400**	gsf	1.00	67,400		
	SUBTOTAL					722,360	
D5040	**OTHER ELECTRICAL SYSTEMS**						
	Lightning protection	**1**	ls	27,000.00	27,000		
	Miscellaneous						
	Temp power & lights	**1**	ls	40,000.00	40,000		
	Permits and fees	**1**	ls	20,000.00	20,000		
	SUBTOTAL					87,000	
	TOTAL - ELECTRICAL						**$1,792,420**
E10	***EQUIPMENT***						
E10	**EQUIPMENT, GENERALLY**						
	Gym wall pads	**220**	lf	60.00	13,200		
	Gymnasium hard panel dividing net; electrically operated (one location)	**5,000**	sf	22.00	110,000		
	Gymnasium fabric dividing net; electrically operated (four locations)	**8,000**	sf	12.00	96,000		
	Adjustable chin up bar	**3**	loc	300.00	900		
	Volley ball standards	**1**	ls	1,500.00	1,500		
	Scoreboard and shot clock				In Electric		
	Basketball backstops; retractable	**10**	ea	10,000.00	100,000		
	Telescoping bleachers (1200 seat capacity)	**1**	ls	156,000.00	156,000		
	SUBTOTAL					477,600	
	TOTAL - EQUIPMENT						**$477,600**
E20	***FURNISHINGS***						
E2010	**FIXED FURNISHINGS**						
	Rolling mesh shades at exterior windows in non circulation spaces	**1,764**	sf	7.00	12,348		
	Solid roller shades at all interior storefront and borrowed lights	**1,500**	sf	7.00	10,500		
	SUBTOTAL					22,848	
E2020	**MOVABLE FURNISHINGS**						
	All movable furnishings to be provided and installed by owner						
	SUBTOTAL					NIC	
	TOTAL - FURNISHINGS						**$22,848**
F10	***SPECIAL CONSTRUCTION***						
F10	**SPECIAL CONSTRUCTION**						
	Pre-engineered Gymnasium structure & enclosure; 40' high	**33,700**	sf	60.00	2,022,000		
	SUBTOTAL					2,022,000	
	TOTAL - SPECIAL CONSTRUCTION						**$2,022,000**
F20	***SELECTIVE BUILDING DEMOLITION***						
F2010	**BUILDING ELEMENTS DEMOLITION**						
	See main summary for demolition of existing buildings				See Summary		
	SUBTOTAL					$0	

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
	NEW GYMNASIUM WING 2A						
	F2020 HAZARDOUS COMPONENTS ABATEMENT						
	See main summary for HazMat allowance				See Summary		
	SUBTOTAL					$0	
	TOTAL - SELECTIVE BUILDING DEMOLITION						**$0**

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CONSTRUCTION COST SUMMARY

NEW BRIDGES (2 QTY)

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
A10	**FOUNDATIONS**					
	A1010	Standard Foundations	$52,683			
	A1020	Special Foundations	$178,000			
	A1030	Lowest Floor Construction	$0	**$230,683**	$26.82	5.2%
B10	**SUPERSTRUCTURE**					
	B1010	Upper Floor Construction	$1,069,060			
	B1020	Roof Construction	$28,125	**$1,097,185**	$127.58	24.7%
B20	**EXTERIOR CLOSURE**					
	B2010	Exterior Walls	$1,164,200			
	B2020	Windows/Curtainwall	$753,254			
	B2030	Exterior Doors	$0	**$1,917,454**	$222.96	43.2%
B30	**ROOFING**					
	B3010	Roof Coverings	$129,960			
	B3020	Roof Openings	$0	**$129,960**	$15.11	2.9%
C10	**INTERIOR CONSTRUCTION**					
	C1010	Partitions	$0			
	C1020	Interior Doors	$68,000			
	C1030	Specialties/Millwork	$170,640	**$238,640**	$27.75	5.4%
C20	**STAIRCASES**					
	C2010	Stair Construction	$0			
	C2020	Stair Finishes	$0	**$0**	$0.00	0.0%
C30	**INTERIOR FINISHES**					
	C3010	Wall Finishes	$25,800			
	C3020	Floor Finishes	$172,000			
	C3030	Ceiling Finishes	$129,000	**$326,800**	$38.00	7.4%
D10	**CONVEYING SYSTEMS**					
	D1010	Elevator	$0	**$0**	$0.00	0.0%
D20	**PLUMBING**					
	D20	Plumbing	$21,500	**$21,500**	$2.50	0.5%
D30	**HVAC**					
	D30	HVAC	$199,950	**$199,950**	$23.25	4.5%
D40	**FIRE PROTECTION**					
	D40	Fire Protection	$38,700	**$38,700**	$4.50	0.9%
D50	**ELECTRICAL**					
	D5010	Electrical Systems	$178,800	**$178,800**	$20.79	4.0%
E10	**EQUIPMENT**					
	E10	Equipment	$0	**$0**	$0.00	0.0%
E20	**FURNISHINGS**					
	E2010	Fixed Furnishings	$0			
	E2020	Movable Furnishings	NIC	**$0**	$0.00	0.0%

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GFA 8,600

CONSTRUCTION COST SUMMARY

BUILDING SYSTEM			*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
NEW BRIDGES (2 QTY)						
F10	**SPECIAL CONSTRUCTION**					
	F10	Special Construction	$0	**$0**	$0.00	0.0%
F20	**SELECTIVE BUILDING DEMOLITION**					
	F2010	Building Elements Demolition	$60,000			
	F2020	Hazardous Components Abatement	$0	**$60,000**	$6.98	1.4%
TOTAL DIRECT COST (Trade Costs)				**$4,439,672**	$516.24	100.0%

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW BRIDGES (2 QTY)							
	GROSS FLOOR AREA CALCULATION						
	Second Floor			4,500			
	Third floor			4,100			
	TOTAL GROSS FLOOR AREA (GFA)				**8,600** ***sf***		
A10	***FOUNDATIONS***						
A1010	**STANDARD FOUNDATIONS**						
033000	*CONCRETE*						
	8'x16'x3'-6" Concrete mat slab	**4**	ea				
	Formwork	**672**	sf	22.00	14,784		
	Re-bar	**16,000**	lbs.	1.20	19,200		
	Concrete material	**70**	cy	135.00	9,450		
	Placing concrete	**70**	cy	60.00	4,200		
312000	*EARTHWORK*						
	Mat slab						
	Excavation	**123**	cy	15.00	1,845		
	Remove off site	**89**	cy	16.00	1,424		
	Backfill with imported material	**34**	cy	30.00	1,020		
	Gravel base at mat slabs	**19**	cy	40.00	760		
	SUBTOTAL					52,683	
A1020	**SPECIAL FOUNDATIONS**	Average pile length 20'-40' long					
	Mobilization	**1**	ls	50,000.00	50,000		
	Load test	**1**	ls	30,000.00	Included		
	(8) 95 Ton, Conical point piles	**1,280**	lf	100.00	128,000		
	SUBTOTAL					178,000	
A1030	**LOWEST FLOOR CONSTRUCTION**						
	No Work in this section						
	SUBTOTAL					0	
	TOTAL - FOUNDATIONS						**$230,683**
A20	***BASEMENT CONSTRUCTION***						
A2010	**BASEMENT EXCAVATION**						
	No Work in this section						
	SUBTOTAL					0	
A2020	**BASEMENT WALLS**						
	No Work in this section						
	SUBTOTAL					0	
	TOTAL - BASEMENT CONSTRUCTION						**$0**
B10	***SUPERSTRUCTURE***						
		43	lbs/sf				
B1010	**FLOOR CONSTRUCTION**	185	tns				
	Floor Structure - Steel:						
	Steel beams and columns	**185**	tns	4,500.00	832,500		
	Shear studs	**1,720**	ea	2.50	4,300		
	Floor Structure						
	2" 18 Ga. Metal galvanized floor deck	**8,600**	sf	3.75	32,250		
	4 1/2" Normal weight concrete fill at upper floor decks	**8,600**	sf	8.00	68,800		
	Barrier I	**131**	cy	60.00	7,860		
	Miscellaneous						
	Allowance for expansion/ seismic joints	**1**	ls	50,000.00	50,000		

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW BRIDGES (2 QTY)							
	Framing at new opes/ bridge connections	**4**	loc	6,000.00	24,000		
	2hr Fire proofing to columns and beams (at Type IB Construction)	**8,600**	sf	2.25	19,350		
	Intumescent paint	**1**	ls	25,000.00	25,000		
	Fire stopping floors	**1**	ls	5,000.00	5,000		
	SUBTOTAL					1,069,060	
B1020	**ROOF CONSTRUCTION**						
	Roof steel tonnage included w/ floor						
	Roof Structure						
	3" 18 Ga. galvanized Metal Roof Deck	**4,500**	sf	4.00	18,000		
	2hr Fire proofing to columns and beams (at Type IB Construction) excluded at Gym & Auditorium	**4,500**	sf	2.25	10,125		
	SUBTOTAL					28,125	
	TOTAL - SUPERSTRUCTURE						**$1,097,185**
B20	***EXTERIOR CLOSURE***						
B2010	**EXTERIOR WALLS**						
	Exterior Wall Area - Solid 50%	*7,500*	sf				
042000	*MASONRY*						
	Brick veneer, running bond (0%)				NR		
	Staging to exterior wall	**15,000**	sf	4.00	Included		
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Air barrier	**7,500**	sf	6.50	48,750		
	Air barrier/flashing at windows	**4,412**	lf	6.25	27,575		
	Miscellaneous sealants to closure	**7,500**	sf	1.00	7,500		
072100	*THERMAL INSULATION*						
	4" Mineral wool insulation	**7,500**	sf	4.00	30,000		
	4" Spray insulation	**7,500**	sf	5.00	37,500		
076400	*CLADDING*						
	Alucobond composite metal panels (50%)	**7,500**	sf	75.00	562,500		
	Metal panel soffit system at bridge	**4,500**	sf	75.00	337,500		
092900	*GYPSUM BOARD ASSEMBLIES*						
	6" metal stud backup	**7,500**	sf	9.00	67,500		
	Gypsum Sheathing	**7,500**	sf	2.75	20,625		
	Drywall lining to interior face of stud backup	**7,500**	sf	3.30	24,750		
	SUBTOTAL					1,164,200	
B2020	**WINDOWS**						
	Exterior Wall Area - Glazed Assume 50%	*7,500*	sf				
061000	*ROUGH CARPENTRY*						
	Wood blocking at openings	**4,412**	lf	8.00	35,296		
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Backer rod & double sealant	**4,412**	lf	9.00	39,708		
080001	*METAL WINDOWS*						
	Storefront, double glazed; 100% of glazed area	**7,500**	sf	90.00	675,000		
089000	*LOUVERS*						
	Louvers	**50**	sf	65.00	3,250		
	SUBTOTAL					753,254	
B2030	**EXTERIOR DOORS**						
	No items in this section						
	SUBTOTAL					0	

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW BRIDGES (2 QTY)							
	TOTAL - EXTERIOR CLOSURE						**$1,917,454**
B30	***ROOFING***						
B3010	**ROOF COVERINGS**						
	Membrane roofing, complete	**4,500**	sf	22.00	99,000		
	Coping system	**688**	lf	45.00	30,960		
	Soffit included with closure cladding						
	SUBTOTAL					129,960	
B3020	**ROOF OPENINGS**						
	No items in this section						
	SUBTOTAL					0	
	TOTAL - ROOFING						**$129,960**
C10	***INTERIOR CONSTRUCTION***						
C1010	**PARTITIONS**						
	Reconfiguration of spaces at connection to existing buildings in included w/ the specific buildings						
	SUBTOTAL					0	
C1020	**INTERIOR DOORS**						
	Interior doors, frames and hardware	**8**	pr	8,500.00	68,000		
	SUBTOTAL					68,000	
C1030	**SPECIALTIES / MILLWORK**						
	Signage	**8,600**	sf	0.40	3,440		
	Fire extinguisher cabinets	**4**	ea	350.00	1,400		
	Interior railings along perimeter glazing	**700**	lf	200.00	140,000		
	Miscellaneous metals throughout building	**8,600**	sf	2.00	17,200		
	Miscellaneous sealants throughout building	**8,600**	sf	1.00	8,600		
	SUBTOTAL					170,640	
	TOTAL - INTERIOR CONSTRUCTION						**$238,640**
C20	***STAIRCASES***						
C2010	**STAIR CONSTRUCTION**						
	No items in this section				0		
	SUBTOTAL					0	
C2020	**STAIR FINISHES**						
	No items in this section						
	SUBTOTAL					0	
	TOTAL - STAIRCASES						**$0**
C30	***INTERIOR FINISHES***						
C3010	**WALL FINISHES**						
	Wall finishes	**8,600**	gsf	3.00	25,800		
	SUBTOTAL					25,800	
C3020	**FLOOR FINISHES**						
	Floor & base	**8,600**	gsf	20.00	172,000		
	SUBTOTAL					172,000	
C3030	**CEILING FINISHES**						
	Ceiling finishes	**8,600**	sf	15.00	129,000		
	SUBTOTAL					129,000	
	TOTAL - INTERIOR FINISHES						**$326,800**
D10	***CONVEYING SYSTEMS***						

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Lowell High School
Lowell, MA

20-Apr-18

PSR Pricing Options

GFA 8,600

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW BRIDGES (2 QTY)							
D1010	**ELEVATOR**						
	No items in this section						
	SUBTOTAL					0	
	TOTAL - CONVEYING SYSTEMS						**$0**
D20	***PLUMBING***						
D20	**PLUMBING, GENERALLY**						
	New bridge connectors with roof drainage						
	Plumbing equipment	**8,600**	gsf	0.50	4,300		
	Storm water pipe with fittings & hangers	**8,600**	gsf	1.50	12,900		
	Miscellaneous	**8,600**	gsf	0.50	4,300		
	SUBTOTAL					21,500	
	TOTAL - PLUMBING						**$21,500**
D30	***HVAC***						
D30	**HVAC, GENERALLY**						
	New bridge connectors with radiant heat						
	Radiant ceiling panel & fintube	**8,600**	gsf	2.00	17,200		
	Hot water piping with fittings & hangers	**8,600**	gsf	3.50	30,100		
	Pipe insulation	**8,600**	gsf	2.25	19,350		
	Sheet metal & accessories	**8,600**	gsf	10.00	86,000		
	Automatic temperature controls DDC	**8,600**	gsf	3.00	25,800		
	System testing & balancing	**8,600**	gsf	1.00	8,600		
	Miscellaneous	**8,600**	gsf	1.50	12,900		
	SUBTOTAL					199,950	
	TOTAL - HVAC						**$199,950**
D40	***FIRE PROTECTION***						
D40	**FIRE PROTECTION, GENERALLY**						
	Fire protection system	**8,600**	gsf	4.50	38,700		
	SUBTOTAL					38,700	
	TOTAL - FIRE PROTECTION						**$38,700**
D50	***ELECTRICAL***						
D50	**ELECTRICAL, GENERALLY**						
	Equipment Wiring						
	Equipment wiring feed and connections	**8,600**	gsf	1.50	12,900		
	Lighting and power						
	Connector lighting and receptacles	**8,600**	gsf	12.00	103,200		
	Fire Alarm						
	Connector devices and cabling	**8,600**	gsf	3.00	25,800		
	Security System						
	Make connections at head end	**1**	ls	2,500.00	2,500		
	Devices and cabling	**8,600**	gsf	2.00	17,200		
	Rough-in	**8,600**	gsf	1.00	8,600		
	Miscellaneous						
	Miscellaneous	**8,600**	gsf	1.00	8,600		
	SUBTOTAL					178,800	
	TOTAL - ELECTRICAL						**$178,800**
E10	***EQUIPMENT***						
E10	**EQUIPMENT, GENERALLY**						
	No items in this section						
	SUBTOTAL					0	
	TOTAL - EQUIPMENT						**$0**

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Lowell High School
Lowell, MA

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PSR Pricing Options

GFA 8,600

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
	NEW BRIDGES (2 QTY)						
	E20 FURNISHINGS						
E2010	**FIXED FURNISHINGS**						
	No items in this section						
	SUBTOTAL					0	
E2020	**MOVABLE FURNISHINGS**						
	All movable furnishings to be provided and installed by owner						
	SUBTOTAL					NIC	
	TOTAL - FURNISHINGS						**$0**
	F10 SPECIAL CONSTRUCTION						
F10	**SPECIAL CONSTRUCTION**						
	No items in this section						
	SUBTOTAL					0	
	TOTAL - SPECIAL CONSTRUCTION						**$0**
	F20 SELECTIVE BUILDING DEMOLITION						
F2010	**BUILDING ELEMENTS DEMOLITION**						
	Allowance to remove exterior closure at new bridge connection/ opes	**4**	loc	15,000.00	60,000		
	SUBTOTAL					60,000	
F2020	**HAZARDOUS COMPONENTS ABATEMENT**						
	See main summary for HazMat allowance				See Summary		
	SUBTOTAL					$0	
	TOTAL - SELECTIVE BUILDING DEMOLITION						**$60,000**

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
	SITEWORK - OPTION 2A						
	G SITEWORK						
G10	**SITE PREPARATION & DEMOLITION**						
	Allowance for temporary work including provisions for trolley service	**1**	ls	50,000.00	50,000		
	Site construction fence/barricades	**3,300**	lf	14.00	46,200		
	Site construction fence gates	**1**	ea	10,000.00	10,000		
	Construction entrances/dust control/ street sweeping/ wheel washes allowance	**1**	ls	100,000.00	100,000		
	Allowance for site demolition of existing landscaping & hardscape including 1922 Building courtyard	**52,500**	sf	3.00	157,500		
	Sidewalks & paths at existing buildings	**29,000**	sf		ETR		
	Miscellaneous demolition; salvage site furnishings, utilities etc	**1**	ls	50,000.00	50,000		
	Site Earthwork						
	Strip topsoil and remove				ETR		
	Fine grading				ETR		
	Silt fence/erosion control, wash bays, stock piles	**3,000**	lf	14.00	42,000		
	Silt fence maintenance and monitoring	**1**	ls	25,000.00	25,000		
	Hazardous Waste Remediation						
	Remove existing underground fuel storage tanks	**1**	ls		NIC		
	Dispose/treat contaminated soils	**1**	ls		NIC		
	SUBTOTAL					480,700	
G20	**SITE IMPROVEMENTS**						
	Asphalt Paving at new Service area;	*10,000*	sf				
	gravel base; 12" thick	**370**	cy	40.00	14,800		
	heavy duty asphalt; 4" thick	**1,111**	sy	30.00	33,330		
	Allowance for asphalt repairs at connection to existing	**1**	ls	20,000.00	20,000		
	Allowance for new/ replacement of existing curbs	**960**	lf	40.00	38,400		
	Single solid lines, 4" thick	**1**	ls	5,000.00	5,000		
	Crosswalk hatchings, other road markings	**1**	ls	7,500.00	7,500		
	Assume no new traffic signals required at relocated crosswalk				NR		
	New crosswalks	**10**	loc	15,000.00	150,000		
	HC curb cuts; allow	**8**	loc	350.00	2,800		
	Signage	**1**	ls	30,000.00	30,000		
	Allowance for 1922 Building courtyard upgrades; hardscape & landscape	**6,000**	sf	30.00	180,000		
	Allowance for repairs of existing paths at 1922 & 1980 Buildings	**14,000**	sf	8.00	112,000		
	Allowance for repairs where necessary at city sidewalks - assume minimal	**15,000**	sf	6.00	90,000		
	Specialty paving areas	**7,840**	sf	30.00	235,200		
	Allowance for concrete pads	**1,000**	sf	25.00	25,000		
	Site Improvements						
	Other site improvements; accessibility improvements, ADA ramps & entry pads, new walls, rails, fences etc.	**1**	ls	500,000.00	500,000		
	Site furnishings; bollards, benches, bike racks, trash receptacles, flagpole etc.	**1**	ls	50,000.00	50,000		
	SUBTOTAL					1,494,030	
	Landscaping						
	New landscaped areas	**30,000**	sf	3.00	90,000		
	Plantings - allowance	**1**	ls	150,000.00	150,000		
	Irrigation to landscaped areas	**30,000**	sf	1.50	45,000		
	SUBTOTAL					285,000	
G30	**CIVIL MECHANICAL UTILITIES**						
	Water supply; allowance, pricing includes E&B and bedding						
	New DI piping; 8"	**500**	lf	100.00	50,000		
	New DI piping; 8" Fire	**500**	lf	100.00	50,000		
	Connect to existing	**2**	loc	10,000.00	20,000		

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
SITEWORK - OPTION 2A							
	FD connection	**2**	ea	2,000.00	4,000		
	Gate valves	**4**	ea	750.00	3,000		
	Fire hydrant	**4**	ea	5,000.00	20,000		
	Sanitary allowance	**1**	ls	50,000.00	50,000		
	Storm water; Pricing includes E&B and bedding						
	Allowance for new/ modify existing drainage systems	**1**	ls	750,000	750,000		
	Gas service						
	E&B trench for new gas pipe - install by plumbing	**500**	lf	25.00	12,500		
	SUBTOTAL					959,500	
G40	**ELECTRICAL UTILITIES**						
	Power						
	Utility co. back charges, allow				By Owner		
	Primary service conduits, concrete encased (allow)	**500**	lf	60.00	30,000		
	Primary cabling by utility co.				By Utility co.		
	New padmount transformer	**2**	ls		By Utility co.		
	Transformer pad	**2**	ea	2,500.00	5,000		
	4000A secondary service, Total of 2 runs (allow)	**100**	lf	1,100.00	110,000		
	Generator Ductbank						
	400A service, Total of 2 runs (allow)	**100**	lf	270.00	27,000		
	Communications						
	Communications service entrance				ETR		
	Manholes				ETR		
	Site Lighting						
	Service access area lighting	**1**	ls	50,000.00	50,000		
	Pedestrian lighting upgrades/ replacement	**1**	ls	40,000.00	40,000		
	Courtyard lighting	**1**	ls	20,000.00	20,000		
	Site Security						
	CCTV surveillance at site	**1**	ls	75,000.00	75,000		
	Blue phones	**4**	loc	10,000.00	40,000		
	SUBTOTAL					397,000	
	TOTAL - SITE DEVELOPMENT						***$3,616,230***

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PSR Pricing Options GFA 128,300

CONSTRUCTION COST SUMMARY

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
1980 BUILDING RENOVATION 3A						
A10	**FOUNDATIONS**					
	A1010	Standard Foundations	$25,000			
	A1020	Special Foundations	$0			
	A1030	Lowest Floor Construction	$204,400	**$229,400**	$1.79	0.7%
B10	**SUPERSTRUCTURE**					
	B1010	Upper Floor Construction	$610,700			
	B1020	Roof Construction	$495,000	**$1,105,700**	$8.62	3.4%
B20	**EXTERIOR CLOSURE**					
	B2010	Exterior Walls	$1,411,170			
	B2020	Windows/Curtainwall	$1,453,710			
	B2030	Exterior Doors	$40,040	**$2,904,920**	$22.64	8.8%
B30	**ROOFING**					
	B3010	Roof Coverings	$1,013,200			
	B3020	Roof Openings	$336,800	**$1,350,000**	$10.52	4.1%
C10	**INTERIOR CONSTRUCTION**					
	C1010	Partitions	$2,823,620			
	C1020	Interior Doors	$679,300			
	C1030	Specialties/Millwork	$895,262	**$4,398,182**	$34.28	13.4%
C20	**STAIRCASES**					
	C2010	Stair Construction	$427,500			
	C2020	Stair Finishes	$55,000	**$482,500**	$3.76	1.5%
C30	**INTERIOR FINISHES**					
	C3010	Wall Finishes	$557,444			
	C3020	Floor Finishes	$1,280,695			
	C3030	Ceiling Finishes	$1,279,063	**$3,117,202**	$24.30	9.5%
D10	**CONVEYING SYSTEMS**					
	D1010	Elevator	$150,000	**$150,000**	$1.17	0.5%
D20	**PLUMBING**					
	D20	Plumbing	$1,914,690	**$1,914,690**	$14.92	5.8%
D30	**HVAC**					
	D30	HVAC	$7,700,100	**$7,700,100**	$60.02	23.4%
D40	**FIRE PROTECTION**					
	D40	Fire Protection	$633,010	**$633,010**	$4.93	1.9%
D50	**ELECTRICAL**					
	D5010	Electrical Systems	$4,572,185	**$4,572,185**	$35.64	13.9%
E10	**EQUIPMENT**					
	E10	Equipment	$982,000	**$982,000**	$7.65	3.0%

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Lowell High School 20-Apr-18
Lowell, MA

PSR Pricing Options GFA 128,300

CONSTRUCTION COST SUMMARY

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
1980 BUILDING RENOVATION 3A						
E20	**FURNISHINGS**					
	E2010	Fixed Furnishings	$2,278,085			
	E2020	Movable Furnishings	NIC	**$2,278,085**	$17.76	6.9%
F10	**SPECIAL CONSTRUCTION**					
	F10	Special Construction	$0	**$0**	$0.00	0.0%
F20	**SELECTIVE BUILDING DEMOLITION**					
	F2010	Building Elements Demolition	$1,019,940			
	F2020	Hazardous Components Abatement	$0	**$1,019,940**	$7.95	3.1%
TOTAL DIRECT COST (Trade Costs)				***$32,837,914***	*$255.95*	*100.0%*

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING RENOVATION 3A							
	GROSS FLOOR AREA CALCULATION						
	First Floor				40,200		
	Second Floor				44,800		
	Third Floor				43,300		
	TOTAL GROSS FLOOR AREA (GFA)				**128,300** ***sf***		
A10	***FOUNDATIONS***						
A1010	**STANDARD FOUNDATIONS**						
	Miscellaneous repairs/ resurfacing of cracks at exposed concrete foundations at NE corner	**1**	ls	25,000.00	25,000		
	SUBTOTAL					25,000	
A1020	**SPECIAL FOUNDATIONS**						
	No items in this section						
	SUBTOTAL					-	
A1030	**LOWEST FLOOR CONSTRUCTION**						
	Cutting and patching for MEP	**44,800**	sf	2.00	89,600		
	General slab replacement at damaged/ deteriorated areas, replacement at reconfigured areas for ADA improvement	**2,240**	sf	20.00	44,800		
	New elevator pit including temporary protection of existing adjacent foundations	**1**	ea	50,000.00	50,000		
	Equipment pads for new MEP equipment	**1**	ls	20,000.00	20,000		
	SUBTOTAL					204,400	
	TOTAL - FOUNDATIONS						**$229,400**
B10	***SUPERSTRUCTURE***						
B1010	**FLOOR CONSTRUCTION**						
	Cut opening & reframe at new light well (2 floors)	**3,520**	sf	40.00	140,800		
	Openings in existing structure for new MEP systems	**83,500**	sf	2.00	167,000		
	Spray firefroofing	**83,500**	sf	2.50	208,750		
	Opening in existing structure for new elevator	**3**	opes	10,000.00	30,000		
	Allowance for additional modifications for accessibility compliance for ramps/ stairs etc	**1**	ls	64,150.00	64,150		
	SUBTOTAL					610,700	
B1020	**ROOF CONSTRUCTION**						
	Cut opening & reframe at new skylights	**1,760**	sf	35.00	61,600		
	Allowance for roof screen framing	**10**	tns	4,500.00	45,000		
	Support framing for new MEP systems	**1**	ls	30,000.00	30,000		
	Spray firefroofing	**44,800**	sf	3.00	134,400		
	Allowance for PV Array reinforcement (roof not yet evaluated by Engineer - allowance)	**44,800**	sf	5.00	224,000		
	SUBTOTAL					495,000	
	TOTAL - SUPERSTRUCTURE						**$1,105,700**
B20	***EXTERIOR CLOSURE***						
B2010	**EXTERIOR WALLS**	*20,700*	*sf*				
	New brick closure system at demolished area infills, match existing	**2,002**	sf	85.00	170,170		

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING RENOVATION 3A							
	Allowance to repair relieving angle system; includes for removal & reinstallation of existing brick	**3,080**	lf	300.00	924,000		
	Miscellaneous repairs of existing closure - minimal	**20,700**	sf	10.00	207,000		
	Roof screens at new MEP equipment; allow 200 lf	**2,000**	sf	55.00	110,000		
	SUBTOTAL					1,411,170	
B2020	**WINDOWS/CURTAINWALL**	*13,800*	*sf*				
	Replace existing operable windows/ storefront (non-historic)	**13,800**	sf	100.00	1,380,000		
	Replace louvers - allow	**150**	sf	65.00	9,750		
	Backer rod & double sealant	**4,920**	lf	10.00	49,200		
	Wood blocking at openings	**4,920**	lf	3.00	14,760		
	SUBTOTAL					1,453,710	
B2030	**EXTERIOR DOORS**						
	Replace exterior glazed door, double	**4**	pr	8,500.00	34,000		
	Overhead doors; allowance	**1**	ea	5,000.00	5,000		
	Backer rod & double sealant	**80**	lf	10.00	800		
	Wood blocking at openings	**80**	lf	3.00	240		
	SUBTOTAL					40,040	
	TOTAL - EXTERIOR CLOSURE						**$2,904,920**
B30	***ROOFING***						
B3010	**ROOF COVERINGS**						
	EPDM roof system replacement including removal of existing down to existing deck	**44,800**	sf	22.00	985,600		
	Replace all edge flashings/copings	**920**	lf	30.00	27,600		
	SUBTOTAL					1,013,200	
B3020	**ROOF OPENINGS**						
	Skylights on curbs; 22'x40'	**2**	ea	158,400.00	316,800		
	Replace roof ladders/hatches etc.	**1**	ls	20,000.00	20,000		
	SUBTOTAL					336,800	
	TOTAL - ROOFING						**$1,350,000**
C10	***INTERIOR CONSTRUCTION***						
C1010	**PARTITIONS**						
	Allowance to anchor/brace tops of all non structural interior masonry partitions	**1,197**	loc	120.00	143,640		
	Seismic clips at exterior masonry partitions	**544**	loc	450.00	244,800		
	Repair existing interior partitions disturbed by new work/ at ACM demo/ at ADA new access locations	**128,300**	gsf	18.00	2,309,400		
	New elevator shaft	**2,026**	sf	30.00	60,780		
	Allowance for interior storefront	**1**	ls	15,000.00	15,000		
	Borrowed lights/sidelights allowance	**1**	ls	50,000.00	50,000		
	SUBTOTAL					2,823,620	
C1020	**INTERIOR DOORS**						
	3'-0" wide sidelight at classroom entry	**30**	ea	1,260.00	37,800		
	New doors, frame & hardware throughout	**128,300**	gsf	5.00	641,500		
	SUBTOTAL					679,300	
C1030	**SPECIALTIES / MILLWORK**						
	Gang bathroom accessories including electric handryers	**6**	rms	3,150.00	18,900		
	Janitors closet accessories	**3**	rms	300.00	900		

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING RENOVATION 3A							
	HDPE Toilet Partitions at gang bathrooms	**6**	loc	10,000.00	60,000		
	2-tier metal student lockers 18" x 15" x 48" h	**739**	opes	190.00	140,410		
	Markerboards	**7,616**	sf	22.00	167,552		
	Tackboards	**4,224**	sf	20.00	84,480		
	Allowance for circulation desk at media center	**1**	ls	14,000.00	14,000		
	Allowance for admin desks at main office and bank	**2**	loc	6,000.00	12,000		
	Display cases	**403**	sf	90.00	36,270		
	Brushed aluminum standoff signage at bank, cafeteria, media center, nurses suite, store and main office	**8**	loc	5,000.00	40,000		
	Allowance for miscellaneous specialties; wall protection, fire extinguishers	**128,300**	gsf	0.50	64,150		
	Miscellaneous metals throughout building	**128,300**	gsf	0.50	64,150		
	Rough blocking	**128,300**	gsf	0.15	19,245		
	Miscellaneous sealants throughout building	**128,300**	gsf	1.00	128,300		
	Code compliant signage	**128,300**	gsf	0.35	44,905		
	SUBTOTAL					895,262	
	TOTAL - INTERIOR CONSTRUCTION						**$4,398,182**
C20	***STAIRCASES***						
C2010	**STAIR CONSTRUCTION**						
	Concrete fill to stairs	**11**	flt	2,500.00	27,500		
	Egress stairs - metal pan	**10**	flt	35,000.00	350,000		
	Monumental stairs at library lobby	**1**	flt	50,000.00	50,000		
	SUBTOTAL					427,500	
C2020	**STAIR FINISHES**						
	New stair finishes; rubber treads/risers/landing and painting	**11**	flt	5,000.00	55,000		
	SUBTOTAL					55,000	
	TOTAL - STAIRCASES						**$482,500**
C30	***INTERIOR FINISHES***						
C3010	**WALL FINISHES**						
	Painting throughout	**128,300**	gsf	2.50	320,750		
	24x12 Porcelain tile wainscot at corridor - classroom wing; assumed 4' high	**7,700**	sf	24.00	184,800		
	Tectum wall panels at cafetorium	**1**	ls	40,000.00	40,000		
	Hardwood trim at tectum panels in cafetorium	**1**	ls	5,000.00	5,000		
	Tectum wall panels at TV studio	**383**	sf	18.00	6,894		
	SUBTOTAL					557,444	
C3020	**FLOOR FINISHES**	*117,786*	*sf*				
	Allowance for floor prep/ leveling/ wood sub-floor repairs	**117,786**	sf	3.00	353,358		
	Linoleum tile flooring	**96,660**	sf	7.00	676,620		
	Sealed concrete	**1,400**	sf	2.00	2,800		
	Quarry tile	**4,740**	sf	26.00	123,240		
	Quarry tile base	**356**	lf	18.00	6,408		
	Poured epoxy at bathrooms	**2,485**	sf	12.00	29,820		
	Carpet	**1,389**	sy	45.00	62,505		
	New resilient bases	**8,648**	lf	3.00	25,944		
	SUBTOTAL					1,280,695	

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING RENOVATION 3A							
C3030	**CEILING FINISHES**						
	2' x 2' ACT	**7,775**	sf	5.50	42,763		
	2' x 4' ACT	**37,095**	sf	5.00	185,475		
	2' x 4' ACT, health zone	**4,740**	sf	6.00	28,440		
	2' x 6' ACT	**12,320**	sf	8.00	98,560		
	Sloped ACT ceiling 2x4 at music rooms, teacher planning, science rooms, visual art rooms, SPED and typical classrooms	**47,240**	sf	5.75	271,630		
	Moisture resistant GWB ceilings in bathrooms	**2,485**	sf	14.00	34,790		
	Acoustic ceiling panels at cafetorium	**1**	ls	50,000.00	50,000		
	GWB soffit	**21,834**	sf	25.00	545,850		
	Paint exposed ceiling	**1,400**	sf	1.50	2,100		
	Paint GWB ceilings	**24,319**	sf	0.80	19,455		
	SUBTOTAL					1,279,063	
	TOTAL - INTERIOR FINISHES						**$3,117,202**
D10	***CONVEYING SYSTEMS***						
	New 3-stop elevator; 3500#	**1**	ea	150,000.00	150,000		
	SUBTOTAL					150,000	
	TOTAL - CONVEYING SYSTEMS						**$150,000**
D20	***PLUMBING***						
D20	**PLUMBING, GENERALLY**						
	1980 Building contains science rooms, classrooms, culinary kitchen & restaurant. Hot water by gas fired heaters						
	Plumbing equipment	**128,300**	gsf	1.75	224,525		
	Plumbing fixtures	**128,300**	gsf	2.75	352,825		
	Domestic water pipe with fittings & hangers	**128,300**	gsf	2.75	352,825		
	Domestic water pipe insulation	**128,300**	gsf	1.55	198,865		
	Sanitary waste pipe with fittings & hangers	**128,300**	gsf	2.50	320,750		
	Tempered water pipe with fittings & hangers	**128,300**	gsf	0.25	32,075		
	Acid waste pipe with fittings & hangers	**128,300**	gsf	0.35	44,905		
	Storm water pipe with fittings & hangers	**128,300**	gsf	1.00	128,300		
	Gas pipe with fittings & hangers	**128,300**	gsf	0.75	96,225		
	Culinary rough-in	**1**	ls	30,000.00	30,000		
	Demolition/phasing	**1**	ls	50,000.00	50,000		
	Miscellaneous	**128,300**	gsf	0.65	83,395		
	SUBTOTAL					1,914,690	
	TOTAL - PLUMBING						**$1,914,690**
D30	***HVAC***						
D30	**HVAC, GENERALLY**						
	1980 Building contains science rooms, classrooms, culinary kitchen & restaurant						
	1980 Building HVAC system contains HW boilers, water cooled chillers & cooling tower, RTU's with ERW, VAV systems, partial 4 pipe chilled beam system in selective areas & displacement diffuser system						
	Gas fired HW boiler 5600 MBH	**3**	ea	168,000.00	504,000		
	Hot water pumps with VFD	**2**	ea	25,000.00	50,000		
	Water cooled chiller 275 ton	**2**	ea	550,000.00	1,100,000		

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING RENOVATION 3A							
	Cooling tower with filtration 550 ton	**1**	ea	192,500.00	192,500		
	Chilled water pump with VFD	**2**	ea	30,000.00	60,000		
	Condenser water pump with VFD	**2**	ea	35,000.00	70,000		
	Heating and cooling devices throughout including active chilled beams to admin, TV studio, media center. CUH's, fintube...	**128,300**	sf	3.00	384,900		
	AHU with HW, CHW coil & ERW classrooms	**21,700**	cfm	15.00	325,500		
	AHU with HW, CHW coil & ERW kitchen & support	**7,100**	cfm	15.00	106,500		
	AHU with HW, CHW coil & ERW cafeteria	**16,800**	cfm	15.00	252,000		
	AHU with HW, CHW coil & ERW culinary arts & rest	**4,800**	cfm	15.00	72,000		
	AHU with HW, CHW coil & ERW admin, student act	**3,600**	cfm	15.00	54,000		
	AHU with HW, CHW coil & ERW tv studios	**2,300**	cfm	15.00	34,500		
	Make up air unit culinary	**1**	ls	32,000.00	32,000		
	Miscellaneous air distribution equipment	**128,300**	gsf	2.50	320,750		
	Hot water piping with fittings & hangers	**128,300**	gsf	4.00	513,200		
	Chilled water piping with fittings & hangers	**128,300**	gsf	2.50	320,750		
	Condenser water piping with fittings & hangers	**128,300**	gsf	0.50	64,150		
	Pipe insulation	**128,300**	gsf	2.50	320,750		
	Sheet metal & accessories	**128,300**	gsf	12.00	1,539,600		
	Automatic temperature controls DDC	**128,300**	gsf	7.50	962,250		
	System testing & balancing	**128,300**	gsf	1.00	128,300		
	Demolition/phasing	**1**	ls	100,000.00	100,000		
	Miscellaneous	**128,300**	gsf	1.50	192,450		
	SUBTOTAL					7,700,100	
	TOTAL - HVAC						**$7,700,100**
D40	***FIRE PROTECTION***						
D40	**FIRE PROTECTION, GENERALLY**						
	New sprinkler system to replace existing system.	**128,300**	gsf	4.70	603,010		
	Demolition/phasing	**1**	ls	30,000.00	30,000		
	SUBTOTAL					633,010	
	TOTAL - FIRE PROTECTION						**$633,010**
D50	***ELECTRICAL***						
D5010	**SERVICE & DISTRIBUTION**						
	Gear & Distribution						
	Normal						
	2500A main switchboard				See 1922 Bldg		
	Associated panelboards and feeders	**128,300**	sf	2.00	256,600		
	Emergency						
	350KW diesel generator with sound atten. cover				See 1922 Bldg		
	Associated ATS's, panelboards and feeders	**128,300**	gsf	1.50	192,450		
	45KW UPS	**2**	ea	30,000.00	60,000		
	Provisions for PV system (Rough-in only)	**1**	ls	5,000.00	5,000		
	Grounding	**1**	ls	5,000.00	5,000		
	Equipment Wiring						
	Equipment wiring feed and connections	**141,200**	gsf	2.00	282,400		
	Chiller unit feed and connection	**2**	ea	10,500.00	21,000		
	Cooling tower feed and connection	**1**	ea	6,500.00	6,500		
	AHU feed and connection	**3**	ea	4,500.00	13,500		
	Pump feed and connection	**6**	ea	1,500.00	9,000		
	Boiler feed and connection	**1**	ea	1,500.00	1,500		
	MAU feed and connection	**2**	ea	3,520.00	7,040		
	VFD's feed and connection only	**6**	ea	950.00	5,700		
	Culinary kitchen equipment feed and connections	**1**	ls	5,000.00	5,000		

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING RENOVATION 3A							
	SUBTOTAL					870,690	
D5020	**LIGHTING & POWER**						
	LED lighting allowance	**128,300**	gsf	6.00	769,800		
	Emergency/egress lighting	**128,300**	gsf	0.50	64,150		
	Lighting to exterior	**1**	ls	8,500.00	8,500		
	Lighting controls						
	Automated lighting controls system	**128,300**	gsf	1.75	224,525		
	Branch devices						
	Branch devices	**128,300**	sf	0.60	76,980		
	Lighting and branch circuitry						
	Branch circuitry	**128,300**	gsf	5.50	705,650		
	SUBTOTAL					1,849,605	
D5030	**COMMUNICATION & SECURITY SYSTEMS**						
	Fire Alarm						
	Control panel	**1**	ls	12,000.00	12,000		
	Annunciator	**1**	ea	1,500.00	1,500		
	Beacon	**1**	ea	225.00	225		
	Knox box	**1**	ea	600.00	600		
	Devices and cabling (Including Mass. notification)	**128,300**	gsf	3.00	384,900		
	Testing and programming	**1**	ls	4,500.00	4,500		
	BDA/DAS system	**1**	ls	85,000.00	85,000		
	Telephone/Data/CATV						
	MDF/IDF closets	**1**	ls	10,000.00	10,000		
	Devices and cabling	**128,300**	sf	2.00	256,600		
	Backbone cabling (allow)	**300**	lf	15.00	4,500		
	Rough-in	**128,300**	sf	1.00	128,300		
	Clock/PA System						
	Head end	**1**	ls	20,000.00	20,000		
	Devices and cabling	**128,300**	gsf	0.60	76,980		
	Rough-in	**128,300**	gsf	0.20	25,660		
	Sound systems						
	Cafeteria sound system	**1**	ls	20,000.00	20,000		
	Two Way Communications System						
	Elevator lobby two way communication system	**1**	ls	15,000.00	15,000		
	TV Studio						
	Electrical to TV Studio	**1**	ls	30,000.00	30,000		
	Auditorium						
	Stage lighting and dimming system				See 1922 Bldg		
	Auditorium sound system				See 1922 Bldg		
	Rough-in with 120V power				See 1922 Bldg		
	AV						
	AV equipment provided by others				By Others		
	Rough-in and power	**128,300**	gsf	0.25	32,075		
	Security System						
	Head end	**1**	ls	25,000.00	25,000		
	Devices and cabling	**128,300**	gsf	2.50	320,750		
	Rough-in	**128,300**	gsf	1.00	128,300		
	SUBTOTAL					1,581,890	
D5040	**OTHER ELECTRICAL SYSTEMS**						
	Lightning protection	**1**	ls	60,000.00	60,000		
	Seismic	**1**	ls	10,000.00	10,000		
	Testing	**1**	ls	5,000.00	5,000		
	Miscellaneous						
	Demolition/phasing	**1**	ls	75,000.00	75,000		
	Temp power & lights	**1**	ls	80,000.00	80,000		
	Permits and fees	**1**	ls	40,000.00	40,000		

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING RENOVATION 3A							
	SUBTOTAL					270,000	
	TOTAL - ELECTRICAL						**$4,572,185**
E10	***EQUIPMENT***						
E10	**EQUIPMENT, GENERALLY**						
	Thru wall fume hood at science prep	**8**	ea	14,000.00	112,000		
	Allowance for miscellaneous equipment; projection screens, residential appliances etc	**1**	ls	8,000.00	8,000		
	Allowance for residential equipment at life skills labs	**4**	loc	11,500.00	46,000		
	Kitchen equipment	**1**	ls	w/ 1980 Addition			
	Culinary arts equipment	**1**	ls	816,000.00	816,000		
	SUBTOTAL					982,000	
	TOTAL - EQUIPMENT						**$982,000**
E20	***FURNISHINGS***						
E2010	**FIXED FURNISHINGS**						
	Rolling mesh shades at exterior windows in non circulation spaces	**13,800**	sf	7.00	96,600		
	Solid roller shades at all interior storefront and borrowed lights; allowance	**2,000**	sf	7.00	14,000		
	Base cabinets with solid surface countertop	**1,058**	lf	425.00	449,650		
	Base cabinet with phenolic countertop	**1,160**	lf	500.00	580,000		
	Student science tables, allowance of 12 per room	**11**	rms	30,000.00	330,000		
	Upper cabinets	**1,198**	lf	220.00	263,560		
	Upper cabinets with marker board doors	**1,020**	lf	250.00	255,000		
	Teachers wardrobe	**57**	ea	1,400.00	79,800		
	Tall storage	**116**	ea	1,400.00	162,400		
	Bookcase allowance at media center	**1**	ls	15,000.00	15,000		
	Allowance for miscellaneous casework in support spaces	**128,300**	gsf	0.25	32,075		
	SUBTOTAL					2,278,085	
E2020	**MOVABLE FURNISHINGS**						
	All movable furnishings to be provided and installed by owner						
	SUBTOTAL					NIC	
	TOTAL - FURNISHINGS						**$2,278,085**
F10	***SPECIAL CONSTRUCTION***						
F10	**SPECIAL CONSTRUCTION**						
	No items in this section						
	SUBTOTAL					-	
	TOTAL - SPECIAL CONSTRUCTION						
F20	***SELECTIVE BUILDING DEMOLITION***						
F2010	**BUILDING ELEMENTS DEMOLITION**						
	Remove exterior glazing	**13,800**	sf	7.00	96,600		
	Roof membrane demo	**44,800**	demo included in roof replacement				
	Allowance for selective exterior wall demolition at connection to new addition	**8,939**	sf	10.00	89,390		

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Lowell, MA

PSR Pricing Options **GFA** 128,300

	CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
	1980 BUILDING RENOVATION 3A							
390		Interior demolition; some demolition included in abatement costs	**128,300**	gsf	6.00	769,800		
391		Temporary enclosures/protection	**128,300**	sf	0.50	64,150		
392		SUBTOTAL					1,019,940	
393								
394	**F2020**	**HAZARDOUS COMPONENTS ABATEMENT**						
395		See summary						
396		SUBTOTAL						
397								
398		***TOTAL - SELECTIVE BUILDING DEMOLITION***						**$1,019,940**
399								

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Lowell High School 20-Apr-18
Lowell, MA

PSR Pricing Options GFA 20,000

CONSTRUCTION COST SUMMARY

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
1980 BUILDING 3A SOUTH ADDITIONS						
A10	**FOUNDATIONS**					
	A1010	Standard Foundations	$175,721			
	A1020	Special Foundations	$274,800			
	A1030	Lowest Floor Construction	$356,826	**$807,347**	$40.37	11.6%
A20	**BASEMENT EXCAVATION**					
	A2010	Basement Excavation	$0			
	A2030	Basement Walls	$0	**$0**	$0.00	0.0%
B10	**SUPERSTRUCTURE**					
	B1010	Upper Floor Construction	$362,150			
	B1020	Roof Construction	$513,725	**$875,875**	$43.79	12.6%
B20	**EXTERIOR CLOSURE**					
	B2010	Exterior Walls	$1,093,801			
	B2020	Windows/Curtainwall	$333,256			
	B2030	Exterior Doors	$39,700	**$1,466,757**	$73.34	21.0%
B30	**ROOFING**					
	B3010	Roof Coverings	$370,750			
	B3020	Roof Openings	$5,000	**$375,750**	$18.79	5.4%
C10	**INTERIOR CONSTRUCTION**					
	C1010	Partitions	$160,000			
	C1020	Interior Doors	$100,000			
	C1030	Specialties/Millwork	$50,132	**$310,132**	$15.51	4.4%
C20	**STAIRCASES**					
	C2010	Stair Construction	$0			
	C2020	Stair Finishes	$0	**$0**	$0.00	0.0%
C30	**INTERIOR FINISHES**					
	C3010	Wall Finishes	$82,400			
	C3020	Floor Finishes	$211,305			
	C3030	Ceiling Finishes	$118,744	**$412,449**	$20.62	5.9%
D10	**CONVEYING SYSTEMS**					
	D1010	Elevator	$0	**$0**	$0.00	0.0%
D20	**PLUMBING**					
	D20	Plumbing	$310,000	**$310,000**	$15.50	4.4%
D30	**HVAC**					
	D30	HVAC	$831,000	**$831,000**	$41.55	11.9%
D40	**FIRE PROTECTION**					
	D40	Fire Protection	$94,000	**$94,000**	$4.70	1.3%
D50	**ELECTRICAL**					
	D5010	Electrical Systems	$623,250	**$623,250**	$31.16	8.9%
E10	**EQUIPMENT**					
	E10	Equipment	$840,000	**$840,000**	$42.00	12.0%

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Lowell High School 20-Apr-18
Lowell, MA

PSR Pricing Options GFA 20,000

CONSTRUCTION COST SUMMARY

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
1980 BUILDING 3A SOUTH ADDITIONS						
E20	**FURNISHINGS**					
	E2010	Fixed Furnishings	$26,975			
	E2020	Movable Furnishings	NIC	**$26,975**	$1.35	0.4%
F10	**SPECIAL CONSTRUCTION**					
	F10	Special Construction	$0	**$0**	$0.00	0.0%
F20	**SELECTIVE BUILDING DEMOLITION**					
	F2010	Building Elements Demolition	$0			
	F2020	Hazardous Components Abatement	$0	**$0**	$0.00	0.0%
TOTAL DIRECT COST (Trade Costs)				***$6,973,535***	*$348.68*	*100.0%*

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Lowell High School
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20-Apr-18

PSR Pricing Options

GFA 20,000

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST

1980 BUILDING 3A SOUTH ADDITIONS

GROSS FLOOR AREA CALCULATION

First Floor	12,500
Second Floor	7,500

TOTAL GROSS FLOOR AREA (GFA) **20,000** ***sf***

A10 FOUNDATIONS

A1010 STANDARD FOUNDATIONS

033000	*CONCRETE*						
	Grade Beams	*127*	*CY*	*$963*			
	Pile Caps	*37*	*CY*	*$637*			
	Pilasters	*8*	*CY*	*$750*			
	Total Foundation Concrete	*172*	*CY*				
	Perimeter Grade Beams; 18"x4'-6"						
	Formwork	**3,150**	sf	20.00	63,000		
	Re-bar, 90#/LF	**8,280**	lbs.	1.20	9,936		
	Concrete material	**92**	cy	135.00	12,420		
	Placing concrete	**92**	cy	60.00	5,520		
	Form shelf	**350**	lf	10.00	3,500		
	Grade Beam at braced frames; 24"x2'-6"						
	Formwork	**900**	sf	20.00	18,000		
	Re-bar, 75#/LF	**2,625**	lbs.	1.20	3,150		
	Concrete material	**35**	cy	135.00	4,725		
	Placing concrete	**35**	cy	60.00	2,100		
	Pile caps, 5' x 5' x 2'-6" Pile cap	**12**	ea				
	Formwork	**600**	sf	22.00	13,200		
	Re-bar	**2,610**	lbs.	1.20	3,132		
	Concrete material	**29**	cy	135.00	3,915		
	Placing concrete	**29**	cy	60.00	1,740		
	Slab thickening at individual piles						
	Intermediate slab support pile	**8**	cy	200.00	1,600		
	Pilaster at perimeter columns; 24" x24"						
	Pilasters, 24"x24", complete	**8**	cy	750.00	6,000		
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Troweled-on bituminous mastic at perimeter grade beam	**1,575**	sf	3.00	4,725		
072100	*THERMAL INSULATION*						
	2" Insulation to grade beams	**1,575**	sf	3.00	4,725		
312000	*EARTHWORK*						
	Grade Beams						
	Excavation	**222**	cy	15.00	3,330		
	Remove off site	**222**	cy	16.00	3,552		
	Backfill with existing material	**95**	cy	12.00	1,140		
	Pile caps						
	Excavation	**65**	cy	15.00	975		
	Remove off site	**65**	cy	16.00	1,040		
	Backfill with existing material	**28**	cy	12.00	336		
	Soil disposal premiums						
	Premium for disposal of contaminated soil; assume 25% of volume	**66**	tns	60.00	3,960		
	Miscellaneous						
	Dewatering				NR		
	SUBTOTAL					175,721	

A1020 SPECIAL FOUNDATIONS Average pile length 30'-50' long per FBR Report dated 3.28.18 (page 4)

	Mobilization	**1**	ls	50,000.00	50,000		
	Load test	**1**	ls	30,000.00	30,000		
	(2) 95 Ton, Conical point pile	**1,167**	vlf	100.00	116,700		
	(1) 95 Ton, Conical point pile at intermediate slab supports (every 800sf of lowest slab)	**781**	vlf	100.00	78,100		

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Lowell High School
Lowell, MA

20-Apr-18

PSR Pricing Options

GFA 20,000

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING 3A SOUTH ADDITIONS							
	SUBTOTAL					274,800	
A1030	**LOWEST FLOOR CONSTRUCTION**						
	Excavation at level 1 slab						
	Slab excavation	**926**	cy	15.00	13,890		
	Remove off site	**926**	cy	16.00	14,816		
	Soil disposal premiums						
	Premium for disposal of contaminated soil; assume 25% of volume	**370**	tns	60.00	22,200		
	Structural; Slab on grade, 10" thick						
	Gravel fill, assume 12"	**463**	cy	40.00	18,520		
	4" Rigid insulation	**12,500**	sf	4.00	50,000		
	Vapor barrier	**12,500**	sf	1.00	12,500		
	Compact existing sub-grade	**12,500**	sf	0.50	6,250		
	Formwork	**620**	sf	12.00	7,440		
	Rebar; 7 lbs/sf	**87,500**	lbs	1.20	105,000		
	Concrete - 10" thick	**403**	cy	125.00	50,375		
	Placing concrete	**403**	cy	45.00	18,135		
	Finishing and curing concrete	**12,500**	sf	1.50	18,750		
	Barrier I	**403**	cy	60.00	NR		
	Control joints - saw cut	**12,500**	sf	0.10	1,250		
	Perimeter drain	**350**	lf	22.00	7,700		
	Miscellaneous						
	Equipment pads	**1**	ls	10,000.00	10,000		
	SUBTOTAL					356,826	
	TOTAL - FOUNDATIONS						**$807,347**
A20	***BASEMENT CONSTRUCTION***						
A2010	**BASEMENT EXCAVATION**						
	No items in this section						
	SUBTOTAL					0	
A2020	**BASEMENT WALLS**						
	No items in this section						
	SUBTOTAL					0	
	TOTAL - BASEMENT CONSTRUCTION						**$0**
B10	***SUPERSTRUCTURE***						
		14.10	lbs/sf				
B1010	**FLOOR CONSTRUCTION**	141	tns				
	Floor Structure - Steel:						
	Steel beams and columns; 14#/SF including relieving angles at exterior walls	**53**	tns	3,500.00	185,500		
	Premium for HSS	**13**	tns	300.00	3,900		
	Shear studs	**1,500**	ea	2.50	3,750		
	Floor Structure						
	2" 18 Ga. Metal galvanized floor deck	**7,500**	sf	3.75	28,125		
	4 1/2" Normal weight concrete fill at upper floor decks	**8,625**	sf	8.00	69,000		
	Barrier I	**131**	cy	60.00	NR		
	Miscellaneous						
	Allowance for expansion/ seismic joints	**1**	ls	50,000.00	50,000		
	2hr Fire proofing to columns and beams (at Type IB Construction)	**7,500**	sf	2.25	16,875		
	Intumescent paint				NR		
	Fire stopping floors	**1**	ls	5,000.00	5,000		
	SUBTOTAL					362,150	

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Lowell, MA

PSR Pricing Options GFA 20,000

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING 3A SOUTH ADDITIONS							
B1020	**ROOF CONSTRUCTION**						
	Roof Structure - Steel:						
	Steel beams/Joists; 14#/SF	**88**	tns	3,500.00	308,000		
	Premium for HSS	**22**	tns	300.00	6,600		
	Canopy framing	**3,200**	sf	35.00	112,000		
	Roof Structure						
	3" 18 Ga. galvanized Metal Roof Deck	**12,500**	sf	4.00	50,000		
	Miscellaneous						
	Concrete under RTU's	**750**	sf	12.00	9,000		
	2hr Fire proofing to columns and beams (at Type IB Construction)	**12,500**	sf	2.25	28,125		
	SUBTOTAL					513,725	
	TOTAL - SUPERSTRUCTURE						**$875,875**
B20	***EXTERIOR CLOSURE***						
B2010	**EXTERIOR WALLS**						
	Exterior Wall Area - Solid 75%	*8,250*	sf				
042000	*MASONRY*						
	Brick veneer, running bond (25%)	**2,750**	sf	40.00	110,000		
	Staging to exterior wall	**11,000**	sf	4.00	Included		
055000	*MISC. METALS*						
	Signage at entrances	**1**	ls	20,000.00	20,000		
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Air barrier	**8,250**	sf	6.50	53,625		
	Air barrier/flashing at windows	**1,618**	lf	6.25	10,113		
	Miscellaneous sealants to closure	**8,250**	sf	1.00	8,250		
072100	*THERMAL INSULATION*						
	4" Mineral wool insulation	**8,250**	sf	4.00	33,000		
	4" Spray insulation	**8,250**	sf	5.00	41,250		
076400	*CLADDING*						
	Alucobond composite metal panels (50%)	**5,500**	sf	75.00	412,500		
	Wood-look linear plastic soffit system at canopy	**3,200**	sf	62.00	198,400		
	Corrugated aluminum panel roof screen, Morin or similar	**1,500**	sf	55.00	82,500		
092900	*GYPSUM BOARD ASSEMBLIES*						
	6" metal stud backup	**8,250**	sf	9.00	74,250		
	Gypsum Sheathing	**8,250**	sf	2.75	22,688		
	Drywall lining to interior face of stud backup	**8,250**	sf	3.30	27,225		
	SUBTOTAL					1,093,801	
B2020	**WINDOWS**						
	Exterior Wall Area - Glazed Assume 25%	*2,750*	sf				
061000	*ROUGH CARPENTRY*						
	Wood blocking at openings	**1,618**	lf	8.00	12,944		
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Backer rod & double sealant	**1,618**	lf	9.00	14,562		
080001	*METAL WINDOWS*						
	Windows/Storefront, double glazed; 20% of glazed area	**550**	sf	90.00	49,500		
	Curtainwall, Kawneer 1600 or equal, double glazed; 80% of glazed area	**2,200**	sf	115.00	253,000		

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PSR Pricing Options GFA 20,000

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING 3A SOUTH ADDITIONS							
	Sunshades; horizontal				NR		
089000	*LOUVERS*						
	Louvers	**50**	sf	65.00	3,250		
	SUBTOTAL					333,256	
B2030	**EXTERIOR DOORS**						
	Glazed entrance doors including frame and hardware; double door	**4**	pr	8,500.00	34,000		
	HM doors, frames and hardware- single	**1**	ea	2,000.00	2,000		
	HM doors, frames and hardware- double	**1**	pr	3,000.00	3,000		
	Backer rod & double sealant	**100**	lf	4.00	400		
	Wood blocking at openings	**100**	lf	3.00	300		
	SUBTOTAL					39,700	
	TOTAL - EXTERIOR CLOSURE						**$1,466,757**
B30	***ROOFING***						
B3010	**ROOF COVERINGS**						
	Membrane roofing, complete	**12,500**	sf	22.00	275,000		
	Coping system	**350**	lf	45.00	15,750		
	Green roof tray system on membrane roof at canopy	**3,200**	sf	25.00	80,000		
	SUBTOTAL					370,750	
B3020	**ROOF OPENINGS**						
	Skylights, allow				NR		
	Roof hatch & ladders	**1**	loc	5,000.00	5,000		
	SUBTOTAL					5,000	
	TOTAL - ROOFING						**$375,750**
C10	***INTERIOR CONSTRUCTION***						
C1010	**PARTITIONS**						
	Miscellaneous partitions/glazed partitions/sidelights/blocking etc.	**20,000**	gsf	8.00	160,000		
	SUBTOTAL					160,000	
C1020	**INTERIOR DOORS**						
	Interior doors, frames and hardware	**20,000**	gsf	5.00	100,000		
	SUBTOTAL					100,000	
C1030	**SPECIALTIES / MILLWORK**						
	Markerboards	**81**	sf	22.00	1,782		
	Tackboards	**45**	sf	20.00	900		
	Fire extinguisher cabinets	**7**	ea	350.00	2,450		
	Miscellaneous metals throughout building	**20,000**	sf	1.50	30,000		
	Miscellaneous sealants throughout building	**20,000**	sf	0.75	15,000		
	SUBTOTAL					50,132	
	TOTAL - INTERIOR CONSTRUCTION						**$310,132**
C20	***STAIRCASES***						
C2010	**STAIR CONSTRUCTION**						
	No items in this section						
	SUBTOTAL						
C2020	**STAIR FINISHES**						
	No items in this section						
	SUBTOTAL						
	TOTAL - STAIRCASES						**$0**
C30	***INTERIOR FINISHES***						

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PSR Pricing Options GFA 20,000

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING 3A SOUTH ADDITIONS							
C3010	**WALL FINISHES**						
	Paint to walls	**20,000**	gsf	2.50	50,000		
	24x12 Porcelain tile wainscot at main entry corridor; assumed 4' high	**1,350**	sf	24.00	32,400		
	SUBTOTAL					82,400	
C3020	**FLOOR FINISHES**						
	Linoleum tile flooring	**15,705**	sf	7.00	109,935		
	Quarry tile	**1,665**	sf	26.00	43,290		
	Quarry tile base	**125**	lf	18.00	2,250		
	Carpet	**70**	sy	45.00	3,150		
	New resilient bases	**1,225**	lf	3.00	3,675		
	Moisture mitigation	**16,335**	sf	3.00	49,005		
	SUBTOTAL					211,305	
C3030	**CEILING FINISHES**						
	2' x 4' ACT	**14,857**	sf	5.00	74,285		
	2' x 4' ACT, health zone	**1,850**	sf	6.00	11,100		
	GWB soffit	**1,293**	sf	25.00	32,325		
	Paint GWB ceilings	**1,293**	sf	0.80	1,034		
	SUBTOTAL					118,744	
	TOTAL - INTERIOR FINISHES						**$412,449**
D10	***CONVEYING SYSTEMS***						
D1010	**ELEVATOR**						
	No items in this section						
	SUBTOTAL					0	
	TOTAL - CONVEYING SYSTEMS						**$0**
D20	***PLUMBING***						
D20	**PLUMBING, GENERALLY**						
	Entry, Kitchen & Library space						
	Plumbing equipment	**20,000**	gsf	1.75	35,000		
	Plumbing fixtures	**20,000**	gsf	2.00	40,000		
	Domestic water pipe with fittings & hangers	**20,000**	gsf	2.50	50,000		
	Domestic water pipe insulation	**20,000**	gsf	1.50	30,000		
	Sanitary waste pipe with fittings & hangers	**20,000**	gsf	2.00	40,000		
	Storm water pipe with fittings & hangers	**20,000**	gsf	1.00	20,000		
	Gas pipe with fittings & hangers	**20,000**	gsf	0.75	15,000		
	Kitchen rough-in	**1**	ls	70,000.00	70,000		
	Miscellaneous	**20,000**	gsf	0.50	10,000		
	SUBTOTAL					310,000	
	TOTAL - PLUMBING						**$310,000**
D30	***HVAC***						
D30	**HVAC, GENERALLY**						
	Entry, Kitchen & Library space						
	HVAC equipment	**20,000**	ea	2.00	40,000		
	Make up air unit kitchen	**1**	ls	40,000.00	40,000		
	Air distribution equipment	**20,000**	gsf	8.00	160,000		
	Hot water piping with fittings & hangers	**20,000**	gsf	3.55	71,000		
	Chilled water piping with fittings & hangers	**20,000**	gsf	1.50	30,000		
	Pipe insulation	**20,000**	gsf	2.50	50,000		
	Sheet metal & accessories	**20,000**	gsf	12.00	240,000		
	Automatic temperature controls DDC	**20,000**	gsf	7.50	150,000		
	System testing & balancing	**20,000**	gsf	1.00	20,000		
	Miscellaneous	**20,000**	gsf	1.50	30,000		
	SUBTOTAL					831,000	
	TOTAL - HVAC						**$831,000**

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PSR Pricing Options GFA 20,000

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING 3A SOUTH ADDITIONS							
D40	***FIRE PROTECTION***						
D40	**FIRE PROTECTION, GENERALLY**						
	Fire protection system	**20,000**	gsf	4.70	94,000		
	SUBTOTAL					94,000	
	TOTAL - FIRE PROTECTION						**$94,000**
D50	***ELECTRICAL***						
D50	**ELECTRICAL, GENERALLY**						
	Gear & Distribution						
	Normal						
	Associated panelboards and feeders	**20,000**	gsf	2.00	40,000		
	Emergency						
	Associated ATS's, panelboards and feeders	**20,000**	gsf	1.00	20,000		
	Equipment Wiring						
	Kitchen equipment feed and connections	**1**	ls	25,000.00	25,000		
	Equipment wiring feed and connections	**20,000**	gsf	2.00	40,000		
	SUBTOTAL					125,000	
D5020	**LIGHTING & POWER**						
	LED lighting allowance	**20,000**	gsf	6.00	120,000		
	Emergency/egress lighting	**20,000**	gsf	0.50	10,000		
	Lighting to exterior	**1**	ls	750.00	750		
	Lighting controls						
	Automated lighting controls system	**20,000**	gsf	1.75	35,000		
	Branch devices						
	Branch devices	**20,000**	gsf	0.40	8,000		
	Lighting and branch circuitry						
	Branch circuitry	**20,000**	gsf	5.00	100,000		
	SUBTOTAL					273,750	
D5030	**COMMUNICATION & SECURITY SYSTEMS**						
	Fire Alarm						
	Make connections at new control panel	**1**	ls	3,500.00	3,500		
	Devices and cabling (Including Mass. notification)	**20,000**	gsf	3.00	60,000		
	BDA/DAS system	**1**	ls	12,000.00	12,000		
	Telephone/Data/CATV						
	Make connection at IDF closet	**1**	ls	1,500.00	1,500		
	Devices and cabling	**20,000**	gsf	1.50	30,000		
	Rough-in	**20,000**	gsf	0.50	10,000		
	Clock/PA System						
	Make connections at existing Head end	**1**	ls	2,000.00	2,000		
	Devices and cabling	**20,000**	gsf	0.60	12,000		
	Rough-in	**20,000**	gsf	0.20	4,000		
	AV						
	AV equipment provided by others				By Others		
	Rough-in only	**20,000**	gsf	0.20	4,000		
	Security System						
	Head end	**1**	ls	3,000.00	3,000		
	Devices and cabling	**20,000**	gsf	2.00	40,000		
	Rough-in	**20,000**	gsf	1.00	20,000		
	SUBTOTAL					202,000	
D5040	**OTHER ELECTRICAL SYSTEMS**						
	Lightning protection	**1**	ls	5,000.00	5,000		
	Miscellaneous						
	Temp power & lights	**1**	ls	10,000.00	10,000		
	Permits and fees	**1**	ls	7,500.00	7,500		
	SUBTOTAL					22,500	
	TOTAL - ELECTRICAL						**$623,250**

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
1980 BUILDING 3A SOUTH ADDITIONS							
E10	***EQUIPMENT***						
E10	**EQUIPMENT, GENERALLY**						
	Kitchen equipment	**1**	ls	840,000.00	840,000		
	SUBTOTAL					840,000	
	TOTAL - EQUIPMENT						**$840,000**
E20	***FURNISHINGS***						
E2010	**FIXED FURNISHINGS**						
	Window blinds	**1,925**	sf	7.00	13,475		
	Bookcase allowance at media center				F,F+E		
	Recessed walk off carpet at vestibule entries	**300**	sf	45.00	13,500		
	SUBTOTAL					26,975	
E2020	**MOVABLE FURNISHINGS**						
	All movable furnishings to be provided and installed by owner						
	SUBTOTAL					NIC	
	TOTAL - FURNISHINGS						**$26,975**
F10	***SPECIAL CONSTRUCTION***						
F10	**SPECIAL CONSTRUCTION**						
	No items in this section						
	SUBTOTAL					0	
	TOTAL - SPECIAL CONSTRUCTION						**$0**
F20	***SELECTIVE BUILDING DEMOLITION***						
F2010	**BUILDING ELEMENTS DEMOLITION**						
	See main summary for demolition of existing buildings				See Summary		
	SUBTOTAL					0	
F2020	**HAZARDOUS COMPONENTS ABATEMENT**						
	See main summary for HazMat allowance				See Summary		
	SUBTOTAL					$0	
	TOTAL - SELECTIVE BUILDING DEMOLITION						**$0**

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PSR Pricing Options GFA 67,400

CONSTRUCTION COST SUMMARY

NEW GYMNASIUM WING 3A

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
A10	**FOUNDATIONS**					
	A1010	Standard Foundations	$491,316			
	A1020	Special Foundations	$793,900			
	A1030	Lowest Floor Construction	$929,486	**$2,214,702**	$32.86	13.4%
B10	**SUPERSTRUCTURE**					
	B1010	Upper Floor Construction	$1,351,825			
	B1020	Roof Construction	$0	**$1,351,825**	$20.06	8.2%
B20	**EXTERIOR CLOSURE**					
	B2010	Exterior Walls	$1,258,037			
	B2020	Windows/Curtainwall	$312,144			
	B2030	Exterior Doors	$53,840	**$1,624,021**	$24.10	9.8%
B30	**ROOFING**					
	B3010	Roof Coverings	$0			
	B3020	Roof Openings	$0	**$0**	$0.00	0.0%
C10	**INTERIOR CONSTRUCTION**					
	C1010	Partitions	$808,800			
	C1020	Interior Doors	$337,000			
	C1030	Specialties/Millwork	$375,920	**$1,521,720**	$22.58	9.2%
C20	**STAIRCASES**					
	C2010	Stair Construction	$111,000			
	C2020	Stair Finishes	$15,000	**$126,000**	$1.87	0.8%
C30	**INTERIOR FINISHES**					
	C3010	Wall Finishes	$263,740			
	C3020	Floor Finishes	$833,614			
	C3030	Ceiling Finishes	$388,343	**$1,485,697**	$22.04	9.0%
D10	**CONVEYING SYSTEMS**					
	D1010	Elevator	$100,000	**$100,000**	$1.48	0.6%
D20	**PLUMBING**					
	D20	Plumbing	$775,100	**$775,100**	$11.50	4.7%
D30	**HVAC**					
	D30	HVAC	$2,713,350	**$2,713,350**	$40.26	16.4%
D40	**FIRE PROTECTION**					
	D40	Fire Protection	$303,300	**$303,300**	$4.50	1.8%
D50	**ELECTRICAL**					
	D5010	Electrical Systems	$1,792,420	**$1,792,420**	$26.59	10.8%
E10	**EQUIPMENT**					
	E10	Equipment	$479,400	**$479,400**	$7.11	2.9%
E20	**FURNISHINGS**					
	E2010	Fixed Furnishings	$22,848			
	E2020	Movable Furnishings	NIC	**$22,848**	$0.34	0.1%

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PSR Pricing Options

GFA 67,400

CONSTRUCTION COST SUMMARY

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
NEW GYMNASIUM WING 3A						
F10	**SPECIAL CONSTRUCTION**					
	F10	Special Construction	$2,022,000	**$2,022,000**	$30.00	12.2%
F20	**SELECTIVE BUILDING DEMOLITION**					
	F2010	Building Elements Demolition	$0			
	F2020	Hazardous Components Abatement	$0	**$0**	$0.00	0.0%
TOTAL DIRECT COST (Trade Costs)				***$16,532,383***	*$245.29*	*100.0%*

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PSR Pricing Options

GFA 67,400

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST

NEW GYMNASIUM WING 3A

GROSS FLOOR AREA CALCULATION

	First Floor			33,700			
	Second Floor			33,700			
	TOTAL GROSS FLOOR AREA (GFA)				**67,400**	***sf***	
A10	***FOUNDATIONS***						
A1010	**STANDARD FOUNDATIONS**						
033000	*CONCRETE*						
	Grade Beams	*292*	*CY*	*$959*			
	Pile Caps	*151*	*CY*	*$674*			
	Pilasters	*16*	*CY*	*$750*			
	Total Foundation Concrete	*459*	*CY*				
	Perimeter Grade Beams; 18"x4'-6"						
	Formwork	**7,200**	sf	20.00	144,000		
	Re-bar, 90#/LF	**18,900**	lbs.	1.20	22,680		
	Concrete material	**210**	cy	135.00	28,350		
	Placing concrete	**210**	cy	60.00	12,600		
	Form shelf	**700**	lf	10.00	7,000		
	Grade Beam at braced frames; 24"x2'-6"						
	Formwork	**2,100**	sf	20.00	42,000		
	Re-bar, 75#/LF	**6,150**	lbs.	1.20	7,380		
	Concrete material	**82**	cy	135.00	11,070		
	Placing concrete	**82**	cy	60.00	4,920		
	Pile caps, 5' x 5' x 2'-6" Pile cap	**53**	ea				
	Formwork	**2,650**	sf	22.00	58,300		
	Re-bar	**11,610**	lbs.	1.20	13,932		
	Concrete material	**129**	cy	135.00	17,415		
	Placing concrete	**129**	cy	60.00	7,740		
	Slab thickening at individual piles						
	Intermediate slab support pile	**22**	cy	200.00	4,400		
	Pilaster at perimeter columns; 24" x24"						
	Pilasters, 24"x24", complete	**16**	cy	750.00	12,000		
	Miscellaneous						
	Elevator pit, 24" slab w/ 12" walls	**1**	ea	40,000.00	40,000		
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Troweled-on bituminous mastic at perimeter grade beam	**3,150**	sf	3.00	9,450		
072100	*THERMAL INSULATION*						
	2" Insulation to grade beams	**3,150**	sf	3.00	9,450		
312000	*EARTHWORK*						
	Grade Beams						
	Excavation	**511**	cy	15.00	7,665		
	Remove off site	**511**	cy	16.00	8,176		
	Backfill with existing material	**219**	cy	12.00	2,628		
	Pile caps						
	Excavation	**264**	cy	15.00	3,960		
	Remove off site	**264**	cy	16.00	4,224		
	Backfill with existing material	**113**	cy	12.00	1,356		
	Soil disposal premiums						
	Premium for disposal of contaminated soil; assume 25% of volume	**177**	tns	60.00	10,620		
	Miscellaneous						
	Dewatering				NR		
	SUBTOTAL					491,316	
A1020	**SPECIAL FOUNDATIONS**	Average pile length 30'-50' long per FBR Report dated 3.28.18 (page 4)					
	Mobilization	**1**	ls	50,000.00	50,000		
	Load test	**1**	ls	30,000.00	Included Elsewhere		
	(2) 95 Ton, Conical point pile	**5,333**	vlf	100.00	533,300		

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW GYMNASIUM WING 3A							
	(1) 95 Ton, Conical point pile at intermediate slab supports (every 800sf of lowest slab)	**2,106**	vlf	100.00	210,600		
	SUBTOTAL					793,900	
A1030	**LOWEST FLOOR CONSTRUCTION**						
	Excavation at level 1 slab						
	Slab excavation	**2,496**	cy	15.00	37,440		
	Remove off site	**2,496**	cy	16.00	39,936		
	Soil disposal premiums						
	Premium for disposal of contaminated soil; assume 25% of volume	**998**	tns	60.00	59,880		
	Structural; Slab on grade, 10" thick						
	Gravel fill, assume 12"	**1,248**	cy	40.00	49,920		
	4" Rigid insulation	**33,700**	sf	4.00	134,800		
	Vapor barrier	**33,700**	sf	1.00	33,700		
	Compact existing sub-grade	**33,700**	sf	0.50	16,850		
	Formwork	**800**	sf	12.00	9,600		
	Rebar; 7 lbs/sf	**235,900**	lbs	1.20	283,080		
	Concrete - 10" thick	**1,088**	cy	125.00	136,000		
	Placing concrete	**1,088**	cy	45.00	48,960		
	Finishing and curing concrete	**33,700**	sf	1.50	50,550		
	Barrier I	**1,088**	cy	60.00	NR		
	Control joints - saw cut	**33,700**	sf	0.10	3,370		
	Perimeter drain	**700**	lf	22.00	15,400		
	Miscellaneous						
	Equipment pads	**1**	ls	10,000.00	10,000		
	SUBTOTAL					929,486	
	TOTAL - FOUNDATIONS						**$2,214,702**
A20	***BASEMENT CONSTRUCTION***						
A2010	**BASEMENT EXCAVATION**						
	No items in this section						
	SUBTOTAL					0	
A2020	**BASEMENT WALLS**						
	No items in this section						
	SUBTOTAL					0	
	TOTAL - BASEMENT CONSTRUCTION						**$0**
B10	***SUPERSTRUCTURE***						
		12.5	lbs/sf				
B1010	**FLOOR CONSTRUCTION**	211	tns				
	Floor Structure - Steel:						
	Steel beams and columns at level 2; 12.5#/SF	**211**	tns	3,500.00	738,500		
	Premium for HSS	**53**	tns	300.00	15,900		
	Shear studs	**6,740**	ea	2.50	16,850		
	Floor Structure						
	2" 18 Ga. Metal galvanized floor deck	**33,700**	sf	3.75	126,375		
	4 1/2" Normal weight concrete fill at upper floor decks	**38,755**	sf	8.00	310,040		
	Barrier I	**589**	cy	60.00	NR		
	Miscellaneous						
	Allowance for expansion/ seismic joints	**1**	ls	30,000.00	30,000		
	3hr Firewall between 1980 Building & Gymnasium wing	**2,976**	sf	35.00	104,160		
	2hr Fire proofing to columns and beams (at Type IIB Construction)				NR		

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW GYMNASIUM WING 3A							
	Intumescent paint				NR		
	Fire stopping floors	**1**	ls	10,000.00	10,000		
	SUBTOTAL					1,351,825	
B1020	**ROOF CONSTRUCTION**						
	Roof Structure	Included in Special Construction - Pre-engineered building					
	SUBTOTAL					0	
	TOTAL - SUPERSTRUCTURE						**$1,351,825**
B20	***EXTERIOR CLOSURE***						
B2010	**EXTERIOR WALLS**						
	Exterior Wall Area - Solid 80%	*10,080*	sf				
042000	*MASONRY*						
	Brick veneer, running bond (25%)	**3,150**	sf	40.00	126,000		
	Staging to exterior wall	**12,600**	sf	4.00	Included		
055000	*MISC. METALS*						
	Signage at entrances	**1**	ls	10,000.00	10,000		
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Air barrier	**10,080**	sf	6.50	65,520		
	Air barrier/flashing at windows	**1,482**	lf	6.25	9,263		
	Miscellaneous sealants to closure	**10,080**	sf	1.00	10,080		
072100	*THERMAL INSULATION*						
	4" Mineral wool insulation	**10,080**	sf	4.00	40,320		
	4" Spray insulation	**10,080**	sf	5.00	50,400		
076400	*CLADDING*						
	Alucobond composite metal panels (55%)	**6,930**	sf	75.00	519,750		
	Corrugated aluminum panel roof screen, Morin or similar	**5,000**	sf	55.00	275,000		
092900	*GYPSUM BOARD ASSEMBLIES*						
	6" metal stud backup	**10,080**	sf	9.00	90,720		
	Gypsum Sheathing	**10,080**	sf	2.75	27,720		
	Drywall lining to interior face of stud backup	**10,080**	sf	3.30	33,264		
	SUBTOTAL					1,258,037	
B2020	**WINDOWS**						
	Exterior Wall Area - Glazed Assume 20%	*2,520*	sf				
061000	*ROUGH CARPENTRY*						
	Wood blocking at openings	**1,482**	lf	8.00	11,856		
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Backer rod & double sealant	**1,482**	lf	9.00	13,338		
080001	*METAL WINDOWS*						
	Windows/Storefront, double glazed; 20% of glazed area	**504**	sf	90.00	45,360		
	Curtainwall, Kawneer 1600 or equal, double glazed; 80% of glazed area	**2,016**	sf	115.00	231,840		
	Sunshades; horizontal				NR		
089000	*LOUVERS*						
	Louvers	**150**	sf	65.00	9,750		
	SUBTOTAL					312,144	
B2030	**EXTERIOR DOORS**						

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW GYMNASIUM WING 3A							
	Glazed entrance doors including frame and hardware; double door	**4**	pr	8,500.00	34,000		
	HM doors, frames and hardware- single	**4**	ea	2,000.00	8,000		
	HM doors, frames and hardware- double	**2**	pr	3,000.00	6,000		
	Overhead doors; allowance	**1**	ea	5,000.00	5,000		
	Backer rod & double sealant	**120**	lf	4.00	480		
	Wood blocking at openings	**120**	lf	3.00	360		
	SUBTOTAL					53,840	
	TOTAL - EXTERIOR CLOSURE						**$1,624,021**
B30	***ROOFING***						
B3010	**ROOF COVERINGS**						
	Roofing	Included in Special Construction - Pre-engineered building					
	SUBTOTAL					0	
B3020	**ROOF OPENINGS**						
	No items in this section						
	SUBTOTAL					0	
	TOTAL - ROOFING						**$0**
C10	***INTERIOR CONSTRUCTION***						
C1010	**PARTITIONS**						
	Miscellaneous partitions/glazed partitions/borrowed lights/blocking etc.	**67,400**	gsf	12.00	808,800		
	SUBTOTAL					808,800	
C1020	**INTERIOR DOORS**						
	Interior doors, frames and hardware	**67,400**	gsf	5.00	337,000		
	SUBTOTAL					337,000	
C1030	**SPECIALTIES / MILLWORK**						
	Backer panels in electrical closets	**1**	ls	2,000.00	2,000		
	Window sills	**445**	lf	40.00	17,800		
	Gang bathroom accessories including electric handryers	**2**	rms	3,150.00	6,300		
	Janitors closet accessories	**2**	rms	300.00	600		
	HDPE Toilet Partitions at gang bathrooms	**2**	loc	10,000.00	20,000		
	2-tier metal student lockers 18" x 15" x 48" h	**387**	opes	190.00	73,530		
	Athletic lockers at gym locker rooms	**8,270**	sf	5.00	41,350		
	Brushed aluminum standoff signage	**2**	loc	5,000.00	10,000		
	Display cases	**211**	sf	90.00	18,990		
	Allowance for miscellaneous specialties; wall protection, fire extinguishers	**67,400**	gsf	0.50	33,700		
	Miscellaneous metals throughout building	**67,400**	gsf	1.00	67,400		
	Rough blocking	**67,400**	gsf	0.15	10,110		
	Miscellaneous sealants throughout building	**67,400**	gsf	0.75	50,550		
	Code compliant signage	**67,400**	gsf	0.35	23,590		
	SUBTOTAL					375,920	
	TOTAL - INTERIOR CONSTRUCTION						**$1,521,720**
C20	***STAIRCASES***						
C2010	**STAIR CONSTRUCTION**						
	Metal pan stair; egress stair	**3**	flt	35,000.00	105,000		
	Concrete fill to stairs	**3**	flt	2,000.00	6,000		
	SUBTOTAL					111,000	
C2020	**STAIR FINISHES**						
	High performance coating to stairs including all railings etc.	**3**	flt	3,000.00	9,000		
	Concrete sealer at stairs - landings	**300**	sf	2.00	600		

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW GYMNASIUM WING 3A							
	Norament treads at stairs - treads & risers	**360**	lft	15.00	5,400		
	SUBTOTAL					15,000	
	TOTAL - STAIRCASES						**$126,000**
C30	***INTERIOR FINISHES***						
C3010	**WALL FINISHES**						
	Painting throughout	**67,400**	gsf	2.50	168,500		
	24x12 Porcelain tile wainscot at corridor - classroom wing; 4' high	**1,708**	sf	24.00	40,992		
	Tectum wall panels at gym	**2,736**	sf	18.00	49,248		
	Hardwood trim at tectum panels in gym	**1**	ls	5,000.00	5,000		
	SUBTOTAL					263,740	
C3020	**FLOOR FINISHES**						
	Linoleum tile flooring	**12,915**	sf	7.00	90,405		
	Sealed concrete	**9,105**	sf	2.00	18,210		
	Poured epoxy	**8,620**	sf	12.00	103,440		
	Carpet	**56**	sy	45.00	2,520		
	New resilient bases	**4,124**	lf	3.00	12,372		
	Wood athletic floor in Gymnasium	**14,590**	sf	18.00	262,620		
	Athletic flooring in Exercise rooms & Running track	**17,870**	sf	14.00	250,180		
	Moisture mitigation	**31,289**	sf	3.00	93,867		
	SUBTOTAL					833,614	
C3030	**CEILING FINISHES**						
	2' x 2' ACT	**12,980**	sf	5.50	71,390		
	2' x 4' ACT	**10,045**	sf	5.00	50,225		
	Moisture resistant GWB ceilings	**8,270**	sf	14.00	115,780		
	GWB soffit	**2,303**	sf	25.00	57,575		
	Paint exposed ceiling	**28,305**	sf	3.00	84,915		
	Paint GWB ceilings	**10,573**	sf	0.80	8,458		
	SUBTOTAL					388,343	
	TOTAL - INTERIOR FINISHES						**$1,485,697**
D10	***CONVEYING SYSTEMS***						
D1010	**ELEVATOR**						
	Elevators; 2 stop	**1**	ea	100,000.00	100,000		
	SUBTOTAL					100,000	
	TOTAL - CONVEYING SYSTEMS						**$100,000**
D20	***PLUMBING***						
D20	**PLUMBING, GENERALLY**						
	Gym wing contains gym, locker rm, training rms's & fitness rm's						
	Plumbing equipment	**67,400**	gsf	1.50	101,100		
	Plumbing fixtures	**67,400**	gsf	2.00	134,800		
	Domestic water pipe with fittings & hangers	**67,400**	gsf	2.50	168,500		
	Domestic water pipe insulation	**67,400**	gsf	1.50	101,100		
	Sanitary waste pipe with fittings & hangers	**67,400**	gsf	2.50	168,500		
	Storm water pipe with fittings & hangers	**67,400**	gsf	1.00	67,400		
	Miscellaneous	**67,400**	gsf	0.50	33,700		
	SUBTOTAL					775,100	
	TOTAL - PLUMBING						**$775,100**
D30	***HVAC***						
D30	**HVAC, GENERALLY**						
	Gym wing contains gym, locker rm, training rms's & fitness rm's						

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW GYMNASIUM WING 3A							
	AHU with HW, CHW coil & ERW gym	**32,400**	cfm	15.00	486,000		
	AHU with HW, CHW coil & ERW ROTC, multi & fit	**23,800**	cfm	15.00	357,000		
	Miscellaneous air distribution equipment	**67,400**	gsf	1.00	67,400		
	Hot water piping with fittings & hangers	**67,400**	gsf	3.50	235,900		
	Chilled water piping with fittings & hangers	**67,400**	gsf	1.00	67,400		
	Pipe insulation	**67,400**	gsf	2.25	151,650		
	Sheet metal & accessories	**67,400**	gsf	10.00	674,000		
	Automatic temperature controls DDC	**67,400**	gsf	7.50	505,500		
	System testing & balancing	**67,400**	gsf	1.00	67,400		
	Miscellaneous	**67,400**	gsf	1.50	101,100		
	SUBTOTAL					2,713,350	
	TOTAL - HVAC						**$2,713,350**
D40	***FIRE PROTECTION***						
D40	**FIRE PROTECTION, GENERALLY**						
	Fire protection system	**67,400**	gsf	4.50	303,300		
	SUBTOTAL					303,300	
	TOTAL - FIRE PROTECTION						**$303,300**
D50	***ELECTRICAL***						
D50	**ELECTRICAL, GENERALLY**						
	Gear & Distribution						
	Normal						
	Associated panelboards and feeders	**67,400**	gsf	2.00	134,800		
	Equipment Wiring						
	Equipment wiring feed and connections	**67,400**	gsf	1.50	101,100		
	AHU feed and connection	**2**	ea	4,500.00	9,000		
	SUBTOTAL					244,900	
D5020	**LIGHTING & POWER**						
	Gymnasium lighting	**67,400**	ea	3.00	202,200		
	Emergency/egress lighting	**67,400**	gsf	0.25	16,850		
	Lighting to exterior	**1**	ls	3,500.00	3,500		
	Lighting controls						
	Automated lighting controls system	**67,400**	gsf	1.75	117,950		
	Branch devices						
	Branch devices	**67,400**	gsf	0.40	26,960		
	Lighting and branch circuitry						
	Branch circuitry	**67,400**	gsf	5.50	370,700		
	SUBTOTAL					738,160	
D5030	**COMMUNICATION & SECURITY SYSTEMS**						
	Fire Alarm						
	Make connections at new control panel	**1**	ls	1,500.00	1,500		
	Devices and cabling (Including Mass. notification)	**67,400**	gsf	3.00	202,200		
	BDA/DAS system	**1**	ls	35,000.00	35,000		
	Telephone/Data/CATV						
	MDF/IDF closets	**1**	ls	2,500.00	2,500		
	Devices and cabling	**67,400**	gsf	1.00	67,400		
	Backbone cabling (allow)	**300**	lf	15.00	4,500		
	Rough-in	**67,400**	gsf	0.50	33,700		
	Two Way Communications System						
	Elevator lobby two way communication system	**1**	ls	15,000.00	15,000		
	Clock/PA System						
	Make connections at head end	**1**	ls	3,500.00	3,500		
	Devices and cabling	**67,400**	gsf	0.60	40,440		
	Rough-in	**67,400**	gsf	0.20	13,480		
	Scoreboard						
	Scoreboard shot clocks and circuitry	**2**	ls	13,500.00	27,000		
	Gym equipment feed and connections	**1**	ls	15,000.00	15,000		

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW GYMNASIUM WING 3A							
	Gymnasium sound system	**1**	ls	15,000.00	15,000		
	AV						
	AV equipment provided by others				By Others		
	Rough-in only	**67,400**	gsf	0.10	6,740		
	Security System						
	Make connections at head end	**1**	ls	3,500.00	3,500		
	Devices and cabling	**67,400**	gsf	2.50	168,500		
	Rough-in	**67,400**	gsf	1.00	67,400		
	SUBTOTAL					722,360	
D5040	**OTHER ELECTRICAL SYSTEMS**						
	Lightning protection	**1**	ls	27,000.00	27,000		
	Miscellaneous						
	Temp power & lights	**1**	ls	40,000.00	40,000		
	Permits and fees	**1**	ls	20,000.00	20,000		
	SUBTOTAL					87,000	
	TOTAL - ELECTRICAL						**$1,792,420**
E10	***EQUIPMENT***						
E10	**EQUIPMENT, GENERALLY**						
	Gym wall pads	**250**	lf	60.00	15,000		
	Gymnasium hard panel dividing net; electrically operated (one location)	**5,000**	sf	22.00	110,000		
	Gymnasium fabric dividing net; electrically operated (four locations)	**8,000**	sf	12.00	96,000		
	Adjustable chin up bar	**3**	loc	300.00	900		
	Volley ball standards	**1**	ls	1,500.00	1,500		
	Scoreboard and shot clock				In Electric		
	Basketball backstops; retractable	**10**	ea	10,000.00	100,000		
	Telescoping bleachers (1200 seat capacity)	**1**	ls	156,000.00	156,000		
	SUBTOTAL					479,400	
	TOTAL - EQUIPMENT						**$479,400**
E20	***FURNISHINGS***						
E2010	**FIXED FURNISHINGS**						
	Rolling mesh shades at exterior windows in non circulation spaces	**1,764**	sf	7.00	12,348		
	Solid roller shades at all interior storefront and borrowed lights	**1,500**	sf	7.00	10,500		
	SUBTOTAL					22,848	
E2020	**MOVABLE FURNISHINGS**						
	All movable furnishings to be provided and installed by owner						
	SUBTOTAL					NIC	
	TOTAL - FURNISHINGS						**$22,848**
F10	***SPECIAL CONSTRUCTION***						
F10	**SPECIAL CONSTRUCTION**						
	Pre-engineered Gymnasium structure & enclosure; 40' high	**33,700**	sf	60.00	2,022,000		
	SUBTOTAL					2,022,000	
	TOTAL - SPECIAL CONSTRUCTION						**$2,022,000**
F20	***SELECTIVE BUILDING DEMOLITION***						
F2010	**BUILDING ELEMENTS DEMOLITION**						
	See main summary for demolition of existing buildings				See Summary		
	SUBTOTAL					$0	
F2020	**HAZARDOUS COMPONENTS ABATEMENT**						

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GFA 67,400

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW GYMNASIUM WING 3A							
397	See main summary for HazMat allowance				See Summary		
398	SUBTOTAL					$0	
399							
400	***TOTAL - SELECTIVE BUILDING DEMOLITION***						**$0**

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GFA 93,600

CONSTRUCTION COST SUMMARY

NEW FRESHMAN WING 3A

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
A10	**FOUNDATIONS**					
	A1010	Standard Foundations	$383,727			
	A1020	Special Foundations	$942,500			
	A1030	Lowest Floor Construction	$506,193	**$1,832,420**	$19.58	6.3%
B10	**SUPERSTRUCTURE**					
	B1010	Upper Floor Construction	$3,351,265			
	B1020	Roof Construction	$728,925	**$4,080,190**	$43.59	14.0%
B20	**EXTERIOR CLOSURE**					
	B2010	Exterior Walls	$3,346,176			
	B2020	Windows/Curtainwall	$1,467,006			
	B2030	Exterior Doors	$68,840	**$4,882,022**	$52.16	16.8%
B30	**ROOFING**					
	B3010	Roof Coverings	$446,850			
	B3020	Roof Openings	$5,000	**$451,850**	$4.83	1.6%
C10	**INTERIOR CONSTRUCTION**					
	C1010	Partitions	$2,059,200			
	C1020	Interior Doors	$509,580			
	C1030	Specialties/Millwork	$922,176	**$3,490,956**	$37.30	12.0%
C20	**STAIRCASES**					
	C2010	Stair Construction	$376,000			
	C2020	Stair Finishes	$40,000	**$416,000**	$4.44	1.4%
C30	**INTERIOR FINISHES**					
	C3010	Wall Finishes	$296,400			
	C3020	Floor Finishes	$921,711			
	C3030	Ceiling Finishes	$1,007,313	**$2,225,424**	$23.78	7.6%
D10	**CONVEYING SYSTEMS**					
	D1010	Elevator	$250,000	**$250,000**	$2.67	0.9%
D20	**PLUMBING**					
	D20	Plumbing	$1,349,760	**$1,349,760**	$14.42	4.6%
D30	**HVAC**					
	D30	HVAC	$4,021,300	**$4,021,300**	$42.96	13.8%
D40	**FIRE PROTECTION**					
	D40	Fire Protection	$459,920	**$459,920**	$4.91	1.6%
D50	**ELECTRICAL**					
	D5010	Electrical Systems	$3,041,240	**$3,041,240**	$32.49	10.5%
E10	**EQUIPMENT**					
	E10	Equipment	$284,000	**$284,000**	$3.03	1.0%
E20	**FURNISHINGS**					
	E2010	Fixed Furnishings	$2,306,615			
	E2020	Movable Furnishings	NIC	**$2,306,615**	$24.64	7.9%

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GFA 93,600

CONSTRUCTION COST SUMMARY

BUILDING SYSTEM			*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
NEW FRESHMAN WING 3A						
F10	**SPECIAL CONSTRUCTION**					
	F10	Special Construction	$0	**$0**	$0.00	0.0%
F20	**SELECTIVE BUILDING DEMOLITION**					
	F2010	Building Elements Demolition	$0			
	F2020	Hazardous Components Abatement	$0	**$0**	$0.00	0.0%
TOTAL DIRECT COST (Trade Costs)				***$29,091,697***	*$310.81*	*100.0%*

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST

NEW FRESHMAN WING 3A

GROSS FLOOR AREA CALCULATION

First Floor	18,000
Second Floor	18,900
Third floor	18,900
Fourth floor	18,900
Fifth floor	18,900

TOTAL GROSS FLOOR AREA (GFA) **93,600** ***sf***

A10 FOUNDATIONS

A1010 STANDARD FOUNDATIONS

	Grade Beams	*194*	*CY*	*$971*			
	Pile Caps	*164*	*CY*	*$605*			
	Pilasters	*13*	*CY*	*$750*			
	Total Foundation Concrete	*371*	*CY*				
	Perimeter Grade Beams; 18"x4'-6"						
	Formwork	**5,040**	sf		20.00		100,800
	Re-bar, 90#/LF	**13,230**	lbs.		1.20		15,876
	Concrete material	**147**	cy		135.00		19,845
	Placing concrete	**147**	cy		60.00		8,820
	Form shelf	**560**	lf		10.00		5,600
	Grade Beam at braced frames; 24"x2'-6"						
	Formwork	**1,200**	sf		20.00		24,000
	Re-bar, 75#/LF	**3,525**	lbs.		1.20		4,230
	Concrete material	**47**	cy		135.00		6,345
	Placing concrete	**47**	cy		60.00		2,820
	Pile caps, 5' x 5' x 2'-6" Pile cap	**19**	ea				
	Formwork	**950**	sf		22.00		20,900
	Re-bar	**4,140**	lbs.		1.20		4,968
	Concrete material	**46**	cy		135.00		6,210
	Placing concrete	**46**	cy		60.00		2,760
	Pile caps, 8' x 8' x 2'-6" Pile cap	**17**	ea				
	Formwork	**1,360**	sf		22.00		29,920
	Re-bar	**9,540**	lbs.		1.20		11,448
	Concrete material	**106**	cy		135.00		14,310
	Placing concrete	**106**	cy		60.00		6,360
	Slab thickening at individual piles						
	Intermediate slab support pile	**12**	cy		200.00		2,400
	Pilaster at perimeter columns; 24" x24"						
	Pilasters, 24"x24", complete	**13**	cy		750.00		9,750
	Miscellaneous						
	Elevator pits, 24" slab w/ 12" walls	**1**	ea		40,000.00		40,000
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Troweled-on bituminous mastic at perimeter grade beam	**2,520**	sf		3.00		7,560
072100	*THERMAL INSULATION*						
	2" Insulation to grade beams	**2,520**	sf		3.00		7,560
312000	*EARTHWORK*						
	Grade Beams						
	Excavation	**340**	cy		15.00		5,100
	Remove off site	**340**	cy		16.00		5,440
	Backfill with existing material	**146**	cy		12.00		1,752
	Pile caps						
	Excavation	**287**	cy		15.00		4,305
	Remove off site	**287**	cy		16.00		4,592
	Backfill with existing material	**123**	cy		12.00		1,476
	Soil disposal premiums						
	Premium for disposal of contaminated soil; assume 25% of volume	**143**	tns		60.00		8,580
	Miscellaneous						
	Dewatering						NR

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW FRESHMAN WING 3A							
	SUBTOTAL					383,727	
A1020	**SPECIAL FOUNDATIONS**	Average pile length 30'-50' long per FBR Report dated 3.28.18 (page 4)					
	Mobilization	**1**	ls	50,000.00	50,000		
	Load test	**1**	ls	30,000.00	Included elsewhere		
	(3) 95 Ton, Conical point pile at perimeter	**2,800**	vlf	100.00	280,000		
	(6) 95 Ton, Conical point pile at interior columns	**5,000**	vlf	100.00	500,000		
	(1) 95 Ton, Conical point pile at intermediate slab supports (every 800sf of lowest slab)	**1,125**	vlf	100.00	112,500		
	SUBTOTAL					942,500	
A1030	**LOWEST FLOOR CONSTRUCTION**						
	Excavation at level 1 slab						
	Slab excavation	**1,333**	cy	15.00	19,995		
	Remove off site	**1,333**	cy	16.00	21,328		
	Soil disposal premiums						
	Premium for disposal of contaminated soil; assume 25% of volume	**533**	cy	60.00	31,980		
	Structural; Slab on grade, 10" thick						
	Gravel fill, assume 12"	**667**	cy	40.00	26,680		
	4" Rigid insulation	**18,000**	sf	4.00	72,000		
	Vapor barrier	**18,000**	sf	1.00	18,000		
	Compact existing sub-grade	**18,000**	sf	0.50	9,000		
	Formwork	**620**	sf	12.00	7,440		
	Rebar; 7 lbs/sf	**126,000**	lbs	1.20	151,200		
	Concrete - 10" thick	**581**	cy	125.00	72,625		
	Placing concrete	**581**	cy	45.00	26,145		
	Finishing and curing concrete	**18,000**	sf	1.50	27,000		
	Barrier I	**581**	cy	60.00	NR		
	Control joints - saw cut	**18,000**	sf	0.10	1,800		
	Perimeter drain	**500**	lf	22.00	11,000		
	Miscellaneous						
	Equipment pads	**1**	ls	10,000.00	10,000		
	SUBTOTAL					506,193	
	TOTAL - FOUNDATIONS						**$1,832,420**
A20	***BASEMENT CONSTRUCTION***						
A2010	**BASEMENT EXCAVATION**						
	No items in this section						
	SUBTOTAL					0	
A2020	**BASEMENT WALLS**						
	No items in this section						
	SUBTOTAL					0	
	TOTAL - BASEMENT CONSTRUCTION						**$0**
B10	***SUPERSTRUCTURE***						
		15.38	lbs/sf				
B1010	**FLOOR CONSTRUCTION**	720	tns				
	Floor Structure - Steel:						
	Steel beams and columns; 15.25#/SF including relieving angles at exterior walls	**576**	tns	3,500.00	2,016,000		
	Premium for HSS	**144**	tns	300.00	43,200		
	Shear studs	**15,120**	ea	2.50	37,800		
	Floor Structure						
	2" 18 Ga. Metal galvanized floor deck	**75,600**	sf	3.75	283,500		
	4 1/2" Normal weight concrete fill at upper floor decks	**86,940**	sf	8.00	695,520		

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW FRESHMAN WING 3A							
	Barrier I	**1,320**	cy	60.00	NR		
	Miscellaneous						
	Allowance for expansion/ seismic joints	**1**	ls	20,000.00	20,000		
	3hr Firewall between Freshman Wing and 1980 Building	**2,147**	sf	35.00	75,145		
	2hr Fire proofing to columns and beams (at Type IB Construction)	**75,600**	sf	2.25	170,100		
	Intumescent paint	**1**	ls	50,000.00	NR		
	Fire stopping floors	**1**	ls	10,000.00	10,000		
	SUBTOTAL					3,351,265	
B1020	**ROOF CONSTRUCTION**						
	Roof Structure - Steel:						
	Steel beams/Joists; 15.25#/SF	**144**	tns	3,500.00	504,000		
	Premium for HSS	**36**	tns	300.00	10,800		
	Canopy framing				w/ 1980 Addition		
	Roof Structure						
	3" 18 Ga. galvanized Metal Roof Deck	**18,900**	sf	4.00	75,600		
	Miscellaneous						
	Framing at rooftop screens - allow 150 lf	**8**	tns	4,500.00	36,000		
	Concrete under RTU's	**5,000**	sf	12.00	60,000		
	2hr Fire proofing to columns and beams (at Type IB Construction)	**18,900**	sf	2.25	42,525		
	SUBTOTAL					728,925	
	TOTAL - SUPERSTRUCTURE						**$4,080,190**
B20	***EXTERIOR CLOSURE***						
B2010	**EXTERIOR WALLS**						
	Exterior Wall Area - Solid 75%	*33,750*	sf				
042000	*MASONRY*						
	Brick veneer, running bond (25%)	**11,250**	sf	40.00	450,000		
	Staging to exterior wall	**45,000**	sf	4.00	Included		
055000	*MISC. METALS*						
	Signage at entrances	**1**	ls	20,000.00	20,000		
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Air barrier	**33,750**	sf	6.50	219,375		
	Air barrier/flashing at windows	**6,618**	lf	6.25	41,363		
	Miscellaneous sealants to closure	**33,750**	sf	1.00	33,750		
072100	*THERMAL INSULATION*						
	4" Mineral wool insulation	**33,750**	sf	4.00	135,000		
	4" Spray insulation	**33,750**	sf	5.00	168,750		
076400	*CLADDING*						
	Alucobond composite metal panels (50%)	**22,500**	sf	75.00	1,687,500		
	Wood-look linear plastic soffit system at canopy				w/ 1980 Addition		
	Corrugated aluminum panel roof screen, Morin or similar	**1,500**	sf	55.00	82,500		
092900	*GYPSUM BOARD ASSEMBLIES*						
	6" metal stud backup	**33,750**	sf	9.00	303,750		
	Gypsum Sheathing	**33,750**	sf	2.75	92,813		
	Drywall lining to interior face of stud backup	**33,750**	sf	3.30	111,375		
	SUBTOTAL					3,346,176	
B2020	**WINDOWS**						
	Exterior Wall Area - Glazed Assume 25%	*11,250*	sf				

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CSI CODE		DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
		NEW FRESHMAN WING 3A						
	061000	*ROUGH CARPENTRY*						
		Wood blocking at openings	**6,618**	lf	8.00	52,944		
	070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
		Backer rod & double sealant	**6,618**	lf	9.00	59,562		
	080001	*METAL WINDOWS*						
		Windows/Storefront, double glazed; 20% of glazed area	**2,250**	sf	90.00	202,500		
		Curtainwall, Kawneer 1600 or equal, double glazed; 80% of glazed area	**9,000**	sf	115.00	1,035,000		
		Sunshades; horizontal	**800**	lf	130.00	104,000		
	089000	*LOUVERS*						
		Louvers	**200**	sf	65.00	13,000		
		SUBTOTAL					1,467,006	
	B2030	**EXTERIOR DOORS**						
		Glazed entrance doors including frame and hardware; double door	**4**	pr	8,500.00	34,000		
		Premium for school guard at vestibule	**1**	ls	20,000.00	20,000		
		HM doors, frames and hardware- single	**4**	ea	2,000.00	8,000		
		HM doors, frames and hardware- double	**2**	pr	3,000.00	6,000		
		Backer rod & double sealant	**120**	lf	4.00	480		
		Wood blocking at openings	**120**	lf	3.00	360		
		SUBTOTAL					68,840	
		TOTAL - EXTERIOR CLOSURE						**$4,882,022**
	B30	***ROOFING***						
	B3010	**ROOF COVERINGS**						
		Membrane roofing, complete	**18,900**	sf	22.00	415,800		
		Coping system	**690**	lf	45.00	31,050		
		Green roof tray system on membrane roof at canopy				w/ 1980 Addition		
		SUBTOTAL					446,850	
	B3020	**ROOF OPENINGS**						
		Skylights, allow				NR		
		Roof hatch & ladders	**1**	loc	5,000.00	5,000		
		SUBTOTAL					5,000	
		TOTAL - ROOFING						**$451,850**
	C10	***INTERIOR CONSTRUCTION***						
	C1010	**PARTITIONS**						
		Miscellaneous partitions/glazed partitions/borrowed lights/blocking etc.	**93,600**	gsf	22.00	2,059,200		
		SUBTOTAL					2,059,200	
	C1020	**INTERIOR DOORS**						
		3'-0" wide sidelight at classroom entry	**33**	ea	1,260.00	41,580		
		Interior doors, frames and hardware	**93,600**	gsf	5.00	468,000		
		SUBTOTAL					509,580	
	C1030	**SPECIALTIES / MILLWORK**						
06100		Backer panels in electrical closets	**1**	ls	2,000.00	2,000		
		Window sills	**1,985**	lf	40.00	79,400		
		Allowance for single bathroom accessories	**2**	rms	500.00	1,000		
10160		Gang bathroom accessories including electric handryers	**10**	rms	3,150.00	31,500		
10160		Janitors closet accessories	**5**	rms	300.00	1,500		
10160		HDPE Toilet Partitions at gang bathrooms; per bathroom	**10**	loc	10,000.00	100,000		

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
	NEW FRESHMAN WING 3A						
	2-tier metal student lockers 18" x 15" x 48" h	**528**	opes	190.00	100,320		
	Markerboards	**8,048**	sf	22.00	177,056		
	Tackboards	**4,464**	sf	20.00	89,280		
	Brushed aluminum standoff signage	**2**	loc	5,000.00	10,000		
	Display cases	**288**	sf	90.00	25,920		
	Allowance for miscellaneous specialties; wall protection, fire extinguishers	**93,600**	gsf	0.50	46,800		
050001	Miscellaneous metals throughout building	**93,600**	gsf	1.25	117,000		
061000	Rough blocking	**93,600**	gsf	0.15	14,040		
070001	Miscellaneous sealants throughout building	**93,600**	gsf	1.00	93,600		
101400	Code compliant signage	**93,600**	gsf	0.35	32,760		
	SUBTOTAL					922,176	
	TOTAL - INTERIOR CONSTRUCTION						**$3,490,956**
	C20 STAIRCASES						
	C2010 STAIR CONSTRUCTION						
	Metal pan stair; egress stair	**8**	flt	45,000.00	360,000		
	Concrete fill to stairs	**8**	flt	2,000.00	16,000		
	SUBTOTAL					376,000	
	C2020 STAIR FINISHES						
	High performance coating to stairs including all railings etc.	**8**	flt	3,000.00	24,000		
	Concrete sealer at stairs - landings	**800**	sf	2.00	1,600		
	Norament treads at stairs - treads & risers	**960**	lft	15.00	14,400		
	SUBTOTAL					40,000	
	TOTAL - STAIRCASES						**$416,000**
	C30 INTERIOR FINISHES						
	C3010 WALL FINISHES						
	Painting throughout	**93,600**	gsf	2.50	234,000		
	24x12 Porcelain tile wainscot at corridor - classroom wing; 4' high	**2,600**	sf	24.00	62,400		
	SUBTOTAL					296,400	
	C3020 FLOOR FINISHES						
	Linoleum tile flooring	**86,880**	sf	7.00	608,160		
	Poured epoxy at bathrooms	**1,750**	sf	12.00	21,000		
	Carpet in Admin areas	**167**	sy	45.00	7,515		
	New resilient bases	**6,629**	lf	3.00	19,887		
	Moisture mitigation	**88,383**	sf	3.00	265,149		
	SUBTOTAL					921,711	
	C3030 CEILING FINISHES						
	2' x 2' ACT	**6,700**	sf	5.50	36,850		
	Sloped ACT ceiling 2x4 at music rooms, teacher planning, science rooms, visual art rooms, SPED and typical classrooms	**84,750**	sf	5.75	487,313		
	GWB soffit	**18,290**	sf	25.00	457,250		
	Moisture resistant GWB ceilings	**1,750**	sf	14.00	24,500		
	Paint GWB ceilings	**1,750**	sf	0.80	1,400		
	SUBTOTAL					1,007,313	
	TOTAL - INTERIOR FINISHES						**$2,225,424**
	D10 CONVEYING SYSTEMS						
	D1010 ELEVATOR						
	Elevators; 5 stop	**1**	ea	250,000.00	250,000		
	SUBTOTAL					250,000	
	TOTAL - CONVEYING SYSTEMS						**$250,000**

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW FRESHMAN WING 3A							
D20	***PLUMBING***						
D20	**PLUMBING, GENERALLY**						
	Freshman building contains science rooms & classrooms						
	Plumbing equipment	**93,600**	gsf	1.75	163,800		
	Plumbing fixtures	**93,600**	gsf	2.55	238,680		
	Domestic water pipe with fittings & hangers	**93,600**	gsf	2.75	257,400		
	Domestic water pipe insulation	**93,600**	gsf	1.55	145,080		
	Sanitary waste pipe with fittings & hangers	**93,600**	gsf	2.50	234,000		
	Tempered water pipe with fittings & hangers	**93,600**	gsf	0.25	23,400		
	Acid waste pipe with fittings & hangers	**93,600**	gsf	0.35	32,760		
	Storm water pipe with fittings & hangers	**93,600**	gsf	1.00	93,600		
	Gas pipe with fittings & hangers	**93,600**	gsf	0.75	70,200		
	Demolition/phasing	**1**	ls	30,000.00	30,000		
	Miscellaneous	**93,600**	gsf	0.65	60,840		
	SUBTOTAL					1,349,760	
	TOTAL - PLUMBING						**$1,349,760**
D30	***HVAC***						
D30	**HVAC, GENERALLY**						
	Freshman building contains science rooms & classrooms						
	Green house heating & ventilation	**1**	ls	10,000.00	10,000		
	AHU with HW, CHW coil & ERW classrooms	**58,500**	cfm	15.00	877,500		
	Miscellaneous air distribution equipment	**93,600**	gsf	2.50	234,000		
	Hot water piping with fittings & hangers	**93,600**	gsf	3.50	327,600		
	Chilled water piping with fittings & hangers	**93,600**	gsf	2.00	187,200		
	Condenser water piping with fittings & hangers	**93,600**	gsf	0.50	46,800		
	Pipe insulation	**93,600**	gsf	2.50	234,000		
	Sheet metal & accessories	**93,600**	gsf	12.00	1,123,200		
	Automatic temperature controls DDC	**93,600**	gsf	7.50	702,000		
	System testing & balancing	**93,600**	gsf	1.00	93,600		
	Demolition/phasing	**1**	ls	45,000.00	45,000		
	Miscellaneous	**93,600**	gsf	1.50	140,400		
	SUBTOTAL					4,021,300	
	TOTAL - HVAC						**$4,021,300**
D40	***FIRE PROTECTION***						
D40	**FIRE PROTECTION, GENERALLY**						
	Fire protection system	**93,600**	sf	4.70	439,920		
	Demolition/phasing	**1**	ls	20,000.00	20,000		
	SUBTOTAL					459,920	
	TOTAL - FIRE PROTECTION						**$459,920**
D50	***ELECTRICAL***						
D50	**ELECTRICAL, GENERALLY**						
	Gear & Distribution						
	Normal						
	Associated panelboards and feeders	**93,600**	gsf	2.50	234,000		
	Emergency						
	Associated ATS's, panelboards and feeders	**93,600**	gsf	1.00	93,600		
	Equipment Wiring						
	Equipment wiring feed and connections	**93,600**	gsf	2.00	187,200		
	AHU feed and connection	**1**	ea	4,500.00	4,500		
	SUBTOTAL					$519,300	
D5020	**LIGHTING & POWER**						
	LED lighting allowance	**93,600**	gsf	6.00	561,600		
	Emergency/egress lighting	**93,600**	gsf	0.50	46,800		

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW FRESHMAN WING 3A							
	Lighting to exterior	**1**	ls	5,000.00	5,000		
	Lighting controls						
	Automated lighting controls system	**93,600**	gsf	1.75	163,800		
	Branch devices						
	Branch devices	**93,600**	gsf	0.60	56,160		
	Lighting and branch circuitry						
	Branch circuitry	**93,600**	gsf	5.50	514,800		
	SUBTOTAL					$1,348,160	
D5030	**COMMUNICATION & SECURITY SYSTEMS**						
	Fire Alarm						
	Make connections at new control panel	**1**	ls	3,500.00	3,500		
	Devices and cabling (Including Mass. notification)	**93,600**	gsf	3.00	280,800		
	BDA/DAS system	**1**	ls	45,000.00	45,000		
	Telephone/Data/CATV						
	Make connection at IDF closet	**1**	ls	4,500.00	4,500		
	Devices and cabling	**93,600**	gsf	2.00	187,200		
	Rough-in	**93,600**	gsf	0.75	70,200		
	Two Way Communications System						
	Elevator lobby two way communication system	**1**	ls	15,000.00	15,000		
	Clock/PA System						
	Make connections at existing Head end	**1**	ls	3,500.00	3,500		
	Devices and cabling	**93,600**	gsf	0.60	56,160		
	Rough-in	**93,600**	gsf	0.20	18,720		
	AV						
	AV equipment provided by others				By Others		
	Rough-in only	**93,600**	gsf	0.25	23,400		
	Security System (Rough-in only)						
	Head end	**1**	ls	5,000.00	5,000		
	Devices and cabling	**93,600**	gsf	2.00	187,200		
	Rough-in	**93,600**	gsf	1.00	93,600		
	SUBTOTAL					993,780	
D5040	**OTHER ELECTRICAL SYSTEMS**						
	Lightning protection	**1**	ls	40,000.00	40,000		
	Miscellaneous						
	Demolition/phasing	**1**	ls	60,000.00	60,000		
	Temp power & lights	**1**	ls	50,000.00	50,000		
	Permits and fees	**1**	ls	30,000.00	30,000		
	SUBTOTAL					180,000	
	TOTAL - ELECTRICAL						**$3,041,240**
E10	***EQUIPMENT***						
E10	**EQUIPMENT, GENERALLY**						
	Fume Hoods	**6**	ea	14,000.00	84,000		
	Vocation and technology equipment	**1**	ls	200,000.00	200,000		
	SUBTOTAL					284,000	
	TOTAL - EQUIPMENT						**$284,000**
E20	***FURNISHINGS***						
E2010	**FIXED FURNISHINGS**						
	Rolling mesh shades at exterior windows in non circulation spaces	**7,875**	sf	7.00	55,125		
	Solid roller shades at all interior storefront and borrowed lights	**1**	ls	20,000.00	20,000		
	Recessed walk off carpet at vestibule entries	**380**	sf	45.00	17,100		
	Student science tables, allowance of 12 per room	**8**	rms	30,000.00	240,000		
	Base cabinets with solid surface countertop	**1,602**	lf	425.00	680,850		
	Base cabinet with phenolic countertop	**880**	lf	500.00	440,000		
	Upper cabinets	**1,492**	lf	220.00	328,240		
	Upper cabinets with marker board doors	**990**	lf	250.00	247,500		

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
	NEW FRESHMAN WING 3A						
	Teachers wardrobe	**55**	ea	1,400.00	77,000		
	Tall storage	**110**	ea	1,400.00	154,000		
	Allowance for miscellaneous casework in support spaces	**93,600**	gsf	0.50	46,800		
	SUBTOTAL					2,306,615	
E2020	**MOVABLE FURNISHINGS**						
	All movable furnishings to be provided and installed by owner						
	SUBTOTAL					NIC	
	TOTAL - FURNISHINGS						**$2,306,615**
F10	***SPECIAL CONSTRUCTION***						
F10	**SPECIAL CONSTRUCTION**						
	No items in this section						
	SUBTOTAL					0	
	TOTAL - SPECIAL CONSTRUCTION						**$0**
F20	***SELECTIVE BUILDING DEMOLITION***						
F2010	**BUILDING ELEMENTS DEMOLITION**						
	See main summary for demolition of existing buildings				See Summary		
	SUBTOTAL					0	
F2020	**HAZARDOUS COMPONENTS ABATEMENT**						
	See main summary for HazMat allowance				See Summary		
	SUBTOTAL					$0	
	TOTAL - SELECTIVE BUILDING DEMOLITION						**$0**

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
SITEWORK - OPTION 3A							
	G SITEWORK						
G10	**SITE PREPARATION & DEMOLITION**						
	Allowance for temporary work including provisions for trolley service	**1**	ls	50,000.00	50,000		
	Site construction fence/barricades	**3,700**	lf	14.00	51,800		
	Site construction fence gates	**1**	ea	10,000.00	10,000		
	Construction entrances/dust control/ street sweeping/ wheel washes allowance	**1**	ls	100,000.00	100,000		
	Allowance for site demolition of existing landscaping & hardscape including 1922 Building courtyard & 75 Armand paving/ curbs etc	**100,000**	sf	3.00	300,000		
	Demo paths at existing buildings	**14,000**	sf	1.50	21,000		
	Miscellaneous demolition; demo site furnishings, utilities etc	**1**	ls	50,000.00	50,000		
	Site Earthwork						
	Strip topsoil and remove				ETR		
	Fine grading				ETR		
	Silt fence/erosion control, wash bays, stock piles	**3,500**	lf	12.00	42,000		
	Silt fence maintenance and monitoring	**1**	ls	25,000.00	25,000		
	Hazardous Waste Remediation						
	Remove existing underground fuel storage tanks	**1**	ls		NIC		
	Dispose/treat contaminated soils	**1**	ls		NIC		
	SUBTOTAL					649,800	
G20	**SITE IMPROVEMENTS**						
	Asphalt Paving at new Service area & Bus parking;	*20,000*	sf				
	gravel base; 12" thick	**741**	cy	40.00	29,640		
	heavy duty asphalt; 4" thick	**2,222**	sy	30.00	66,660		
	Allowance for asphal7 repairs at connection to existing	**1**	ls	20,000.00	20,000		
	Allowance for new/ replacement of existing curbs	**1,580**	lf	40.00	63,200		
	Single solid lines, 4" thick	**1**	ls	5,000.00	5,000		
	Crosswalk hatchings, other road markings	**1**	ls	7,500.00	7,500		
	New crosswalks	**10**	loc	15,000.00	150,000		
	HC curb cuts; allow	**10**	loc	350.00	3,500		
	Signage	**1**	ls	30,000.00	30,000		
	Specialty paving areas	**19,500**	sf	30.00	585,000		
	Concrete pavers in new Courtyard	**5,500**	sf	25.00	137,500		
	New concrete paving/ extension of existing paths	**6,500**	sf	10.00	65,000		
	Allowance for 1922 Building courtyard upgrades; hardscape & landscape	**6,000**	sf	30.00	180,000		
	Allowance for replacement of existing paths at 1980 & 1922 Buildings	**14,000**	sf	10.00	140,000		
	Allowance for repairs where necessary at city sidewalks - assume minimal	**11,400**	sf	6.00	68,400		
	New city sidewalks	**3,000**	sf	15.00	45,000		
	Allowance for concrete pads	**1,000**	sf	25.00	25,000		
	Site Improvements						
	6' Ornamental fence at new Courtyard	**60**	lf	250.00	15,000		
	Double gates at Courtyard	**2**	ea	2,000.00	4,000		
	Artificial turf at Courtyard	**11,500**	sf	11.00	126,500		
	Other site improvements; accessibility improvements, ADA ramps & entry pads, raised planters, new walls, rails, fences etc.	**1**	ls	750,000.00	750,000		
	Site furnishings; bollards, benches, bike racks, trash receptacles, flagpole etc.	**1**	ls	75,000.00	75,000		
	SUBTOTAL					2,591,900	
	Landscaping						
	New landscaped areas	**35,000**	sf	3.00	105,000		
	Plantings - allowance	**1**	ls	150,000.00	150,000		
	Irrigation to landscaped areas	**35,000**	sf	1.50	52,500		
	SUBTOTAL					307,500	

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
SITEWORK - OPTION 3A							
G30	**CIVIL MECHANICAL UTILITIES**						
	Water supply; allowance, pricing includes E&B and bedding						
	New DI piping; 8"	**500**	lf	100.00	50,000		
	New DI piping; 8" Fire	**500**	lf	100.00	50,000		
	Connect to existing	**2**	loc	10,000.00	20,000		
	FD connection	**2**	ea	2,000.00	4,000		
	Gate valves	**4**	ea	750.00	3,000		
	Fire hydrant	**4**	ea	5,000.00	20,000		
	Sanitary allowance	**1**	ls	50,000.00	50,000		
	Storm water; Pricing includes E&B and bedding						
	Allowance for new/ modify existing drainage systems	**1**	ls	750,000	750,000		
	Gas service						
	E&B trench for new gas pipe - install by plumbing	**500**	lf	25.00	12,500		
	SUBTOTAL					959,500	
G40	**ELECTRICAL UTILITIES**						
	Power						
	Utility co. backcharges, allow				By Owner		
	Primary service conduits, concrete encased (allow)	**500**	lf	60.00	30,000		
	Primary cabling by utility co.				By Utility co.		
	New padmount transformer	**2**	ls		By Utility co.		
	Transformer pad	**2**	ea	2,500.00	5,000		
	4000A secondary service, Total of 2 runs (allow)	**100**	lf	1,180.00	118,000		
	Generator Ductbank						
	400A service, Total of 2 runs (allow)	**100**	lf	135.00	13,500		
	Communications						
	Communications service entrance				ETR		
	Site Lighting						
	Service access area lighting	**1**	ls	50,000.00	50,000		
	Pedestrian lighting	**1**	ls	50,000.00	50,000		
	Courtyard lighting	**1**	ls	30,000.00	30,000		
	Site Security						
	CCTV surveillance at site	**1**	ls	75,000.00	75,000		
	Blue phones	**3**	loc	10,000.00	30,000		
	SUBTOTAL					401,500	
	TOTAL - SITE DEVELOPMENT						***$4,910,200***

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Lowell High School
Lowell, MA

20-Apr-18

PSR Pricing Options

GFA 579,400

CONSTRUCTION COST SUMMARY

NEW OPTION A ON EXPANDED SITE

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
A10	**FOUNDATIONS**					
	A1010	Standard Foundations	$3,475,163			
	A1020	Special Foundations	$6,765,600			
	A1030	Lowest Floor Construction	$4,771,011	**$15,011,774**	$25.91	8.7%
A20	**BASEMENT EXCAVATION**					
	A2010	Basement Excavation	$2,339,769			
	A2030	Basement Walls	$0	**$2,339,769**	$4.04	1.4%
B10	**SUPERSTRUCTURE**					
	B1010	Upper Floor Construction	$19,818,820			
	B1020	Roof Construction	$5,088,448	**$24,907,268**	$42.99	14.4%
B20	**EXTERIOR CLOSURE**					
	B2010	Exterior Walls	$12,888,728			
	B2020	Windows/Curtainwall	$5,309,067			
	B2030	Exterior Doors	$222,800	**$18,420,595**	$31.79	10.7%
B30	**ROOFING**					
	B3010	Roof Coverings	$3,131,100			
	B3020	Roof Openings	$530,000	**$3,661,100**	$6.32	2.1%
C10	**INTERIOR CONSTRUCTION**					
	C1010	Partitions	$12,702,400			
	C1020	Interior Doors	$3,093,560			
	C1030	Specialties/Millwork	$4,515,718	**$20,311,678**	$35.06	11.8%
C20	**STAIRCASES**					
	C2010	Stair Construction	$1,556,000			
	C2020	Stair Finishes	$190,000	**$1,746,000**	$3.01	1.0%
C30	**INTERIOR FINISHES**					
	C3010	Wall Finishes	$2,252,336			
	C3020	Floor Finishes	$5,350,306			
	C3030	Ceiling Finishes	$6,007,288	**$13,609,930**	$23.49	7.9%
D10	**CONVEYING SYSTEMS**					
	D1010	Elevator	$1,045,000	**$1,045,000**	$1.80	0.6%
D20	**PLUMBING**					
	D20	Plumbing	$7,532,200	**$7,532,200**	$13.00	4.4%
D30	**HVAC**					
	D30	HVAC	$29,188,200	**$29,188,200**	$50.38	16.9%
D40	**FIRE PROTECTION**					
	D40	Fire Protection	$2,723,180	**$2,723,180**	$4.70	1.6%
D50	**ELECTRICAL**					
	D5010	Electrical Systems	$19,761,200	**$19,761,200**	$34.11	11.5%
E10	**EQUIPMENT**					
	E10	Equipment	$3,691,500	**$3,691,500**	$6.37	2.1%

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Lowell High School 20-Apr-18
Lowell, MA

PSR Pricing Options GFA 579,400

CONSTRUCTION COST SUMMARY

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
NEW OPTION A ON EXPANDED SITE						
E20	**FURNISHINGS**					
	E2010	Fixed Furnishings	$8,546,673			
	E2020	Movable Furnishings	NIC	**$8,546,673**	$14.75	5.0%
F10	**SPECIAL CONSTRUCTION**					
	F10	Special Construction	$0	**$0**	$0.00	0.0%
F20	**SELECTIVE BUILDING DEMOLITION**					
	F2010	Building Elements Demolition	$0			
	F2020	Hazardous Components Abatement	$0	**$0**	$0.00	0.0%
TOTAL DIRECT COST (Trade Costs)				***$172,496,067***	*$297.71*	*100.0%*

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Lowell High School
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PSR Pricing Options

GFA 579,400

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST

NEW OPTION A ON EXPANDED SITE

GROSS FLOOR AREA CALCULATION

Basement	68,800
First Floor	133,800
Second Floor	87,200
Third floor	89,000
Fourth floor	110,600
Fifth floor	90,000

TOTAL GROSS FLOOR AREA (GFA) **579,400** ***sf***

A10 FOUNDATIONS

A1010 STANDARD FOUNDATIONS

033000 CONCRETE

Grade Beams	*630*	*CY*	*$913*		
Pile Caps	*1,210*	*CY*	*$356*		
Basement Wall	*1,122*	*CY*	*$1,140*		
Pilasters	*61*	*CY*	*$750*		
Total Foundation Concrete	*3,023*	*CY*			
Perimeter Grade Beams; 18"x4'-6"					
Formwork	**10,800**	sf	20.00	216,000	
Re-bar, 90#/LF	**28,350**	lbs.	1.20	34,020	
Concrete material	**315**	cy	135.00	42,525	
Placing concrete	**315**	cy	60.00	18,900	
Form shelf	**1,200**	lf	10.00	12,000	
Grade Beam at braced frames; 24"x2'-6"					
Formwork	**8,100**	sf	20.00	162,000	
Re-bar, 75#/LF	**23,625**	lbs.	1.20	28,350	
Concrete material	**315**	cy	135.00	42,525	
Placing concrete	**315**	cy	60.00	18,900	
Basement walls; 16" thick					
Formwork	**43,400**	sf	20.00	868,000	
Re-bar, 7#/SF	**151,900**	lbs.	1.20	182,280	
Concrete material	**1,122**	cy	135.00	151,470	
Placing concrete	**1,122**	cy	60.00	67,320	
Form shelf	**1,050**	lf	10.00	10,500	
Continuous Pile cap at basement wall; assume 24"x48'					
Formwork	**12,000**	sf	22.00	264,000	
Re-bar, 90#/LF	**42,030**	lbs.	1.20	50,436	
Concrete material	**467**	cy	135.00	63,045	
Placing concrete	**467**	cy	60.00	28,020	
Pile caps, 5' x 5' x 2'-6" Pile caps at perimeter of classroom wings	**40**	ea			
Formwork	**2,000**	sf	22.00	44,000	
Re-bar	**8,730**	lbs.	1.20	10,476	
Concrete material	**97**	cy	135.00	13,095	
Placing concrete	**97**	cy	60.00	5,820	
Pile caps, 6' x 6' x 2'-6" Pile caps at Gym/Media	**17**	ea			
Formwork	**1,020**	sf	22.00	22,440	
Re-bar	**5,400**	lbs.	1.20	6,480	
Concrete material	**60**	cy	135.00	8,100	
Placing concrete	**60**	cy	60.00	3,600	
Pile caps, 8' x 8' x 2'-6 Pile caps, typical interior	**83**	ea			
Formwork	**6,640**	sf	22.00	146,080	
Re-bar	**46,440**	lbs.	1.20	55,728	
Concrete material	**516**	cy	135.00	69,660	
Placing concrete	**516**	cy	60.00	30,960	
Slab thickening at individual piles					
Intermediate slab support pile	**70**	cy	200.00	14,000	
Pilaster at perimeter columns; 24" x24"					
Pilasters, 24"x24", complete	**61**	cy	750.00	45,750	
Miscellaneous					
Elevator pits, 24" slab w/ 12" walls	**4**	ea	40,000.00	160,000	

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PSR Pricing Options

GFA 579,400

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW OPTION A ON EXPANDED SITE							
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Waterproofing at basement wall	**30,700**	sf	8.00	245,600		
	Troweled-on bituminous mastic at perimeter grade beam	**5,400**	sf	3.00	16,200		
072100	*THERMAL INSULATION*						
	4" Insulation & drainage mat at basement wall	**21,700**	sf	3.00	65,100		
	2" Insulation to grade beams	**5,400**	sf	3.00	16,200		
312000	*EARTHWORK*						
	Grade Beams						
	Excavation	**1,103**	cy	15.00	16,545		
	Remove off site	**1,103**	cy	16.00	17,648		
	Backfill with existing material	**473**	cy	12.00	5,676		
	Pile caps						
	Excavation	**2,118**	cy	15.00	31,770		
	Remove off site	**2,118**	cy	16.00	33,888		
	Backfill with existing material	**908**	cy	12.00	10,896		
	Soil disposal premiums						
	Premium for disposal of contaminated soil; assume 25% of volume	**736**	tns	60.00	44,160		
	Miscellaneous						
	Dewatering	**1**	ls	75,000.00	75,000		
	SUBTOTAL					3,475,163	
A1020	**SPECIAL FOUNDATIONS**	Average pile length 30'-50' long per FBR Report dated 3.28.18 (page 4)					
	Mobilization	**1**	ls	50,000.00	50,000		
	Load test	**1**	ls	30,000.00	30,000		
	(1) 95 Ton, Conical point pile **@ 3' o/c** at perimeter of basement walls	**25,833**	vlf	100.00	2,583,300		
	(3) 95 Ton, Conical point pile at perimeter of Classroom wings	**6,000**	vlf	100.00	600,000		
	(4) 95 Ton, Conical point pile at Gymnasium/Media wing	**3,333**	vlf	100.00	333,300		
	(6) 95 Ton, Conical point pile at interior columns	**25,000**	vlf	100.00	2,500,000		
	(1) 95 Ton, Conical point pile at intermediate slab supports (every 800sf of lowest slab)	**6,690**	vlf	100.00	669,000		
	SUBTOTAL					6,765,600	
A1030	**LOWEST FLOOR CONSTRUCTION**						
	Excavation at level 1 slab						
	Slab excavation	**4,815**	cy	15.00	72,225		
	Remove off site	**4,815**	cy	16.00	77,040		
	Soil disposal premiums						
	Premium for disposal of contaminated soil; assume 25% of volume	**1,926**	tns	60.00	115,560		
	Structural; Slab on grade, 12" thick						
	Gravel fill, assume 12"	**4,956**	cy	36.00	178,416		
	4" Rigid insulation	**133,800**	sf	4.00	535,200		
	Waterproofing	**133,800**	sf	6.00	802,800		
	Compact existing sub-grade	**133,800**	sf	0.50	66,900		
	Formwork	**2,675**	sf	12.00	32,100		
	Rebar; 8.5 lbs/sf	**1,137,300**	lbs	1.20	1,364,760		
	Concrete - 12" thick	**5,203**	cy	125.00	650,375		
	Placing concrete	**5,203**	cy	45.00	234,135		
	Finishing and curing concrete	**133,800**	sf	1.50	200,700		
	Barrier I	**5,203**	cy	60.00	NR		
	Control joints - saw cut	**133,800**	sf	0.10	13,380		
	Premium for sloped slab at Auditorium	**11,627**	sf	10.00	116,270		
	Underslab drainage system @ basement level	**68,800**	sf	3.00	206,400		
	Perimeter drain	**1,125**	lf	22.00	24,750		
	Miscellaneous						

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PSR Pricing Options GFA 579,400

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW OPTION A ON EXPANDED SITE							
	New loading dock	**1**	ea	30,000.00	30,000		
	Equipment pads	**1**	ls	50,000.00	50,000		
	SUBTOTAL					4,771,011	
	TOTAL - FOUNDATIONS						**$15,011,774**
A20	***BASEMENT CONSTRUCTION***						
A2010	**BASEMENT EXCAVATION**						
	Basement excavation	**43,437**	cy	15.00	651,555		
	Remove off site	**43,437**	cy	12.00	521,244		
	Premium for disposal of contaminated soil; assume 25% of volume	**6,116**	tns	60.00	366,960		
	Backfill with imported material	**2,667**	cy	30.00	80,010		
	Allowance for sheeting/ shoring	**14,400**	sf	50.00	720,000		
	SUBTOTAL					2,339,769	
A2020	**BASEMENT WALLS**						
	Included w/ foundations						
	SUBTOTAL					0	
	TOTAL - BASEMENT CONSTRUCTION						**$2,339,769**
B10	***SUPERSTRUCTURE***						
		15.50	lbs/sf				
B1010	**FLOOR CONSTRUCTION**	4,490	tns				
	Floor Structure - Steel:						
	Steel beams and columns; 15.5#/SF including relieving angles at exterior walls	**3,453**	tns	3,500.00	12,085,500		
	Premium for HSS	**863**	tns	300.00	258,900		
	Shear studs	**89,120**	ea	2.50	222,800		
	Floor Structure						
	2" 18 Ga. Metal galvanized floor deck	**445,600**	sf	3.75	1,671,000		
	Premium for acoustic deck & additional acoustic separation components at 4th floor Media Center	**21,900**	sf	15.00	328,500		
	4 1/2" Normal weight concrete fill at upper floor decks	**512,440**	sf	8.00	4,099,520		
	Barrier I	**7,781**	cy	60.00	NR		
	Miscellaneous						
	Allowance for expansion/ seismic joints	**1**	ls	75,000.00	75,000		
	2hr Fire proofing to columns and beams (at Type IB Construction)	**445,600**	sf	2.25	1,002,600		
	Intumescent paint	**1**	ls	50,000.00	50,000		
	Fire stopping floors	**1**	ls	25,000.00	25,000		
	SUBTOTAL					19,818,820	
B1020	**ROOF CONSTRUCTION**						
	Roof Structure - Steel:						
	Steel beams/Joists; 15.5#/SF	**1,037**	tns	3,500.00	3,629,500		
	Premium for HSS	**259**	tns	300.00	77,700		
	Exposed steel	**1**	ls	75,000.00	75,000		
	Canopy framing	**1,500**	sf	35.00	52,500		
	Roof Structure						
	3" Acoustic deck allowance @ Gymnasium	**28,408**	sf	9.00	255,672		
	3" 18 Ga. galvanized Metal Roof Deck	**105,392**	sf	4.00	421,568		
	Miscellaneous						
	Framing at rooftop screens - allow 500 lf	**25**	tns	4,500.00	112,500		
	Concrete under RTU's	**20,000**	sf	12.00	240,000		
	2hr Fire proofing to columns and beams (at Type IB Construction) excluded at Gym & Auditorium	**99,559**	sf	2.25	224,008		

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW OPTION A ON EXPANDED SITE							
	SUBTOTAL					5,088,448	
	TOTAL - SUPERSTRUCTURE						**$24,907,268**
B20	***EXTERIOR CLOSURE***						
B2010	**EXTERIOR WALLS**						
	Exterior Wall Area - Solid 75%	*128,503*	sf				
042000	*MASONRY*						
	Brick veneer, running bond (25%)	**42,834**	sf	40.00	1,713,360		
	CMU backup at Gymnasium	**8,250**	sf	24.00	198,000		
	Staging to exterior wall	**171,337**	sf	4.00	Incl		
055000	*MISC. METALS*						
	Signage at entrances	**1**	ls	25,000.00	25,000		
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Air barrier	**128,503**	sf	6.50	835,270		
	Air barrier/flashing at windows	**25,196**	lf	6.25	157,475		
	Miscellaneous sealants to closure	**128,503**	sf	1.00	128,503		
072100	*THERMAL INSULATION*						
	4" Mineral wool insulation	**128,503**	sf	4.00	514,012		
	4" Spray insulation	**128,503**	sf	5.00	642,515		
076400	*CLADDING*						
	Alucobond composite metal panels (50%)	**85,669**	sf	75.00	6,425,175		
	Wood-look linear plastic soffit system at canopy	**1,500**	sf	62.00	93,000		
	Corrugated aluminum panel roof screen, Morin or similar	**5,000**	sf	55.00	275,000		
092900	*GYPSUM BOARD ASSEMBLIES*						
	6" metal stud backup	**120,253**	sf	9.00	1,082,277		
	Gypsum Sheathing	**120,253**	sf	2.75	330,696		
	Drywall lining to interior face of stud backup	**120,253**	sf	3.30	396,835		
	Drywall lining & furring to interior face of basement wall	**21,700**	sf	3.30	71,610		
	SUBTOTAL					12,888,728	
B2020	**WINDOWS**						
	Exterior Wall Area - Glazed Assume 25%	*42,834*	sf				
061000	*ROUGH CARPENTRY*						
	Wood blocking at openings	**25,196**	lf	8.00	201,568		
070001	*WATERPROOFING, DAMPPROOFING AND CAULKING*						
	Backer rod & double sealant	**25,196**	lf	9.00	226,764		
080001	*METAL WINDOWS*						
	Windows/Storefront, double glazed; 20% of glazed area	**8,567**	sf	90.00	771,030		
	Curtainwall, Kawneer 1600 or equal, double glazed; 80% of glazed area	**34,267**	sf	115.00	3,940,705		
	Sunshades; horizontal	**800**	lf	130.00	104,000		
089000	*LOUVERS*						
	Louvers	**1,000**	sf	65.00	65,000		
	SUBTOTAL					5,309,067	
B2030	**EXTERIOR DOORS**						
	Glazed entrance doors including frame and hardware; double door	**12**	pr	8,500.00	102,000		
	Premium for school guard at vestibule	**1**	ls	20,000.00	20,000		

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW OPTION A ON EXPANDED SITE							
	Allowance for auto door openers	**1**	ls	20,000.00	20,000		
	HM doors, frames and hardware- single	**12**	ea	2,000.00	24,000		
	HM doors, frames and hardware- double	**8**	pr	3,000.00	24,000		
	Overhead doors; allowance	**6**	ea	5,000.00	30,000		
	Backer rod & double sealant	**400**	lf	4.00	1,600		
	Wood blocking at openings	**400**	lf	3.00	1,200		
	SUBTOTAL					222,800	
	TOTAL - EXTERIOR CLOSURE						**$18,420,595**
B30	***ROOFING***						
B3010	**ROOF COVERINGS**						
	Membrane roofing, complete	**133,800**	sf	22.00	2,943,600		
	Coping system	**3,000**	lf	45.00	135,000		
	Green roof tray system on membrane roof at canopy	**1,500**	sf	25.00	37,500		
	Roof ladders	**1**	ls	15,000.00	15,000		
	SUBTOTAL					3,131,100	
B3020	**ROOF OPENINGS**						
	Skylights, allow	**1**	ls	500,000.00	500,000		
	Roof hatch	**4**	loc	2,500.00	10,000		
	Smoke vents @ Stage	**2**	loc	10,000.00	20,000		
	SUBTOTAL					530,000	
	TOTAL - ROOFING						**$3,661,100**
C10	***INTERIOR CONSTRUCTION***						
C1010	**PARTITIONS**						
	Miscellaneous partitions/glazed partitions/sidelights/blocking etc.	**579,400**	gsf	21.00	12,167,400		
	Borrowed lights	**400**	lf	525.00	210,000		
	Operable partitions for use between adjoining classrooms; assumed 25'-0" long x 10'-0" high	**20**	loc	16,250.00	325,000		
	SUBTOTAL					12,702,400	
C1020	**INTERIOR DOORS**						
	3'-0" wide sidelight at classroom entry	**156**	ea	1,260.00	196,560		
	Interior doors, frames and hardware	**579,400**	gsf	5.00	2,897,000		
	SUBTOTAL					3,093,560	
C1030	**SPECIALTIES / MILLWORK**						
	Backer panels in electrical closets	**1**	ls	8,000.00	8,000		
	Window sills	**3,779**	lf	40.00	151,160		
	Allowance for circulation desk at media center	**1**	ls	10,000.00	10,000		
	Allowance for admin desks at main office, house/academy offices, student support office and bank	**8**	loc	6,000.00	48,000		
	2-tier metal student lockers 18" x 15" x 48" h	**3,520**	opes	190.00	668,800		
	Staff lockers	**50**	ea	350.00	17,500		
	Athletic lockers at gym locker rooms (8,250sf)	**1**	ls	100,000.00	100,000		
	Railings to open to below areas	**50**	lf	350.00	17,500		
	Gang bathroom accessories including electric handryers	**28**	rms	3,150.00	88,200		
	Allowance for single bathroom accessories	**8**	rms	500.00	4,000		
	Janitors closet accessories	**5**	rms	300.00	1,500		
	HDPE Toilet Partitions at gang bathrooms	**28**	loc	10,000.00	280,000		
	Allowance for miscellaneous specialties; wall protection, fire extinguishers	**579,400**	gsf	0.50	289,700		
	Brushed aluminum standoff signage at bank, cafeteria, media center, nurses suite, and main office	**28**	loc	5,000.00	140,000		
	Markerboards	**31,344**	sf	22.00	689,568		
	Tackboards	**17,392**	sf	20.00	347,840		

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CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW OPTION A ON EXPANDED SITE							
	Display cases	**1,920**	sf	90.00	172,800		
	Stainless steel plaque 18 x 24	**1**	loc	2,500.00	2,500		
	Catwalk in Auditorium/ Stage	**1**	ls	175,000.00	175,000		
	Miscellaneous metals throughout building	**579,400**	gsf	1.00	579,400		
	Rough blocking	**579,400**	gsf	0.15	86,910		
	Miscellaneous sealants throughout building	**579,400**	gsf	0.75	434,550		
	Code compliant signage	**579,400**	gsf	0.35	202,790		
	SUBTOTAL					4,515,718	
	TOTAL - INTERIOR CONSTRUCTION						**$20,311,678**
C20	***STAIRCASES***						
C2010	**STAIR CONSTRUCTION**						
	Metal pan stair; egress stair (includes 2 to roof)	**38**	flt	35,000.00	1,330,000		
	Commons tired seating allowance	**1**	flt	100,000.00	100,000		
	Auditorium stair & rails - allowance	**1**	ls	50,000.00	50,000		
	Concrete fill to stairs	**38**	flt	2,000.00	76,000		
	SUBTOTAL					1,556,000	
C2020	**STAIR FINISHES**						
	High performance coating to stairs including all railings etc.	**38**	flt	3,000.00	114,000		
	Concrete sealer at stairs - landings	**3,800**	sf	2.00	7,600		
	Norament treads at stairs - treads & risers	**4,560**	lft	15.00	68,400		
	SUBTOTAL					190,000	
	TOTAL - STAIRCASES						**$1,746,000**
C30	***INTERIOR FINISHES***						
C3010	**WALL FINISHES**						
	Tectum panels in music rooms	**1,305**	sf	18.00	23,490		
	Painting throughout	**579,400**	gsf	2.50	1,448,500		
	24x12 Porcelain tile wainscot at corridor - classroom wing; 4' high	**21,080**	sf	24.00	505,920		
	Tectum wall panels at gym	**2,730**	sf	18.00	49,140		
	Tectum wall panels at TV studio	**477**	sf	18.00	8,586		
	Wood wainscot at auditorium walls, 3'-6" high	**945**	sf	60.00	56,700		
	Custom tectum wall panels and reflectors at Auditorium	**1**	ls	150,000.00	150,000		
	Hardwood trim at tectum panels in gym and café	**1**	ls	10,000.00	10,000		
	SUBTOTAL					2,252,336	
C3020	**FLOOR FINISHES**						
	Linoleum tile flooring	**355,260**	sf	7.00	2,486,820		
	Sealed concrete	**57,375**	sf	2.00	114,750		
	Poured epoxy	**21,330**	sf	12.00	255,960		
	Carpet	**5,988**	sy	45.00	269,460		
	Quarry tile	**9,800**	sf	26.00	254,800		
	Quarry tile base	**735**	lf	18.00	13,230		
	Wood athletic floor in Gymnasium	**9,650**	sf	18.00	173,700		
	Athletic flooring in Exercise rooms & Running track	**25,950**	sf	14.00	363,300		
	New resilient bases	**37,660**	lf	3.00	112,980		
	Moisture mitigation	**435,102**	sf	3.00	1,305,306		
	SUBTOTAL					5,350,306	
C3030	**CEILING FINISHES**						
	2' x 2' ACT	**14,400**	sf	5.50	79,200		
	2' x 4' ACT	**17,520**	sf	5.00	87,600		
	2' x 4' ACT, health zone	**9,800**	sf	6.00	58,800		
	2' x 6' ACT	**13,040**	sf	8.00	104,320		
	Moisture resistant GWB ceilings	**18,930**	sf	16.00	302,880		

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Lowell High School 20-Apr-18
Lowell, MA

PSR Pricing Options GFA 579,400

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW OPTION A ON EXPANDED SITE							
	Sloped ACT ceiling 2x4 at music rooms, teacher planning, science rooms, visual art rooms, SPED and typical classrooms	**368,400**	sf	5.75	2,118,300		
	GWB soffit	**88,418**	sf	25.00	2,210,450		
	Paint exposed ceiling	**51,000**	sf	2.00	102,000		
	Paint GWB ceilings	**107,348**	sf	0.80	85,878		
	Custom acoustical ceiling panels at Auditorium	**1**	ls	250,000.00	250,000		
	GWB ceiling with wood trim at Auditorium and Stage	**13,508**	sf	45.00	607,860		
	SUBTOTAL					6,007,288	
	TOTAL - INTERIOR FINISHES						**$13,609,930**
D10	***CONVEYING SYSTEMS***						
D1010	**ELEVATOR**						
	Accessible lift at stage	**1**	ea	35,000.00	35,000		
	Elevators; 2 stop, Freight	**1**	ea	110,000.00	110,000		
	Elevators; 6 stop	**3**	ea	300,000.00	900,000		
	SUBTOTAL					1,045,000	
	TOTAL - CONVEYING SYSTEMS						**$1,045,000**
D20	***PLUMBING***						
D20	**PLUMBING, GENERALLY** *New building contains science rooms, classrooms, auditorium, cafeteria, gym & other training classrooms. Hot water from gas fired heaters*						
	Plumbing equipment	**579,400**	gsf	1.50	869,100		
	Plumbing fixtures	**579,400**	gsf	2.25	1,303,650		
	Domestic water pipe with fittings & hangers	**579,400**	gsf	2.50	1,448,500		
	Domestic water pipe insulation	**579,400**	gsf	1.50	869,100		
	Sanitary waste pipe with fittings & hangers	**579,400**	gsf	2.50	1,448,500		
	Tempered water pipe with fittings & hangers	**579,400**	gsf	0.25	144,850		
	Acid waste pipe with fittings & hangers	**579,400**	gsf	0.25	144,850		
	Storm water pipe with fittings & hangers	**579,400**	gsf	1.00	579,400		
	Gas pipe with fittings & hangers	**579,400**	gsf	0.75	434,550		
	Miscellaneous	**579,400**	gsf	0.50	289,700		
	SUBTOTAL					7,532,200	
	TOTAL - PLUMBING						**$7,532,200**
D30	***HVAC***						
D30	**HVAC, GENERALLY** *New building HVAC system contains HW boilers, water cooled chillers & cooling tower, RTU's with ERW, VAV systems, partial 4 pipe chilled beam system in selective areas & displacement diffuser system*						
	HVAC Equipment						
	Gas fired HW boiler 4500 MBH	**6**	ea	135,000.00	810,000		
	Hot water pumps with VFD	**4**	ea	20,000.00	80,000		
	Water cooled chiller 305 ton	**3**	ea	610,000.00	1,830,000		
	Cooling tower with filtration 915 ton	**1**	ea	320,250.00	320,250		
	Chilled water pump with VFD	**2**	ea	25,000.00	50,000		
	Condenser water pump with VFD	**2**	ea	30,000.00	60,000		
	Heating and cooling devices throughout including active chilled beams to admin, TV studio, media center. CUH's, fintube...	**579,400**	sf	3.00	1,738,200		
	Air Distribution Equipment						
	AHU with HW, CHW coil & ERW classrooms	**190,200**	cfm	15.00	2,853,000		
	AHU with HW, CHW coil & ERW gym, pe	**34,600**	cfm	15.00	519,000		
	AHU with HW, CHW coil & ERW locker rm, fitness	**18,600**	cfm	15.00	279,000		
	AHU with HW, CHW coil & ERW aud & stage	**14,000**	cfm	15.00	210,000		
	AHU with HW, CHW coil & ERW admin & media	**13,600**	cfm	15.00	204,000		

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PSR Pricing Options GFA 579,400

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW OPTION A ON EXPANDED SITE							
	AHU with HW, CHW coil & ERW kit, sup, rec	**7,100**	cfm	15.00	106,500		
	AHU with HW, CHW coil & ERW cafeteria	**17,700**	cfm	15.00	265,500		
	AHU with HW, CHW coil & ERW culinary arts & class	**7,200**	cfm	15.00	108,000		
	AHU with HW, CHW coil & ERW tv studios	**2,000**	cfm	15.00	30,000		
	Make up air unit kitchen	**1**	ls	40,000.00	40,000		
	Make up air unit culinary	**1**	ls	30,000.00	30,000		
	Specialty exhaust for dust collectors, kilns, science room fume hoods.....	**1**	ls	100,000.00	100,000		
	Miscellaneous air distribution equipment	**579,400**	gsf	3.00	1,738,200		
	Hot water piping with fittings & hangers	**579,400**	gsf	4.50	2,607,300		
	Chilled water piping with fittings & hangers	**579,400**	gsf	2.00	1,158,800		
	Condenser water piping with fittings & hangers	**579,400**	gsf	0.75	434,550		
	Pipe insulation	**579,400**	gsf	2.50	1,448,500		
	Sheet metal & accessories	**579,400**	gsf	11.00	6,373,400		
	Automatic temperature controls DDC; with Aircuity Control System	**579,400**	gsf	7.50	4,345,500		
	System testing & balancing	**579,400**	gsf	1.00	579,400		
	Miscellaneous	**579,400**	gsf	1.50	869,100		
	SUBTOTAL					29,188,200	
	TOTAL - HVAC						**$29,188,200**
D40	***FIRE PROTECTION***						
D40	**FIRE PROTECTION, GENERALLY**						
	Fire protection system	**579,400**	gsf	4.70	2,723,180		
	SUBTOTAL					2,723,180	
	TOTAL - FIRE PROTECTION						**$2,723,180**
D50	***ELECTRICAL***						
D50	**ELECTRICAL, GENERALLY**						
	Gear & Distribution						
	Normal						
	4000A main switchboard	**2**	ea	110,000.00	220,000		
	Associated panelboards and feeders	**579,400**	gsf	2.00	1,158,800		
	Emergency						
	600KW diesel generator with sound atten. cover	**1**	ea	185,000.00	185,000		
	Associated ATS's, panelboards and feeders	**579,400**	gsf	1.50	869,100		
	45KW UPS	**2**	ea	30,000.00	60,000		
	Provisions for PV system (Rough-in only)	**1**	ls	10,000.00	10,000		
	Grounding	**1**	ls	40,000.00	40,000		
	Equipment Wiring						
	Equipment wiring feed and connections	**579,400**	gsf	1.75	1,013,950		
	Elevator feed and connection	**2**	ea	4,000.00	8,000		
	Elevator cab power feed and connection	**2**	ea	1,500.00	3,000		
	Chiller unit feed and connection	**3**	ea	10,500.00	31,500		
	Cooling tower feed and connection	**1**	ea	6,500.00	6,500		
	AHU feed and connection	**9**	ea	4,500.00	40,500		
	Pump feed and connection	**6**	ea	1,500.00	9,000		
	Boiler feed and connection	**6**	ea	1,500.00	9,000		
	MAU feed and connection	**2**	ea	3,520.00	7,040		
	VFD's feed and connection only	**6**	ea	950.00	5,700		
	Kitchen equipment feed and connections	**1**	ls	30,000.00	30,000		
	SUBTOTAL					3,707,090	
D5020	**LIGHTING & POWER**						
	LED lighting allowance	**579,400**	gsf	6.00	3,476,400		
	Gymnasium lighting (allow)	**24**	ea	550.00	13,200		
	Emergency/egress lighting	**579,400**	gsf	0.50	289,700		
	Lighting to exterior	**1**	ls	30,000.00	30,000		
	Lighting controls						
	Automated lighting controls system	**579,400**	gsf	1.75	1,013,950		

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PSR Pricing Options GFA 579,400

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW OPTION A ON EXPANDED SITE							
	Branch devices						
	Branch devices	**579,400**	gsf	0.60	347,640		
	Lighting and branch circuitry						
	Branch circuitry	**579,400**	gsf	5.50	3,186,700		
	SUBTOTAL					8,357,590	
D5030	**COMMUNICATION & SECURITY SYSTEMS**						
	Fire Alarm						
	Control panel	**1**	ea	12,000.00	12,000		
	Annunciator	**1**	ea	15,000.00	15,000		
	Beacon	**1**	ea	225.00	225		
	Knox box	**1**	ea	600.00	600		
	Master box	**1**	ea	3,800.00	3,800		
	Devices and cabling (Including Mass. notification)	**579,400**	gsf	3.00	1,738,200		
	Testing and programming	**1**	ls	4,500.00	4,500		
	BDA/DAS system	**1**	ls	300,000.00	300,000		
	Telephone/Data/CATV						
	MDF/IDF closets	**1**	ls	30,000.00	30,000		
	Devices and cabling	**579,400**	gsf	2.00	1,158,800		
	Backbone cabling (allow)	**500**	lf	25.00	12,500		
	Rough-in	**579,400**	gsf	1.00	579,400		
	Clock/PA System						
	Head end	**1**	ls	50,000.00	50,000		
	Devices and cabling	**579,400**	gsf	0.60	347,640		
	Rough-in	**579,400**	gsf	0.20	115,880		
	Two Way Communications System						
	Elevator lobby two way communication system	**1**	ls	30,000.00	30,000		
	Sound system						
	Cafeteria sound system	**1**	ls	20,000.00	20,000		
	Gymnasium						
	Scoreboard shot clocks and circuitry	**2**	ls	13,500.00	27,000		
	Gym equipment feed and connections	**1**	ls	12,000.00	12,000		
	TV Studio						
	Electrical to TV Studio	**1**	ls	30,000.00	30,000		
	Auditorium						
	Stage lighting and dimming system	**1**	ls	150,000.00	150,000		
	Auditorium sound system	**1**	ls	50,000.00	50,000		
	Rough-in with 120V power	**1**	ls	25,000.00	25,000		
	Audio/visual systems rough-in with 120V power	**1**	ls	50,000.00	50,000		
	AV General Building						
	AV equipment provided by others				By Others		
	Rough-in and power	**304,300**	gsf	0.25	76,075		
	Security System						
	Head end	**1**	ls	35,000.00	35,000		
	Devices and cabling	**579,400**	gsf	2.50	1,448,500		
	Rough-in	**579,400**	gsf	1.00	579,400		
	SUBTOTAL					6,901,520	
D5040	**OTHER ELECTRICAL SYSTEMS**						
	Lightning protection	**1**	ls	230,000.00	230,000		
	Seismic	**1**	ls	10,000.00	10,000		
	Testing	**1**	ls	5,000.00	5,000		
	Miscellaneous						
	Temp power & lights	**1**	ls	300,000.00	300,000		
	Permits and fees	**1**	ls	250,000.00	250,000		
	SUBTOTAL					795,000	
	TOTAL - EQUIPMENT						**$19,761,200**
E10	***EQUIPMENT***						
E10	**EQUIPMENT, GENERALLY**						
	Gym wall pads	**245**	lf	60.00	14,700		

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PSR Pricing Options

GFA 579,400

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW OPTION A ON EXPANDED SITE							
	Gymnasium hard panel dividing net; electrically operated (one location)	**5,000**	sf	16.00	80,000		
	Gymnasium fabric dividing net; electrically operated (four locations)	**7,200**	sf	12.00	86,400		
	Adjustable chin up bar	**3**	loc	300.00	900		
	Volley ball standards	**1**	ls	1,500.00	1,500		
	Scoreboard and shot clock				In Electric		
	Basketball backstops; retractable	**10**	ea	10,000.00	100,000		
	Telescoping bleachers (1200 seat capacity)	**1**	ls	156,000.00	156,000		
	Theatrical stage curtains, rigging, lighting and controls	**1**	ls	450,000.00	450,000		
	Auditorium AV equipment, allow	**1**	ls	200,000.00	200,000		
	Thru wall fume hood at science prep	**10**	ea	14,000.00	140,000		
	Auditorium seating (1200 seats)	**1**	ls	420,000.00	420,000		
	Auditorium projection screen	**1**	loc	20,000.00	20,000		
	Allowance for miscellaneous equipment; projection screens, residential appliances etc	**1**	ls	80,000.00	80,000		
	Allowance for residential equipment at life skills labs	**4**	loc	11,500.00	46,000		
	Kitchen equipment	**1**	ls	840,000.00	840,000		
	Culinary arts equipment	**1**	ls	816,000.00	816,000		
	Vocation and technology equipment	**1**	ls	200,000.00	200,000		
	Kiln	**1**	ls	5,000.00	5,000		
	Loading dock equipment	**1**	loc	20,000.00	20,000		
	Electrically operated projection screens	**1**	loc	15,000.00	15,000		
	SUBTOTAL					3,691,500	
	TOTAL - EQUIPMENT						**$3,691,500**
E20	***FURNISHINGS***						
E2010	**FIXED FURNISHINGS**						
	Rolling mesh shades at exterior windows in non circulation spaces	**29,984**	sf	7.00	209,888		
	Solid roller shades at all interior storefront and borrowed lights	**1**	ls	50,000.00	50,000		
	Recessed walk off carpet at vestibule entries	**1,200**	sf	45.00	54,000		
	Base cabinets with solid surface countertop	**5,893**	lf	425.00	2,504,525		
	Base cabinet with phenolic countertop	**2,960**	lf	500.00	1,480,000		
	Upper cabinets	**3,958**	lf	220.00	870,760		
	Upper cabinets with marker board doors	**4,895**	lf	250.00	1,223,750		
	Student science tables, allowance of 12 per room	**28**	rms	30,000.00	840,000		
	Teachers wardrobe	**229**	ea	1,400.00	320,600		
	Tall storage	**482**	ea	1,400.00	674,800		
	Music storage cabinets	**135**	lf	1,100.00	148,500		
	Bookcase allowance at media center	**1**	ls	25,000.00	25,000		
	Allowance for miscellaneous casework in support spaces	**579,400**	gsf	0.25	144,850		
	SUBTOTAL					8,546,673	
E2020	**MOVABLE FURNISHINGS**						
	All movable furnishings to be provided and installed by owner						
	SUBTOTAL					NIC	
	TOTAL - FURNISHINGS						**$8,546,673**
F10	***SPECIAL CONSTRUCTION***						
F10	**SPECIAL CONSTRUCTION**						
	No items in this section						
	SUBTOTAL						
	TOTAL - SPECIAL CONSTRUCTION						**$0**

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Lowell High School
Lowell, MA

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PSR Pricing Options

GFA 579,400

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
NEW OPTION A ON EXPANDED SITE							
F20	***SELECTIVE BUILDING DEMOLITION***						
F2010	**BUILDING ELEMENTS DEMOLITION**						
	See main summary for demolition of existing buildings				See Summary		
	SUBTOTAL						
F2020	**HAZARDOUS COMPONENTS ABATEMENT**						
	See main summary for HazMat allowance				See Summary		
	SUBTOTAL						
	TOTAL - SELECTIVE BUILDING DEMOLITION						**$0**

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
	SITEWORK - NEW OPTION A						
	G SITEWORK						
G10	**SITE PREPARATION & DEMOLITION**						
	Allowance for temporary work including provisions for trolley service	**1**	ls	50,000.00	50,000		
	Site construction fence/barricades	**2,950**	lf	14.00	41,300		
	Site construction fence gates	**1**	ea	10,000.00	10,000		
	Construction entrances/dust control/ street sweeping/ wheel washes allowance	**1**	ls	100,000.00	100,000		
	Allowance for site demolition of existing landscaping & hardscape including 1922 Building courtyard & 75 Armand paving/ curbs etc	**100,000**	sf	3.00	300,000		
	Demo paths at existing 1980 building	**4,800**	sf	1.50	7,200		
	Miscellaneous demolition; demo site furnishings, utilities etc	**1**	ls	50,000.00	50,000		
	Site Earthwork						
	Strip topsoil and remove				ETR		
	Fine grading				ETR		
	Silt fence/erosion control, wash bays, stock piles	**3,000**	lf	12.00	36,000		
	Silt fence maintenance and monitoring	**1**	ls	25,000.00	25,000		
	Hazardous Waste Remediation						
	Remove existing underground fuel storage tanks	**1**	ls		NIC		
	Dispose/treat contaminated soils	**1**	ls		NIC		
	SUBTOTAL					619,500	
G20	**SITE IMPROVEMENTS**						
	Asphalt Paving at new Service area, Driveway & Bus parking;	*15,000*	sf				
	gravel base; 12" thick	**556**	cy	40.00	22,240		
	heavy duty asphalt; 4" thick	**1,667**	sy	30.00	50,010		
	Allowance for asphalt repairs at connection to existing	**1**	ls	20,000.00	20,000		
	Allowance for new/ replacement of existing curbs	**1,820**	lf	40.00	72,800		
	Single solid lines, 4" thick	**1**	ls	5,000.00	5,000		
	Crosswalk hatchings, other road markings	**1**	ls	7,500.00	7,500		
	HC curb cuts; allow	**8**	loc	350.00	2,800		
	New crosswalks	**10**	loc	15,000.00	150,000		
	Signage	**1**	ls	30,000.00	30,000		
	Concrete pavers	**8,000**	sf	25.00	200,000		
	Concrete paving	**8,000**	sf	10.00	80,000		
	Specialty paving areas	**8,300**	sf	30.00	249,000		
	Allowance for replacement of existing paths at 1980 Building	**4,800**	sf	10.00	48,000		
	Allowance for repairs where necessary at city sidewalks - assume minimal	**2,400**	sf	6.00	14,400		
	New city sidewalks	**1,950**	sf	15.00	29,250		
	Allowance for concrete pads	**1,000**	sf	25.00	25,000		
	Site Improvements						
	Other site improvements; accessibility improvements, ADA ramps & entry pads, raised planters, new walls, rails, fences etc.	**1**	ls	650,000.00	650,000		
	Site furnishings; bollards, benches, bike racks, trash receptacles, flagpole etc.	**1**	ls	75,000.00	75,000		
	SUBTOTAL					1,731,000	
	Landscaping						
	New landscaped areas	**35,000**	sf	3.00	105,000		
	Plantings - allowance	**1**	ls	150,000.00	150,000		
	Irrigation to landscaped areas	**35,000**	sf	1.50	52,500		
	SUBTOTAL					307,500	
G30	**CIVIL MECHANICAL UTILITIES**						
	Water supply; allowance, pricing includes E&B and bedding						
	New DI piping; 8"	**500**	lf	100.00	50,000		
	New DI piping; 8" Fire	**500**	lf	100.00	50,000		

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
SITEWORK - NEW OPTION A							
	Connect to existing	**2**	loc	10,000.00	20,000		
	FD connection	**2**	ea	2,000.00	4,000		
	Gate valves	**4**	ea	750.00	3,000		
	Fire hydrant	**4**	ea	5,000.00	20,000		
	Sanitary allowance	**1**	ls	50,000.00	50,000		
	Storm water; Pricing includes E&B and bedding						
	Allowance for new/ modify existing drainage systems	**1**	ls	750,000	750,000		
	Gas service						
	E&B trench for new gas pipe - install by plumbing	**500**	lf	25.00	12,500		
	SUBTOTAL					959,500	
G40	**ELECTRICAL UTILITIES**						
	Power						
	Utility co. backcharges, allow				By Owner		
	Primary service conduits, concrete encased (allow)	**500**	lf	60.00	30,000		
	Primary cabling by utility co.				By Utility co.		
	New padmount transformer	**3**	ls		By Utility co.		
	Transformer pad	**3**	ea	2,500.00	7,500		
	4000A secondary service, Total of 2 runs (allow)	**100**	lf	1,180.00	118,000		
	Generator Ductbank						
	800A service, Total of 2 runs (allow)	**100**	lf	320.00	32,000		
	Communications						
	Communication ductbank				ETR		
	Site Lighting						
	Service access area lighting	**1**	ls	50,000.00	50,000		
	Pedestrian lighting	**1**	ls	50,000.00	50,000		
	Courtyard lighting	**1**	ls	30,000.00	30,000		
	Site Security						
	CCTV surveillance at site	**1**	ls	75,000.00	75,000		
	Blue phones	**2**	loc	10,000.00	20,000		
	SUBTOTAL					412,500	
	TOTAL - SITE DEVELOPMENT						***$4,030,000***

Reconciled Conceptual Estimate
April 20, 2018

City of Lowell

New Lowell High School



SKANSKA

SKANSKA

City of Lowell
Lowell High School
Lowell MA
Reconcilied Conceptual Estimate - Issue 02 (w/ Draft Revised Indirects)

4/20/2018

Direct Cost Summary

Description		Reconciled Add/Reno Option #2A		Reconciled Add/Reno Option #3A Expanded Site		Reconciled New School A at Expanded /Existing Site	
			618,700		622,200		579,400
A10	Foundation	$4,232,250	$7.32	$4,869,275	$8.40	$13,945,270	$25.04
A20	Basements		$0.00			$4,884,590	$7.65
B10	Superstructure	$6,903,935	$10.52	$7,728,225	$13.10	$23,762,640	$41.16
B20	Exterior Closure	$19,232,197	$31.08	$20,938,968	$33.63	$16,859,465	$29.12
B30	Roofing	$3,337,600	$5.39	$3,282,850	$5.28	$3,938,300	$6.80
C10	Interior Construction	$19,842,555	$32.07	$19,983,090	$32.12	$21,003,250	$36.10
C20	Stairs	$1,155,500	$1.87	$1,155,500	$1.86	$1,255,500	$2.17
C30	Interior Finishes	$12,897,550	$20.85	$12,977,300	$20.86	$11,877,700	$20.50
D10	Conveying	$775,000	$1.25	$775,000	$1.25	$840,000	$1.45
D20	Plumbing	$8,043,100	$13.00	$8,088,600	$13.00	$7,242,500	$13.00
D30	H.V.A.C.	$30,935,000	$50.00	$31,160,000	$50.08	$28,970,000	$50.00
D40	Fire Protection	$3,251,400	$5.26	$3,299,900	$5.30	$2,897,000	$5.00
D50	Electrical/AV	$24,748,000	$42.00	$24,888,000	$42.00	$23,176,000	$44.00
E10	Equipment	$2,957,150	$5.26	$2,978,650	$5.27	$3,052,150	$5.27
E20	Furnishings	$8,965,625	$14.49	$9,025,000	$14.50	$8,111,600	$14.00
F10	Special Construction	$2,022,000	$14.66	$2,022,000	$14.91	$0	$14.77
	Phasing Costs						
Z10	GR's with Trades						
	Total Building Cost	**$149,298,862**	**$255.03**	**$153,172,358**	**$261.55**	**$171,815,965**	**$316.03**
G10	Site Work	$2,474,800	$4.00	$4,355,400	$7.00	$2,027,900	$3.50
G30	Site Mechanical Utilities	$618,700	$1.00	$622,200	$1.00	$579,400	$1.00
G40	Site Electrical Utilities	$773,375	$1.25	$777,750	$1.25	$579,400	$1.00
	Total Site Cost	**$3,866,875**	**$6.25**	**$5,755,350**	**$9.25**	**$3,186,700**	**$5.50**
F20	Demolition	$7,663,610	$12.72	$7,965,210	$13.17	$4,904,000	$8.46
F20	Hazardous Materials						
	Total Demo Cost	**$7,663,610**	**$12.72**	**$7,965,210**	**$13.17**	**$4,904,000**	**$8.46**
	Sub Total Construction Costs	**$160,829,347**	**$274.00**	**$166,892,918**	**$283.98**	**$179,906,665**	**$329.99**
15.00%	Design & Pricing Contingency	$24,124,402	$38.99	$25,033,938	$40.46	$26,986,000	$46.58
13.00%	Escalation	$20,907,815	$33.79	$21,696,079	$35.07	$23,387,866	$40.37
	Subtotal	$205,861,564	$332.73	$213,622,935	$345.28	$230,280,531	$397.45
Variable	General Conditions	$12,750,000	$20.61	$15,000,000	$24.24	$15,300,000	$26.41
4.00%	General Requirements	$8,234,463	$13.31	$8,544,917	$13.81	$9,211,221	$15.90
0.75%	Bonds	$1,543,962	$2.50	$1,602,172	$2.59	$1,727,104	$2.98
1.10%	Insurance	$2,264,477	$3.66	$2,349,852	$3.80	$2,533,086	$4.37
0.00%	Permit	NIC	$0.00	NIC	$0.00	NIC	$0.00
		$230,654,466	$372.81	$241,119,877	$389.72	$259,051,942	$447.10
2.50%	Overhead And Fee	$5,766,362	$9.32	$6,027,997	$9.74	$6,476,299	$11.18
3.00%	GMP Contingency	$6,919,634	$11.18	$7,233,596	$11.69	$7,771,558	$13.41
Variable	Phasing	$13,839,268	$22.37	$14,467,193	$23.38	$7,771,558	$13.41
	Temp Gym	$2,160,000	$3.49	NR	$0.00	$2,700,000	$4.66
	Temp Classrooms	NR	$0.00	NR	$0.00	$2,160,000	$3.73
	Temp Bridge Connection	NR	$0.00	NR	$0.00	$1,200,000	$2.07
	Temp Café Fit-out	NR	$0.00	NR	$0.00	$500,000	$0.86
	Total Construction Budget	**$259,339,729**	**$419.17**	**$268,848,663**	**$432.09**	**$287,631,357**	**$496.43**

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Lowell High School - Replacement Options
Lowell High School
Lowell, MA
1/26/2017 5:00:00 PM

Estimate Type: Conceptual Estimate Options
Project No.: 01
Revision: 00
Building Area: 628,000 sf

Skanska USA Building Inc
101 Seaport Boulevard, Suite 200
Boston, MA 02210

Estimate Detail

Lowell High School - TEF - TH
Reconciled Rev 02

	Description	Qty		Unit Cost	Amount
	02A - Reno Koulouheras & Lord w/ additional New Buildings (Existing Site)				
	A10 - FOUNDATIONS				
	A - Renovate Koulouheras				
1	New Slab On Grade, Complete Presumed not required.	-	n/a	-	-
2	Patch Existing Slab On Grade As required for underslab piping and pits. Included 10% of existing SOG.Adjusted based on Reconciliation.	8,200.00	sf	12.00	98,400
3	Misc Pit Work	1.00	ls	20,000.00	20,000
4	Foundation Systems, Complete Presumed not required.	-	n/a	-	-
	A - Renovate Koulouheras				118,400
	C - Renovate Lord				
5	Foundation Systems, Complete Includes piles, pile caps and perimeter and interior grade beams including all associated excavation and truck-off of material. At lobby and connection corridor between Lord, Gym and Freshman Acadamey. Based on Pile foundation system.	5,100.00	sf	25.00	127,500
6	Structural Slab On Grade, Complete Includes ecavation for slab, truck-off of materials, 12" of gravel, vapor barrier and insulation. At lobby and connection corridor between Lord, Gym and Freshman Acadamey.	5,100.00	sf	21.00	107,100
7	Patch Existing Structural Slab On Grade As required for underslab piping and pits. Presumed 10% of existing SOG.Adjusted based on Reconciliation.	4,450.00	sf	34.47	153,400
8	Misc Pit Work Adjusted based on Reconciliation.	1.00	ls	45,000.00	45,000
	C - Renovate Lord				433,000
	G - New Field House				
9	Foundation Systems, Complete Includes piles, pile caps and perimeter and interior grade beams including all associated excavation and truck-off of material. Adjusted based on Reconciliation.	33,700.00	sf	48.00	1,617,600
10	Structural Slab On Grade, Complete Includes ecavation for slab, truck-off of materials, 12" of gravel, vapor barrier and insulation.	33,700.00	sf	21.00	707,700
11	Soil Disposal	986.25	tn	60.00	59,175

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	Estimate Detail	Lowell High School - TEF - TH Reconciled Rev 02			
	Description	Qty		Unit Cost	Amount
	02A - Reno Koulohera & Lord w/ additional New Buildings (Existing Site)				
	A10 - FOUNDATIONS				
	G - New Field House				
	Adjustment per Reconciliation. 25% of Total Excavated Material				
	G - New Field House				2,384,475
	I - New Bridges				
12	Foundation Element, Complete	8.00	ea	9,750.00	78,000
	Includes piles, pile caps and perimeter grade beams including all associated excavation and truck-off of material. Foundation element includes 8 x 16 x 3-6 foundation on 8 piles. assumed 4 elements per bridge. Adjusted based on Reconciliation.				
13	Structural Slab On Grade	-	n/a	-	-
	I - New Bridges				78,000
	J - New Classroom/Academics				
14	Foundation Systems, Complete	16,800.00	sf	48.00	806,400
	Includes piles, pile caps and perimeter grade beams including all associated excavation and truck-off of material. Adjusted based on Reconciliation.				
15	Structural Slab On Grade	16,800.00	sf	21.00	352,800
	Includes ecavation for slab, truck-off of materials, 12" of gravel, vapor barrier and insulation.				
16	Soil Disposal	986.25	tn	60.00	59,175
	Adjustment per Reconciliation. 25% of Total Excavated Material				
	J - New Classroom/Academics				1,218,375
	A10 - FOUNDATIONS				4,232,250
	B10 - SUPERSTRUCTURE				
	A - Renovate Koulohera				
17	SOMD, Complete	-	n/a	-	-
18	Structural Steel Metal Floor Framing	-	n/a	-	-
19	Structural Metal Framing, Roof	-	n/a	-	-
20	Structural Metal Framing, Mechanical Roof Screen Allowance	12.00	tons	3,800.00	45,600
	Allowed 100 lf @ 15' H @ 15 lbs sf.				
21	Structural Metal Framing, Roof Dunnage	10.00	tons	3,800.00	38,000
22	Cut & Frame Misc Floor & Roof Openings	1.00	ls	30,000.00	30,000
23	Infill Misc Floor & Roof Openings	1.00	ls	520,000.00	520,000
	Adjustments Per Reconciliation				
24	Steel Floor Deck, 3" 18Ga	-	n/a	-	-
25	Steel Roof Deck 2" 20 Ga type B	-	n/a	-	-
26	Seismic Anchors At Masonry Walls	-	ea	-	-
	As required at existing to remain interior and perimeter masonry walls.				

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	Estimate Detail	Qty		Unit Cost	Lowell High School - TEF - TH Reconciled Rev 02 Amount
	Description				
	02A - Reno Kouloheras & Lord w/ additional New Buildings (Existing Site)				
	B10 - SUPERSTRUCTURE				
	A - Renovate Kouloheras				
27	Spray on Fireproofing 2hr Beam only (Cementitious) UL D925, Renovation Adjustments Per Reconciliation	304,300.00	sf	0.33	100,000
	A - Renovate Kouloheras				733,600
	C - Renovate Lord				
28	SOMD, Complete	5,100.00	sf	8.50	43,350
29	Structural Steel Metal Floor Framing	36.00	tons	4,000.00	144,000
30	Structural Metal Framing, Roof	-	n/a	-	-
31	Structural Metal Framing, Mechanical Roof Screen Allowance Allowed 100 lf @ 15' H @ 15 lbs sf.	12.00	tons	3,800.00	45,600
32	Structural Metal Framing, Roof Dunnage	5.00	tons	3,800.00	19,000
33	Cut & Frame Misc Floor & Roof Openings	1.00	ls	30,000.00	30,000
34	Infill Misc Floor & Roof Openings	1.00	ls	20,000.00	20,000
35	Steel Floor Deck, 3" 18Ga	5,100.00	sf	3.75	19,125
36	Steel Roof Deck 2" 20 Ga type B	-	n/a	-	-
37	Spray on Fireproofing 2hr Beam only (Cementitious) UL D925, New	5,100.00	sf	-	-
38	Spray on Fireproofing 2hr Beam only (Cementitious) UL D925, Renovation	93,600.00	sf	-	-
39	Spray on Fireproofing 2hr Beam & Deck (2")(Cementitious) UL D779, Allowance Adjustments Per Reconciliation	47,600.00	sf	2.10	100,000
	C - Renovate Lord				421,075
	G - New Field House				
40	SOMD, Complete	33,700.00	sf	8.50	286,450
41	Structural Steel Metal Floor Framing	211.00	tons	3,500.00	738,500
42	Structural Metal Framing, Roof Presumed 20lbs per sf.	337.00	tons	3,500.00	1,179,500
43	Steel Floor Deck, 3" 18Ga	33,700.00	sf	3.75	126,375
44	Acoustical Deck See Engineered Building.	33,700.00	na	-	-
45	Spray on Fireproofing 2hr Beam only (Cementitious) UL D925	67,400.00	sf	1.30	87,620
46	Deduct for Pre-Engineered Building in lieu of Structural Steel	(1.00)	ea	1,179,500.00	(1,179,500)
	G - New Field House				1,238,945
	I - New Bridges				
47	SOMD, Complete	8,600.00	sf	8.50	73,100
48	Structural Steel Metal Floor & Roof	185.00	tons	3,500.00	647,500
49	Steel Floor Deck, 3" 18Ga	8,600.00	sf	3.75	32,250

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Estimate Detail				Lowell High School - TEF - TH Reconciled Rev 02	
	Description	Qty		Unit Cost	Amount
	02A - Reno Kouloheras & Lord w/ additional New Buildings (Existing Site)				
	B10 - SUPERSTRUCTURE				
	I - New Bridges				
50	Steel Roof Deck 2" 20 Ga type B	4,100.00	sf	3.15	12,915
51	Spray on Fireproofing 2hr Beam only (Cementitious) UL D925	8,600.00	sf	2.60	22,360
52	Spray on Fireproofing 2hr Beam & Deck (2")(Cementitious) UL D779	4,100.00	sf	3.90	15,990
	I - New Bridges				804,115
	J - New Classroom/Academics				
53	SOMD, Complete	73,400.00	sf	8.50	623,900
54	Structural Steel Metal Floor Framing	560.00	tons	3,500.00	1,960,000
55	Structural Metal Framing, Roof Presumed 20lbs per sf.	143.00	tons	3,500.00	500,500
56	Structural Metal Framing, Roof Dunnage	5.00	tons	3,800.00	19,000
57	Steel Floor Deck, 3" 18Ga	74,700.00	sf	3.75	280,125
58	Steel Roof Deck 2" 20 Ga type B	18,700.00	sf	3.15	58,905
59	Spray on Fireproofing 2hr Beam only (Cementitious) UL D925	73,400.00	sf	2.60	190,840
60	Spray on Fireproofing 2hr Beam & Deck (2")(Cementitious) UL D779	18,700.00	sf	3.90	72,930
	J - New Classroom/Academics				3,706,200
	B10 - SUPERSTRUCTURE				6,903,935
	B20 - EXTERIOR CLOSURE				
	A - Renovate Kouloheras				
61	Brick Exterior Wall Assemblies, Complete, 60% - Renovation	68,883.00	sf	10.00	688,830
62	Glazed Curtain Wall and Aluminum Windows 40% - Renovation Per Reconciliation Meeting	45,922.00	sf	160.00	7,347,520
63	Remove Existing Windows	45,922.00	sf	3.00	137,766
64	Mechanical Screen Wall	1,500.00	sf	75.00	112,500
65	Historical Window Premium Per Reconciliation Meeting	5,000.00	sf	40.00	200,000
	A - Renovate Kouloheras				8,486,616
	C - Renovate Lord				
66	Brick Exterior Wall Assemblies, Complete, 60% - Renovation	20,954.00	sf	10.00	209,540
67	Glazed Curtain Wall and Aluminum Windows 40% - Renovation	13,969.00	sf	100.00	1,396,900
68	Glazed Curtain Wall 100% - New Bldg	3,880.00	sf	115.00	446,200
69	Remove Existing Windows	14,347.00	sf	3.00	43,041
70	Mechanical Screen Wall	1,500.00	sf	75.00	112,500
71	25% Sunshading @ Ext Glazing	500.00	lf	130.00	65,000

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	Estimate Detail	Qty		Unit Cost	Lowell High School - TEF - TH Reconciled Rev 02 Amount
	Description				
	02A - Reno Kouloheras & Lord w/ additional New Buildings (Existing Site)				
	B20 - EXTERIOR CLOSURE				
	C - Renovate Lord				2,273,181
	G - New Field House				
72	Brick Exterior Wall Assemblies, Complete, 30%	11,958.00	sf	85.00	1,016,430
73	Metal Panels, Complete, 50%	19,930.00	sf	90.00	1,793,700
74	Glazed Curtain Wall and Aluminum Windows 20%	7,972.00	sf	100.00	797,200
75	Deduct Fascade for Pre-Engineered Buildings	(1.00)	ea	1,026,270.00	(1,026,270)
	G - New Field House				2,581,060
	I - New Bridges				
76	Metal Panels, Complete, 20%	3,557.00	sf	90.00	320,130
77	Glazed Curtain Wall 80%	14,231.00	sf	115.00	1,636,565
	I - New Bridges				1,956,695
	J - New Classroom/Academics				
78	Brick Exterior Wall Assemblies, Complete, 25%	10,673.00	sf	85.00	907,205
79	Metal Panels, Complete, 50%	21,346.00	sf	90.00	1,921,140
80	Glazed Curtain Wall and Aluminum Windows 25%	10,673.00	sf	100.00	1,067,300
81	25% Sunshading @ Ext Glazing	300.00	lf	130.00	39,000
	J - New Classroom/Academics				3,934,645
	B20 - EXTERIOR CLOSURE				19,232,197
	B30 - ROOFING				
	A - Renovate Kouloheras				
82	Membrane Roofing System, Complete Presumed to be by others.	-	sf	-	-
83	Replace Skylights	648.00	sf	150.00	97,200
84	Restore Skylights	512.00	sf	50.00	25,600
	A - Renovate Kouloheras				122,800
	C - Renovate Lord				
85	Membrane Roofing System, Complete	49,100.00	sf	28.50	1,399,350
86	Membrane Roofing System, Demo	49,100.00	sf	2.50	122,750
	C - Renovate Lord				1,522,100
	G - New Field House				
87	Membrane Roofing System, Complete	33,700.00	sf	28.50	960,450
	G - New Field House				960,450
	I - New Bridges				
88	Membrane Roofing System, Complete	4,300.00	sf	28.50	122,550
	I - New Bridges				122,550
	J - New Classroom/Academics				
89	Membrane Roofing System, Complete	19,200.00	sf	28.50	547,200
90	Entrance Canopy Allowance	500.00	sf	125.00	62,500

Grouping: MasterGrp / Uniformat2 / UDF1

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	Estimate Detail	Qty		Unit Cost	Lowell High School - TEF - TH Reconciled Rev 02 Amount
	02A - Reno Kouloheras & Lord w/ additional New Buildings (Existing Site)				
	B30 - ROOFING				
	J - New Classroom/Academics				609,700
	B30 - ROOFING				3,337,600
	C10 - INTERIOR CONSTRUCTION				
	A - Renovate Kouloheras				
91	Metal Fabrications	304,300.00	sf	3.10	943,330
92	Interior Construction	304,300.00	sf	28.00	8,520,400
93	Slavaging Existing Walls & Door in Lieu of Providing New Per Reconciliation Mtg.	(304,300.00)	sf	8.07	(2,455,350)
94	Specialties	304,300.00	sf	5.90	1,795,370
	A - Renovate Kouloheras				8,803,750
	C - Renovate Lord				
95	Metal Fabrications	141,200.00	sf	3.10	437,720
96	Interior Construction	146,300.00	sf	28.00	4,096,400
97	Specialties	146,300.00	sf	5.50	804,650
	C - Renovate Lord				5,338,770
	G - New Field House				
98	Metal Fabrications	67,400.00	sf	3.10	208,940
99	Interior Construction	67,400.00	sf	28.00	1,887,200
100	Specialties	67,400.00	sf	2.50	168,500
	G - New Field House				2,264,640
	I - New Bridges				
101	Metal Fabrications	8,600.00	sf	3.10	26,660
102	Interior Construction	8,600.00	n/a	28.00	240,800
103	Specialties	8,600.00	n/a	0.50	4,300
	I - New Bridges				271,760
	J - New Classroom/Academics				
104	Metal Fabrications	92,100.00	sf	3.10	285,510
105	Interior Construction	92,100.00	sf	28.00	2,578,800
106	Specialties	92,100.00	sf	3.25	299,325
	J - New Classroom/Academics				3,163,635
	C10 - INTERIOR CONSTRUCTION				19,842,555
	C20 - STAIRS				
	A - Renovate Kouloheras				
107	Metal Pan Stairs, Renovation	783.00	rs	500.00	391,500
	A - Renovate Kouloheras				391,500
	C - Renovate Lord				
108	Metal Pan Stairs, Renovation	310.00	rs	500.00	155,000
109	Metal Pan Stairs, New	77.00	rs	1,500.00	115,500

Grouping: MasterGrp / Uniformat2 / UDF1

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	Estimate Detail			Lowell High School - TEF - TH Reconciled Rev 02	
	Description	Qty		Unit Cost	Amount
	02A - Reno Kouloheras & Lord w/ additional New Buildings (Existing Site)				
	C20 - STAIRS				
	C - Renovate Lord				270,500
	G - New Field House				
110	Metal Pan Stairs	93.00	rs	1,500.00	139,500
	G - New Field House				139,500
	I - New Bridges				
111	Metal Pan Stairs	-	n/a	-	-
	I - New Bridges				-
	J - New Classroom/Academics				
112	Metal Pan Stairs	236.00	rs	1,500.00	354,000
	J - New Classroom/Academics				354,000
	C20 - STAIRS				1,155,500
	C30 - INTERIOR FINISHES				
	A - Renovate Kouloheras				
113	Ceilings	304,300.00	sf	6.50	1,977,950
114	Flooring	304,300.00	sf	7.50	2,282,250
115	Wall Finishes	304,300.00	sf	5.00	1,521,500
	A - Renovate Kouloheras				5,781,700
	C - Renovate Lord				
116	Ceilings	146,300.00	sf	8.00	1,170,400
117	Flooring	146,300.00	sf	8.00	1,170,400
118	Wall Finishes	146,300.00	sf	10.00	1,463,000
	C - Renovate Lord				3,803,800
	G - New Field House				
119	Ceilings	67,400.00	sf	4.00	269,600
120	Flooring	67,400.00	sf	13.50	909,900
121	Wall Finishes	67,400.00	sf	4.00	269,600
	G - New Field House				1,449,100
	I - New Bridges				
122	Ceilings	8,600.00	sf	9.00	77,400
123	Flooring	8,600.00	sf	8.50	73,100
124	Wall Finishes	8,600.00	sf	1.00	8,600
	I - New Bridges				159,100
	J - New Classroom/Academics				
125	Ceilings	92,100.00	sf	6.00	552,600
126	Flooring	92,100.00	sf	8.50	782,850
127	Wall Finishes	92,100.00	sf	4.00	368,400
	J - New Classroom/Academics				1,703,850

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	Estimate Detail	Lowell High School - TEF - TH Reconciled Rev 02			
	Description	Qty		Unit Cost	Amount
	02A - Reno Kouloheras & Lord w/ additional New Buildings (Existing Site)				
	C30 - INTERIOR FINISHES				12,897,550
	D10 - CONVEYING				
	A - Renovate Kouloheras				
128	Elevators	8.00	stps	40,000.00	320,000
	A - Renovate Kouloheras				320,000
	C - Renovate Lord				
129	Elevators	3.00	stps	45,000.00	135,000
	C - Renovate Lord				135,000
	G - New Field House				
130	Elevators	2.00	stps	60,000.00	120,000
	G - New Field House				120,000
	I - New Bridges				
131	Elevators	-	n/a	-	-
	I - New Bridges				-
	J - New Classroom/Academics				
132	Elevators	5.00	stps	40,000.00	200,000
	J - New Classroom/Academics				200,000
	D10 - CONVEYING				775,000
	D20 - PLUMBING				
	A - Renovate Kouloheras				
133	Plumbing	304,300.00	sf	13.00	3,955,900
	A - Renovate Kouloheras				3,955,900
	C - Renovate Lord				
134	Plumbing	146,300.00	sf	13.00	1,901,900
	C - Renovate Lord				1,901,900
	G - New Field House				
135	Plumbing	67,400.00	sf	13.00	876,200
	G - New Field House				876,200
	I - New Bridges				
136	Plumbing	8,600.00	sf	13.00	111,800
	I - New Bridges				111,800
	J - New Classroom/Academics				
137	Plumbing	92,100.00	sf	13.00	1,197,300
	J - New Classroom/Academics				1,197,300
	D20 - PLUMBING				8,043,100
	D30 - HVAC				
	A - Renovate Kouloheras				
138	HVAC	304,300.00	sf	50.00	15,215,000

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	Estimate Detail			Lowell High School - TEF - TH Reconciled Rev 02
	Description	Qty	Unit Cost	Amount
	02A - Reno Kouloheras & Lord w/ additional New Buildings (Existing Site)			
	D30 - HVAC			
	A - Renovate Kouloheras			15,215,000
	C - Renovate Lord			
139	HVAC	146,300.00 sf	50.00	7,315,000
	C - Renovate Lord			7,315,000
	G - New Field House			
140	HVAC	67,400.00 sf	50.00	3,370,000
	G - New Field House			3,370,000
	I - New Bridges			
141	HVAC	8,600.00 sf	50.00	430,000
	I - New Bridges			430,000
	J - New Classroom/Academics			
142	HVAC	92,100.00 sf	50.00	4,605,000
	J - New Classroom/Academics			4,605,000
	D30 - HVAC			30,935,000
	D40 - FIRE PROTECTION			
	A - Renovate Kouloheras			
143	Fire Suppression	304,300.00 sf	5.50	1,673,650
	A - Renovate Kouloheras			1,673,650
	C - Renovate Lord			
144	Fire Suppression	146,300.00 sf	5.50	804,650
	C - Renovate Lord			804,650
	G - New Field House			
145	Fire Suppression	67,400.00 sf	4.00	269,600
	G - New Field House			269,600
	I - New Bridges			
146	Fire Suppression	8,600.00 sf	5.00	43,000
	I - New Bridges			43,000
	J - New Classroom/Academics			
147	Fire Suppression	92,100.00 sf	5.00	460,500
	J - New Classroom/Academics			460,500
	D40 - FIRE PROTECTION			3,251,400
	D50 - ELECTRICAL			
	A - Renovate Kouloheras			
148	Electrical	304,300.00 sf	40.00	12,172,000
	A - Renovate Kouloheras			12,172,000
	C - Renovate Lord			
149	Electrical	146,300.00 sf	40.00	5,852,000

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	Estimate Detail	Lowell High School - TEF - TH Reconciled Rev 02			
	Description	Qty		Unit Cost	Amount
	02A - Reno Kouloheras & Lord w/ additional New Buildings (Existing Site)				
	D50 - ELECTRICAL				
	C - Renovate Lord				5,852,000
	G - New Field House				
150	Electrical	67,400.00	sf	40.00	2,696,000
	G - New Field House				2,696,000
	I - New Bridges				
151	Electrical	8,600.00	sf	40.00	344,000
	I - New Bridges				344,000
	J - New Classroom/Academics				
152	Electrical	92,100.00	sf	40.00	3,684,000
	J - New Classroom/Academics				3,684,000
	D50 - ELECTRICAL				24,748,000
	E10 - EQUIPMENT				
	A - Renovate Kouloheras				
153	Equipment	304,300.00	sf	3.50	1,065,050
	A - Renovate Kouloheras				1,065,050
	C - Renovate Lord				
154	Equipment	146,300.00	sf	10.00	1,463,000
	C - Renovate Lord				1,463,000
	G - New Field House				
155	Equipment	67,400.00	sf	5.00	337,000
	G - New Field House				337,000
	I - New Bridges				
156	Equipment	8,600.00	sf	-	-
	I - New Bridges				-
	J - New Classroom/Academics				
157	Equipment	92,100.00	sf	1.00	92,100
	J - New Classroom/Academics				92,100
	E10 - EQUIPMENT				2,957,150
	E20 - FURNISHINGS				
	A - Renovate Kouloheras				
158	Furnishings	304,300.00	sf	14.50	4,413,782
	A - Renovate Kouloheras				4,413,782
	C - Renovate Lord				
159	Furnishings	146,300.00	sf	16.79	2,457,097
	C - Renovate Lord				2,457,097
	G - New Field House				
160	Furnishings	67,400.00	sf	3.44	231,541

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	Estimate Detail	Lowell High School - TEF - TH Reconciled Rev 02			
	Description	Qty		Unit Cost	Amount
	02A - Reno Kouloheras & Lord w/ additional New Buildings (Existing Site)				
	E20 - FURNISHINGS				
	G - New Field House				231,541
	I - New Bridges				
161	Furnishings	8,600.00	sf	-	-
	I - New Bridges				-
	J - New Classroom/Academics				
162	Furnishings	92,100.00	sf	20.23	1,863,206
	J - New Classroom/Academics				1,863,206
	E20 - FURNISHINGS				8,965,625
	F10 - SPECIAL CONSTRUCTION				
	D - Renovate Field House				
163	Pre-Engineered Gym Building	1.00	ea	2,022,000.00	2,022,000
	D - Renovate Field House				2,022,000
	F10 - SPECIAL CONSTRUCTION				2,022,000
	F20 - SELECTIVE BUILDING DEMOLITION				
	A - Renovate Kouloheras				
164	Selective Demolition	307,800.00	sf	8.00	2,462,400
165	Selective Demo Mezzanine	3,500.00	sf	25.00	87,500
166	Hazardous Materials	1.00	ea	1,003,200.00	1,003,200
	Excludes roofing demo.				
	A - Renovate Kouloheras				3,553,100
	C - Renovate Lord				
167	Selective Demolition	141,200.00	sf	8.00	1,129,600
168	Hazardous Material Allowance	1.00	ea	2,163,910.00	2,163,910
	C - Renovate Lord				3,293,510
	G - New Field House				
169	Demo Bridges	75,100.00	sf	10.00	751,000
	G - New Field House				751,000
	I - New Bridges				
170	Demo Bridges	4,400.00	sf	15.00	66,000
	I - New Bridges				66,000
	F20 - SELECTIVE BUILDING DEMOLITION				7,663,610
	G10 - SITE PREPARATION				
	K - Site Improvements				
171	Site Improvements	618,700.00	sf	4.00	2,474,800
	K - Site Improvements				2,474,800
	G10 - SITE PREPARATION				2,474,800

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	Estimate Detail			Lowell High School - TEF - TH Reconciled Rev 02
	Description	Qty	Unit Cost	Amount
	02A - Reno Kouloheras & Lord w/ additional New Buildings (Existing Site)			
	G30 - SITE CIVIL/MECHANICAL UTILITIES			
	K - Site Improvements			
172	Site Mechanical Utilities	618,700.00 sf	1.00	618,700
	K - Site Improvements			618,700
	G30 - SITE CIVIL/MECHANICAL UTILITIES			618,700
	G40 - SITE ELECTRICAL UTILITIES			
	K - Site Improvements			
173	Site Electrical Utilities	618,700.00 sf	1.25	773,375
	K - Site Improvements			773,375
	G40 - SITE ELECTRICAL UTILITIES			773,375
	02A - Reno Kouloheras & Lord w/ additional New Buildings (Existing Site)			160,829,347

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	Estimate Detail			Lowell High School - TEF - TH Reconciled Rev 02	
	Description	**Qty**		**Unit Cost**	**Amount**
	03A - Reno Koulohera & Lord w/ additional New Buildings (Expanded Site)				
	A10 - FOUNDATIONS				
	A - Renovate Kouloheras				
174	Foundation Systems, Complete	-	n/a	-	-
	Presumed not required.				
175	New Slab On Grade, Complete	-	n/a	-	-
	Presumed not required.				
176	Patch Existing Slab On Grade	8,200.00	sf	12.00	98,400
	As required for underslab piping and pits. Included 10% of existing SOG.Adjusted based on Reconciliation.				
177	Misc Pit Work	1.00	ls	20,000.00	20,000
	A - Renovate Kouloheras				118,400
	C - Renovate Lord				
178	Foundation Systems, Complete	12,500.00	sf	41.00	512,500
	Includes piles, pile caps and perimeter and interior grade beams including all associated excavation and truck-off of material. At lobby and connection corridor between Lord, Gym and Freshman Acadamey. Based on Pile foundation system.				
179	Structural Slab On Grade, Complete	12,500.00	sf	21.00	262,500
	Includes ecavation for slab, truck-off of materials, 12" of gravel, vapor barrier and insulation. At lobby and connection corridor between Lord, Gym and Freshman Acadamey.				
180	Patch Existing Structural Slab On Grade	4,020.00	sf	36.89	148,280
	As required for underslab piping and pits. Presumed 10% of existing SOG.Adjusted based on Reconciliation.				
181	Misc Pit Work	1.00	ls	45,000.00	45,000
	Adjusted based on Reconciliation.				
	C - Renovate Lord				968,280
	G - New Field House				
182	Foundation Systems, Complete	33,700.00	sf	48.00	1,617,600
	Includes piles, pile caps and perimeter and interior grade beams including all associated excavation and truck-off of material.				
183	Structural Slab On Grade	33,700.00	sf	21.00	707,700
	Includes ecavation for slab, truck-off of materials, 12" of gravel, vapor barrier and insulation.				
184	Soil Disposal	1,308.25	cy	60.00	78,495
	25% of Total Excavated Material				
	G - New Field House				2,403,795
	I - New Bridges				
185	Foundation Element, Complete	8.00	ea	9,750.00	78,000

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Estimate Detail				Lowell High School - TEF - TH Reconciled Rev 02	
	Description	Qty		Unit Cost	Amount
	03A - Reno Kouloheras & Lord w/ additional New Buildings (Expanded Site)				
	A10 - FOUNDATIONS				
	I - New Bridges				
	Includes piles, pile caps and perimeter grade beams including all associated excavation and truck-off of material. Foundation element includes 8 x 16 x 3-6 foundation on 8 piles. assumed 4 elements per bridge. Adjusted based on Reconciliation.				
186	Structural Slab On Grade	-	n/a	-	-
	I - New Bridges				78,000
	J - New Classroom/Academics				
187	Foundation Systems, Complete	18,000.00	sf	48.00	864,000
	Includes piles, pile caps and perimeter grade beams including all associated excavation and truck-off of material. Adjusted based on Reconciliation.				
188	Structural Slab On Grade	18,000.00	sf	21.00	378,000
	Includes ecavation for slab, truck-off of materials, 12" of gravel, vapor barrier and insulation.				
189	Soil Disposal	980.00	cy	60.00	58,800
	25% of Total Excavated Material				
	J - New Classroom/Academics				1,300,800
	A10 - FOUNDATIONS				4,869,275
	B10 - SUPERSTRUCTURE				
	A - Renovate Kouloheras				
190	SOMD, Complete	-	n/a	-	-
191	Structural Steel Metal Floor Framing	-	n/a	-	-
192	Structural Metal Framing, Roof	-	n/a	-	-
193	Structural Metal Framing, Mechanical Roof Screen Allowance	23.00	tons	3,800.00	87,400
	Allowed 200 lf @ 15' H @ 15 lbs sf.				
194	Structural Metal Framing, Roof Dunnage	10.00	tons	3,800.00	38,000
195	Cut & Frame Misc Floor & Roof Openings	1.00	ls	30,000.00	30,000
196	Infill Misc Floor & Roof Openings	1.00	ls	520,000.00	520,000
197	Steel Floor Deck, 3" 18Ga	-	n/a	-	-
198	Steel Roof Deck 2" 20 Ga type B	-	n/a	-	-
199	Seismic Anchors At Masonry Walls	-	ea	-	-
	As required at existing to remain interior and perimeter masonry walls.				
200	Spray on Fireproofing 2hr Beam only (Cementitious) UL D925, Renovation	304,300.00	sf	0.33	100,000
	A - Renovate Kouloheras				775,400
	C - Renovate Lord				
201	SOMD, Complete	20,000.00	sf	8.50	170,000
202	Structural Steel Metal Floor & Roof Framing	140.00	tons	3,500.00	490,000

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	Estimate Detail	Qty		Unit Cost	Lowell High School - TEF - TH Reconciled Rev 02 Amount
	Description				
	03A - Reno Koulohera & Lord w/ additional New Buildings (Expanded Site)				
	B10 - SUPERSTRUCTURE				
	C - Renovate Lord				
203	Structural Metal Framing, Mechanical Roof Screen Allowance Allowed 100 lf @ 15' H @ 15 lbs sf.	12.00	tons	3,800.00	45,600
204	Structural Metal Framing, Roof Dunnage	5.00	tons	3,800.00	19,000
205	Cut & Frame Misc Floor & Roof Openings	1.00	ls	15,000.00	15,000
206	Infill Misc Floor & Roof Openings	1.00	ls	10,000.00	10,000
207	Cut & Frame Light Well Openings	6.00	ea	20,000.00	120,000
208	Steel Floor Deck, 3" 18Ga	7,500.00	sf	3.75	28,125
209	Steel Roof Deck 2" 20 Ga type B	12,500.00	n/a	3.00	37,500
210	Spray on Fireproofing 2hr Beam only (Cementitious) UL D925, New	20,000.00	sf	-	-
211	Spray on Fireproofing 2hr Beam only (Cementitious) UL D925, Renovation	85,000.00	sf	-	-
212	Spray on Fireproofing 2hr Beam & Deck (2")(Cementitious) UL D779, Allowance Per Reconciliation Meeting.	43,300.00	sf	2.31	100,000
	C - Renovate Lord				1,035,225
	G - New Field House				
213	SOMD, Complete	33,700.00	sf	8.50	286,450
214	Structural Steel Metal Floor Framing	211.00	tons	3,500.00	738,500
215	Structural Metal Framing, Roof Presumed 20lbs per sf.	337.00	tons	3,500.00	1,179,500
216	Steel Floor Deck, 3" 18Ga	33,700.00	sf	3.75	126,375
217	Acoustical Deck	33,700.00	na	-	-
218	Spray on Fireproofing 2hr Beam only (Cementitious) UL D925	67,400.00	sf	1.30	87,620
219	Deduct for Pre-Engineered Building in lieu of Structural Steel Per Reconciliation Meeting	(1.00)	ea	1,179,500.00	(1,179,500)
	G - New Field House				1,238,945
	I - New Bridges				
220	SOMD, Complete	8,600.00	sf	8.50	73,100
221	Structural Steel Metal Floor & Roof	185.00	tons	3,500.00	647,500
222	Steel Floor Deck, 3" 18Ga	8,600.00	sf	3.75	32,250
223	Steel Roof Deck 2" 20 Ga type B	4,100.00	sf	3.15	12,915
224	Spray on Fireproofing 2hr Beam only (Cementitious) UL D925	8,600.00	sf	2.60	22,360
225	Spray on Fireproofing 2hr Beam & Deck (2")(Cementitious) UL D779	4,100.00	sf	3.90	15,990
	I - New Bridges				804,115
	J - New Classroom/Academics				
226	SOMD, Complete	74,700.00	sf	8.50	634,950

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	Estimate Detail			Lowell High School - TEF - TH Reconciled Rev 02	
	Description	Qty		Unit Cost	Amount
	03A - Reno Kouloheras & Lord w/ additional New Buildings (Expanded Site)				
	B10 - SUPERSTRUCTURE				
	J - New Classroom/Academics				
227	Structural Steel Metal Floor Framing	570.00	tons	3,500.00	1,995,000
228	Structural Metal Framing, Roof Presumed 20lbs per sf.	159.00	tons	3,600.00	572,400
229	Structural Metal Framing, Mechanical Roof Screen Allowance Allowed 100 lf @ 15' H @ 15 lbs sf.	12.00	tons	3,800.00	45,600
230	Structural Metal Framing, Roof Dunnage	5.00	tons	3,800.00	19,000
231	Steel Floor Deck, 3" 18Ga	74,700.00	sf	3.75	280,125
232	Steel Roof Deck 2" 20 Ga type B	18,900.00	sf	3.15	59,535
233	Spray on Fireproofing 2hr Beam only (Cementitious) UL D925	74,700.00	sf	2.60	194,220
234	Spray on Fireproofing 2hr Beam & Deck (2")(Cementitious) UL D779	18,900.00	sf	3.90	73,710
	J - New Classroom/Academics				3,874,540
	B10 - SUPERSTRUCTURE				7,728,225
	B20 - EXTERIOR CLOSURE				
	A - Renovate Kouloheras				
235	Brick Exterior Wall Assemblies, Complete, 60% - Renovation	68,883.00	sf	10.00	688,830
236	Glazed Curtain Wall and Aluminum Windows 40% - Renovation Includes hitoric profile windows.	45,922.00	sf	160.00	7,347,520
237	Remove Existing Windows	45,922.00	sf	3.00	137,766
238	Historical Window Premium Per Reconciliation Meeting	5,000.00	sf	40.00	200,000
239	Mechanical Screen Wall	1,500.00	sf	75.00	112,500
	A - Renovate Kouloheras				8,486,616
	C - Renovate Lord				
240	Brick Exterior Wall Assemblies, Complete, 60% - Renovation	23,259.00	sf	10.00	232,590
241	Glazed Curtain Wall and Aluminum Windows 40% - Renovation	15,506.00	sf	100.00	1,550,600
242	Glazed Curtain Wall 100% - New Bldg	7,485.00	sf	115.00	860,775
243	Remove Existing Windows	15,506.00	sf	3.00	46,518
244	Mechanical Screen Wall	1,500.00	sf	75.00	112,500
245	25% Sunshading @ Ext Glazing	500.00	lf	130.00	65,000
	C - Renovate Lord				2,867,983
	G - New Field House				
246	Brick Exterior Wall Assemblies, Complete, 30%	12,600.00	sf	85.00	1,071,000
247	Metal Panels, Complete, 50%	21,000.00	sf	90.00	1,890,000
248	Glazed Curtain Wall and Aluminum Windows 20%	8,400.00	sf	100.00	840,000

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	Estimate Detail			Lowell High School - TEF - TH Reconciled Rev 02	
	Description	**Qty**		**Unit Cost**	**Amount**
	03A - Reno Kouloheras & Lord w/ additional New Buildings (Expanded Site)				
	B20 - EXTERIOR CLOSURE				
	G - New Field House				
249	Deduct Fascade for Pre-Engineered Buildings	(1.00)	ea	1,130,526.00	(1,130,526)
	G - New Field House				2,670,474
	I - New Bridges				
250	Metal Panels, Complete, 20%	3,557.00	sf	90.00	320,130
251	Glazed Curtain Wall 80%	14,231.00	sf	115.00	1,636,565
	I - New Bridges				1,956,695
	J - New Classroom/Academics				
252	Brick Exterior Wall Assemblies, Complete, 25%	10,516.00	sf	85.00	893,860
253	Metal Panels, Complete, 50%	21,346.00	sf	90.00	1,921,140
254	Glazed Curtain Wall and Aluminum Windows 25%	21,032.00	sf	100.00	2,103,200
255	25% Sunshading @ Ext Glazing	300.00	lf	130.00	39,000
	J - New Classroom/Academics				4,957,200
	B20 - EXTERIOR CLOSURE				20,938,968
	B30 - ROOFING				
	A - Renovate Kouloheras				
256	Membrane Roofing System, Complete	-	sf	-	-
	Presumed to be by others.				
257	Replace Skylights	648.00	sf	150.00	97,200
258	Restore Skylights	512.00	sf	50.00	25,600
	A - Renovate Kouloheras				122,800
	C - Renovate Lord				
259	Membrane Roofing System, Complete	52,700.00	sf	28.50	1,501,950
260	Membrane Roofing System, Demo	52,700.00	sf	2.50	131,750
261	New Skylights	1,760.00	sf	150.00	264,000
	C - Renovate Lord				1,897,700
	G - New Field House				
262	Membrane Roofing System, Complete	18,900.00	sf	28.50	538,650
	G - New Field House				538,650
	I - New Bridges				
263	Membrane Roofing System, Complete	4,300.00	sf	28.50	122,550
	I - New Bridges				122,550
	J - New Classroom/Academics				
264	Membrane Roofing System, Complete	18,900.00	sf	28.50	538,650
265	Entrance Canopy Allowance	500.00	sf	125.00	62,500
	J - New Classroom/Academics				601,150
	B30 - ROOFING				3,282,850

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	Estimate Detail			Lowell High School - TEF - TH Reconciled Rev 02	
	Description	Qty		Unit Cost	Amount
	03A - Reno Kouloheras & Lord w/ additional New Buildings (Expanded Site)				
	C10 - INTERIOR CONSTRUCTION				
	A - Renovate Kouloheras				
266	Metal Fabrications	304,300.00	sf	3.10	943,330
267	Interior Construction	304,300.00	sf	28.00	8,520,400
268	Slavaging Existing Walls & Door in Lieu of Providing New	(304,300.00)	sf	8.07	(2,455,350)
	Per Reconciliation Mtg.				
269	Specialties	304,300.00	sf	5.90	1,795,370
	A - Renovate Kouloheras				8,803,750
	C - Renovate Lord				
270	Metal Fabrications	148,300.00	sf	3.10	459,730
271	Interior Construction	148,300.00	sf	28.00	4,152,400
272	Specialties	148,300.00	sf	5.50	815,650
	C - Renovate Lord				5,427,780
	G - New Field House				
273	Metal Fabrications	67,400.00	sf	3.10	208,940
274	Interior Construction	67,400.00	sf	28.00	1,887,200
275	Specialties	67,400.00	sf	2.50	168,500
	G - New Field House				2,264,640
	I - New Bridges				
276	Metal Fabrications	8,600.00	sf	3.10	26,660
277	Interior Construction	8,600.00	n/a	28.00	240,800
278	Specialties	8,600.00	n/a	0.50	4,300
	I - New Bridges				271,760
	J - New Classroom/Academics				
279	Metal Fabrications	93,600.00	sf	3.10	290,160
280	Interior Construction	93,600.00	sf	28.00	2,620,800
281	Specialties	93,600.00	sf	3.25	304,200
	J - New Classroom/Academics				3,215,160
	C10 - INTERIOR CONSTRUCTION				19,983,090
	C20 - STAIRS				
	A - Renovate Kouloheras				
282	Metal Pan Stairs, Renovation	783.00	rs	500.00	391,500
	A - Renovate Kouloheras				391,500
	C - Renovate Lord				
283	Metal Pan Stairs, Renovation	310.00	rs	500.00	155,000
284	Metal Pan Stairs, New	77.00	rs	1,500.00	115,500
	C - Renovate Lord				270,500
	G - New Field House				
285	Metal Pan Stairs	93.00	rs	1,500.00	139,500

Grouping: MasterGrp / Uniformat2 / UDF1

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	Estimate Detail	Lowell High School - TEF - TH Reconciled Rev 02			
	Description	Qty		Unit Cost	Amount
	03A - Reno Kouloheras & Lord w/ additional New Buildings (Expanded Site)				
	C20 - STAIRS				
	G - New Field House				139,500
	I - New Bridges				
286	Metal Pan Stairs	-	n/a	-	-
	I - New Bridges				-
	J - New Classroom/Academics				
287	Metal Pan Stairs	236.00	rs	1,500.00	354,000
	J - New Classroom/Academics				354,000
	C20 - STAIRS				1,155,500
	C30 - INTERIOR FINISHES				
	A - Renovate Kouloheras				
288	Ceilings	304,300.00	sf	6.50	1,977,950
289	Flooring	304,300.00	sf	7.50	2,282,250
290	Wall Finishes	304,300.00	sf	5.00	1,521,500
	A - Renovate Kouloheras				5,781,700
	C - Renovate Lord				
291	Ceilings	148,300.00	sf	8.00	1,186,400
292	Flooring	148,300.00	sf	8.00	1,186,400
293	Wall Finishes	148,300.00	sf	10.00	1,483,000
	C - Renovate Lord				3,855,800
	G - New Field House				
294	Ceilings	67,400.00	sf	4.00	269,600
295	Flooring	67,400.00	sf	13.50	909,900
296	Wall Finishes	67,400.00	sf	4.00	269,600
	G - New Field House				1,449,100
	I - New Bridges				
297	Ceilings	8,600.00	sf	9.00	77,400
298	Flooring	8,600.00	sf	8.50	73,100
299	Wall Finishes	8,600.00	sf	1.00	8,600
	I - New Bridges				159,100
	J - New Classroom/Academics				
300	Ceilings	93,600.00	sf	6.00	561,600
301	Flooring	93,600.00	sf	8.50	795,600
302	Wall Finishes	93,600.00	sf	4.00	374,400
	J - New Classroom/Academics				1,731,600
	C30 - INTERIOR FINISHES				12,977,300

SKANSKA

	Estimate Detail			Lowell High School - TEF - TH Reconciled Rev 02	
	Description	Qty		Unit Cost	Amount
	03A - Reno Kouloheras & Lord w/ additional New Buildings (Expanded Site)				
	D10 - CONVEYING				
	A - Renovate Kouloheras				
303	Elevators	8.00	stps	40,000.00	320,000
	A - Renovate Kouloheras				320,000
	C - Renovate Lord				
304	Elevators	3.00	stps	45,000.00	135,000
	C - Renovate Lord				135,000
	G - New Field House				
305	Elevators	2.00	stps	60,000.00	120,000
	G - New Field House				120,000
	I - New Bridges				
306	Elevators	-	n/a	-	-
	I - New Bridges				-
	J - New Classroom/Academics				
307	Elevators	5.00	stps	40,000.00	200,000
	J - New Classroom/Academics				200,000
	D10 - CONVEYING				775,000
	D20 - PLUMBING				
	A - Renovate Kouloheras				
308	Plumbing	304,300.00	sf	13.00	3,955,900
	A - Renovate Kouloheras				3,955,900
	C - Renovate Lord				
309	Plumbing	148,300.00	sf	13.00	1,927,900
	C - Renovate Lord				1,927,900
	G - New Field House				
310	Plumbing	67,400.00	sf	13.00	876,200
	G - New Field House				876,200
	I - New Bridges				
311	Plumbing	8,600.00	sf	13.00	111,800
	I - New Bridges				111,800
	J - New Classroom/Academics				
312	Plumbing	93,600.00	sf	13.00	1,216,800
	J - New Classroom/Academics				1,216,800
	D20 - PLUMBING				8,088,600
	D30 - HVAC				
	A - Renovate Kouloheras				
313	HVAC	304,300.00	sf	50.00	15,215,000
	A - Renovate Kouloheras				15,215,000

Grouping: MasterGrp / Uniformat2 / UDF1

SKANSKA

	Estimate Detail			Lowell High School - TEF - TH Reconciled Rev 02	
	Description	Qty		Unit Cost	Amount
	03A - Reno Kouloheras & Lord w/ additional New Buildings (Expanded Site)				
	D30 - HVAC				
	C - Renovate Lord				
314	HVAC	148,300.00	sf	50.00	7,415,000
315	HVAC - Light Well Smoke Exhaust	2.00	sf	25,000.00	50,000
	C - Renovate Lord				7,465,000
	G - New Field House				
316	HVAC	67,400.00	sf	50.00	3,370,000
	G - New Field House				3,370,000
	I - New Bridges				
317	HVAC	8,600.00	sf	50.00	430,000
	I - New Bridges				430,000
	J - New Classroom/Academics				
318	HVAC	93,600.00	sf	50.00	4,680,000
	J - New Classroom/Academics				4,680,000
	D30 - HVAC				31,160,000
	D40 - FIRE PROTECTION				
	A - Renovate Kouloheras				
319	Fire Suppression	304,300.00	sf	5.50	1,673,650
	A - Renovate Kouloheras				1,673,650
	C - Renovate Lord				
320	Fire Suppression	148,300.00	sf	5.50	815,650
321	Fire Suppression - Light Well Deluge System	2.00	ea	15,000.00	30,000
	C - Renovate Lord				845,650
	G - New Field House				
322	Fire Suppression	67,400.00	sf	4.00	269,600
	G - New Field House				269,600
	I - New Bridges				
323	Fire Suppression	8,600.00	sf	5.00	43,000
	I - New Bridges				43,000
	J - New Classroom/Academics				
324	Fire Suppression	93,600.00	sf	5.00	468,000
	J - New Classroom/Academics				468,000
	D40 - FIRE PROTECTION				3,299,900
	D50 - ELECTRICAL				
	A - Renovate Kouloheras				
325	Electrical	304,300.00	sf	40.00	12,172,000
	A - Renovate Kouloheras				12,172,000

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	Estimate Detail	Lowell High School - TEF - TH Reconciled Rev 02			
	Description	Qty		Unit Cost	Amount
	03A - Reno Kouloheras & Lord w/ additional New Buildings (Expanded Site)				
	D50 - ELECTRICAL				
	C - Renovate Lord				
326	Electrical	148,300.00	sf	40.00	5,932,000
	C - Renovate Lord				5,932,000
	G - New Field House				
327	Electrical	67,400.00	sf	40.00	2,696,000
	G - New Field House				2,696,000
	I - New Bridges				
328	Electrical	8,600.00	sf	40.00	344,000
	I - New Bridges				344,000
	J - New Classroom/Academics				
329	Electrical	93,600.00	sf	40.00	3,744,000
	J - New Classroom/Academics				3,744,000
	D50 - ELECTRICAL				24,888,000
	E10 - EQUIPMENT				
	A - Renovate Kouloheras				
330	Equipment	304,300.00	sf	3.50	1,065,050
	A - Renovate Kouloheras				1,065,050
	C - Renovate Lord				
331	Equipment	148,300.00	sf	10.00	1,483,000
	C - Renovate Lord				1,483,000
	G - New Field House				
332	Equipment	67,400.00	sf	5.00	337,000
	G - New Field House				337,000
	I - New Bridges				
333	Equipment	8,600.00	sf	-	-
	I - New Bridges				-
	J - New Classroom/Academics				
334	Equipment	93,600.00	sf	1.00	93,600
	J - New Classroom/Academics				93,600
	E10 - EQUIPMENT				2,978,650
	E20 - FURNISHINGS				
	A - Renovate Kouloheras				
335	Furnishings	304,300.00	sf	14.50	4,411,552
	A - Renovate Kouloheras				4,411,552
	C - Renovate Lord				
336	Furnishings	148,300.00	sf	16.79	2,489,429
	C - Renovate Lord				2,489,429

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	Estimate Detail			Lowell High School - TEF - TH Reconciled Rev 02	
	Description	Qty		Unit Cost	Amount
	03A - Reno Koulohera & Lord w/ additional New Buildings (Expanded Site)				
	E20 - FURNISHINGS				
	G - New Field House				
337	Furnishings	67,400.00	sf	3.43	231,424
	G - New Field House				231,424
	I - New Bridges				
338	Furnishings	8,600.00	sf	-	-
	I - New Bridges				-
	J - New Classroom/Academics				
339	Furnishings	93,600.00	sf	20.22	1,892,595
	J - New Classroom/Academics				1,892,595
	E20 - FURNISHINGS				9,025,000
	F10 - SPECIAL CONSTRUCTION				
	D - Renovate Field House				
340	Pre-Engineered Gym Building	1.00	ea	2,022,000.00	2,022,000
	D - Renovate Field House				2,022,000
	F10 - SPECIAL CONSTRUCTION				2,022,000
	F20 - SELECTIVE BUILDING DEMOLITION				
	A - Renovate Kouloheras				
341	Selective Demolition	307,800.00	sf	8.00	2,462,400
342	Selective Demo Mezzanine	3,500.00	sf	25.00	87,500
343	Hazardous Materials	1.00	ea	1,003,200.00	1,003,200
	A - Renovate Kouloheras				3,553,100
	C - Renovate Lord				
344	Selective Demolition	128,300.00	sf	8.00	1,026,400
345	Hazardous Materials	1.00	ea	2,413,910.00	2,413,910
	Includes abatement at extended site building.				
346	Selective Demo Buildings	12,900.00	sf	12.00	154,800
	C - Renovate Lord				3,595,110
	G - New Field House				
347	Demo Buildings	75,100.00	sf	10.00	751,000
	G - New Field House				751,000
	I - New Bridges				
348	Demo Bridges	4,400.00	sf	15.00	66,000
	I - New Bridges				66,000
	F20 - SELECTIVE BUILDING DEMOLITION				7,965,210
	G10 - SITE PREPARATION				
	K - Site Improvements				
349	Demo Building At Expanded Site	1.00	all	503,982.00	503,982

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	Estimate Detail	Lowell High School - TEF - TH Reconciled Rev 02			
	Description	Qty		Unit Cost	Amount
	03A - Reno Kouloheras & Lord w/ additional New Buildings (Expanded Site)				
	G10 - SITE PREPARATION				
	K - Site Improvements				
350	Site Improvements	622,200.00	sf	6.19	3,851,418
	K - Site Improvements				4,355,400
	G10 - SITE PREPARATION				4,355,400
	G30 - SITE CIVIL/MECHANICAL UTILITIES				
	K - Site Improvements				
351	Site Mechanical Utilities	622,200.00	sf	1.00	622,200
	K - Site Improvements				622,200
	G30 - SITE CIVIL/MECHANICAL UTILITIES				622,200
	G40 - SITE ELECTRICAL UTILITIES				
	K - Site Improvements				
352	Site Electrical Utilities	622,200.00	sf	1.25	777,750
	K - Site Improvements				777,750
	G40 - SITE ELECTRICAL UTILITIES				777,750
	03A - Reno Kouloheras & Lord w/ additional New Buildings (Expanded Site)				166,892,918

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	Estimate Detail			Lowell High School - TEF - TH Reconciled Rev 02	
	Description	**Qty**		**Unit Cost**	**Amount**
	A - New Construction				
	A10 - FOUNDATIONS				
	H - New School Complete				
353	Foundation Systems, Complete - Basement Level Includes piles, pile caps and interior grade beams including all associated excavation.	68,800.00	sf	48.00	3,302,400
354	Foundation Systems, Complete - Ground Level Includes piles, pile caps and perimeter and interior grade beams including all associated excavation.	65,000.00	sf	48.00	3,120,000
355	Structural Slab 12" - Basement Level Includes excavation, waterproofing and insulation.	68,800.00	sf	32.00	2,201,600
356	Structural Slab 10" - Ground Level Includes excavation, vapor barrier and insulation.	65,000.00	sf	21.00	1,365,000
357	Slab On Grade 5" - Basement Level Includes excavation, vapor barrier and insulation.	65,000.00	sf	30.00	1,950,000
358	Underslab Drainage System - Basement Level Includes 12" thick drainage layer and drain piping.	68,800.00	sf	4.00	275,200
359	Pit Allowance @ Slab On Grade Adjusted based on Reconciliation.	6.00	ea	30,166.67	181,000
360	Basement Walls - One Sided CIP Wall Includes waterproofing.	21,390.00	sf	65.00	1,390,350
361	Soil Disposal Adjustment per Reconciliation 25% of overall Excavated material	2,662.00	tn	60.00	159,720
	H - New School Complete				13,945,270
	A10 - FOUNDATIONS				13,945,270
	A20 - BASEMENT CONSTRUCTION				
	H - New School Complete				
362	Basement Excavation - Dewatering Includes waterproofing.	1.00	ea	100,000.00	100,000
363	Basement Excavation - Earth Retention (Face Area)	21,390.00	sf	55.00	1,176,450
364	Basemenet Excavation - Excavation	38,222.00	cy	20.00	764,440
365	Basement Excavation - Truck-Off / Disposal	68,799.00	ton	20.00	1,375,980
366	Soil Disposal Adjustment per Reconciliation	24,462.00	cy	60.00	1,467,720
	H - New School Complete				4,884,590
	A20 - BASEMENT CONSTRUCTION				4,884,590
	B10 - SUPERSTRUCTURE				
	H - New School Complete				
367	SOMD, Complete	445,600.00	sf	8.50	3,787,600

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	Estimate Detail	Lowell High School - TEF - TH Reconciled Rev 02			
	Description	**Qty**		**Unit Cost**	**Amount**
	A - New Construction				
	B10 - SUPERSTRUCTURE				
	H - New School Complete				
368	SOMD, Complete - Roof Top Equipment Allowance	2,500.00	sf	12.00	30,000
369	Structural Steel Metal Floor Framing	3,454.00	ton	3,500.00	12,089,000
370	Structural Metal Framing, Roof	1,037.00	ton	3,500.00	3,629,500
371	Structural Metal Framing, Mech Roof Screen Allowance Allowed 200 lf @ 15' H @ 15 lbs sf.	23.00	ton	3,800.00	87,400
372	Structural Metal Framing, Roof Dunnage	20.00	ton	3,800.00	76,000
373	Steel Floor Deck, 3" 18Ga	445,600.00	sf	3.70	1,648,720
374	Steel Roof Deck 2" 20 Ga type B	133,800.00	sf	3.15	421,470
375	Media Center Acoustical Upgrades	21,900.00	sf	7.00	153,300
376	Spray on Fireproofing 2hr Beam only (Cementitious) UL D925	445,600.00	sf	2.75	1,225,400
377	Spray on Fireproofing 2hr Beam & Deck (2")(Cementitious) UL D779	133,800.00	sf	3.75	501,750
378	Screen Wall Steel Support	1.00	ea	112,500.00	112,500
	H - New School Complete				23,762,640
	B10 - SUPERSTRUCTURE				23,762,640
	B20 - EXTERIOR CLOSURE				
	H - New School Complete				
379	Brick Exterior Wall Assemblies, Complete, 25%	43,225.00	sf	85.00	3,674,125
380	Metal Panels, Complete, 50%	86,451.00	sf	90.00	7,780,590
381	Glazed Curtain Wall and Aluminum Windows 25%	43,225.00	sf	110.00	4,754,750
382	Mechanical Screen Wall	3,250.00	sf	76.92	250,000
383	Exterior Door Allowance	172,000.00	sf	2.33	400,000
	H - New School Complete				16,859,465
	B20 - EXTERIOR CLOSURE				16,859,465
	B30 - ROOFING				
	H - New School Complete				
384	Membrane Roofing System, Complete	133,800.00	sf	28.50	3,813,300
385	Entrance Canopy Allowance	500.00	sf	125.00	62,500
	H - New School Complete				3,875,800
	J - New Classroom/Academics				
386	Entrance Canopy Allowance	500.00	sf	125.00	62,500
	J - New Classroom/Academics				62,500
	B30 - ROOFING				3,938,300
	C10 - INTERIOR CONSTRUCTION				
	H - New School Complete				
387	Metal Fabrications	579,400.00	sf	3.25	1,883,050
388	Interior Construction	579,400.00	sf	28.00	16,223,200

Grouping: MasterGrp / Uniformat2 / UDF1

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	Estimate Detail			Lowell High School - TEF - TH Reconciled Rev 02	
	Description	Qty		Unit Cost	Amount
	A - New Construction				
	C10 - INTERIOR CONSTRUCTION				
	H - New School Complete				
389	Specialties	579,400.00	sf	5.00	2,897,000
	H - New School Complete				21,003,250
	C10 - INTERIOR CONSTRUCTION				21,003,250
	C20 - STAIRS				
	H - New School Complete				
390	Metal Pan Stairs	837.00	rs	1,500.00	1,255,500
	H - New School Complete				1,255,500
	C20 - STAIRS				1,255,500
	C30 - INTERIOR FINISHES				
	H - New School Complete				
391	Ceilings	579,400.00	sf	8.00	4,635,200
392	Flooring	579,400.00	sf	9.00	5,214,600
393	Wall Finishes	579,400.00	sf	3.50	2,027,900
	H - New School Complete				11,877,700
	C30 - INTERIOR FINISHES				11,877,700
	D10 - CONVEYING				
	H - New School Complete				
394	Elevators	18.00	stps	40,000.00	720,000
395	Elevators - Freight	2.00	stps	60,000.00	120,000
	H - New School Complete				840,000
	D10 - CONVEYING				840,000
	D20 - PLUMBING				
	H - New School Complete				
396	Plumbing	579,400.00	sf	12.50	7,242,500
	H - New School Complete				7,242,500
	D20 - PLUMBING				7,242,500
	D30 - HVAC				
	H - New School Complete				
397	HVAC	579,400.00	sf	50.00	28,970,000
	H - New School Complete				28,970,000
	D30 - HVAC				28,970,000
	D40 - FIRE PROTECTION				
	H - New School Complete				
398	Fire Suppression	579,400.00	sf	5.00	2,897,000
	H - New School Complete				2,897,000
	D40 - FIRE PROTECTION				2,897,000

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	Estimate Detail			Lowell High School - TEF - TH Reconciled Rev 02	
	Description	Qty		Unit Cost	Amount
	A - New Construction				
	D50 - ELECTRICAL				
	H - New School Complete				
399	Electrical	579,400.00	sf	40.00	23,176,000
	H - New School Complete				23,176,000
	D50 - ELECTRICAL				23,176,000
	E10 - EQUIPMENT				
	H - New School Complete				
400	Equipment	579,400.00	sf	5.27	3,052,150
	H - New School Complete				3,052,150
	E10 - EQUIPMENT				3,052,150
	E20 - FURNISHINGS				
	H - New School Complete				
401	Furnishings	579,400.00	sf	14.00	8,111,600
	H - New School Complete				8,111,600
	E20 - FURNISHINGS				8,111,600
	F20 - SELECTIVE BUILDING DEMOLITION				
	H - New School Complete				
402	Demo Buildings;Lord & Field House	216,300.00	sf	10.00	2,163,000
403	Hazardous Materials	1.00	ea	2,675,000.00	2,675,000
	Includes$250,000 for 75 Arcand Street.Excludes				
	H - New School Complete				4,838,000
	I - New Bridges				
404	Demo Bridges	4,400.00	sf	15.00	66,000
	I - New Bridges				66,000
	F20 - SELECTIVE BUILDING DEMOLITION				4,904,000
	G10 - SITE PREPARATION				
	K - Site Improvements				
405	Site Allowance	579,400.00	sf	3.50	2,027,900
	K - Site Improvements				2,027,900
	G10 - SITE PREPARATION				2,027,900
	G30 - SITE CIVIL/MECHANICAL UTILITIES				
	K - Site Improvements				
406	Site Mechanical Utilities	579,400.00	sf	1.00	579,400
	K - Site Improvements				579,400
	G30 - SITE CIVIL/MECHANICAL UTILITIES				579,400
	G40 - SITE ELECTRICAL UTILITIES				
	K - Site Improvements				
407	Site Electrical Utilities	579,400.00	sf	1.00	579,400

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Estimate Detail	Lowell High School - TEF - TH Reconciled Rev 02		
Description	Qty	Unit Cost	Amount
A - New Construction			
G40 - SITE ELECTRICAL UTILITIES			
K - Site Improvements			579,400
G40 - SITE ELECTRICAL UTILITIES			579,400
A - New Construction			179,906,665
Total			**507,628,930**

Estimate Total	**507,628,930**

Budget Statement for Preferred Schematic - Expenditures

As reported on the school district's most recent three end of year information, please updated to the 3 latest fiscal year periods and complete the fields below.

	2013-2014 FY2014		2014-2015 FY2015		2015-2016 FY2016		Change from Previous Year		Post-Constuction Budget		New Facility vs. Current	
Category	Staff (FTE)	Budget	Staff (FTE)	Budget	Staff	Budget	Staff (FTE)	Budget	Staff	Budget	Staff (FTE)	Budget
Salaries												
Administration												
Admin. Secretary	20.00	739,299	21.00	710,615	22.00	730,944	1.00	20,329	22.00	730,944	0.00	-
Assistant Principal	7.00	680,315	7.00	702,904	7.00	717,479	0.00	14,575	7.00	717,479	0.00	-
Business Office	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-
Curriculum Director/Coord.	10.00	1,007,814	10.00	1,030,534	10.00	1,054,004	0.00	23,470	10.00	1,054,004	0.00	-
Custodians/Maintenance Staff	21.00	908,614	21.00	920,025	21.00	341,830	0.00	(578,195)	21.00	261,830	0.00	(80,000)
Newtwork Manager	1.00	456,370	1.00	65,250	1.00	58,653	0.00	(6,597)	1.00	58,653	0.00	-
Security Guards	10.00	316,500	10.00	325,791	10.00	324,323	0.00	(1,468)	10.00	324,323	0.00	-
Facilities Manager	1.00	96,776	1.00	95,695	1.00	99,985	0.00	4,290	1.00	99,985	0.00	-
Guidance	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-
Adjustment Counselor	4.00	331,953	4.00	333,019	4.00	339,225	0.00	6,206	4.00	339,225	0.00	-
Guidance Counselors	15.00	1,242,637	15.00	1,220,088	24.00	1,207,305	9.00	(12,783)	24.00	1,207,305	0.00	-
Guidance Director	1.00	111,967	1.00	112,091	1.00	114,953	0.00	2,863	1.00	114,953	0.00	-
Scheduler	1.00	76,041	1.00	76,041	1.00	77,942	0.00	1,901	1.00	77,942	0.00	-
Nurse	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-
Other	2.50	90,661	2.00	52,988	2.50	89,210	0.50	36,222	2.50	89,210	0.00	-
Principal	1.00	130,500	1.00	133,768	1.00	135,704	0.00	1,936	1.00	135,704	0.00	-
Special Education Admin	1.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-
Superintendent/Asst. Superintendent	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-
Video Producer/Scheduler	1.00	47,590	1.00	47,590	1.00	49,512	0.00	1,922	1.00	49,512	0.00	-
Treasurer	1.00	44,824	1.00	44,824	1.00	45,945	0.00	1,121	1.00	45,945	0.00	-
Total Administration	**97.50**	**6,281,860**	**97.00**	**5,871,223**	**107.50**	**5,387,014**	**10.50**	**(484,208)**	**107.50**	**5,307,014**	**0.00**	**(80,000)**
Instruction - Teaching Services												
Arts	4.00	289,709	4.00	291,217	4.00	309,369	0.00	18,152	4.00	309,369	0.00	-
Business	5.00	388,185	4.00	292,872	4.00	290,705	0.00	(2,167)	4.00	290,705	0.00	-
Communications	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-
In house Suspension Instructor	3.00	188,811	2.00	122,174	2.00	121,656	0.00	(518)	2.00	121,656	0.00	-
Culinary Arts	2.00	159,660	3.00	209,662	3.00	218,783	0.00	9,121	3.00	218,783	0.00	-
ELL	18.00	1,349,186	15.00	1,106,556	15.00	1,086,723	0.00	(19,832)	15.00	1,086,723	0.00	-
English Language	25.00	2,132,352	27.00	2,096,806	29.00	2,139,191	2.00	42,385	29.00	2,139,191	0.00	-
Family Consumer Services	2.00	161,547	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-
Foreign Language	16.00	1,208,873	16.00	1,213,519	17.00	1,333,264	1.00	119,745	17.00	1,333,264	0.00	-
Health Services	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-
History & Social Science	24.00	1,859,754	25.00	1,882,624	25.00	1,954,064	0.00	71,440	25.00	1,954,064	0.00	-
Instructional Assistant/Paraprofessionals	27.00	651,032	27.00	734,092	27.00	686,288	0.00	(47,804)	27.00	686,288	0.00	-
Library/Media	1.00	81,853	1.00	81,853	1.00	84,691	0.00	2,838	1.00	84,691	0.00	-
Mathematics	29.00	2,117,547	29.00	2,090,522	29.00	2,029,997	0.00	(60,525)	29.00	2,029,997	0.00	-
Student Activity Advisor	1.00	68,234	1.00	70,260	1.00	77,539	0.00	7,279	1.00	77,539	0.00	-
Music	3.00	235,386	3.00	225,406	3.00	232,844	0.00	7,438	3.00	232,844	0.00	-
Other	5.00	280,129	6.00	336,137	6.00	351,079	0.00	14,942	6.00	351,079	0.00	-
Physical Education	17.00	1,194,006	16.00	1,166,455	16.00	1,173,696	0.00	7,241	16.00	1,173,696	0.00	-
Reading	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-
School Adjustment Counselor	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-
Science												
Biology	29.00	2,106,684	28.00	2,086,868	29.00	2,142,647	1.00	55,779	29.00	2,142,647	0.00	-
Botany	0.00	-	0.00		0.00		0.00	-	0.00		0.00	-
Chemistry	0.00	-	0.00		0.00		0.00	-	0.00		0.00	-
Geology	0.00	-	0.00		0.00		0.00	-	0.00		0.00	-
Physics	0.00	-	0.00		0.00		0.00	-	0.00		0.00	-
Special Education	0.00	691,811	0.00	645,483	19.00	592,740	19.00	(52,743)	19.00	592,740	0.00	-
Substitute Teachers	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-	0.00	-
Technology	1.00	-	1.00	65,402	1.00	82,703	0.00	17,301	1.00	82,703	0.00	-
Video Production	1.00	80,001	1.00	48,545	1.00	71,307	0.00	22,762	1.00	71,307	0.00	-
Total Instruction - Teaching Services	**213.00**	**15,244,760**	**209.00**	**14,766,452**	**232.00**	**14,979,286**	**23.00**	**212,834**	**232.00**	**14,979,286**	**0.00**	**-**
Total Salaries Administration & Instruction	**310.50**	**21,526,621**	**306.00**	**20,637,675**	**339.50**	**20,366,301**	**33.50**	**(271,374)**	**339.50**	**20,286,301**	**0.00**	**(80,000)**
Employee Benefits												
All employee-related fringe (health insurance, retirement etc)		**-**		**-**		**-**		**-**		**-**		**-**
Materials & Services												
Materials												
Audio-Visual Materials		26,070		28,944		38,215		9,271		38,215		-
Culinary Arts Materials		-		-		-		-		-		-
General Office Supplies		296,014		293,473		298,862		5,389		298,862		-
Information technology		23,098		46,414		49,839		3,425		49,839		-
Hardware		65,563		189,435		110,510		(78,925)		110,510		-
Software		298,084		282,653		268,556		(14,097)		268,556		-
Library Materials		9,753		14,979		13,421		(1,558)		13,421		-
Non info-tech equipment		21,861		31,593		26,678		(4,915)		26,678		-
Testing Materials & Supplies		108,310		99,079		124,965		25,886		124,965		-
Textbooks		129,214		106,651		80,862		(25,789)		80,862		-
Vocational Program Materials		-		-		-		-		-		-
Total Materials		**977,967**		**1,093,221**		**1,011,908**		**(81,313)**		**1,011,908**		**-**

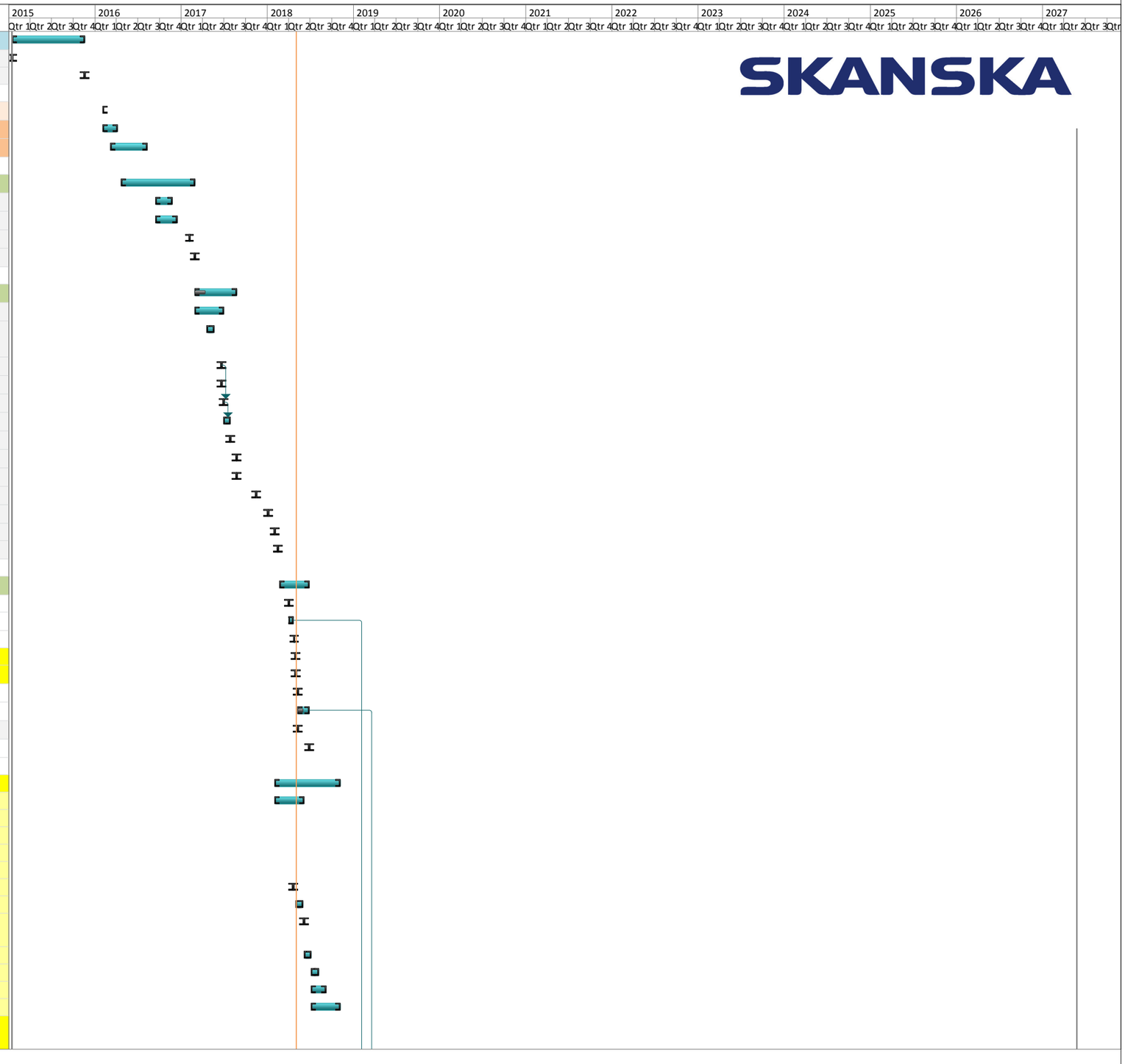
27.30

Budget Statement for Preferred Schematic - Expenditures

Category	2013-2014 FY2014 Staff (FTE)	2013-2014 FY2014 Budget	2014-2015 FY2015 Staff (FTE)	2014-2015 FY2015 Budget	2015-2016 FY2016 Staff	2015-2016 FY2016 Budget	Change from Previous Year Staff (FTE)	Change from Previous Year Budget	Post-Constuction Budget Staff	Post-Constuction Budget Budget	New Facility vs. Current Staff (FTE)	New Facility vs. Current Budget
Services												
Athletics		611,534		601,565		619,478		17,913		619,478		-
Attendance		-		-		-		-		-		-
Food Service		-		-		-		-		-		-
Health Services		-		-		-		-		-		-
Other Student Activities		516,784		439,185		312,717		(126,469)		312,717		-
Psychological Services		-		-		-		-		-		-
School Security		-		18,765		18,000		(765)		18,000		-
Student Transportation		113,000		118,108		113,000		(5,108)		113,000		-
Total Services		**1,241,318**		**1,177,623**		**1,063,195**		**(127,234)**		**1,063,195**		**-**
Total Material & Services		**2,219,286**		**2,270,845**		**2,075,103**		**(208,547)**		**2,075,103**		**-**
Facility Costs & Capital Improvements												
Facility Costs												
Custodial Supplies		65,477		75,242		82,746		7,504		82,746		-
Electricity		572,340		562,332		568,370		6,038		578,519		10,149
Heating Oil		-		-		-		-		-		-
Maintenance												
Building Security Maintenance		-		-		-		-		-		-
Elevator		-		-		-		-		-		-
Equipment Maintenance		-		-		-		-		-		-
Exterminating		-		-		-		-		-		-
Facility Maintenance		167,761		137,555		160,291		22,736		160,291		-
Fire Alarm		-		-		-		-		-		-
Fire Extinguisher Inspection		-		-		-		-		-		-
Generator		-		-		-		-		-		-
HVAC Maintenance		-		-		-		-		-		-
Other		-		-		-		-		-		-
Site Maintenance (Grouds)		-		-		-		-		-		-
Technology		-		-		-		-		-		-
Trash Removal		-		-		-		-		-		-
Natural Gas		342,490		297,211		194,409		(102,802)		85,163		(109,246)
Snow Removal		-		-		-		-		33,763		33,763
Telephone		75,167		46,447		52,458		6,011		52,458		-
Water/Sewer		51,270		48,433		40,965		(7,468)		40,965		-
Total Facility Costs		**1,274,505**		**1,167,220**		**1,099,239**		**(67,981)**		**1,033,905**		**(65,334)**
Capital Improvements												
Capital Improvements		59,427		72,599		52,938		(19,661)		-		(52,938)
Total Facility Costs & Capital Improvements		**1,333,932**		**1,239,819**		**1,152,177**		**(87,642)**		**1,033,905**		**(118,272)**
Debt Service												
Short-term				-		-		-		-		-
Long-term		264,322		319,850		304,506		(15,344)		8,850,000		8,545,494
Total Debt Service		**264,322**		**319,850**		**304,506**		**(15,344)**		**8,850,000**		**8,545,494**
Total Budget & Staff	**310.50**	**25,344,160**	**306.00**	**24,468,189**	**339.50**	**23,898,087**	**34**	**(582,907)**	**340**	**32,245,309**	**0**	**8,347,222**

LOWELL HIGH SCHOOL PROJECT - Preferred Schematic Report (PSR SCHEDULE)

ID	Task Name	Start	Finish	Duration
1	**Module 1 - Eligibility Period Activity**	**Wed 1/14/15**	**Wed 11/18/15**	**221 days**
2	**Invite to Eligibility Period**	**Wed 1/14/15**	**Wed 1/14/15**	**1 day**
3	**Invite to Feasibility Study**	**Wed 11/18/15**	**Wed 11/18/15**	**1 day**
4				
5	**Module 2 - Forming the Project Team**	**Wed 2/3/16**		
6	**Owners Project Manager Selection**	**Wed 2/3/16**	**Tue 4/5/16**	**45 days**
7	**Designer Selection**	**Mon 3/7/16**	**Tue 8/9/16**	**112 days**
8				
9	**Preliminary Design Program (Module 3.1)**	**Thu 4/21/16**	**Mon 2/27/17**	**223 days**
10	**Educational Planner: Visioning Sessions**	**Wed 9/14/16**	**Wed 11/23/16**	**51 days**
11	**PDP Submittal Development**	**Wed 9/14/16**	**Wed 12/14/16**	**66 days**
12	**SBC Recommend to City Council - Approval of PDP**	**Thu 2/2/17**	**Tue 2/7/17**	**4 days**
13	**PDP Submittal Date to MSBA (At least 8 weeks before PSR date)**	**Mon 2/27/17**	**Mon 2/27/17**	**1 day**
14				
15	**Preferred Schematic Report (Module 3.2)**	**Mon 2/27/17**	**Wed 8/23/17**	**128 days**
16	PSR Submittal Development	Mon 2/27/17	Thu 6/29/17	89 days
17	**Massachusetts Historical Commission (MHC) File Project Notification Form (PNF) - Additional Submissions required**	**Wed 4/19/17**	**Fri 5/19/17**	**23 days**
18	**SBC Recommend to City Council Approval of PSR Submission**	**Tue 6/20/17**	**Tue 6/20/17**	**1 day**
19	City Council Approve PSR Submission	Tue 6/20/17	Tue 6/20/17	1 day
20	**PSR Submittal Date to MSBA**	**Thu 6/29/17**	**Thu 6/29/17**	**1 day**
21	MSBA Review of PSR	Thu 6/29/17	Thu 7/27/17	21 days
22	**Meet Facility Assessment Subcommittee (FAS) 7/27**	**Thu 7/27/17**	**Thu 7/27/17**	**1 day**
23	**MSBA Board Meeting - PSR Approval - VOTE TABLED**	**Wed 8/23/17**	**Wed 8/23/17**	**1 day**
24	**PSR Section 3.3.4 Resubmission on 10/13/17 - ALL WORK ON HOLD**	**Wed 8/23/17**	**Wed 8/23/17**	**1 day**
25	**Letter to MSBA to Advise City is reconsidering a Downtown Option**	**Tue 11/14/17**	**Tue 11/14/17**	**1 day**
26	Letter to MSBA: Confirm intent to change PSR Submitted	Thu 1/4/18	Thu 1/4/18	1 day
27	MSBA/ City of Lowell Meeting - Request for Extension FSA Agreement to 8/30/19	Thu 2/1/18	Thu 2/1/18	1 day
28	**MSBA Board Meeting - Approval to Extend Feasibility Study**	**Wed 2/14/18**	**Wed 2/14/18**	**1 day**
29				
30	**Preferred Schematic Report - PSR (Module 3.2) - Revise and update**	**Thu 2/22/18**	**Wed 6/27/18**	**90 days**
31	Documents to Estimators	Mon 4/2/18	Mon 4/2/18	1 day
32	Cost Estimate (3 wks) /Reconciliation/VE if Required (4 Weeks)	Mon 4/2/18	Fri 4/20/18	15 days
33	City Review PSR	Mon 4/23/18	Thu 4/26/18	4 days
34	**SBC Presentation costs/SBC Vote Recommendation Preferred option**	**Mon 4/30/18**	**Mon 4/30/18**	**1 day**
35	**Approval of Preferred Schematic Option & Budget (City Council)**	**Tue 5/1/18**	**Tue 5/1/18**	**1 day**
36	**PSR Section 3.3.4 Resubmission**	**Wed 5/9/18**	**Wed 5/9/18**	**1 day**
37	MSBA PSR Review	Wed 5/9/18	Wed 6/27/18	36 days
38	**Meet Facility Assessment Subcommittee (FAS) 5/9/18**	**Wed 5/9/18**	**Wed 5/9/18**	**1 day**
39	**MSBA Board Meeting - PSR Approval - NEW TARGET DATE**	**Wed 6/27/18**	**Wed 6/27/18**	**1 day**
40				
41	***27 ARCAND DRIVE ACQUISITION or EMINENT DOMAIN - if required***	***Thu 2/1/18***	***Mon 11/5/18***	***198 days***
42	City to effectuate an eminent domain taking	Thu 2/1/18	Tue 6/5/18	89 days
43	*City issues MGL c. 30B bids for independent appraisers			
44	*City Departments perform pretaking research on property			
45	*City contacts Bureau of Relocation			
46	*City Secures Necessary Funds			
47	Bureau of Relocation Plan (Submit at least 45 days before property acquisition)	Fri 4/20/18	Fri 4/20/18	1 day
48	Notice of Public Meeting to all affected parties	Tue 5/1/18	Thu 5/31/18	23 days
49	**Order of Taking: City Council holds public hearing and vote on Order of Taking/Pro Tanto Award of Damages**	**Tue 6/5/18**	**Tue 6/5/18**	**1 day**
50	City to record certified copy of Order of Taking with Registry of Deeds	Wed 6/6/18	Thu 7/5/18	22 days
51	City must provide notice of Eminent Domain Taking and award of Damages	Thu 7/5/18	Mon 8/6/18	23 days
52	City must provide any payment of damages (60 days after record of taking)	Thu 7/5/18	Thu 9/6/18	46 days
53	4 month period where tenants are not required to vacate	Thu 7/5/18	Mon 11/5/18	88 days
54	**PROJECT FUNDING AGREEMENT WITH MSBA CONTINGENT ON SUCCESSFUL COMPLETION OF EMINENT DOMAIN TAKING OF 75 ARCAND DRIVE**			

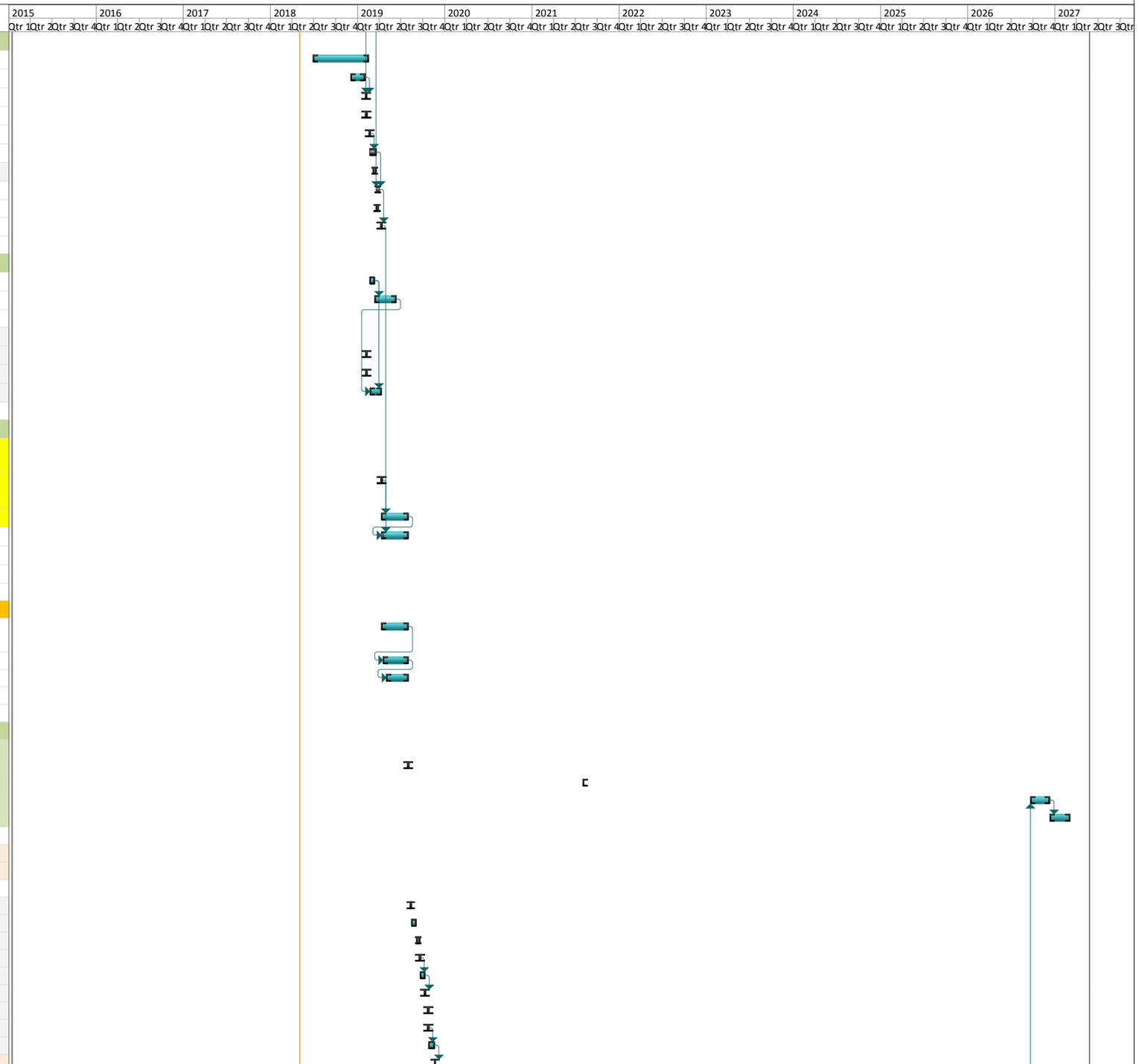


Project: Lowell High School
Date: Fri 5/4/18

Task	Summary	External Milestone	Inactive Summary	Manual Summary Rollup	Finish-only
Split	Project Summary	Inactive Task	Manual Task	Manual Summary	Deadline
Milestone	External Tasks	Inactive Milestone	Duration-only	Start-only	Progress

LOWELL HIGH SCHOOL PROJECT - Preferred Schematic Report (PSR SCHEDULE)

ID	Task Name	Start	Finish	Duration
55	**Schematic Design (Module 4) - Preferred Option**			
56	Schematic Design (SD)	Thu 6/28/18	Fri 2/15/19	167 days
57	Cost Estimate (4 wks) /Reconciliation/VE if Required (8 Weeks)	Mon 12/3/18	Thu 1/31/19	44 days
58	**Approval of Schematic Design & Budget (SBC & City Council)**	**Tue 2/5/19**	**Tue 2/5/19**	**1 day**
59	OPM SD Notification Email to MSBA 10 Days Prior to SD Submission	Wed 2/6/19	Wed 2/6/19	1 day
60	**SD Submittal Date to MSBA**	**Wed 2/20/19**	**Wed 2/20/19**	**1 day**
61	MSBA SD Review	Wed 2/20/19	Wed 3/20/19	21 days
62	**Meet Facility Assessment Sub. (FAS) 3/13/19 or 3/27/19**	**Wed 3/6/19**	**Wed 3/20/19**	**11 days**
63	Address SD Comments	Wed 3/20/19	Tue 4/2/19	10 days
64	MSBA/CITY: Project Scope and Budget Conference/PS&B Agreement Executed	Mon 3/18/19	Fri 3/29/19	10 days
65	**MSBA Board Meeting - PS&B Approval - MSBA 2019 Schedule TBD**	**Wed 4/10/19**	**Wed 4/10/19**	**1 day**
66				
67	**DESE Review**			
68	MSBA Review of DESE Submittal	Wed 2/20/19	Wed 3/13/19	16 days
69	DESE Review and Approval	Wed 3/13/19	Tue 6/11/19	65 days
70				
71	**CM at Risk Application to Office of Inspector General**			
72	Establish Prequal Committee for CM	Thu 2/7/19	Thu 2/7/19	1 day
73	**SBC Authorize CMr Submission To Inspector General**	**Thu 2/7/19**	**Thu 2/7/19**	**1 day**
74	Submission of CMr Application to IG Office (up to 60 days)	Thu 2/21/19	Wed 4/10/19	35 days
75				
76	**Project Funding Appropriation (Module 5) District Driven Schedule**			
77	**PROJECT FUNDING AGREEMENT WITH MSBA CONTINGENT ON SUCCESSFUL COMPLETION OF EMINENT DOMAIN TAKING OF 75 ARCAND DRIVE**			
78	**Recommended Early Approval Period from District/City Council CONTINGENT APPROVAL BASED ON MSBA APPROVAL**	**Thu 4/11/19**	**Thu 4/11/19**	**1 day**
79	**120 Day Period allowed Local Actions & Approvals (MSBA BOD date)**	**Wed 4/10/19**	**Thu 8/1/19**	**82 days**
80	**Certificate of Vote Sent to the MSBA**	**Wed 4/10/19**	**Thu 8/1/19**	**82 days**
81	Project Funding Agreement Sent			
82	Project Funding Agreement Executed			
83				
84	**Module 6 Kick-off Activities**			
85	**Vote to Amend OPM and Designer Contracts /Issue Amendments Notice to Proceed with Design Development**	**Wed 4/10/19**	**Thu 8/1/19**	**82 days**
86	**Send Amended OPM and Designer Contracts to MSBA**	**Wed 4/17/19**	**Thu 8/1/19**	**77 days**
87	Schedule MSBA Kick-off Meeting	Wed 5/1/19	Thu 8/1/19	67 days
88	Engage Cx and distribute schedule and workplan			
89				
90	**Sustainable Design Milestones**			
91	Green Charette - Basis of Design			
92	Substainable Design, LEED Silver Project Registration	Thu 8/1/19	Thu 8/1/19	1 day
93	Provisional Review Submittal 3 Months After Bidding	Mon 8/2/21		
94	USGBC Final Review Submission 3 Mos after Substantial Complete	Sun 9/20/26	Thu 12/10/26	60 days
95	Green School Program Certification Letter	Fri 12/11/26	Thu 3/4/27	60 days
96				
97	**Procurement:**			
98	**CM Selection Procurement CM at Risk**			
99	SBC Establish Prequalifications Committee			
100	Advertisement to Central Register/COMPass/Newspaper	Thu 8/8/19	Thu 8/15/19	6 days
101	RFQ available to CM Firms	Wed 8/14/19	Tue 9/3/19	15 days
102	Prequal Committee reviews CM SOQs	Wed 9/4/19	Thu 9/19/19	12 days
103	**SBC Approve shortlist of CM Firms**	**Thu 9/19/19**	**Thu 9/19/19**	**1 day**
104	Issue RFP for CM at Risk	Fri 9/20/19	Thu 10/10/19	15 days
105	RFP responses due from CM at Risk	Thu 10/10/19	Thu 10/10/19	1 day
106	Prequal Committee Completes CM Interviews	Thu 10/24/19	Thu 10/24/19	1 day
107	**Select Highest Ranked CM Firm**	**Thu 10/24/19**	**Thu 10/24/19**	**1 day**
108	Negotiate with CM for Precontruction and Construction Contract (Fee/GC)	Fri 10/25/19	Tue 11/19/19	18 days
109	**CM Contract Award for Precontruction (Fee/GC)**	**Wed 11/20/19**	**Fri 11/22/19**	**3 days**

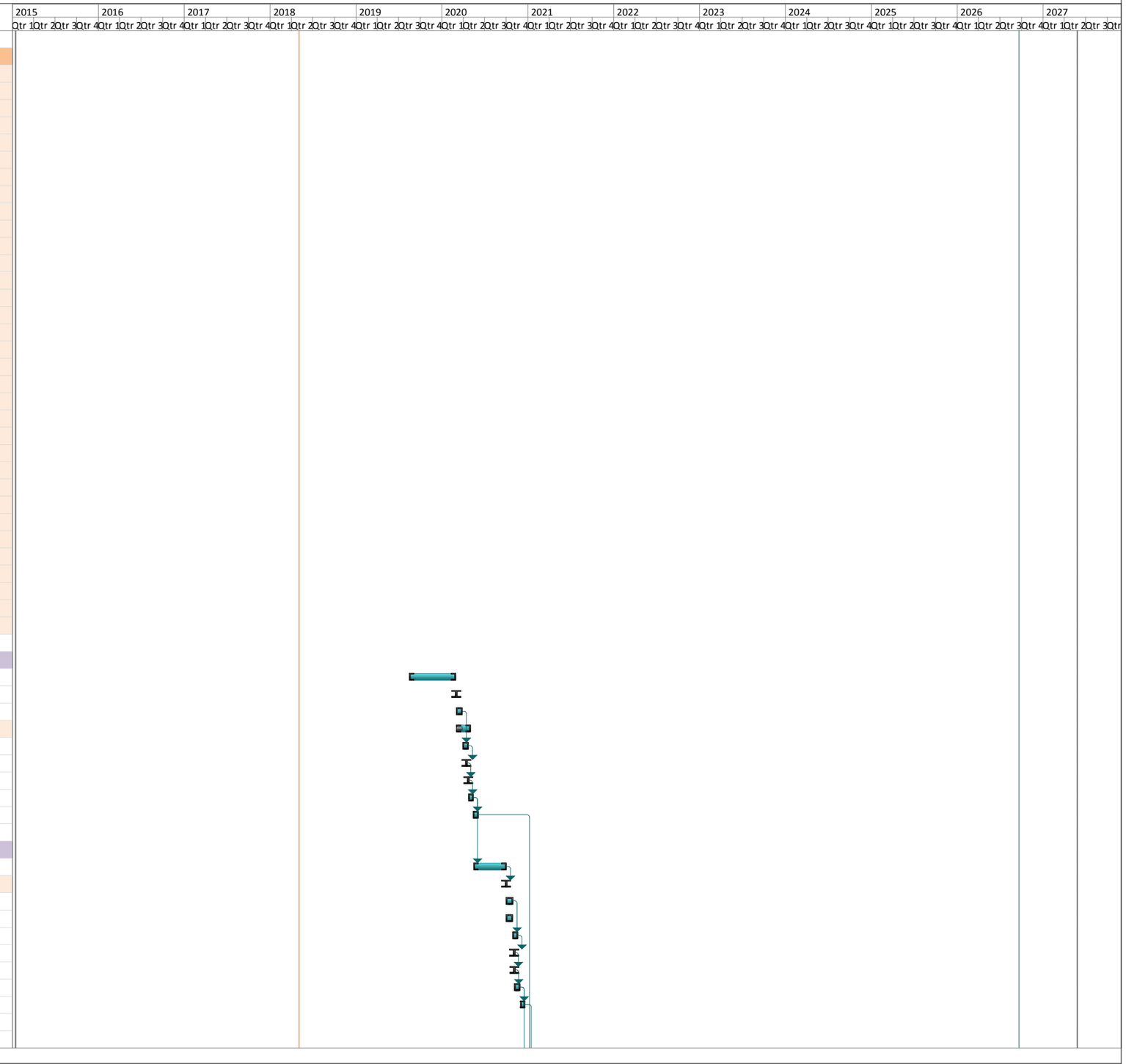


Project: Lowell High School
Date: Fri 5/4/18

Task	Summary	External Milestone	Inactive Summary	Manual Summary Rollup	Finish-only
Split	Project Summary	Inactive Task	Manual Task	Manual Summary	Deadline
Milestone	External Tasks	Inactive Milestone	Duration-only	Start-only	Progress

LOWELL HIGH SCHOOL PROJECT - Preferred Schematic Report (PSR SCHEDULE)

ID	Task Name	Start	Finish	Duration
110				
111	**Approvals**			
112	ZBA Variance - 6 months (if applicable)			
113	Site Plan Review 6 months			
114	NPDES			
115	Air rights at Canal/Article 97 Approval			
116	MA_DEP Notice of Abatement - 10 working Days			
117	DEP Demo Permit (in addition to the ACM permit)			
118	LT&TD Construction Management Plan - 30 Days			
119	Public Way Occupancy (lane closure)			
120	Gas Utility Shut Off Notice - 30 Days			
121	Electric Utility Shut Off Notice - 30 Days			
122	ISD Electrical Make-safe Permit - 2 Days			
123	LFD Demo Permit - 30 Days			
124	ISD Plumbing Make-safe Permit - 2 Days			
125	ISD Building Demolition Permit - 30 Days			
126	LRWWU Sewer Demolition Permit - 2 Days			
127	LRWU Water Demolition Permit - 2 Days			
128	Notice of Intent - 2 months (if applicable)			
129	Request for Determination of Applicability - 1 month			
130	**Precursor to ZBA, Plan Bd. And ConCom**			
131	**Environmental Notification Form / Determination - 6 months (if applicable)**			
132	**Applicability / Environmental Impact Report**			
133	LRWU Hydrant Metering Permit - 2 weeks			
134	LDPW Storm Water New Connection Permit driven by discharge permit			
135	LDPW Street Opening Permit - 2 Days			
136	ISD Building Permit - 30 Days			
137	ISD Electrical Permit - 30 Days			
138	ISD Plumbing Permit - 30 Days			
139	Street Opening Permit - 2 Days			
140	Driveway Permit - 2 Days			
141	Emergency Responder Review - 30 Days/ ongoing during design			
142	Health Department - 5 Days			
143	Lowell Historic / National Park - 2 months			
144	DEP Fossil Fuel (if facility uses 40,000,000 +BTU or emerg generator 3,000,000 +BTU)			
145				
146	**Design Development (DD)**			
147	80% DD Documents	Thu 8/15/19	Fri 2/28/20	142 days
148	80% Design Development (DD) – documents to Estimators	Mon 3/2/20	Mon 3/2/20	1 day
149	Commissioning Agent Comments on 80% DD	Mon 3/2/20	Fri 3/27/20	20 days
150	**Cost Estimate/Reconciliation/VE if Required CM/AE**	**Mon 3/2/20**	**Fri 5/1/20**	**45 days**
151	Team Respond to Commissioning Agent's Comments and Finalize 100% DD	Mon 3/30/20	Wed 4/22/20	18 days
152	**Authorize - 100% DD Submission to MSBA**	**Tue 4/14/20**	**Tue 4/14/20**	**1 day**
153	**100% DD Submission Date to MSBA**	**Wed 4/22/20**	**Wed 4/22/20**	**1 day**
154	MSBA DD review (21 days)	Thu 4/23/20	Wed 5/13/20	15 days
155	Address DD Review Comments (21 days)	Wed 5/13/20	Wed 6/3/20	16 days
156				
157	**60% Construction Documents (CD)**			
158	60% CD Documents	Fri 5/15/20	Wed 9/30/20	99 days
159	**60% CDs – documents to Estimators**	**Wed 9/30/20**	**Wed 9/30/20**	**1 day**
160	CM/Commissioning agent comments on 60%CD	Wed 9/30/20	Wed 10/28/20	21 days
161	Cost Estimate/Reconciliation/VE if Required	Wed 9/30/20	Tue 10/27/20	20 days
162	Team Respond to Commissioning Agent's Comments	Wed 10/28/20	Wed 11/18/20	16 days
163	**SBC - Authorize - 60% CD Submission to MSBA**	**Tue 11/3/20**	**Tue 11/3/20**	**1 day**
164	**60% CD Submission Date to MSBA**	**Wed 11/4/20**	**Wed 11/4/20**	**1 day**
165	MSBA 60% CD Review Comments (21 days)	Wed 11/4/20	Fri 11/27/20	18 days
166	Address 60% Review Comments (21 days)	Mon 11/30/20	Fri 12/18/20	15 days
167				
168				

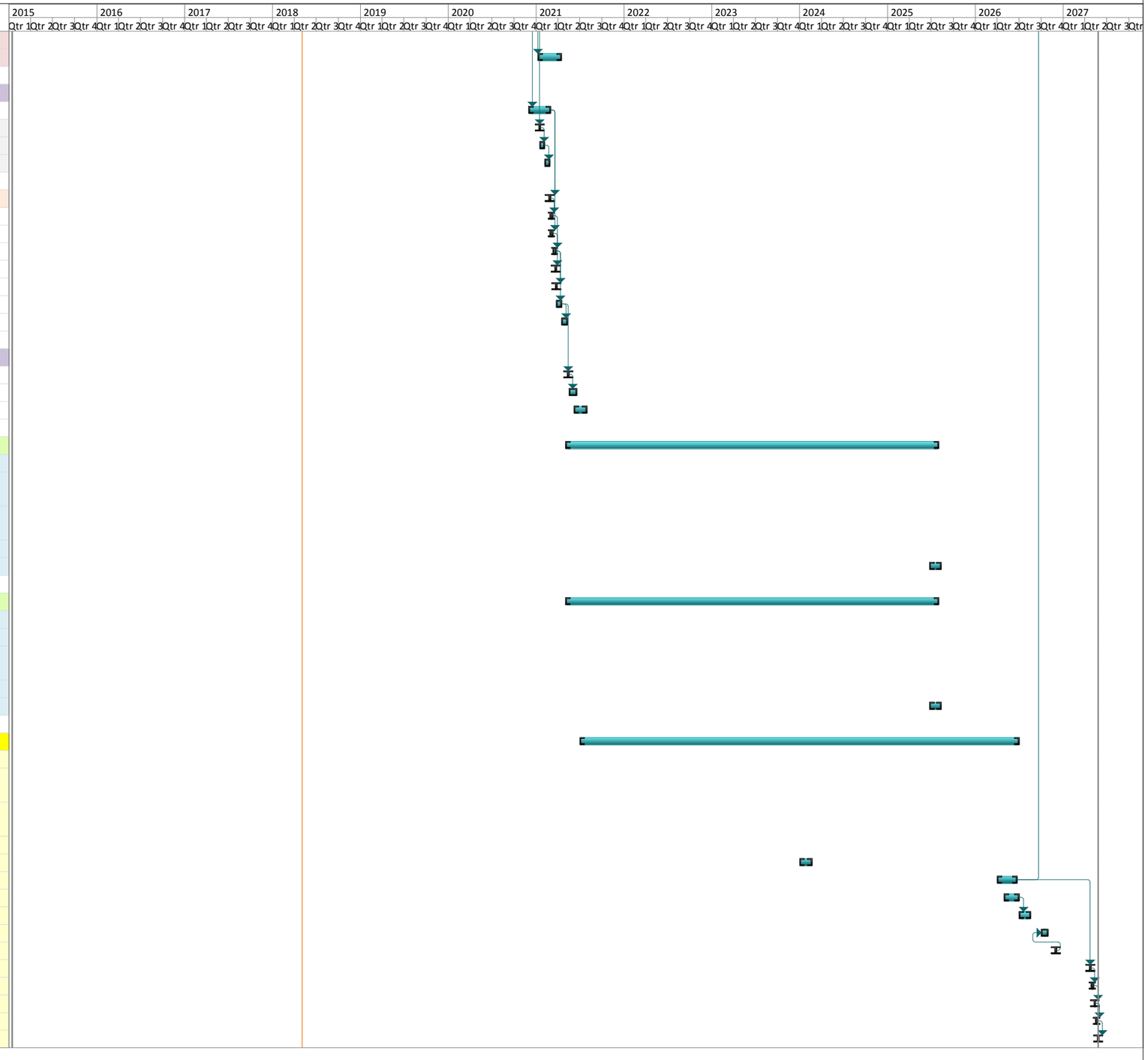


Project: Lowell High School
Date: Fri 5/4/18

Task | Summary | External Milestone | Inactive Summary | Manual Summary Rollup | Finish-only
Split | Project Summary | Inactive Task | Manual Task | Manual Summary | Deadline
Milestone | External Tasks | Inactive Milestone | Duration-only | Start-only | Progress

LOWELL HIGH SCHOOL PROJECT - Preferred Schematic Report (PSR SCHEDULE)

ID	Task Name	Start	Finish	Duration
169	**Prequalify Filed Sub Bidders**			
170	Prequalify Filed Sub Bidders (FSB)	Fri 1/8/21	Thu 4/15/21	70 days
171				
172	**90% CD Development**			
173	90% CD Documents	Mon 11/30/20	Mon 3/1/21	66 days
174	**Issue 90% CDs Structural Steel to Peer Reviewer and CM**	**Fri 1/15/21**	**Fri 1/15/21**	**1 day**
175	Structural Steel Peer Review on 90% CDs	Fri 1/15/21	Thu 2/4/21	15 days
176	Incorporate Structural Peer Review Comments complete design	Fri 2/5/21	Fri 2/26/21	16 days
177				
178	**90% CDs – documents to Estimators**	**Fri 2/26/21**	**Fri 2/26/21**	**1 day**
179	Cost Estimate/Reconciliation/VE if Required	Fri 2/26/21	Thu 3/11/21	10 days
180	CM/Commissioning Agent Comments on 90%CD's	Fri 2/26/21	Thu 3/11/21	10 days
181	Team Respond to Commissioning Agent's Comments	Thu 3/11/21	Wed 3/24/21	10 days
182	**SBC - Authorize - 90% CD Submission to MSBA**	**Tue 3/23/21**	**Tue 3/23/21**	**1 day**
183	**90% CD Submission Date to MSBA**	**Thu 3/25/21**	**Thu 3/25/21**	**1 day**
184	MSBA 90% CD Review Comments (21 days)	Thu 3/25/21	Fri 4/16/21	17 days
185	Address 90% Review Comments (21 days)	Fri 4/16/21	Mon 5/10/21	17 days
186				
187	**100% CD / Bid Package**			
188	100% CD Documents	Fri 5/14/21	Fri 5/14/21	1 day
189	Bids due	Mon 5/17/21	Fri 6/18/21	25 days
190	Bid Awards	Mon 6/7/21	Fri 7/30/21	40 days
191				
192	**Construction Duration Option "A" NEW EXPANDED SITE (51 Months)**	**Mon 5/3/21**	**Fri 8/1/25**	**1110 days**
193	24 MODULAR CLASSROOMS: 1 YEAR FOR PLANNING/DESIGN AND INSTALLATION			
194	Phase 1: Demolition and abatement of 75 Arcand Drive/Build New Freshman Academy/Complete Temp.connection to the 1922 Bldg			
195	Phase 2: Portable Gym/Vacate interior classrooms/Demo Gym and Lord Building Build New Gym and Freshman Buildings			
196	Phase 3: Remove portables and complete Fit-out at Temp Café			
197	Move-In and full Occupancy	Tue 6/24/25	Mon 8/11/25	35 days
198				
199	**Construction Duration ADD/RENO 2A Phased/Occupied (51 Months)**	**Mon 5/3/21**	**Fri 8/1/25**	**1110 days**
200	Phase 1: Portable Gym/Vacate interior classrooms and Demo existing Gym Building			
201	Phase 2: New Freshman and New Gymnasium Wings - Reno West Side Lord			
202	Phase 3: Renovate remainder of Lord Building and Renovate North End of 1922 Buildings/Build new North Bridge			
203	Phase 4: Renovate remainder of 1922 Bldg and Build New South Bridge			
204	Move-In and full Occupancy	Tue 6/24/25	Mon 8/11/25	35 days
205				
206	**Construction Duration ADD/RENO 3A EXPANDED SITE (60 Months) - PREFERRED**	**Thu 7/1/21**	**Wed 7/1/26**	**1305 days**
207	Phase 1: Demolition and abatement of 75 Arcand Drive/Build New Gymnasium Wing			
208	Phase 2: Demo Gym/Vacate interior classrooms/Build New Freshman Wing - Reno West Side Lord			
209	Phase 3: Renovate remainder of Lord Building and Renovate North End of 1922 Buildings/Build new North Bridge			
210	Phase 4: Renovate remainder of 1922 Bldg and Build New South Bridge			
211	50% DCAMM Notification	Mon 1/1/24	Wed 2/21/24	38 days
212	Substantial Completion and C of O Finalized	Wed 4/1/26	Tue 6/23/26	60 days
213	Punchlist	Thu 4/30/26	Wed 7/1/26	45 days
214	Move-In and full Occupancy	Wed 7/1/26	Tue 8/18/26	35 days
215	100% DCAMM Notification	Thu 10/1/26	Thu 10/29/26	21 days
216	GC/CM Request for Final Payment	Tue 12/1/26	Tue 12/1/26	1 day
217	Commissioning Consultant Inspection (10 Months after Substantial Completion)	Fri 4/23/27	Fri 4/23/27	1 day
218	Submittal of Final Commissioning Report to MSBA	Mon 4/26/27	Fri 5/7/27	10 days
219	Submittal Date of Commissioning Certificate of Commissioning	Mon 5/10/27	Thu 5/13/27	4 days
220	Final Completion / Project Closeout	Fri 5/14/27	Tue 5/25/27	8 days
221	Submittal Date to MSBA of Final Reimbursement Request	Wed 5/26/27	Wed 5/26/27	1 day



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Educational Program (v12 for the revised PSR)

Lowell High School, established in 1831 with a principal and 47 students, was the first public co-educational high school in the United States and one of the first integrated high schools in the nation. In 1896 Coburn Hall was erected and an adjacent building was added in 1922. The school was expanded across the canal in 1980 with the construction of a new building and field house. Expansion and renovation of both buildings occurred in 1997. In 2005, the district repurposed a nearby middle school to serve as additional space for the Lowell High School Freshman Academy.

Throughout its long life, the high school buildings have been repurposed to the extent possible to meet educational needs, but the structure only allows for minimum flexibility and usage. As the school expands in numbers and evolves into a modern educational approach, a new facility is needed to implement technology seamlessly across the building and to offer flexible spaces that support collaboration and 21st century teaching and learning.

LHS successfully completed the Fall 2015 NEASC Accreditation process and received full reaccreditation. However, the school was placed on warning for standard 7: Community Resources for Learning, which deals with budget, facilities, and the physical plant. The accreditation committee listed the following concerns (noted in the 4/22/16 Accreditation letter):

> *The school site and plant do not minimally support the delivery of high quality school programs and services, including but not limited to the following:*
>
> - *Leaks in the roof, the tunnel, and from sinks*
> - *Temperature fluctuations where one room is considerably warm while another is considerably colder*
> - *The presence of pests in the building*
> - *Windows in need of repair*
> - *The nurse's office which is small and not easily navigated by wheelchair-bound students*
> - *The lack of full accessibility to individuals with physical handicaps*
> - *The main cafeteria that is at or near capacity*
> - *The lack of capacity of the electrical system resulting in the inability to support upgrades in technology*
> - *The lack of natural light or adequate ventilation in art rooms*
> - *The inability of the science labs in both the 1922 and the 1980 buildings to support modern science curriculum and pedagogy*
> - *The lack of equitable facilities to support students in life skills programs*
> - *The lack of equitable access to up-to-date technology for all students*

According to the Fall 2015 NEASC Accreditation report,

> *In the 2013-2014 school year, a comprehensive facilities assessment by OMR Architects determined that the building's needs, based on enrollment trends for the next ten years and the fluctuations in enrollment, provide justification for a renovation or for the construction of a new high school. A request has been submitted to the Massachusetts School Building Authority (MSBA) and has been accepted and is being looked upon favorably. The city of Lowell and the Lowell School Department are unified in their support for this petition to the MSBA. The adoption and funding of a comprehensive, long-range plan for programs and services, facility needs, technology, and capital improvement will ensure the ability of Lowell High School students to achieve the school's expectations for learning.*

The Lowell Public Schools are incredibly diverse. The ethnic/racial/cultural composition of the student body in the schools makes it one of the most diverse districts in the Commonwealth: African American students 7.1%, Asian students 29.4%, Hispanic students 30.1%, White students 30.1%, and all other students 3.2%. In the district, 75.1% of the student body qualifies as low-income, 15.1% are classified as Special Education, and the English Language Learner population is 26.6%. The high school reflects the great diversity of the City of Lowell with students representing over 50 countries from all over the world and speaking almost 60 different languages. Given this cultural, racial and socioeconomic diversity, Lowell High School has been successful at consistently maintaining a high graduation rate for an urban district (over 80%) and a high college attendance rate (over 85% of students seek post-secondary education at four-year and 2-year colleges and universities).

The proposed planning concepts, whether renovation or new construction, will include the scope/costs of creating a weather-tight, code compliant facility (including full accessibility) along with new mechanical (indoor air quality, heating and cooling), electrical, plumbing, fire protection, technology, communications and safety/security systems. All options have been planned to address program deficiencies, including sub-standard Nurse's Office, Cafeteria, Science Labs, Special Education (including Life Skills) and numerous other program deficiencies that do not meet MSBA guidelines or capacity needs.

The great diversity represented by the student body is expected to be celebrated in new and different ways, possibly through new means of display and broadcasting within the school, but also by having Special Education and English Language Learner (ELL) to be integrated as 2-room clusters, adjacent to regular academic classrooms (as opposed to a separate zone within the school).

A. GRADE AND SCHOOL CONFIGURATION POLICIES

Lowell High School currently educates over 3,125 students in grades 9-12. The school has twelve academic departments each led by an Academic Department Chair, nine Pathway Programs (eight currently and one in development), an academically-accelerated Latin Lyceum program, and four administrative houses that consist of a House Dean, two Guidance Counselors, a Social Worker, and two clerks. The houses in the main building are located in four different areas of the building, two in the 1980s building and two in the 1922 building. Classes are randomly scattered within the buildings, a product of repurposing space as needed, and teachers are assigned to houses based on proximity to the house office for organizational purposes only. Courses and teachers are not scheduled in a single house but rather across the building. There is a Freshman Academy program housed in a building separated from the rest of the high school by a public roadway. The Freshman Academy is its own separate house, with its own two clerks, three Guidance Counselors, and a Social Worker. Students are placed into one of three clusters in the Freshman Academy; two clusters contains two English, History, Math and Science teachers and a third super-cluster contains three English, History, Math, and Science teachers. Ninth grade students need to travel to the main buildings for physical education and other elective courses.

House offices are a means to break down the large student body into smaller cohorts for the purpose of student support and guidance. Having physically separate office areas ensures a more manageable and personable experience.

The house office is the epicenter of student support. It is here that students are serviced for behavioral, social-emotional, or guidance needs. The house dean oversees their caseload of students with the support of two guidance counselors, one social worker and one office clerk and one clerk scheduler. The house staff works as a team to help address any issues a student might have whether it is attendance, discipline, social-emotional scheduling or college preparation. This house approach is very effective in helping to ensure students are receiving the services they require. The issue currently is that the house offices have had to conform to previously established space. This has left two house offices without the ability to have the social worker in the same space as the rest of the team. It has also led to various space configurations that are not optimum. The fact that the houses are spread out between two buildings also hinders collaboration between houses and the distance some houses are from the main entrance requires parents/guardians to walk quite a distance to meet with the house staff.

Established in 2005 the Freshman Academy was designed to forge greater articulation between grades 8 and 9. The Freshman Academy employs a team-based model similar to that seen in middle schools and offers programming and structure which promotes an effective and positive transition for students entering their first year at Lowell High School.

Upon entering, students from the 8 public middle schools and various private schools are placed into cluster teams. A cluster is a small team of content teachers that works extensively with a group of approximately 200 students. Cluster teams are placed on one floor to allow teachers close proximity to one another in order to minimize transitions and create a small school feel within the larger high school community. Through the offered academic and social supports, our vision is to insure that all students who enter as freshman successfully leave with the skills and knowledge necessary to be successful Lowell High School students

Proposed Change: We would like to keep our current grade and school configuration in regards to departments, pathways and administrative houses. We would like to incorporate the Freshman Academy within the new/renovated high school in its own wing, which would allow the Freshman Academy to keep its distinct program identity but make it more connected to the rest of the school and safer for students who would no longer have to cross a street to get to classes during the school day. We want to ensure that all members of each house team are part of the house suite. We would like to strengthen collaboration between house teams and make it easier for parents to access house offices by placing house offices near the main entrance(s) and in proximity to each other.
This also supports the safety and security of the building, eliminating traffic streaming in through open doors and the need to share security officers in multiple buildings. One physical plant would ensure that there is a more cooperative effort to support safety and security throughout the building.

The proposed planning concepts intend to create a distinct Freshman Academy as a small learning community within the school, but not completely isolated, as students will utilize shared programs, such as World Language Classrooms, Library/Media Center, Gymnasium and Arts/Tech programs. Class scheduling may be used to keep shared programs distinctly separate, but also intentionally mixed to expose new students to the larger high school community in a deliberate manner. The Freshman Academy will be arranged in teams of 4 classrooms (English/social studies/math and science). Freshmen currently utilize 2 teams of 8 classrooms +1 team of 12 for 3100 students. The proposed enrollment increase of 13% suggests approximately 4 teams of 8 will be needed for an enrollment of 3,520 students.

The proposed administrative program includes space for main administration, main student support as well as the suites for freshman and 4 houses (8 administration suites total). Additional space is earmarked for archived records, teacher workrooms and the career center

B. CLASS SIZE POLICIES

Lowell High School takes pride in its extensive course offerings, offering more variety than most public high schools in Massachusetts. This offers students the opportunity to not only meet core graduation requirements, but also explore their interests in a

variety of areas including Business/Marketing, Culinary, Engineering, the Fine and Performing Arts, and ROTC, just to name a few. This variety does have an impact on the schedule and class sizes. There is no official class size policy in the district, though we do try to keep our college level courses below 28 at the high school. The average class size in the core academic areas of English, mathematics, science, and social studies is 24. ELL courses average 22 and Foreign Language courses average 22. Physical education average 33 and our special education courses average 7. In the elective area of art, business, culinary, and ROTC, average class sizes range from 2 to 22 with outliers ranging due to unique needs of certain programs, from 2 in the bank program, 10 in the Retail Marketing (School Store) to 60 in the band and chorus classes.

Proposed Change: There is a need for flexible classroom space for a variety of reasons to include the ability to appropriately schedule classes that are not within the average class size.

Future space needs are calculated based on the current Master Schedule, prorated for the new student enrollment (3,520 students) and an average class size of 24 students/room (same average as exists now, which results in a range between 20 and 28, sometimes a few more). Given the existing range, rooms are planned larger (at 900sf vs existing 825-850 sf average) and will include furniture layouts for 28. Some classes are deliberately smaller at 8-16 students and were tracked and calculated separately to ensure courses were not averaged-up and course offerings were not eliminated.

Note:
Planning for the future, ELL classes were calculated for a 20 student average and specialty programs, including SPED, Fine Arts, Business and Technology were based on existing sizes. Physical Education needs are based on 26 student class average.

C. SCHOOL SCHEDULING METHOD

Lowell High School is on a seven period day. The school day begins at 7:55 am and ends at 2:30 pm. There are four 25 minute lunch periods per day between two cafeteria locations, one in the main campus and one at the Freshman Academy.

Warning Bell	7:50		
Period 1	7:55	- 8:45	(50)
Period 2	8:45	- 9:35	(50)
Advisory	9:35	- 9:55	(20)
Period 3	9:55	- 10:45	(50)
Lunch 1	10:45	- 11:10	(25)
Period 4A	10:45	- 11:35	(50)

Period 4B	11:10 - 12:00	(50)
Lunch 2	11:35 - 12:00	(25)
Period 5A	11:35 - 12:25	(50)
Period 5B	12:00 - 12:50	(50)
Lunch 3	12:25 - 12:50	(25)
Period 6A	12:25 - 1:15	(50)
Period 6B	12:50 - 1:40	(50)
Lunch 4	1:15 - 1:40	(25)
Period 7	1:40 - 2:30	(50)
Dismissal	2:30	

The academic year is divided into two semesters with half year courses worth 2.5 credits, but most core courses run for a full year (with consecutive A/B semester sequencing). The master schedule is completed by the school's scheduler with input from the department chairs.

Graduation Requirements:
Students must earn a total of 90 credits, including the following minimum course requirements:

- Ten (10) credits in U.S. History and Government.
- Twenty (20) credits in English.
- Ten (10) credits in Mathematics. Students must pass Algebra IA, Algebra IB, Geometry A, and Geometry B.
- Ten (10) credits in Science.
- Ten (10) credits of Physical Education
- Five (5) credits of Health

Courses are offered in four levels: College, Honors, High Honors, Advanced Placement/Dual Enrollment.

Proposed Changes: The high school is planning to create an exploratory committee to look at schedules to see if there would be a schedule for the high school that would meet the goals of retaining a robust selection of course offerings (7 courses per semester) but with longer blocked class periods. This would not have a significant impact on room usage, but would allow for sustained blocks of teaching time.

Programming calculations are also tied to the available periods per cycle each room can be used. No immediate change to the school schedule is anticipated, but a hypothetical model was discussed that might allow longer blocks that also maintains a 35-period cycle. As such, space needs were based on a 35-period cycle.

D. TEACHING METHODOLOGY AND STRUCTURE

Lowell High School is a community of educators whose core commitment is to provide students with exceptional instruction. Teachers and administrators regularly review and refine instructional practices through scheduled sessions within academic disciplines, formal and informal observations, a new and comprehensive teacher evaluation process, and a building-based support team that serves to ensure that at-risk students are supported in ways that allow them to access the curriculum. Teachers at Lowell High School utilize instructional strategies that are consistent with the school's core values, beliefs, and learning expectations. Strategies that are implemented personalize instruction, engage students in cross-disciplinary learning, engage students to be active learners and emphasize inquiry and problem-solving skills. Opportunities exist to allow students to engage in authentic application of knowledge and skills and to self-assess their performance in those tasks. Technology is utilized in a variety of ways to assist and further the educational process. Teachers maintain expertise in their respective content areas and utilize effective content-specific practices such as formative assessments, strategic differentiation, group activities, and specific support strategies which aid struggling students. Teachers believe it is essential to have more time to collaborate and plan to share and implement additional instructional strategies that will strengthen student achievement and learning and encourage more student-centered classrooms.

Proposed Change: An area of need for the high school, as identified by the most recent NEASC Accreditation process, is to create more opportunities for collaborative planning opportunities and interdisciplinary connections. While the current facility groups together teachers in a variety of ways - some by departments (Fine & Performing Arts on one floor) and some by grade level or program needs - the administration is interested in looking at different organizational structures that would more fully support the concept of expanding areas organized for STEM classrooms, Humanities classrooms, and CVTE classrooms. Also a focus on more interdisciplinary teaching and learning would require some larger, flexible spaces where departments can bring classes together for interdisciplinary work such as guest speakers, teach-out opportunities, learning demonstrations, and other types of interactive group learning.

- Administrative and Academic Organization/Structure:
  Currently the administrative and clerical staff are located throughout the buildings, organized into house offices consisting of house deans, guidance counselors, social workers and clerks; office space for the majority department chairs and the director of curriculum, instruction and assessment in the teachers center, student support services includes the coordinator of student support, discipline & operations specialist, parent liaisons, enrollment and student support services clerks, the main office consisting of the head of school and three clerks. The special education suite includes the department chair for special education, clerk, and educational team chairs. The athletic office has the athletic director,

clerk and school bursar. Data processing office includes a scheduler, clerk and instructional specialist overseeing testing.

The high school has 12 academic departments and nine Pathway Programs (eight currently and one in development for next year) that fall within departments. Each department requires flexible learning spaces for students and teachers to engage in both teacher-directed and student-directed learning.

Proposed change: LHS Administration is considering clustering academic Department Head offices together by subject matter connections (Humanities, STEM, CVT) and integrating the houses into this configuration. One way to do this would be to place two house offices in a combined house and guidance suite in proximity to a department center. This would allow for administrative presence in multiple areas of a large building. Another option would be to place all the house offices into one central space near the main office, such as a house and guidance suite. The Freshman Academy, while housed within the same large building, would have a separate office suite for the Director of the Freshman Academy, Student Support Specialist, clerks, guidance counselors and the FA social worker. The Head of School, the Director of Curriculum, Instruction, and Assessment, and the Discipline and Operations Specialist would all have offices clustered near the main office. It is crucial to have adequate conference room space available for all offices.

The proposed program/plans anticipate the equivalent of 5 House Offices Suites (including Freshman Academy), each with (2) Clerks/Waiting, the House Dean, (1) Social Worker (2) Guidance Counselors and a small Conference area. The Freshman Academy will need space for (1) Student Support Specialist and an additional Guidance Counselor (a total of 3).

A separate Main Office with Secretary/Waiting, Head of School, Bursar, Director of Curriculum/Instruction, Discipline/Operations, large Conference & kitchenette is planned along with a Main Student Support Center including Student Support Coordinator, Conference, (1) Clerk, (1) Registrar/Clerk, Waiting for 10-12, (3) Testing and (4) Parent Liaison stations/desks. A separate College/Career Center with (3) Guidance Counselors, Conference and main room with 24 computers and soft seating area.

- Curriculum Delivery Methods and Practices:
  Lowell High School's course offerings are more comprehensive in range and scope than most public high schools in Massachusetts. As such, curriculum at LHS is comprehensive in design and aims to challenge students at all academic levels. Curriculum maps are currently being revisited to have parallel structure across all departments and to use *Understanding by Design* as the philosophy

behind the curriculum and instructional mapping. In terms of instruction, teachers are encouraged and guided to use a wide variety of instructional techniques, keeping student engagement and active participation at the forefront of the work. In the past few years, a major focus area has been integrating technology into instruction across all content areas. We have also developed the idea of formative and summative assessments being varied, meaningful, and authentic as we move away from using only traditional assessments and integrate more projects, presentations, demonstrations, and other non-traditional assessments across departments.

The one area that has been identified as an important need (as indicated by the faculty in our last NEASC process) is more time for teacher collaboration, especially around sharing instructional practices and tools that will grow student learning across all levels and encourage more student-centered classroom practices.

Priority 21st - Century Learning Goals for LHS
(Created in Fall 2016 Building Visioning Workshops):

Empathy, Global Perspective, and Civic Engagement
- Cultural Awareness
- Personal, Social, and Civic Responsibility
- Awareness of Community and Global Society
- Multicultural Literacy

Critical and Inventive Thinking
- Critical Reasoning and Problem Solving
- Agility, Adaptability, and Risk-Taking
- Joy, Curiosity, and Imagination
- Motivation and Creativity

Communication and Collaboration
- Oral and Written Communication
- Teamwork and Interpersonal Skills
- Media Literacy and Digital Competence
- Accuracy of Information

Real World Interconnectivity
- Executive and Organizational Skills
- Competency in Core Skills and Content
- Career Preparation and Life Skills
- Vocational Opportunities and Certifications

Holistic Awareness
- Self-advocacy
- Wellness
- The Natural World

These 21st-century learning goals expand our existing mission statement and goals for student learning, which we are in the process of revising:

Lowell High School Mission Statement
Commitment to excellence in everything we do: academics, activities and citizenship.
Lowell High School provides a secure and cooperative environment where the emphasis is on mutual respect, curiosity, the free exchange of ideas, and the appreciation of education both as a process and a means to betterment.

We are a community…

- That values a curriculum incorporating the best practices of both traditional and contemporary instruction.
- That creates and supports an atmosphere promoting high expectations for student achievement.
- That strives to meet the needs of a variety of ethnic and language backgrounds, career interests, and learning capabilities and styles by providing a broad range of programmatic offerings.
- That believes student accomplishment is a shared responsibility of students, parents, staff, administration, school committee, and community.
- That provides all students the curriculum to meet school and state graduation requirements, and assesses learning continuously in a variety of ways including mandatory state testing.

Expectations for Student Learning
Lowell High School expects all students:

- To attain an understanding of the educational standards, core knowledge, skills, and concepts defined by the Massachusetts Curriculum Frameworks.
- To take increasing responsibility for educational decisions on a daily and long-term basis.
- To complete academic work both independently and cooperatively in a productive manner.
- To think critically and solve problems using inductive and deductive reasoning.
- To read effectively and communicate ideas and information using a variety of formats.
- To develop an ability to use a variety of mediums—including the creative and the technological—in the process of learning, and demonstrate their acquired learning through use of those mediums.

- To demonstrate respect for individual differences and appreciation for the diversity of a multicultural world.
- To understand and demonstrate a sense of community.

Core Values

- Responsibility
- Integrity
- Determination
- Engagement
- Respect

○ English Language Arts/Literacy:
The Lowell High School English Department is committed to supporting and encouraging students to become independent, life-long learners. All English courses are designed to build skills in effective reading, writing, speaking and listening. Through a sequential program of core courses, students are supported to read critically from a wide range of literary and informational texts, write effectively for a variety of audiences and purposes, and speak effectively in informal and formal situations. We recognize that mastering these complex communication skills is essential for successfully meeting the challenges of the 21st Century.

The English Language Arts curriculum is comprehensive in design and aims to challenge students at all academic levels. Curriculum maps have been redesigned to parallel structure in other departments and to use Understanding by Design as the philosophy behind the curriculum and instructional mapping. In terms of instruction, teachers are encouraged and guided to use a wide variety of instructional techniques, keeping student engagement and active participation at the forefront of the work. In the past few years, a big focus area has also been on integrating technology into instruction as a core part of classrooms. We have also developed the idea of formative and summative assessment being varied, meaningful, and authentic as we move away from using only traditional assessments and integrate more projects, presentations, demonstrations, and other non-traditional assessments across departments.

Proposed Change: The changes proposed deal with upgraded technology, adjacencies, flexible space and storage as detailed at the end of this section on page 14.

○ Mathematics:
A primary goal of the Mathematics Department is for all students to achieve mathematical literacy. However, mathematical literacy includes more than students being able to do arithmetic and to solve routine mathematical problems.

Mathematical literacy requires students to reason and prove, to solve real mathematical problems, to make connections, to use multiple representations of numerical information, and to communicate mathematical information to other people. All of the courses in the Mathematics Department operate with these learning goals in mind. The mathematics curriculum is comprehensive in design and aims to challenge students at all academic levels. Curriculum maps have been redesigned to parallel structure in other departments and to use Understanding by Design as the philosophy behind the curriculum and instructional mapping. In terms of instruction, teachers are encouraged and guided to use a wide variety of instructional techniques, keeping student engagement and active participation at the forefront of the work. Math teachers use various methodologies to differentiate the instruction for all learners including direct instruction, discussion, problem solving, simulation, inquiry-based investigations, and collaborative groupings. In the past few years, a big focus area has also been on integrating technology into instruction as a core part of classrooms. We have also developed the idea of formative and summative assessment being varied, meaningful, and authentic as we move away from using only traditional assessments and integrate more projects, presentations, demonstrations, and other non-traditional assessments across departments.

Proposed Change: The changes proposed deal with upgraded technology, adjacencies, flexible space and storage as detailed at the end of this section on page 14.

- Science:
  Science educators use various methodologies to differentiate the instruction for all learners including direct instruction, discussion, problem solving, simulation, inquiry-based investigations, and collaborative groupings. Science labs currently include traditional fixed benches that take up much of the room. This lack of flexibility and fixed furnishings, such as laboratory tables, limit group sizes because of safety concerns. The limited flexibility of our small, outdated science labs also includes limited storage areas. We would like to have laboratory science rooms that meet today's lab safety standards and allow us to deliver a high quality, hands-on, inquiry-based science curriculum. We envision providing appropriate opportunities for the authentic application of knowledge and skills in our science curriculum. It is essential to have the space, flexibility and equipment to provide opportunities for students to gather quality data for these authentic experiments. Additionally, in collaboration with Middlesex Community College and U-Mass Lowell, we intend to continue to offer Dual Enrollment courses with a focus on biotechnology and medicine, chemistry, computer science, engineering, robotics, and green and renewable energy. It is essential to support interdisciplinary collaboration between science, math and engineering in order to ensure the success of these programs and the practical application of student

knowledge. We must offer these opportunities to Lowell High School students as these are STEM-related fields with enormous potential for college and career opportunities

Standard sized (1440sf) science labs are planned for 9th-12th grades, along with associated prep rooms and a central chemical storage room.

The programming excerpts below show a consolidated tally of science courses (freshmen vs grades 10th-12th +ELL), prorated for the new design enrollment, with the necessary sections (34 for freshman, 99.5 +15 for grades 10th-12th +ELL) to maintain class size averages (approx. 24, with ELL at approx. 20). Science classes meet 5 times/cycle (totaling 170 for freshman, 572.5 for grades 10th-12th +ELL) that are divided by the available sessions/cycle to tabulate the teaching stations needed (4.86 freshman and 16.36 for 10th-12th +ELL if 100% utilized).

Freshman Science

Subject		Course Enrollments	Class Size Avg.	Number of Sections	Sessions per Cycle	Total Sessions in Cycle	Teaching Stations Needed
C/H Integrated Science	[Sci Lab]	705	24	29.0	5	145.0	
Explor in Integrated Science	[Sci Lab]	68	14	5.0	5	25.0	
						170.0	4.857
Total		773	23	34			4.857

10th-12th Science

MCAS Bio Prep, Princ of Bio	[Sci Lab]	44	15	3.0	5	15.0	
C/H/A Bio, Expl in Bio Gen Bio	[Sci Lab]	809	26	31.0	5	155.0	
Anat/Physio/Forens/MicroBio	[Sci Lab]	462	26	18.0	5	90.0	
Genetics	[Sci Lab]	83	24	3.5	5	17.5	
						277.5	7.929
C/H Chemistry	[Sci Lab]	513	24	21.0	5	105.0	
A Chemistry	[Sci Lab]	34	17	2.0	5	10.0	
						115.0	3.286
H/A Physics	[Sci Lab]	236	24	10.0	5	50.0	
Partnership Experience	[Sci Lab]	9	9	1.0	5	5.0	
Geolo/Meteor/Ocean/Astron	[Sci Lab]	206	26	8.0	5	40.0	
Clean Energy Career Explor	[Sci Lab]	17	17	1.0	5	5.0	
Environmental Studies	[Sci Lab]	20	20	1.0	5	5.0	
						105.0	3.000
Total		2433	24	99.5			14.214

ELL Science

ELL Integrated Science	[Sci Lab]	91	18	5.0	5	25.0	
ELL Biology	[Sci Lab]	152	19	8.0	5	40.0	
ELL Chemistry	[Sci Lab]	41	20	2.0	5	10.0	
						75.0	2.143

Using the estimated number of teaching stations and applying an 85% utilization factor, these numbers increase to 5.7 freshman spaces and 19.8 labs for grades

10-12 +ELL. With freshman organized in teams of 8 (2 Eng, 2 Soc.S, 2 Math, 2 Sci.), and requiring 24 general classrooms, the number of freshman science rooms were rounded-up to complete 4 teams and result in 8 freshman science rooms and 20 grade 10-12 +ELL science labs with an overall utilization of 76%.

A total of 28 labs, 8 being Freshman, are proposed. 2 of the 28 are for Health and Bioscience as previously noted. All labs will have 200sf of Prep/Storage space, typically grouped in two's as 400sf, and (1) Chemical Storage is also provided.

- Social Studies:
  The Social Studies Department offers a four-year course of study in history and the social sciences. The content, reading materials, instructional activities, and assessments are designed to promote higher-level thinking and communication skills. All of the history and social science courses at Lowell High School adhere to the Massachusetts Social Studies Curriculum Frameworks and the Common Core State Standards. Social Studies at LHS promotes a College, Career, and Citizenship (C3) approach to student learning and engagement in social studies. The Social Studies curriculum is comprehensive in design and aims to challenge students at all academic levels. Curriculum maps are being designed to parallel structure in other departments and to use Understanding by Design as the philosophy behind the curriculum and instructional mapping. In terms of instruction, teachers are encouraged and guided to use a wide variety of instructional techniques, keeping student engagement and active participation at the forefront of the work. In the past few years, a big focus area has also been on integrating technology into instruction as a core part of classrooms. We have also developed the idea of formative and summative assessment being varied, meaningful, and authentic as we move away from using only traditional assessments and integrate more projects, presentations, demonstrations, and other non-traditional assessments across departments.

Proposed Change: The changes proposed deal with upgraded technology, adjacencies, flexible space and storage as detailed at the end of this section on page 14.

- World Languages/English Language Learners:
  It is the goal of the Foreign Language Department that every student achieves an ability to understand, speak, read and write in the target language, while at the same time developing global awareness and knowledge of different cultures.

  Lowell High School offers English Language Learners (ELLs) in grades nine through twelve a comprehensive academic program to build English language proficiency and academic content knowledge. English Language Learners develop English proficiency while learning the general curriculum. Instruction also

recognizes that language modalities (speaking, listening, reading, and writing) develop interdependently and, therefore, should be integrated to promote skill development. English Language Learners at Lowell High School participate in one or more program models that support English language and content knowledge development. Students' English language proficiency is assessed and academic background reviewed in order to recommend an appropriate program placement in English Language Development (ELD) classes, Sheltered English Instruction (SEI) content classes, and/or English Language Development support classes.

We are not looking for traditional language lab space with fixed listening booths, but rather flexible spaces within foreign language and ELL classrooms that can integrate technology to have "speaking and listening" centers taking place throughout the departments. These classrooms are the regular, classroom teaching spaces (not a shared lab) for ELL and Foreign Languages and ELL and Foreign Languages classes will be scheduled there throughout the day. Both of these departments need classrooms that can serve as flexible language "lab" classrooms, with technology of our current language lab and areas of the classroom that can be used for individual listening/speaking practice as well as collaborative spaces for using the lab technology in small groups, working with direct teacher instruction, or other areas of a language classroom that would allow students to engage in discourse for language practice.

Proposed Change for All Departments: To help ensure the best learning opportunities for students, all academic department teaching spaces must include:

- Modern classrooms with interactive LCD projectors, adequate whiteboard space, adequate storage, maximum natural lighting with windows that open, ample outlets for device charging, FM systems for all classrooms and a streamlined, moveable teacher desk and podium.
- Classrooms that are clustered into inter-disciplinary configurations (adjacencies) to promote cross planning and discourse between academic teachers. While this will not have a direct impact on student scheduling (our school clusters students into multiple classes in grade 9 only), the adjacencies and common teacher planning space will address the NEASC concern that teachers do not have enough time or space to plan collaboratively across departments.
- In terms of adjacencies, we propose that Math and Science teachers have this common planning space together (for STEM collaboration as mentioned in the last bullet) and that English and History teachers have this common space as well (for Humanities collaboration as mentioned in the last bullet).
- Multiple large, flexible group instruction spaces that can be used for combined classes, presentations, lectures, seminar, faculty meetings, and parent meetings. These could be various-sized spaces that can be split up or combined (with movable walls) to better suit the needs of the various users.
- Adequate book storage for all departments, but especially for the core departments (English, Foreign Language, History, Math and Science) where

textbooks and trade books are used extensively in all classes. We would prefer to have a central storage location for many of the books but with smaller distributed book and supply storage for specific departments.

The program/plans provide large, flexible and fully integrated technology for all classroom spaces, including World Language and ELL programs. ELL rooms are intended to be dispersed with general classrooms, but clustered or paired for inter and intra collaborative opportunities. World Language rooms are to be grouped as a department or potentially semi-dispersed by language for the same collaborative opportunities. The Freshman Academy, as a separate zone within the overall school, should have easy access to all language classrooms and will have one ELL team included within (ELL language, social studies, math and science).

Operable walls can be used between select sets of classrooms (1 per cluster) to allow large group gatherings. Likewise, select single classrooms can have sub dividable partitions to allow small group flexibility.

- Academic Support Programming Spaces:
  Lowell High School has 3 Instructional Specialists: 1 is focused on Instructional Technology Support, one is focused on classroom/instructional support, and the third is focused on academic testing support (MCAS, ACCESS, etc.). We also have number of academic tutors (part-time) who work in classrooms to support student learning; these are specifically language tutors in the Newcomers classroom and a “Read 180” tutor for additional literacy support with grade 9 students.

  (1) Office for the academic Instructional Specialist is provided with other Dept Offices, a second will use space within the Tech Center and third will use space within the MCAS room.

- Student Guidance and Support Services:
  School guidance counselors are located in house offices. A social worker is assigned to each house office and the Freshman Academy but not every social worker is physically located in the house due to space constraints.

  Proposed change: Ensure that there is space in each house office to accommodate the assigned social worker for more effective case management.

  Student Support Services suite provides for enrollment, working papers, parent liaison, and support for critical student issues including homelessness. There is a separate college and career center staffed by three guidance counselors with an

attached computer lab for use of Naviance and other college/career research activities.

As noted under Administrative and Academic Organization/Structure, the House Administration areas include (2) Guidance Counselors and (1) Social Worker. Freshman House will include a third Guidance Counselor and (1) Student Support Specialists. A separate Student Support Services Center is provided for the full school.

Accessibility to Restrooms, Locker Rooms and Changing Facilities:
A student may access the restrooms, locker rooms and changing facilities that corresponds to the student's gender identity, with the understanding that he/she is subject to the same rules as all other students utilizing the facilities. Upon a student's request, any student who is uncomfortable using a shared facility, regardless of the reason, shall be provided with a safe and non-stigmatizing alternative. Based upon availability and the appropriateness to address privacy concerns, accommodations that may be offered to a student who desires increased privacy may include, but are not limited, to: (a) use of a nearby private area (such as a gender neutral restroom, gender neutral changing room, nurse's restroom, or a nurse's office); (b) a separate changing schedule, or (c) use of private area within a public area (such as, an area separated by a curtain, or a bathroom or changing stall with a door). Schools will consult with a student and the parents/guardians of the student if they are involved in the process or in the case of a younger student with the student's parents/guardians, to ensure accessibility and address any concerns that may arise.

E. TEACHER PLANNING AND ROOM ASSIGNMENT POLICIES

Lowell High School teachers are assigned to one of 12 departments and for administrative purposes to one of four house offices or the Freshman Academy. There is one Teachers' Center which also houses the majority of the department chairs but no department centers which has hindered collaboration between teachers.

Proposed change: Moving forward the school would benefit from combined academic wings (humanities, STEM, CVT) with teacher workrooms (located near classroom clusters) and multi-media rooms that help to foster cross-curriculum collaboration and support. Teacher workroom space that is designed for both inter and intra departmental collaborative work as well as professional development would greatly enhance the ability of teachers to plan and support robust curriculum. The majority of teachers currently have their own classrooms, teaching 5 periods of a 7 period day with one 50 minute period of prep time, one 50 minute period of duty or collaborative time and a 25 minute lunch period. A combination of dispersed planning rooms that are sized for both small, localized and large, centralized planning is desired and would include smaller planning rooms for each team or

cluster, a medium size department office cluster and the large development/training room. The large space is intended for larger and small planning activities, full departments and inter-department work, gatherings, professional development and training. This type of space exists, currently coined the Little Theater. It is one of the more highly utilized, flexible use spaces in the school and cited as a high priority to maintain.

Classrooms are planned at approximately 85% utilization per state requirements vs 71% per current practices. This effectively means non-ownership of classrooms; most teachers would have primary ownership, but would need to share if one period a day or, conversely, all academic teachers might share two rooms (one for 3 periods, another for 2 periods per day). In either case a dedicated work space for each teacher is required and would be provided via planning rooms dispersed throughout the school and located convenient to each teacher's classroom(s).

The new plans anticipate having (4) freshman planning rooms; (1) for each team and sized for 10+ staff, anticipating SPED & ELL specialists. (13) Additional planning rooms are to be dispersed with grade 10-12 academic classrooms/labs, including (1) with World Language. The program also provides a large seminar room (little theater) to be used for teacher seminars, professional development and other multi-purpose activities as currently occurs.

Note: the proposed number of classrooms/sci-labs are projected at fewer than exist despite a 12.5% planned enrollment increase. This is primarily due to the difference in utilization. For example; 148 core academic classrooms/sci-labs exist for approximately 3,125 students. If enrollment increases 12.5% (to 3,520), you would expect classrooms/labs to increase to approx.166, but if the utilization of those rooms increased 14%, then 166 would become 143 rooms. The program calculates 146 classrooms/sci-labs are required (including 6 scheduled small group classrooms).

F. CLASSROOM INSTRUCTION (9-12)

As described in sub-section D and broken down into each academic subject

G. FOOD SERVICE PROGRAMS

Aramark provides food service for Lowell High School. All lunches are made at the high school. The school has a full service kitchen for grades 10-12 and a warming kitchen at the Freshman Academy. Breakfast is available to all students from 7:00 am to 7:55 am. There are two breakfast carts along with the service in the cafeteria. Lunch is served daily in four 25 minute seatings between 10:45 am and 1:40 pm. in two separate cafeterias (main school and Freshman Academy). All breakfasts and lunches for students are free of charge.

The current space does not adequately accommodate all the students scheduled for lunch in the main school so many students eat in the lobby in front of Student Support Services and in the hallways outside the cafeteria.

Proposed Changes: Ensuring that the designated cafeteria space can accommodate enough students to allow for three lunch periods instead of four will have a positive impact on the scheduling process. It is also important to have a small satellite space off the main cafeteria for students who cannot function in a large space or large groups.

Kitchen and Cafeteria areas are undersized now. The design/program meets the MSBA guidelines for 3 seatings (1/3 of the student population) and is anticipated to be developed as space that has a variety of zones within to accommodate different predilections and to be more flexible for alternative and multi-purpose uses. The potential of separating the freshmen portion of cafeteria, along with a satellite server will be explored during design.

The Cafeteria is to be located for easy and flexible access of students for early and extended hours, as well as for community use. The school would like to include easy and increased access to the breakfast service.

H. TECHNOLOGY POLICIES/PROGRAM REQUIREMENTS

Technology at Lowell High School is not equitable and needs significant upgrading within classrooms and throughout the building. There is a need for reliable technology that assists in the deliver 21st century curriculum along with a robust, high-speed wireless network with enough bandwidth to support a digital learning environment.

All teachers and administrators were recently issued MacBook Air computers. The school has invested in LCD projectors and document cameras over recent years to assist in presenting material in a effective manner to students and this is a basic tool that we are striving to ensure is in every classroom.

The district has computer technicians who are assigned through an online work order process to help maintain technology for the district. Currently the high school has ten shared labs (6 PC and 4 Mac) along with 16 restricted-use computer lab classrooms (8 PC classrooms, 5 Mac classrooms, 1 language lab, 2 ROTC, 1 Maker Space). The school has been migrating to mobile technology carts shared on an as needed basis by the community (4 iPad, 3 Macbook, 1 iPad science cart and 1 Chromebook cart). The school has one technology specialist whose primary focus is helping teachers

integrate technology into their classrooms. She works one-on-one with teachers, offers group trainings, and has open lab hours for teachers to drop in.

The school is moving forward with online curriculum resources as allowed by the current technology. For example, business courses are completely online. While the current facility includes 33 classrooms equipped with Apple TVs and mobile iPad carts, and ten classrooms recently outfitted with interactive whiteboards, the use of such technology is generally limited to those classrooms and the trained teachers using them. While the current budget does not contain specific earmarks for the expansion of new technology to other classrooms, the library media center, or computer labs, the school purchases digital projectors and document cameras to upgrade classrooms when the budget allows. Twenty of these setups were added to classrooms across all academic departments in 2014-15, and another ten in the 2015-16 school year. A few classrooms have older model PCs dedicated to student use, but LHS does not provide classroom sets of mobile laptop computers or other digital devices for general use by teachers or students except in the Apple TV/iPad equipped rooms or with the "rental" carts. One recent technological improvement in the past few years is the installation of wireless access points in most classrooms, which has improved connection to the Internet throughout the school via personal mobile devices. However there are still too many areas in the school where WiFi connection is weak.

Teachers in all disciplines integrate technology into instructional practices. This means the use of technology in classroom pedagogy (e.g., iPads in some classrooms, computer labs in most instructional areas, a growing number of interactive whiteboards, digital projectors and document cameras) and the inclusion of technology in student assignments and outcomes. Some of the latter technologies include Google Apps for Education such as Google Drive, Google Classroom, YouTube and Blogger, iMovie, and Keynote (on iPads and iMacs). Students use a variety of mediums to demonstrate their learning including audio, video, and cloud-based apps. Students in graphic design, television production, and engineering classes use technologies including CAD, Photoshop, Adobe, digital cameras, Avid, etc.

Proposed Change: Moving forward the high school anticipates moving away from shared computer labs to technology embedded in all classrooms with the use of mobile computer carts that allow for greater flexibility in the use of space. Eventually the school would like to be in a position to have student 1:1 use and install an interactive projector in every classroom.

The new school will include robust infrastructure with fiber optics delivery into the building and a fully wireless environment planned for 1:1 capability in the future and designed for access to laptop and/or tablet devices. Specialty labs that require

substantial computing, graphics and streaming capabilities will be outfitted as required.

All classrooms, special education/small group, arts, music, media center and flexible learning areas and conference rooms will be planned with data-projectors, document camera capability, fully wireless computing and have access to laptop or tablet cart storage/charging areas.

The (10) existing unassigned computer labs will not be replicated in the new program, but instead larger rooms and computer carts allow every classroom to become a computer lab.

The proposed program includes (12) specialty computer labs, including (5) Business/Mktg, (3) Art/Graph, (2) Engineering/Robotics, (1) Maker Space and (1) Digital Music are included in the program, along with (4) classrooms with computers; (2) ROTC + (1) World Language + (1) Math/Computer Sci. Additional computer lab settings occur within the TV/Media Studio, Library/Media with Technology Center and the Career Center.

Space is required for the existing and ongoing computer/technical support staff, equipment, work area and training lab. These spaces will be included as part of the overall Media Center that will more than double in size, per MSBA standards (from approximately 9,000sf to 22,000sf).

- Media Center/Library:
  The school has a library media center staffed by one Library Media Specialist along with two library aides. The library media center is used broadly by various departments. Teachers schedule time in the library when they need students to research material (3 classes can be scheduled at the same time), work collaboratively in groups, the library also offers instructional sessions on how to use a library or take out books. The center is also open an hour before school five days per week and an hour after school four days per week with teachers hired to provide tutoring or homework help. The Library Media Specialist focuses on using technology as a viable research tool coordinating google docs and the use of library research databases which is the number one library skill students need for college. The library media center has a dedicated computer lab which is essential for both visiting classes and for students coming in during lunch, before/after school and advisory time that need access to computers and printing capabilities. The library also has banks of computers in the library proper. These computers allow students to access key search engines, databases and allow students to write and edit papers.

The Library Media Center also houses the Lowell High School archive which has material dating back to the 1830s.

Proposed change: The library media center needs an upgrade in technology to include a dedicated laptop cart along with a balance of quiet areas, reading areas, collaboration areas, meeting areas and storage space. The space needs to support multi-media, flexible group space and current research practices along with small alcoves for small group or one-on-one tutoring.

The current Media Center is approximately half the size of the state's standards and will be increased substantially, while also accommodating the needs of the school's Technology Center and professional training.

The new Media Center will serve as the technology hub and will be positioned to offer access to students in the morning and for extended day use. The space will be planned to accommodate 3 or more classes simultaneously with reading/soft seating areas, computer lab(s), instructional/presentation area(s) and a series of quiet/small group spaces. The space will include storage/charging for laptop carts and provide a room for Lowell High School archives.

I. ART PROGRAMS

The Mission of the Fine Arts Department of Lowell High School is to provide all students with a wide variety of high quality artistic experiences in Dance, Music, Theater and Visual Arts and to encourage creativity, the development of a unique artistic voice, and the enthusiastic pursuit of excellence in the Arts. The Philosophy of the Fine Arts Department at Lowell High School is to encourage all students to learn in, about, and through the Arts as a process of intellectual growth and self-discovery and as a contribution to the advancement of our collective cultural heritage. We believe that the creative process is essential to learning and we endeavor to provide a diverse, comprehensive, and sequential curriculum that includes creating, performing, presenting, and producing, making aesthetic judgments as well as responding to the numerous connections between art and life. At the core of this creative work is using one's risk-taking, curiosity and collaborative abilities. We challenge students to become life-long learners who understand and appreciate the potential of the Arts. We strive to build student confidence and resiliency that fundamentally transforms students into creative thinkers with 21st-century skills.

Although Graphic Design, Digital Photography, Digital Audio and Animation are listed in the communications pathway, they are also part of the Fine Arts Pathway. Labs with the appropriate technology, data storage and file sharing systems and flexible furniture (except in Digital Audio lab due to pianos) are needed.

The visual arts curricula includes both traditional and digital arts classes. Visual arts courses include Introduction to Studio Art, Intermediate Studio Art and Studio Art Portfolio. Additional traditional arts courses include Drawing and Sculpture. Digital Media Arts include TV Production, Animation, Digital Photography, Graphic Design and Digital Audio Production. In all arts classes students engage in well-rounded curricula delivered through whole and small group instruction where engagement in the process produces product. The visual arts curricula consists of experiences in four interrelated kinds of artistic activity: creating, producing, responding and connecting. Students involved in these ways of learning gain knowledge about the arts, refine their perceptual and expressive skills, and exercise their powers of analysis in order to make and justify judgments about works of art. Multiple sections of Digital Photography, Introduction to Graphic Design, Introduction to TV Production, Drawing, Sculpture and Introduction to Studio Art along with Art Exploration, Animation, Studio Art Portfolio, Advanced Graphic Design, Advanced TV Production, and Film, Video and Society meet approximately 90 times for 50 minute class periods per semester. Each of the 5 Visual Arts educators teaches 5 classes per day providing 25 arts offerings per week and approximately 500 periods of arts instruction per academic cycle.

Currently, the arts classrooms and studios are on three floors and located in two buildings, a definite disadvantage. While the majority of the traditional arts classes take place in close proximity, the TV studio, graphic design lab, digital photography lab and digital audio piano lab are not on the same floors or within one building. The current size of the classrooms and labs are adequate and in some cases somewhat small due to the large numbers of students enrolled, but their lack of proximity makes it difficult to collaborate and share resources. The labs also lack appropriate updated technology, data storage and file sharing systems. For example, students creating audio files in the digital audio lab have no way of digitally sharing those files with students in TV Production who may need audio for a roll in at the start of a news segment. Students in TV production cannot digitally access artwork created in the graphic design lab for use. Cameras and other technology are not easily shared as the labs where they are housed are on different floors and in some cases different buildings. The furnishings in the labs currently do not allow for small, flexible groupings as the tables are long built in pieces of furniture and chairs do not have wheels. Large volume data storage specifically for the arts classes is essential.

The program/plans provide dedicated spaces for Visual Arts in the form of separate 2D, 3D & General Art Studio, Graphics Lab, Digital Photography/Animation Lab and TV Production Classroom. Additional Dark Room, Kiln and Storage and space is provided. The size of each lab is proposed slightly larger than State standards due to the class sizes that run higher than standards.

J. MUSIC AND PERFORMING ARTS PROGRAMS

In the performing arts, a Dance Studio - large enough for 2 classes simultaneously with ballet bars, mirrored walls, appropriate flooring, sound system and technology.

The chorus room should have a flexible foot print. The room does not need built in risers but the floor should be hardwood to allow dancing for show choir. Portable platform and choral risers along with sufficient storage and sound system.

The band room requires very large storage spaces due to the size of many of the instruments including marimbas, tubas, and drums. It also requires practice rooms and an office area. We would like to keep the current size of the auditorium to best meet the needs of the program and school.

The performing arts curricula currently includes Concert Band, Marching Band, Jazz Band (After School), Concert Chorus, Show Choir, String Ensemble, Introduction to Theater Arts, Advanced Theater Arts, Dance I, II, III, IV, Advanced Dance and Senior Dance Project. In addition, we also offer Beginner Guitar, Advanced Guitar Beginner and Advanced Piano, World Drums, and Advanced Music Theory. Like the Visual Arts, the Performing Arts curricula consists of experiences in four interrelated kinds of artistic activity: creating, producing, responding and connecting. Arts education broadens students' thinking about ways of expression and communication, enabling them to create and perform, as well as to respond and connect to both historical and contemporary forms. Performing and visual arts studios, classrooms and digital labs are places where emerging intuitive and intellectual skills can be physically tested. They are places in which students can reflect upon, play with, and remake in their own voices that which they hear, see, and feel in their lives. As they learn to communicate through the arts, students understand why people need more than words alone for eloquent expression.

The space required to engage in these artistic endeavors need to be sizable enough to hold large classes such as band (currently 62 students) as well as the instruments. In particular, percussion instruments such as timpani, marimbas, and vibraphones have large footprints and require space to move around them. Accessible, secure storage for these instruments is needed in addition to secure storage for uniforms, music and additional equipment such as the drum major's conducting podium, portable sound system and the color guard flags, uniforms and gear. The furnishings for the band room should include chairs that allow students to sit with the correct posture while playing an instrument. A sound system, appropriate technology – projector or flat screen TV monitors should also be included. Practice rooms and an office area are essential as the band performs outside of the school day throughout the year. A meeting area plus band office and restroom facilities to support both during the day and out of school use of the band area.

The piano /digital audio production lab serves dual purposes as it provides students instrumental instruction in piano as well as instruction in the creation of digital music.

The chorus room should have a flexible footprint. The current choral room has built in risers and carpeted floor. The room would be far more functional with portable platform and choral risers, hardwood floor, mirrored wall similar to dance studio and storage for choral equipment and show choir costumes. Technology should include a sound system, digital piano for the classroom teacher and flat screen monitors or

projector. Appropriate furniture would include chairs designed specifically for sitting with good posture while singing.

The Dance classrooms/studio should be large enough for 2 simultaneous classes with ballet bars, mirrored walls, appropriate flooring, sound system and technology with adequate sound insulation so each class can play music at an appropriate volume without interrupting the other class. Currently, the dance program has almost 300 students participating and continues to grow each year.

Students are engaged in arts curriculum that enables them to communicate fluently and effectively in the arts, apply both imagination and rational thinking in the creation of art, understand the value of reflection and critical judgment in creative work while presenting art publicly with confidence, pride and distinction. In addition, students in the arts learn how world cultures have been historically shaped and influenced by the arts and understand the ways in which the arts contribute to everyday life.

The Performing Arts spaces include separate Chorus, Band, Digital Music/Piano Lab and (2) Dance Classrooms along with associated practice rooms, storage and office area. Similar to Visual Arts, the traditional Band and Chorus Rooms are proposed larger than State standards.

K. PHYSICAL EDUCATION PROGRAMS

Gymnasium:

The gymnasium and its supporting spaces would be the primary area for physical education instruction and on-campus athletics. Students are required to take 4 years of Physical Education for 1 semester per year. Therefore, the Physical Education spaces are used by at least 9 classes each period. Moving forward the gymnasium should include a flat track (ideally 6-lane, 150 or 200m) and three basketball courts (ideally 4 and not overlapping the track) for physical education, athletic team conditioning and track and field and sub-varsity basketball practices, (currently the four sub-varsity basketball teams and one varsity basketball team practice off campus). The space would also include spectator seating with storage underneath.

An additional gym for special education/adaptive physical education instruction, would be located adjacent to the main gym, allowing for individual and class activities in support of students educational plans. The gym would have a wood floor with set up for three volleyball courts for special education physical education and interscholastic practice and interscholastic volleyball matches. Additionally, a main basketball court with 2 courts lined side by side across the main court for special education physical education and interscholastic practice is included. Spectator stands on one side of the gym with the set up for team benches and scoring table on the other side closest to the locker rooms, trainer's room. Storage needs would include wrestling mat storage for at least two mats.

The supporting spaces in the gymnasium would include:

- A shared space for weights/functional strength with a focus on Olympic-type lifting and dynamic/core training for physical education and athletics.
- Double sized (space for two wrestling mats) and divisible wrestling/multipurpose room for physical education instruction and wrestling practice. The divider would allow for combined or differentiated instructional offerings for physical education and for our large wrestling program to separate practice based on instructional level (currently our beginning/freshman wrestling practice in the Murphy Cafeteria).
- A multipurpose, flexible room with some spectator seating could be used for alternative physical education options during the day such as yoga, pilates, zumba, cheering and gymnastics (moveable equipment)

The programming excerpt below shows a consolidated tally of all PE courses (9th-12th grade), prorated for the new design enrollment, with the necessary number of sections (53) to maintain class size averages (in this case 26). PE classes meet 5 times/cycle (totaling 265 sessions) that are divided by available periods/cycle (35) to tabulate the number of teaching stations needed (7.57 if 100% utilized).

PE Courses 9-12

Subject	Course Enrollments	Class Size Avg.	Number of Sections	Sessions per Cycle	Total Sessions in Cycle	Teaching Stations Needed
Physical Education [Gym]	1359	26	53.0	5	265.0	
					265.0	7.571

Using the estimated number of teaching stations and applying an 85% utilization factor, these numbers increase to 8.9 spaces required. This is the justification for 9 fully utilized teaching stations. The 9 spaces are planned as 6 half-court stations in the Gym (18,000sf), 1 PE alternative space (strength/fitness) at 3,000sf, 1 open floor space (proportioned for flexible use as wrestling) at 3,500sf and 1 multi-purpose space at 3,000sf.

Physical Education classes will no longer utilize the pool.

Administrative/Support:

The administrative/support spaces would include an ice and water fill station for team access without entering the trainer's room. Male and female PE/coaches' offices with showers and restrooms Secure Storage for uniforms, clothing and equipment. An administrative office with a conference room. An athletic training room and locker rooms for use by physical education students and student-athletes.

The MSBA's standards are focused on meeting the needs of Physical Education as opposed to Athletics. As such, the creative/flexible use of PE teaching stations is necessary to best serve the needs of all. A total of (9) stations can be justified based

on the schedule of PE courses, each station is considered to be 3000sf (half a basketball court sized gym).

The program/plans have allocated the 9 station equivalent which allows a 3 court gym with overlapping track, a weights/strength room, a 2-mat wrestling room and separate multi-purpose room (for gymnastics/cheering/yoga) with adjacent storage. The intent is to co-locate the SPED Adaptive PE gym and ROTC Multi-Purpose space within the overall PE/Athletic area for beneficial adjacencies and create an overall space that could include an overlapping 134.1m, 4-lane track (12 laps =1600m)

Note: the MSBA does not fund projects with Natatoriums, as such a pool is not proposed as part of this project.

Separate boys' and girls' locker rooms, team rooms, athletic director's suite, coach's offices, trainer's room and storage rooms are included in the program.

L. SPECIAL EDUCATION PROGRAMS

Currently there is limited handicapped access to the 1922 building. Moving forward this needs to be addressed to ensure that all handicapped students can easily access all buildings to include doors that have handicapped access. Currently inside the 1922 classroom doorways have thresholds which limit a student's independence and mobility to freely move in/out of the room. Another obstacle for the students in being able to turn the door knob. Lever style handles in the classroom would again provide students independence in moving in/out of the classrooms.

It is also important for the steps to be color coded on the edges to allow those visually impaired students independence in getting from area to area. At present we have had a number of falls/trips on the steps due to the perceptual depth problems of some students.

The design plans are to be fully accessible, and seek to accommodate all learners, including those with sight, hearing, cognitive and physical impairments through a universal design approach. This approach focuses on inherent equity and barrier free planning for physical, sensory and cognitive differences. In other words, a fully sloped corridor would be preferred over corridors with a separate stair and ramp, to provide equal access and common experiences for the able and impaired alike. This concept carries into the treatment of wall and floor finishes and colors that should be used to help accentuate changes-of-plane with visual cues. Acoustic considerations include recognition of mechanical system noise, and even quieting the sound of rain on roofs and window sills.

The co-taught inclusion classrooms have two teachers, one special education and one general education teacher teaching in the following areas: one English I, two English II, one English III, one Geometry, one Algebra, one Biology. The makeup is

approximately ⅓ special education with sizes of approximately 26-28 students. This does not affect the design, these are regular sized classrooms. Every special education student is assigned a liaison who helps track progress and supports students as needed and ensures that IEP are being followed and maintained. All special education classrooms should be at general ed size with the exception of 10 Fundamental classrooms that are ½ size and the Instructional Support classroom that is larger than average with all the necessary supporting resources including every textbook and instructional material.

The special education classrooms will be dispersed throughout the school. The only exception is the intensive needs program (two classrooms) needs to be adjacent with a connecting door for toilet/toilet training purposes. The autistic classrooms (four classrooms) should be paired also for the same purpose and for teacher/student collaboration, though the pairs can be in separate sections of the school.

In addition to the number of classrooms that are required by the department, there are some programs that have specific needs. Each will be addressed below:

Life Skills Program Classrooms *(4) – to reach beyond other programs:*
Presently in the 1922 building one of our life skill classrooms houses a cooking area and a laundry area. This room is also the classroom for a group of 18-22 year old students. The facilities provided should be accessible to the entire special education program and not limited to a class. Although the 2 class periods a day that are free can be utilized, it does not afford students the amount of time required to learn the skills needed to successfully transition to adult independent living. The proposal is to have separate space for the kitchens, laundry, mail room and copy center allowing staff to sign up for the rooms.

Intensive Classrooms *(2):*
The Intensive Needs classrooms house our neediest students in terms of physical, medical and cognitive needs. Each class must be full sized to allow for wheelchairs, standing apparatus, swings, etc. The classrooms also need to have full size sinks with running hot water to clean the tubing and machinery (food processors, blenders, etc) used to prepare food and feed students. Presently there is one small room attached to room 118 that serves as a sensory room for the students. It is small and presents an issue of movement on some days; a larger room, though not full size, would alleviate the jams that can be created. In terms of personal needs, the high school has 3 changing bathrooms for our students. There is one in the 1980 building (near the nurse's office) and 2 in the 1922 (ground and first floor). Staff are required to take students out of the classrooms in order to change students. A changing room/bathroom connected to the classrooms is ideal. These bathrooms need toilet facilities with handicap bars, changing tables, sinks, and hoyer lifts.

Autism Classrooms *(8):*

The classrooms for students with autism also require a full-size classroom to allow for movement space and planning stations for students. Even in high school we continue the process of toilet training some of our students so an attached single bathroom in each classroom is ideal. Presently our 18-22 year old class has an attached bathroom. At times students need to be able to go to a quiet area that gives them room to meltdown and then regroup. Presently in our older classroom we have a separate backroom which has been utilized consistently and effectively while in the younger class we had the school department install partitions to allow for such a space. Again it is optimal to keep these types of separations/rooms to manage the potential volatility of some of the students.

The program/plans provide (4) Life Skills classrooms at 1200sf each grouped in two's (one for ages 14-18, the other for 18-22). The duel labs include dedicated toilets and shared kitchen, laundry and mail room areas. A separate Hygiene (wash/changing) space will be provided in a location that can be shared among the program.

The Life Skills program also includes (2) Intensive Classrooms with toilets, (8) Autism Classrooms with toilets, a shared Sensory Room and (2) Adaptive PE (Sensory/Large Motor) stations to be collocated with the main Gym. The Intensive Needs (full sized) Classrooms are also intended to be split-up between two age groups

Adaptive PE *(2):*
Lowell High School services a diverse population of students, which includes students with disabilities that require a specialized program such as Life Skills, CSA and Adjustment. Students with disabilities need to learn about exercise, participate in exercise and adopt an active lifestyle. They are at greater risk for being sedentary and experiencing related health problems. Access to community-based physical activities is often limited due to a myriad of reasons. The American Academy of Pediatrics Council on School Health's Policy Statement *(Active Healthy Living, 2006)* states that physical education and other school-based physical activity opportunities are as important to a student's long-term productivity as are academics.

The importance of the public school in supporting increased physical activity levels in students with disabilities cannot be overstated. The facilities, staff, programming and equipment required needs to be identified through a collaboration between a certified adaptive physical education teacher, physical therapist and teachers. Primary considerations include accessibility, adapted equipment, safety concerns for all students and the range of student abilities within a class. Adaptive PE activities warrant a large open area with tall space that should be able to accommodate twelve students in wheelchairs or other apparatus to participate in activities including: volleyball, basketball, floor hockey, etc. It is important to note that planning for storage of loose, movable equipment is essential.

Students in the Intensive Special Needs Life Skills Program have complex medical and physical needs. They require highly specialized equipment and adequate space

to accommodate the equipment including their wheelchairs. The students with complex medical needs, significant physical disabilities and sensory processing deficits need daily access to a separate sensory motor room that is specifically designed to stimulates the senses of hearing, vision and touch and is a place for students to work on cause and effect through switch use as well as meaningful functional movement using equipment, such as, gait trainers, therapy platform mats, and hand-cycles. It would be optimal that acoustics be controlled in the space with an operable hard wall and overhead treatment.

We believe that it is important to have the adaptive physical education program connected to gym space to ensure that these students feel that they are a part of the high school and engaging in the same types of activities of students outside their program. In some activities and uses, the partition-wall would remain open and connected to the gym.

In summary, considerations for meeting a subset of the needs of students with disabilities at LHS should include:

- Accessibility and inclusion in physical education
- Adaptive equipment for participation in the physical education curriculum
- Certified adaptive physical education teacher
- A large Sensory Motor Room designed to accommodate positioning equipment, immerse the students in a multisensory environment and provide opportunities for meaningful functional movement and sensory stimulation.

Note: Special Education - Adaptive PE/Sensory-Motor is prorated at 92 students with class sizes averaging 12, for 8 sections that meet 5 times/week. This totals 40 sessions and can't be scheduled into a single space with only 35 periods possible per week. Two Adaptive PE spaces would have only a 57% (scheduled) utilization rate, but every bit of need, particularly with regular PE spaces scheduled efficiently at 85% utilization.

<u>Adjustment Program</u> *(8):*
The Adjustment program has a social worker devoted to the program to help manage the behavioral outbursts and emotional breakdowns of students with emotional disabilities. Presently the social worker is housed central to those classrooms and has a 2-room suite to both counsel and give students space as needed. This type of arrangement needs to continue in order to afford the adjustment students the services they require. Additionally, the adjustment classrooms need to be of good size to allow space between the students and for the opportunity to complete project based activities while allowing areas for students to regroup/take space.

The program/plans provide (8) Adjustment Classrooms (2 to be located with the Freshman Academy) and space for the associated Social Worker, Counseling and Storage.

Fundamental Program *(10 half + 1 suite):*
One of the course offering in the Fundamentals Program is the Instructional Support Class which services well over 100 students. In this class we presently work on transitional skills, self-determination skills, and largely on academics from other classrooms. These subject area classes are using Google Classroom and students are regularly accessing information on Aspen. Presently many teachers teach this course with inadequate materials and space to truly service students fully. To meet the students' required work we require a large classroom (larger than the average) that can house up to 10-12 computers for students to regularly access. Our "Instructional support" classroom - solely dedicated to this class- presently houses as many as 12-16 students with a mere 4 computers. Students are continuously waiting to get on the systems to complete their work or check in on their progress/work that needs to be completed. As a school we are having students send information/work through Google Drive constantly but we cannot meet this need in our classes. In order to meet needs we need a large space with many computers and study carrels for students to use when they come to take a test. Presently students will leave a gen education class and come to test in the IS class but we have no private/quiet space to offer them and the efforts we and the student put in are compromised. In addition, shelving is critical as the IS center should house a textbook from each classroom as well as space for every student to have an individualized binder to track their work and transitional planning.

The program/plans provides (10) half-classroom sized spaces (2 to be located with the Freshman Academy) and space for the large Instructional Support suite. The Instructional Support space must support the equivalent of 3 classes of 10-12 students working closely with specialists.

Deaf and Hard of Hearing *(1):*
The DHOH program is presently housed at the Freshman Academy. It requires a ½ size classroom with the typical classroom needs (i.e. whiteboard, computer, etc.).

The DHOH students follow a regular schedule with an interpreter in general education classes or special education classes. For one or two periods per day DHOH students are in a substantially separate classroom to work on sign language skills and other study skills.

Speech and Language (SPL):
Presently housed in 2 smaller rooms in the back of a classroom (#305), the SPL class requires office space as well as teaching space. There is an assistant that works with the speech therapist. A ½ size classroom would be sufficient and would also house a little space for the Occupational Therapist and the Physical Therapist to complete some paperwork. The Speech Therapist holds small groups (6-8) students that work as a group at a round table.

Administrative Needs:
The Special Education administrative team at LHS consists of the following: 2 Evaluation Team Chairpersons (ETC), 1 Social Worker (in addition to adjustment social worker), 2 Evaluators, 2 Psychologists, 1 Department Chair and 1 Clerk. The staff requires office space, meeting rooms and testing rooms in order to complete their work. The main office for special education must be a locked room as it contains confidential files. This room (presently #144) houses the clerk, Department Head, and ETCs and works well. Optimally, each staff member evaluating (evaluators, psychologists) would have a small office to allow them to test in their room where all the materials are located. Presently evaluations occur in a number of places - wherever there is a free spot. The teams hold over 400 meetings a year and the need for meeting rooms is critical. We presently have 2 rooms: one is located in the Students Support Services office and one is located in room #220. Social workers also need a room that is individual in order to service students. The adjustment program is a little different and is addressed above.

The program/plans provide a half classroom for the Deaf/Hearing Impaired program, Speech Office for 3 + meeting for 6, (2) Social Workers, (2) Psychologists with (2) Evaluators/Testing, (2) Meeting Rooms, a SPED Dept. Chair, (2) Team Eval. Chairs and SPED Office/Clerk.

M. VOCATIONAL EDUCATION PROGRAMS

Non-chapter 74 Programming

- Air Force ROTC
  The Air Force Junior ROTC Pathway is a four-year citizenship program designed to develop citizens of character dedicated to serving their nation and community. The objectives of AFJROTC are to educate and train high school cadets in citizenship, promote community service, instill responsibility, character, and self-discipline, and provide instruction in air and space fundamentals. The program is grounded in the Air Force core values of integrity first, service before self, and excellence in all we do. The curriculum emphasizes the Air Force heritage and traditions, the development of flight, applied flight sciences, military aerospace policies, and global awareness. Rigid academic courses in military science and leadership provide a solid foundation. The curriculum shows students how to reach their full potential while serving society through self-discipline, structure, followership, and leadership. Students are challenged by assuming various leadership positions throughout the Lowell High School Cadet Corps. Senior Cadets are responsible for organizing, planning, and coordinating all cadet operations and activities. In addition to classroom curriculum, learning includes numerous extra-curricular activities including before/after school programs, field

trips, and community service activities. These activities emphasize teamwork, discipline, and community engagement.

This program provides both classroom instruction and physical fitness training that requires multiple classrooms and a dedicated physical training space where cadets can drill and conduct physical training without disturbing other classes in the vicinity.

The program/plans provide (5) classrooms/PT (1 more than exists) and a 2,500sf multi-purpose space dedicated for drills, color guard, etc. per USAF standards. Additional prescriptive storage, cadet office and conference areas are provided. The ideal location for ROTC programs would be near PE/Athletic areas for shared use of spaces and with easy access to outdoors.

- Communications

  The Colleen Creegan Media Center: The Digital Media Studio requires an adjacent flexible classroom, a Digital Media Production Lab, with state of the art computers, wall monitors and secure storage where students will learn all aspects of media production - pre-production through broadcasting in a flexible, authentic environment. In addition, the Digital Media Studio should have individual editing bays with computers and updated software, a collaborative meeting space for students and digital media studio staff along with sufficient storage to house all the equipment required to maintain a state of the art digital media production studio.

  Within the actual studio, there needs to be a lighting grid with a sufficient number of light fixtures to allow for dedicated lighting cues for sets - newsroom desk, interview set, etc. A teleprompter, digital light and sound boards, the ability to add graphics and transitions, production switchers, duplication and storage, capture and playback deck, broadcast converters, video monitoring, audio monitoring, working communication between studio floor and control room and the ability to shoot/broadcast in HD. An edit/share system allowing for collaboration between digital media classes, graphic design classes, digital photography and digital audio classes.

  In addition to the Digital Media Production studio and lab, additional labs for graphic design and digital photography as well as a digital audio lab that included digital pianos are essential. An edit sharing/storage system that would allow students and staff to work collaboratively - graphic design students create images and logos for TV broadcast, digital audio students create soundtracks for news segments, etc. For animation, tablets and computers are needed.

The Colleen Creegan Media Center also houses Lowell Educational Television, the educational access channel for the city of Lowell. Three staff members manage content and programming for channel 22 and let22.org as well as support LHS class activity. The studio contains a full sized media studio, edit rooms, small offices, and storage rooms. A teacher works in a media computer lab classroom where students create content for in school and city of Lowell broadcasts.

Proposed change: Locate the classroom within the media studio suite and provide students with private workspaces that allow them to focus on their media projects. It is essential to have flexible space and classroom adjacencies to allow for additional related programs to enhance the learning experience and allow for collaboration between the studio and journalism, music and digital music production, graphics, live music production, web radio production and drama and acting.

The Media Studio is replicated in the new program and ideally located with other digital media programs and/or arts programs in the plans, with classroom space nearby.

The program/plans provide equivalent square footage to what exists, with a slight increase to address the need for a larger conference/meeting room. The suite will be configured with a full-size Studio, Waiting Room, Control Room, (8) Editing Suites, Media Classroom, Equipment Room, Offices for 3 and a Conference Room for 15. The location would ideally be clustered near other Digital Media spaces and/or with Fine Arts (Digital Photo/Animation, TV Production & Graphics).

- Culinary

  The Culinary Arts Department is designed for students interested in careers within the Food Service Industry, one of the largest and fastest growing industries in the world. This Pathway is ideally a three year program that can be tailored to one or two years on an individual basis. This Pathway integrates a rigorous academic curriculum, but it also provides “hands-on” training in a student-operated restaurant. Students are exposed to different baking and cooking techniques, a variety of table services, and customer relations. This Pathway provides a professional environment so students will culminate a basic, well-rounded education in Culinary Arts. All students complete the program with a portfolio and enough experience to secure an entry-level position within the Food Service Industry or pursue careers through higher education. Students also have the opportunity to train and test for the Serve-Safe Certification.

  Proposed change: The restaurant with its full service kitchen is not in the best location to serve the general public. It is currently in the basement and anyone being buzzed in the exterior door can go in many different directions within the

school. This is a safety concern. The restaurant should be located with easy monitored access from the lobby in the same vicinity as the school store and the bank. This would keep our school businesses accessible to the general public while ensuring safety. The configuration of culinary area should be made up of the restaurant/kitchen with adjacent classroom space and an adjacent culinary lab for feeder culinary program. This would allow for more effective collaboration within the department. The other piece that is crucial is adequate storage space for inventory to include adjacent space for walk in freezers and refrigerators.

The program/plans provide (2) Culinary Classrooms along with the Kitchen/Restaurant and associated Freezer/Cooler and Dry Storage spaces. The new spaces are sized slightly larger than the existing and ideally located for easy, but controlled access by the public and for after-hours use. The kitchen will benefit further from shared access to loading/receiving areas.

- Engineering
  Maker Space Lab - The LHS Makerspace will allow for student intrinsic motivation and self-directed learning, while engaging students in significant content by allowing for connections to curriculum. The Makerspace will reinforce or introduce to students the components of all LHS STEM disciplines.

  An unassigned Maker Space serves as pull-out space for the 9th Grade. The Science Lab sized space will have an adjacent prep room for associated storage of materials, projects and 3D printing. The space will be located within the Freshman Academy areas.

  Engineering Lab - Technology/engineering classes will be able to move seamlessly between tool-based work, lecture, group work, and non-tool-based labs. Physics and robotics classes will have direct access to woodworking and metal tools for hands-on applications. All classes in this Pathway will be able to move from paper-based lecture or group work to computer based design to manufacturing

  Proposed change: The growth of this program has prompted the need for 2 Engineering labs so that all classes can have full access to this facility and educational/technology tools.

  The program/plans provide (2) Engineering Labs as required to meet prorated scheduling. Each room is sized as a traditional Science Lab, but will be outfitted according to the specific needs for CADD and Robotics.

- Environmental Sustainability (in development)

All classes in this Pathway will be able to move from classroom/academic work to hands-on, designing and manufacturing (computer-based, solar panels, etc.)

Proposed change: With the addition of a lab, students will be able to access design and manufacturing tools in house (rather than using facilities at satellite locations - such as businesses and collaboratives).

The program/plans provide a Science Lab sized space that will be developed as a new pathway for clean energy and sustainable design. The enrollment for this program is expected to come from other tech/engineering programs which might reduce in utilization, but provide specialized spaces to support each pathway.

- Health & Bioscience
  The Health and Bioscience Pathway is designed for students with an interest in the fields of allied health and/or the emerging field of biotechnology. The Health and Bioscience Pathway offers students a unique opportunity to gain essential classroom knowledge and practical experience within the local medical or biotechnological community.

  Proposed change: *Hospital Room Model Classroom* - Students will interact with model patients and learn how to conduct electrocardiograms, draw blood, interpret X-rays, set broken bones, and perform a range of other challenging tasks.

  The program/plans provide a separate Health and Bioscience Lab as part of the overall count of Science Labs, but each is to be outfitted for the specifics of either medical assisting, including associated patient beds, mock toilet/changing room or micro/biotech which includes specialized fume hoods and clean room set-up.

  The design/plans seek to create a dispersed pattern of interdisciplinary STEM and Humanities clusters, each potentially grouped as (3) science labs with (3) math classrooms vs (3) english with (3) social studies classrooms. Ideally, each cluster would have shared pull-out spaces and good visibility to foster collaboration and small-group and project-based activities. The visibility may allow a bit more independent work by students and also provides passive supervision throughout academic areas. ELL academic classrooms/labs will be woven alongside regular academic clusters in groupings of (2), as will health classrooms and special education spaces. World Language is to be grouped as a department, similar to Fine Arts, Business/Tech, ROTC and Physical Education, and located for ease of access among all grades.

Larger classrooms are critical to meet the needs of more active learning and to accommodate more flexible furniture that allows for multi-mode set-ups and better accommodates individual computing.

Chapter 74 Programming:

- Business Marketing & Finance

Lowell High School offers a Marketing & Finance Pathway for students interested in majoring in Business Administration in college or entering the workforce in the areas of management, finance, accounting, or marketing. The Marketing & Finance Pathway offers students authentic learning opportunities. Our students have the ability to work in the 1826 School Store, with a site in the high school and another in the downtown. Students experience the excitement and challenges of being a small business owner. Our marketing program partners with NFTE (Network for Teaching Entrepreneurship) which provides numerous hands-on learning activities and opportunities. Our partnership with the Jeanne D'Arc Credit Union allows students in the pathway to work in the Lowell High School branch of the Jeanne D'Arc Credit Union. In this branch, students learn the day-to-day operations of the banking industry. Both these valuable business opportunities allow students to earn high school credit and real world experiences while providing valuable services to the school and community.

Proposed change: The school store requires an adjacent flexible classroom (marketing retail lab) with retail and storage space to effectively provide students with real world experience in running a store, which includes customization of t-shirts, inventory control, customer service, accounting, marketing/advertising, and online sales. Beyond the retail program there is a need for flexible, technologically-equipped classroom space that allows for the use of online business and marketing simulations, software designed specifically for these types of classes, and online research. Positioning the other four business classrooms in the vicinity of the store would be beneficial in allowing more collaboration between the teachers. The bank is currently located within the cafeteria which allows for access by students and staff but does not allow for easy public access. There is a need for a larger space for the bank. The store and the bank should be co-located with the restaurant program in a configuration that allows for access through the main lobby for security purposes.

The program/plans provide (5) Business Finance/Marketing classroom/labs, (3) of which are recognized under Massachusetts Chapter 74 Program for Marketing and include the School Store. A separate space for the Bank is provided as a pull-out component of this program.

All Business programs would ideally be located as a cluster, but the larger priority is positioning the Bank, Store and associated Classrooms near the Cafeteria, Main

Entry/Lobby and easily accessible for public and afterhours uses. Separate storage for retail/supplies is provided.

N. TRANSPORTATION POLICIES

Transportation is not provided to Lowell High students to get them to and from school. If a student wishes to use the Lowell Regional Transit Authority bus, the cost of a bus pass is $20.00 per month. A survey of students conducted during the 2014-2015 school year indicated that students commute to and from school using the following methods: ride from family/friend (33%), walk (32%), ride city bus (24%), drive (11%). Daily, 11 LRTA buses transport students at drop-off and pick-up times, lining up along French Street and Kirk Street.

Approximately 83 SPED students are transported to and from LHS separately each day with 10 total of the following: specialty equipped wheelchair vans, yellow buses, and smaller vehicles.

Transportation for Athletics is extensive. Daily, about 7 buses line up at the main entrance on Father Morissette Boulevard to transport students to practices at Cawley Stadium, the boat house and other locations. Students provide their own transportation home from practice. On game days, there can be up to 4 additional buses that pick up students (also at the Father Morissette location) for transportation to games.

Note; the Educational Program does not address parking needs. The site program is articulated in section 3.1.5 Site Development Requirements. The school currently benefits from its location that utilizes city transportation, wide streets and adjacent parking garage. Planning options that create a new school a different site will need to account for parking and transportation as part of the site program.

O. FUNCTIONAL AND SPACIAL RELATIONSHIPS

Lowell High is interested in exploring different organizational structures that would more fully support the concept of expanding areas organized for STEM classrooms, Humanities classrooms, and CVTE classrooms. LHS is considering clustering academic Department Head offices together by subject matter connections (Humanities, STEM, CVT) and integrating the houses into this configuration. One way to do this would be to place two house offices in a combined house and guidance suite in proximity to a department center. This would allow for administrative presence in multiple areas of a large building. Another option would be to place all the house offices into one central space near the main office, such as a house and guidance suite. The Freshman Academy, while housed within the same large building, would have a separate office suite for the Director of the Freshman Academy.

- Classrooms that are clustered into inter-disciplinary configurations (adjacencies) to promote cross planning and discourse between academic teachers. While this will not have a direct impact on student scheduling (our school clusters students into multiple classes in grade 9 only), the adjacencies and common teacher planning space will address the NEASC concern that teachers do not have enough time or space to plan collaboratively across departments.
- In terms of adjacencies, we propose that Math and Science teachers have this common planning space together (for STEM collaboration as mentioned in the last bullet) and that English and History teachers have this common space as well (for Humanities collaboration as mentioned in the last bullet).
- Multiple large, flexible group instruction spaces that can be used for combined classes, presentations, lectures, seminar, faculty meetings, and parent meetings. These could be various-sized spaces that can be split up or combined (with movable walls) to better suit the needs of the various users.
- Adequate book storage for all departments, but especially for the core departments (English, Foreign Language, History, Math and Science) where textbooks and trade books are used extensively in all classes. We would prefer to have a central storage location for many of the books but with smaller distributed book and supply storage for specific departments.

The broad planning goals are to organize a new or renovated school for community use and control by having a zone or zones with major activity areas, such as the PE/Athletics spaces, Auditorium, Cafeteria and Media Center able to be opened or closed in a controlled and naturally supervisable way. The Cafeteria and Media Center seek to serve as the heart of the school, one as the social core and the other as the technology hub. Both located and configured for flexible use and access to views and outdoors. The culinary program would ideally be in proximity to the lobby as well as cafeteria kitchen/loading areas. The culinary restaurant, school store and bank also need to be located near the main lobby/community use areas.

The freshman are to be zoned in a separate wing, but well connected to shared programs and major spaces. Freshman academic rooms are to be clustered as teams of 6 classrooms + 2 science labs with nearby special education, health, ELL classrooms and a teacher planning room. Other academic rooms are to be organized in STEM clusters (3 science with 3 math) and Humanities clusters (3 english and 3 social studies), but in an alternating pattern that promotes collaboration within each cluster and convenient cross-discipline connections between STEM and Humanities.

Special Education, ELL and Health Classrooms are to be dispersed with general academic areas (grades 9-12), but ideally in groups of two.

Fine-Arts, World Language, ROTC and Digital Media programs are to be clustered alike, while seeking proximity to general academics for foster potential inter-disciplinary efforts.

P. KEY PROGRAMMATIC ADJACENCIES

As described in section O above

Q. SECURITY AND VISUAL ACCESS REQUIREMENTS

Of critical importance to the Lowell High community is an environment that is safe and secure. The school currently has 32 entrances. After the start of the school day, all doors are kept locked with the exception of the main lobby door. A security guard monitors the door closest to the Freshman Academy at class changing time to allow student to enter the main school without having to go to the main entrance. The main entrance has no buzzer or electronic monitoring system to manage entrance into the building. There is a security desk in the main lobby where visitors are expected to check in and be given a visitor's pass but visitors can easily bypass the guard who might be busy checking another visitor in. The school uses the Raptor visitor system and during school hours the school has over 10,000 visits each year. The high school has approximately 110 analog cameras throughout the three buildings that are being replaced by digital cameras as the analog cameras wear out. Currently the command and control center in an emergency is the security office that has multiple camera monitors and the ability to use the intercom. This space is not secure having both an interior glass door and large ground level windows to the outside.

At its current site the high school has a neighboring facility that is of adequate size to house students in an emergency/evacuation situation. This is important factor in our safety protocols that allows us to account for both students and staff in a safe alternative environment.

The Medical Emergency Response Plan was submitted to DESE on September 23, 2015.

Proposed Change: The plan should include an upgrade to the cameras system. The security vestibule should be configured to better monitor the main entrance to the school to include a camera and buzzer system on the door. If the high school continues to occupy multiple buildings the second building should also have a security entrance to better monitor the flow of students, staff and visitors. The school would also benefit from a secure command and control center preferably in the vicinity of the main office with multiple monitors to display footage from security cameras, an intercom system and space for a conference table. To alleviate bottlenecks and overcrowding during class changing time having multi-level bridges would be very beneficial and would limit the amount of students choosing to go outside to move between buildings. The school also needs a more robust security system that allows for automatic lockdowns of all exterior and interior doors along with a system of communicating with police and rescue. The current intercom system

is past its functional life and needs to be upgraded to better meet the needs of the school.

Lowell Public Schools has very close connections with our emergency responders. There are monthly safety meetings which include school representatives from each school level along with central office staff and representatives from fire, police and EMS (emergency service provider). Our visioning work included a police sergeant who oversees the school resource officer program and a captain from the police department who is the chair of the parent group. Moving forward with the planning process, emergency personnel will be an integral part of the process to determine preferred solutions.

The proposed planning concepts include a controlled main entry vestibule with security desk, adjacent SRO Office and a conference room that can function as Command/Control Center and also serve as DARE meeting space. A satellite SRO Office will be provided due to the large size of the school.

The planning layout for new or renovated facilities will be zoned for the ability to lock-off wings and control after-school use and community access. This includes locating the school store, bank, culinary and administrative houses for access from main lobby and functional areas.

R. OTHER PROGRAMS

Natatorium:
Omitted

In-House Suspension (2): The high school has two separate in-house suspension rooms, one for grades 10-12 and one for grade 9. These rooms are used all day and students do self-reflection and coursework with the assistance of the in-house teacher who acts as tutor/counselor.

Student Activities: The high school also has a student activities office that manages 32 after school activities and clubs. This office space is located in the cafeteria for easy access by students.

Nurses' office. This office has four assigned nurses. This space needs to have a reception area, private exam rooms and storage space for equipment and student records.

Outside service providers provide both academic support and health and social services:

- SCORE Mediation: Mediation office that trains students to work as mediators on student issues referred by house deans and other staff members. This space requires and office and a small meeting room.

- MCC/UMass: Programs provide intensive academic support and college/career support for 1st generation college and underserved populations. These programs require office spaces and a classroom (TRIO; Gear-Up / Talent Search / Upward Bound)

- Catie's Closet: A nonprofit that provides clothing and cosmetic items for students in need. Space needed is the size of a small classroom.

  Catie's Closet-The first location chosen by this non-profit organization was Lowell High School in 2010. Catie's Closet is now located in 37 schools in Massachusetts and New Hampshire. This organization provides in-school resources of clothing and basic necessities to students living in poverty and keeps the closet fully supplied with appropriate seasonal wear. Winter coats, hats and gloves are added to the inventory as the cold weather approaches and is replaced by a shorts and t-shirts with the approach of warm weather. The school location makes it easier for students in need to get access to fundamental necessities, including clothing that is age and design appropriate and helps reduce the stigma of poverty. At Lowell High School the closet is accessed on a daily basis. The space needed for this essential service is the size of a small classroom.

- Health Center: Lowell Community Health has a medical suite at the high school to service students with medical and mental health issues.

  The School-Based Health Center (SBHC) located at Lowell High School is administered by the Massachusetts Department of Public Health through a partnership with Lowell Community Health Center (Lowell CHC). It is one of thirty three (33) SBHCs across the state of Massachusetts and one of 2,315 SBHCs across the country in forty nine (49) states. The SBHC at Lowell High is operated, as a satellite site, by Lowell Community Health Center and licensed by the Massachusetts Department of Public Health's Division of Health Care Quality.

  Lowell CHC's mission to provide caring, quality and culturally competent health services to the people of Greater Lowell regardless of their financial status; to reduce health disparities and enhance the health of the Greater Lowell community; and to empower each individual to maximize their overall well-being.

  The SBHC at Lowell High School provides primary health care and behavioral health services and links students and families to additional services such as dental and vision services currently being offered at Lowell CHC's new facility located on 101 Jackson Street. The SBHC is staffed by a Family Nurse

Practitioner, a Medical Assistant and a Licensed Independent Clinical Social Worker. Services are culturally competent through the availability of trained medical interpreters and telephonic language services. Through well-established collaborative efforts with the school nurses, the SBHC has become an integral part of the health safety net for children in Lowell by promoting easier access to medical care, increasing health utilization among students, and offering students a safe place to receive care.

The partnership between the SBHC and the high school has been extremely beneficial to the student population at LHS. During the 2016-2017 school-years, the SBHC served 410 students through 1,117 primary care visits and 647 behavioral health visits. Examples of services included: immunizations; physical exams; sport exams; exams for employment; sick visits; management of chronic conditions; behavioral health assessments such as depression screening; substance abuse screening and brief interventions; assistance to help families with health insurance enrollment; well-child screenings for vision and hearing; health education and counseling; referrals; and care coordination.

Lowell CHC recognizes that meeting the physical and mental health needs of students increases their readiness for learning, prevents them from missing precious time in class, and enhances opportunities for lifetime success.

- Counseling Services: Outside counseling providers come into the school to support students with mental health needs.

- Safe Harbors Homeless Coordinator: Office space needed for program coordinator that assists our homeless student population.

The program includes (2) classrooms for In School Suspension, a student activities space and full Nurses' Suite per MSBA Guidelines. An office and waiting/secretary is provided for Score Mediation, along with a 3-room suite for MCC/UMass Trio programs, 2 spaces for Catie's Closet (1 with freshmen), a suite of rooms for the Community Health Center and space within the Student Support Center for Safe Harbors.

The program also provides a small space for Latino Connection and an office for substitute teachers. Counseling Services occur throughout the school, within available space.
See Appendix for further information

Proposed Space Summary v14 (for revised PSR)

	Spaces Existing			Spaces Proposed				Spaces per Guidelines			
	3125stu/25class/.71util.=176rms		177	3520stu/24class/.85util.=172rms		172		3520stu/23class/.85util.=181rms		183	
LOWELL HIGH SCHOOL	**Existing Conditions**			**Proposed Total**				**MSBA Guidelines (refer to MSBA Educational Program & Space Standard Guidelines)**			
ROOM TYPE	ROOM NFA[1]	# OF RMS	area totals	ROOM NFA[1]	# OF RMS	area totals		ROOM NFA[1]	# OF RMS	area totals	Comments
CORE ACADEMIC SPACES			136,088			161,620	7K OFFSET BY SPED/ART/TECH			169,040	
Classroom - Freshman (incl Health)	849	27		900	24	21,600					
Classroom - Gr. 10-12 (incl. Health & ELL)	825	95		900	88	79,200					
Classroom - General		122			112		STR/Z+CL SIZE+LES	850	120	102,000	825 SF min - 950 SF max
Teacher Planning - Freshman	493	1	493	450	4	1,800					
Tchr Plng (Tch-Out, Lng, Ktch, Comp, Copy)	604	8	4,834	450	13	5,850					
Dept Off's (Eng, SS, Mth, Sci, WL/ELL, Instr)	112	6	671	125	6	750					
Teacher Develop/Training (Little Thtr + Cntrl)	3,568	1	3,568	3,600	1	3,600					
Teacher Planning		16			24			100	120	12,000	
Small Group Seminar (20-30 seats)				450	6	2,700		500	8	4,000	
Science Classroom / Lab - Freshman	976	7	6,849	1,440	8	11,520					
Science Classroom / Lab - Gr 10-12	900	19	17,100	1,440	20	28,800					
Science Classroom / Lab (incl. 3 ELL Sci)		26			28		STR/Z+CL SIZE+LES	1,440	31	44,640	0 x85% ut=20 Seats-1 per /day/student
Prep Room	156	7	1,091	200	28	5,600		200	31	6,200	
Central Chemical Storage Rm				200	1	200		200	1	200	
Unassigned Green House/Growing Room	196	1	196	200	0	0	INCL VIA PREP				
Clean Room (w/ Micro/Bio Tech Lab)				400	0	0	INCL VIA PREP				
SPECIAL EDUCATION			21,950			38,950	5K OFFSET BY CR'S/ART/TECH			34,240	
LIFE SKILLS (69 stu's =78 prorated)											
Life Skills CRs (2 ages +Kitch/Laund/Mail)	968	4	3,870	1,200	4	4,800					
Life Skills Hygene (Wash/Changing Room)				450	1	450					
Life Skills Intensive CR +Tlt (2 age grps)	872	2	1,744	950	2	1,900					
Life Skills Sensory Room	344	1	344	450	1	450					
Life Skills (CSA) Autism CR + Tlt & Quiet	816	2	1,632	950	8	7,600					
Life Skills - AdaptivePE / Sensory-Motor				3,000	2	6,000					
ADJUSTMENTS (40 stu's =46 prorated)											
Adjustments CR	738	7	5,169	900	8	7,200					
Adjust Social Worker	165	1	165	150	1	150					
Counseling Room				200	1	200					
Storage				100	1	100					
FUNDAMNTL (190 stu's =214 prorated)											
Fundamentals - Freshman	810	2	1,619	450	2	900					
Fundamentals - Gr 10-12	545	7	3,812	450	8	3,600	1 PER SPED DEPT				
Fundamentals Instruct. Support CR (for 24+)				1,900	1	1,900					
OTHER SPECIAL NEEDS											
OT/PT (part-time)				therapy occurs in CRs							
Deaf/Hearing Impared Suite	1,066	1	1,066	450	1	450					
Speech & OT/PT (Office for 3 + mtgs for 6)	178	3	534	450	1	450					
Psych + Evaluators/Testing	299	2	598	150	4	600					
Social Worker	189	1	189	150	1	150					
PALS Mentoring Office/Conf	161	2	321	part of soc worker							
SPED Dept Chair	241	1	241	250	1	250					
SPED Eval Team Chair	237	1	237	150	2	300					
SPED Office (Clerk/Waiting/Files)	304	1	304	300	1	300					
Conference (1 for 12, 1 for 20)				600	2	1,200					

Version
11.24.2010

Proposed Space Summary v14 (for revised PSR)

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LOWELL HIGH SCHOOL	**Existing Conditions**			**Proposed Total**				**MSBA Guidelines (refer to MSBA Educational Program & Space Standard Guidelines)**			
ROOM TYPE	**ROOM NFA[1]**	**# OF RMS**	**area totals**	**ROOM NFA[1]**	**# OF RMS**	**area totals**		**ROOM NFA[1]**	**# OF RMS**	**area totals**	**Comments**
HEALTH & PHYSICAL EDUCATION			**46,121**			**41,700**	+6K (4 MORE STA)			**35,912**	
Gymnasium (6 lane 134 1m trck, LJ, TJ, SP)	28,408	1	28,408	3,000	6	18,000	REQD vs GUIDELN	12,000	1	12,000	
PE Alternatives (Wrestling 42x84 req'd)	1,960	1	1,960	3,500	1	3,500	OFFSET w/ LCKRS	3,000	1	3,000	
Fitness & Functional Strngth	1,474	2	2,948	3,000	1	3,000					
Multi-Purpose (Gymnastics/Yoga/Cheering)	currently off-site			3,000	1	3,000					
Gym Storeroom (incl. Gymnastics w/ MP)	1,133	1	1,133	1,400	1	1,400		300	1	300	
Locker Rooms - Boys / Girls w/ Toilets	3,245	2	6,490	3,600	2	7,200		19,712	1	19,712	5 6 st/student total
Varsity Lockers - Boys/ Girls w/ Toilets	870	2	1,740	1,200	2	2,400					
Phys. Ed. Storage (incl. Equipment)	258	5	1,292	250	6	1,500		500	1	500	
Athletic Director's Office (Lord 1st fl -South)	185	1	185	150	1	150		150	1	150	
AD Secr, Bursor, Conf (Lord 1st fl - South)	155	3	464	150	3	450					
Health Instructor's Office w/ Shower & Toilet	170	5	852	125	4	500		250	1	250	
Trainers Room	216	3	649	600	1	600					
MEDIA CENTER			**13,164**			**21,900**				**21,900**	
Media Center / Reading Room	9,137	1	9,137	21,900	1	21,900		21,900	1	21,900	
Computer Lab											
Tech Ctr, Stor + Training Lab (incl instr sp.)	666	3	1,998		included above						
Data Processing + Scheduler	1,036	1	1,036		included above						
MCAS/Testing Stor (incl instr specialist)	993	1	993		included above						
AUDITORIUM / DRAMA			**20,233**			**15,516**	+5K PER MODEST 1/3 SEATING REQUEST			**10,400**	
Auditorium	11,627	1	11,627	11,616	1	11,616		7,500	1	7,500	2/3 Enrollment @ 10 SF/Seat - 750 seats MAX
Stage	2,614	1	2,614	2,600	1	2,600		1,600	1	1,600	
Auditorium Storage (incl Prop Storage)	598	2	1,196	500	1	500		500	1	500	
Make-up / Dressing Rooms				300	2	600		300	2	600	
Controls / Lighting / Projection	233	1	233	200	1	200		200	1	200	
Theater - Freshman	3,438	1	3,438								
Stage - Freshman	691	1	691								
Dressing/Storage	217	2	434								
DINING & FOOD SERVICE			**21,955**			**25,180**				**25,180**	
Cafeteria - Freshman	4,215	1	4,215	5,000	1	5,000					
Cafeteria / Student Lounge / Break-out	10,408	1	10,408	12,600	1	12,600		17,600	1	17,600	3 seatings - 15SF per seat
Chair / Table Storage	156	1	156	1,030	1	1,030		1,030	1	1,030	
Scramble Serving Area	2,486	1	2,486	600	1	600		600	1	600	
Kitchen - Freshman	466	1	466	1,000	1	1,000					
Kitchen	3,553	1	3,553	3,820	1	3,820		4,820	1	4,820	1600 SF for first 300 + 1 SF/student Add'l
Staff Lunch Room	671	1	671	1,130	1	1,130		1,130	1	1,130	20 SF/Occupant

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ROOM TYPE	ROOM NFA[1]	# OF RMS	area totals	ROOM NFA[1]	# OF RMS	area totals	ROOM NFA[1]	# OF RMS	area totals	Comments

[1] Individual Room Net Floor Area (NFA) storage rooms

[2] Total Building Gross Floor Area (GFA) Includes the entire building gross square footage measured from the outside face of exterior walls

Architect Certification

I hereby certify that all of the information provided in this "Proposed Space Summary" is true, complete and accurate and, except as agreed to in writing by the Massachusetts School Building Authority, in accordance with the guidelines, rules, regulations and policies of the Massachusetts School Building Authority to the best of my knowledge and belief. A true statement, made under the penalties of perjury.

Name of Architect Firm: Perkins Eastman / DPC

Name of Principal Architect: Robert Bell

Signature of Principal Architect:

Date: 7th March 2018

PERKINS EASTMAN

May 9, 2018

Ms. Kathryn DeCristofaro
Capital Program Manager
Massachusetts School Building Authority
40 Broad Street, Suite 500
Boston, MA 02109

Re: Lowell High School Updated Preferred Schematic Report

Dear Ms. DeCristofaro:

This letter is to acknowledge that the Lowell Public School District has identified a goal of 2% additional reimbursement from the MSBA High Efficiency Green School Program. As their Designer, I have submitted a completed LEED scorecard showing all prerequisites and 55 attempted points, which will meet that goal.

The scope of work for the project will include the construction elements and performance tasks to achieve that goal, and all subsequent documents, including but not limited to; specifications, drawings and cost estimates will match the scope of work indicted in the submitted scorecard.

Sincerely,

Joseph Drown, AIA
Principal

Cc: file

Perkins Eastman
Architects DPC

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+1.617.449.4000

PERKINSEASTMAN.COM

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Los Angeles
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New York
Pittsburgh
San Francisco
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Stamford
Toronto
Washington DC

LEED v4 for BD+C: Schools

Project Checklist

Project Name: Lowell High School
Date: 4/30/2018
Prepared By: SSC

Y	?	N			
1	0	0	Credit 1	Integrative Process	1

14	1	0	**Location and Transportation**		15
0	0	na	Credit 1	LEED for Neighborhood Development Location	15
1	0	0	Credit 2	Sensitive Land Protection	1
2	0	0	Credit 3	High Priority Site	2
5	0	0	Credit 4	Surrounding Density and Diverse Uses	5
4	0	0	Credit 5	Access to Quality Transit	4
0	1	0	Credit 6	Bicycle Facilities	1
1	0	0	Credit 7	Reduced Parking Footprint	1
1	0	0	Credit 8	Green Vehicles	1

2	5	5	**Sustainable Sites**		12
Y			Prereq 1	Construction Activity Pollution Prevention	Required
Y			Prereq 2	Environmental Site Assessment	Required
0	1	0	Credit 1	Site Assessment	1
0	0	2	Credit 2	Site Development - Protect or Restore Habitat	2
1	0	0	Credit 3	Open Space	1
0	0	3	Credit 4	Rainwater Management	3
0	2	0	Credit 5	Heat Island Reduction	2
1	0	0	Credit 6	Light Pollution Reduction	1
0	1	0	Credit 7	Site Master Plan	1
0	1	0	Credit 8	Joint Use of Facilities	1

6	5	0	**Water Efficiency**		12
Y			Prereq 1	Outdoor Water Use Reduction	Required
Y			Prereq 2	Indoor Water Use Reduction	Required
Y			Prereq 3	Building-Level Water Metering	Required
1	1	0	Credit 1	Outdoor Water Use Reduction	2
4	2	0	Credit 2	Indoor Water Use Reduction	7
0	2	0	Credit 3	Cooling Tower Water Use	2
1	0	0	Credit 4	Water Metering	1

17	10	6	**Energy and Atmosphere**		31
Y			Prereq 1	Fundamental Commissioning and Verification	Required
Y			Prereq 2	Minimum Energy Performance	Required
Y			Prereq 3	Building-Level Energy Metering	Required
Y			Prereq 4	Fundamental Refrigerant Management	Required
4	2	0	Credit 1	Enhanced Commissioning	6
13	3	2	Credit 2	Optimize Energy Performance	16
0	1	0	Credit 3	Advanced Energy Metering	1
0	0	2	Credit 4	Demand Response	2
0	1	2	Credit 5	Renewable Energy Production	3
0	1	0	Credit 6	Enhanced Refrigerant Management	1
0	2	0	Credit 7	Green Power and Carbon Offsets	2

2	6	5	**Materials and Resources**		13
Y			Prereq 1	Storage and Collection of Recyclables	Required
Y			Prereq 2	Construction and Demolition Waste Management Planning	Required
0	3	2	Credit 1	Building Life-Cycle Impact Reduction	5
0	1	1	Credit 2	Building Product Disclosure and Optimization - Environmental Product Declarations	2
0	1	1	Credit 3	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
0	1	1	Credit 4	Building Product Disclosure and Optimization - Material Ingredients	2
2	0	0	Credit 5	Construction and Demolition Waste Management	2

6	5	4	**Indoor Environmental Quality**		16
Y			Prereq 1	Minimum Indoor Air Quality Performance	Required
Y			Prereq 2	Environmental Tobacco Smoke Control	Required
Y			Prereq 3	Minimum Acoustic Performance	Required
2	0	0	Credit 1	Enhanced Indoor Air Quality Strategies	2
0	1	2	Credit 2	Low-Emitting Materials	3
1	0	0	Credit 3	Construction Indoor Air Quality Management Plan	1
1	0	0	Credit 4	Indoor Air Quality Assessment	2
0	1	0	Credit 5	Thermal Comfort	1
1	1	0	Credit 6	Interior Lighting	2
0	1	2	Credit 7	Daylight	3
1	0	0	Credit 8	Quality Views	1
0	1	0	Credit 9	Acoustic Performance	1

4	2	0	**Innovation**		6
1	0	0	Credit 1.1	Education	1
1	0	0	Credit 1.2	Green Housekeeping	1
0	1	0	Credit 1.3	EP- Quality Transit	1
0	1	0	Credit 1.4	Water Recs	1
1	0	0	Credit 1.5	Integrated Pest Mgmt	1
1	0	0	Credit 2	LEED Accredited Professional	1

3	1	0	**Regional Priority**		4
1	**0**	**0**	Credit 1	Regional Priority: High Priority Site	1
1	**0**	**0**	Credit 2	Regional Priority: Indoor Water Use Reduction 4 of 7 points	1
1	**0**	**0**	Credit 3	Regional Priority: Optimize Energy Performance 8 of 16 points	1
0	**1**	**0**	Credit 4	Regional Priority: Renewable Energy Production 2 of 3 points	1
				Alts - Life Cycle -Rainwater	

55	35	20	**TOTALS**	Possible Points:	110

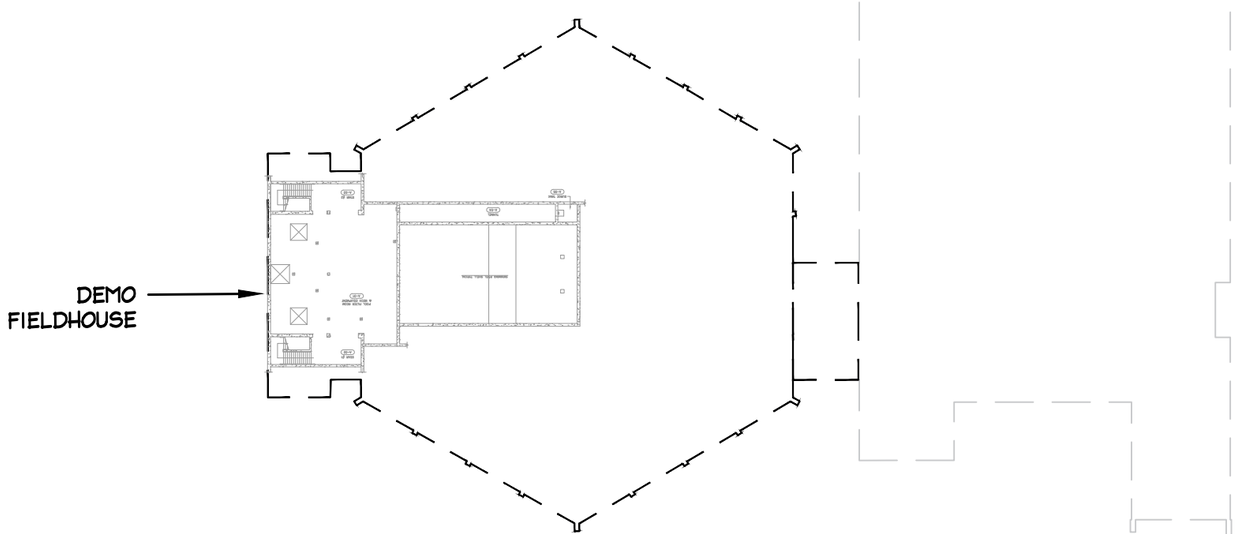
Certified: 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

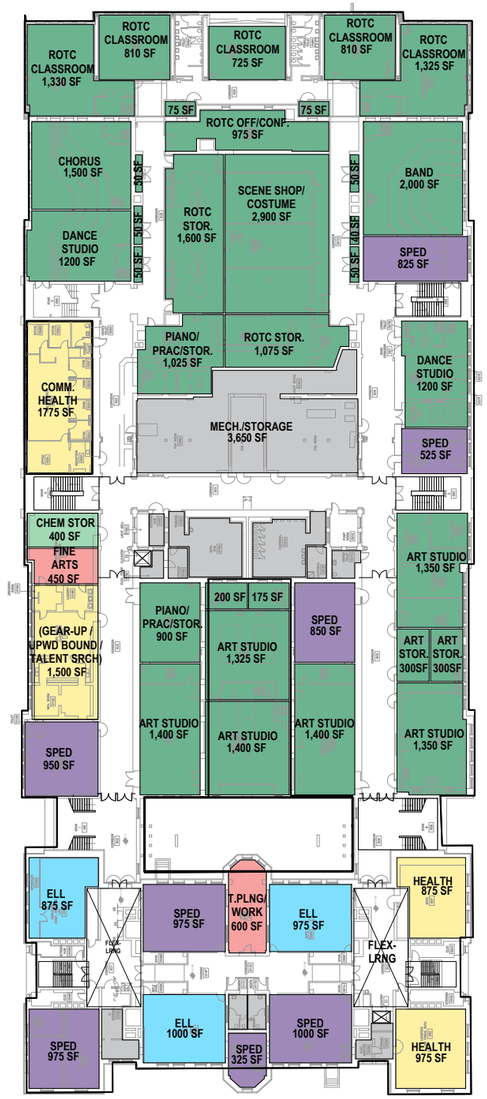
Add/Reno - Opt. 3A

BASMT

May 1, 2018

1/64" = 1'-0"





EXISTING FIELDHOUSE

1980 BUILDING

1922 BUILDING

0 32' 64' 128'

Add/Reno - Opt. 3A

Level 1

May 1, 2018

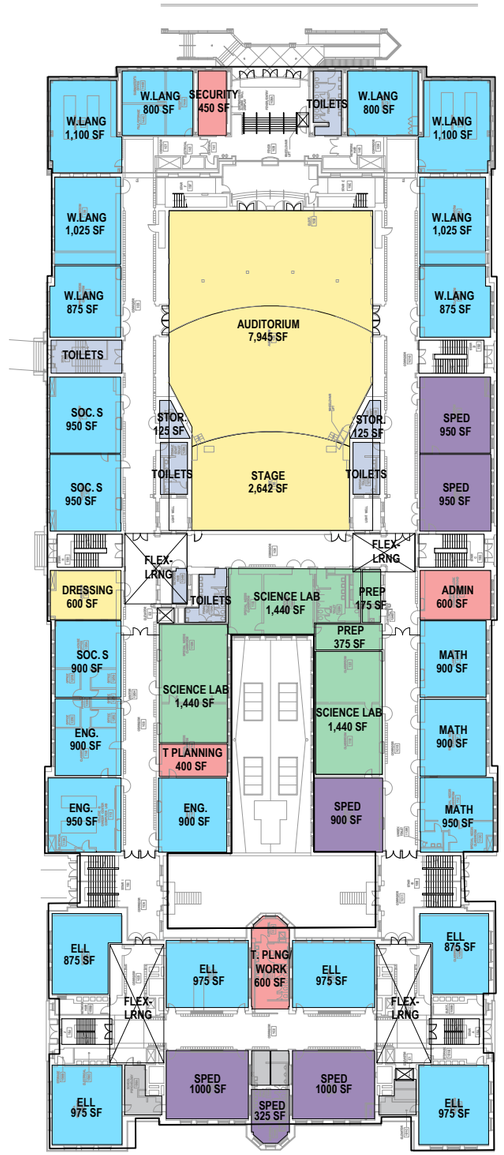
1/64" = 1'-0"

- ADMIN/TEACHER AREAS
- GENERAL CLASSROOMS
- SPECIAL EDUCATION
- SCIENCE
- CAREER/TECHNOLOGY
- GYM/CAF/LIBRARY/OTHER
- MECH/CUST, TLTS, STOR.
- NEW CONSTRUCTION
- DEMO



1980 BUILDING

NEW GYMNASIUM WING



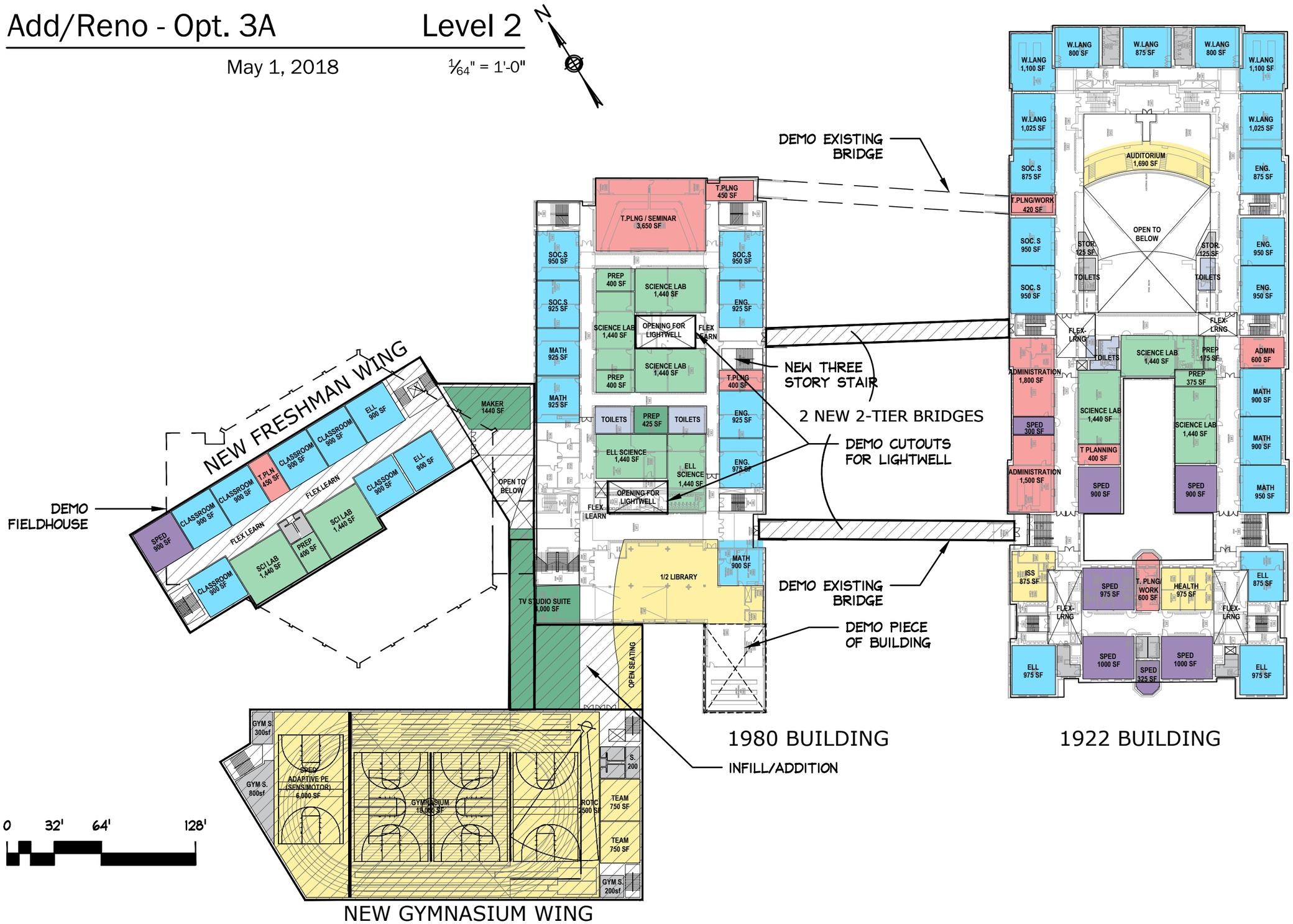
1922 BUILDING

Add/Reno - Opt. 3A

Level 2

May 1, 2018

1/64" = 1'-0"



Add/Reno - Opt. 3A

Level 3

May 1, 2018

1/64" = 1'-0"

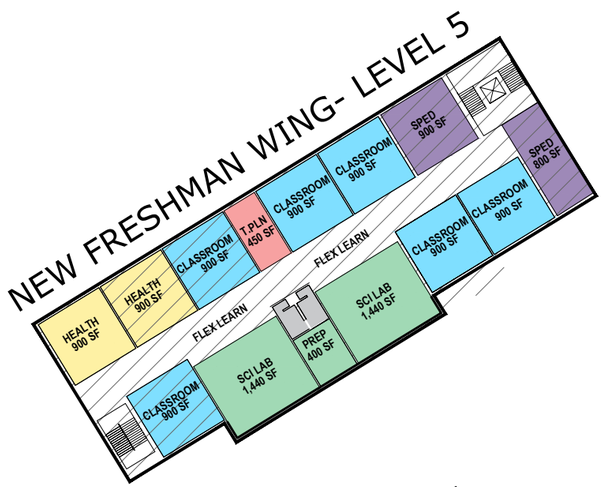


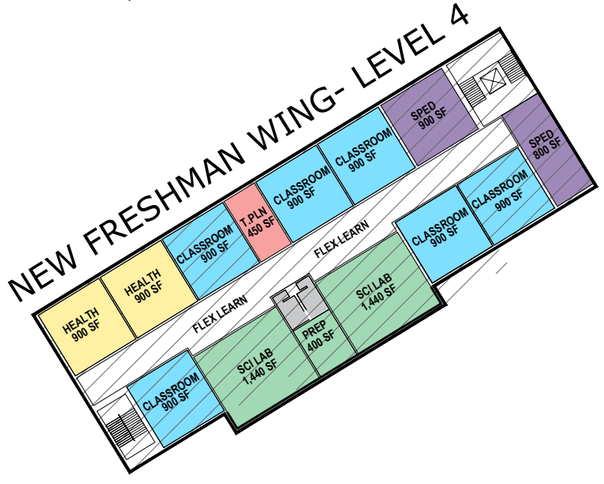
Add/Reno - Opt. 3A

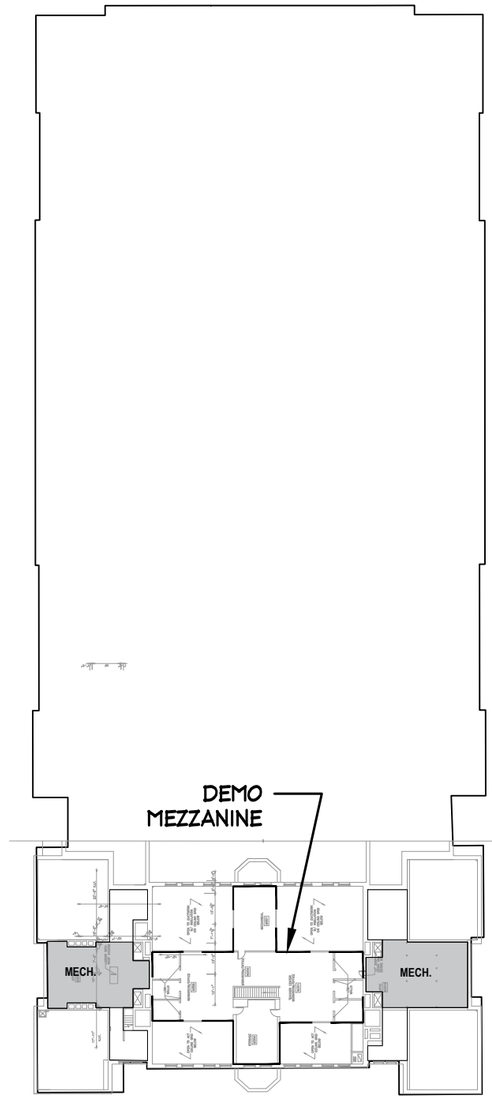
Level 4/5

May 1, 2018

1/64" = 1'-0"







1922 BUILDING

0 32' 64' 128'


ADD/RENO 3A
EXPANDED SITE
POTENTIAL FUTURE POOL
GEORGE AYOTTE PARKING GARAGE
0 50 100 150 200 feet
NORTH
NEW CONSTRUCTION
RENOVATE EXISTING BUILDING
EXISTING CROSSING
CANOPY/MAIN ENTRANCE
6 EXISTING ON STREET HC SPACES
FATHER MORISSETTE BLVD
BUS STOP
50'
DEMOLISH EXISTING BRIDGE
PUBLIC EVENT ENTRY
POTENTIAL BUS LINE UP AREA
DEMOLISH EXISTING BUILDING
NEW FENCE AND GATE
GYM ENTRY
NEW FRESHMAN WING
1980 BUILDING
STEAM PLT
1922 BUILDING
8'
CENTRAL GREEN
NEW GYMNASIUM WING
ARCAND DRIVE
23'
PAIGE STREET
TRANSFORMER AND GENERATOR
SERVICE AREA WITH DUMPSTER AND RECYCLING
MERRIMACK CANAL
NEW 2-TIERED BRIDGES
KIRK ST
BUS STOP
TURN OVER EXISTING FRESHMAN ACADEMY AND STEAM PLT STEAM PLANT TO THE CITY
EXPANDED PROPERTY LINE

Add/Reno - Opt. 2A

BASMT

May 1, 2018

1/64" = 1'-0"

0 32' 64' 128'

- ADMIN/TEACHER AREAS
- GENERAL CLASSROOMS
- SPECIAL EDUCATION
- SCIENCE
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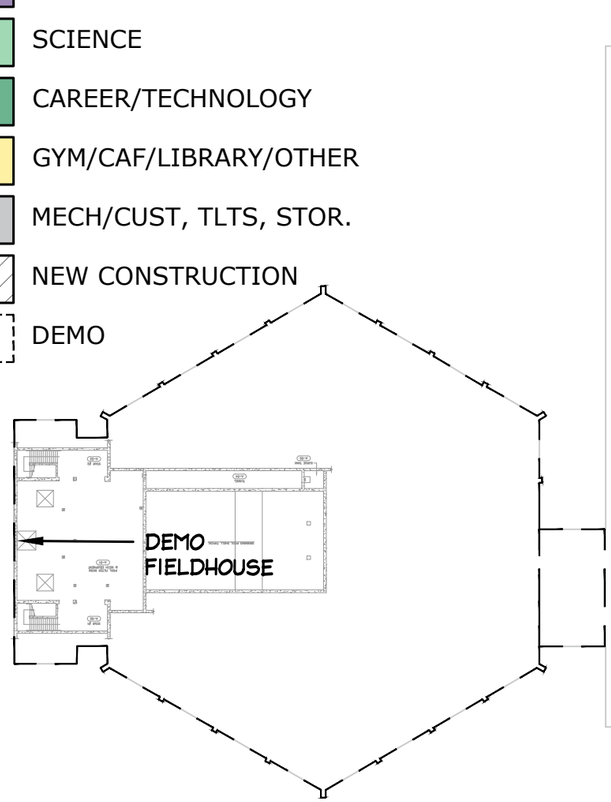
- GYM/CAF/LIBRARY/OTHER
- MECH/CUST, TLTS, STOR.
- NEW CONSTRUCTION
- DEMO





EXISTING FIELDHOUSE 1980 BUILDING 1922 BUILDING

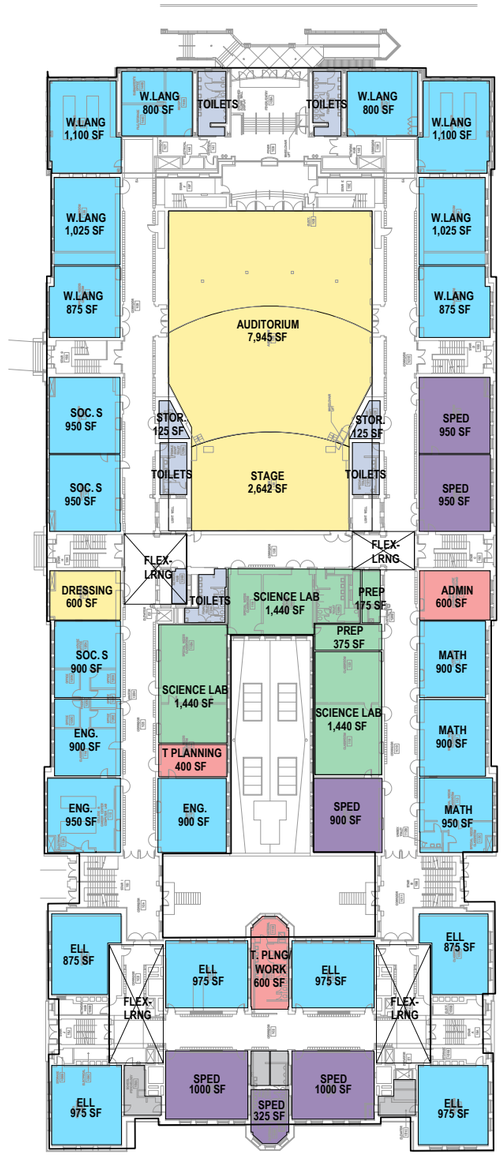
Add/Reno - Opt. 2A

Level 1

May 1, 2018

1/64" = 1'-0"





NEW GYMNASIUM BUILDING 1980 BUILDING

1922 BUILDING

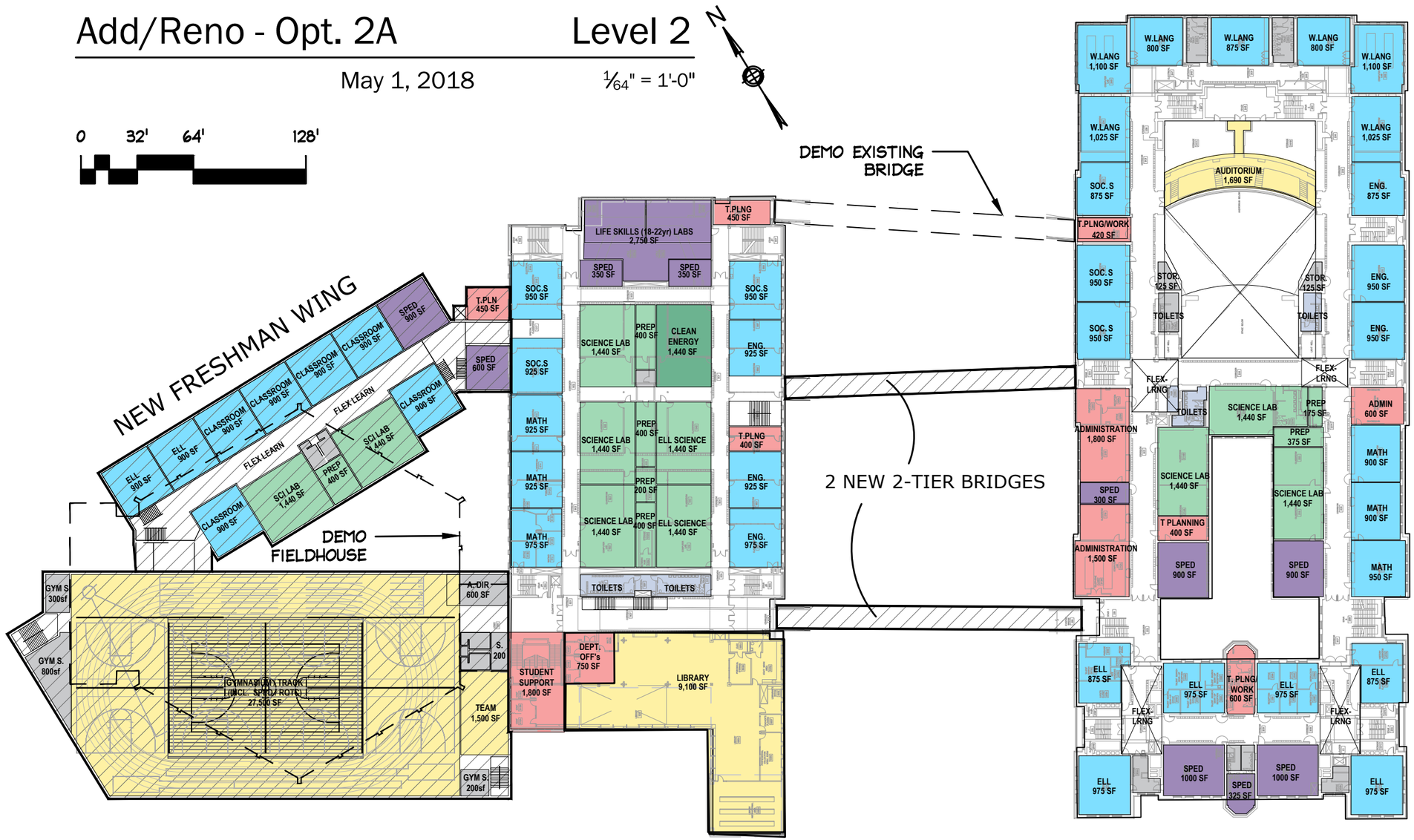
Add/Reno - Opt. 2A

Level 2

May 1, 2018

1/64" = 1'-0"

0 32' 64' 128'



NEW GYMNASIUM BUILDING 1980 BUILDING 1922 BUILDING

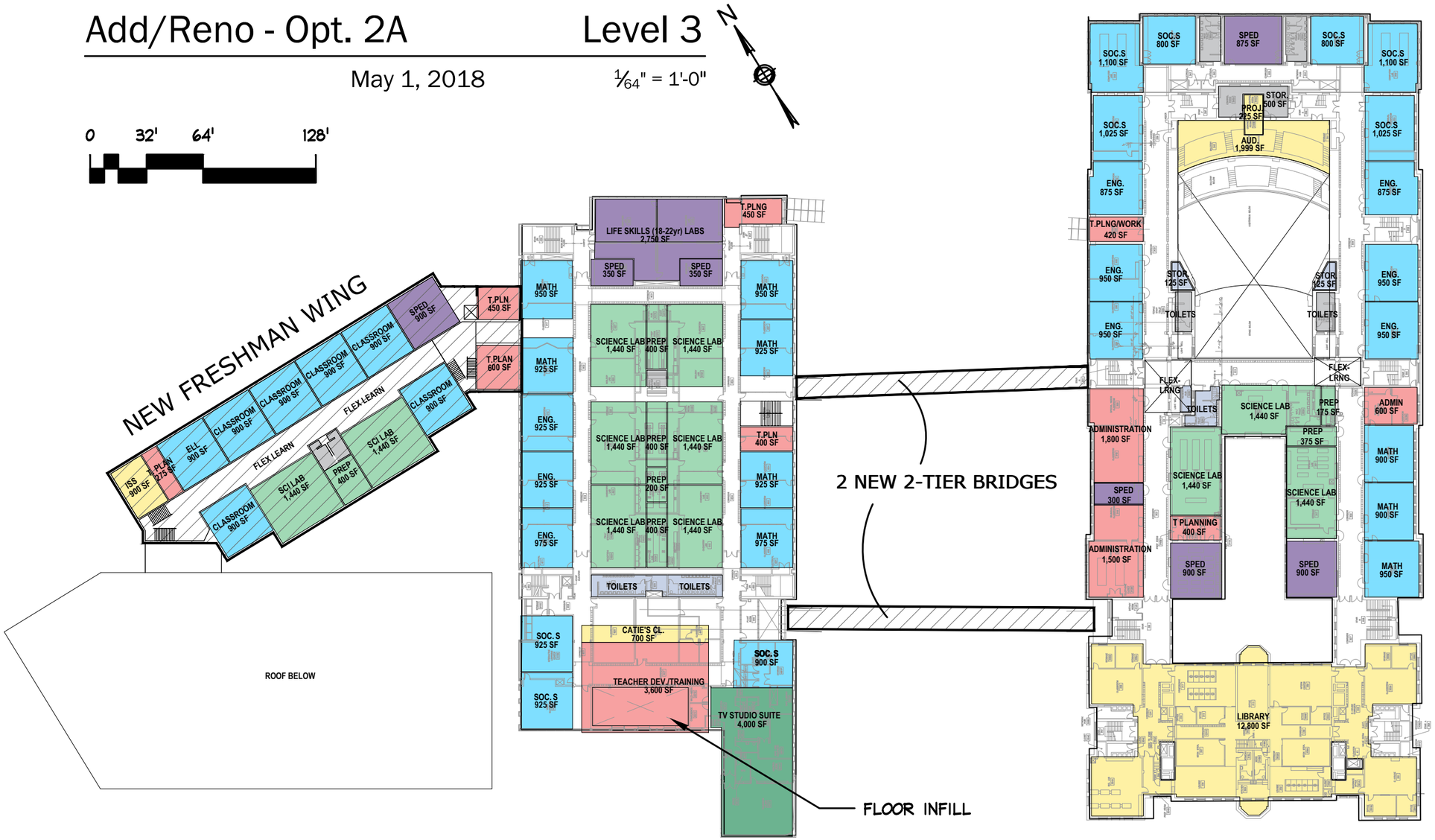
Add/Reno - Opt. 2A

Level 3

May 1, 2018

1/64" = 1'-0"

0 32' 64' 128'



1980 BUILDING

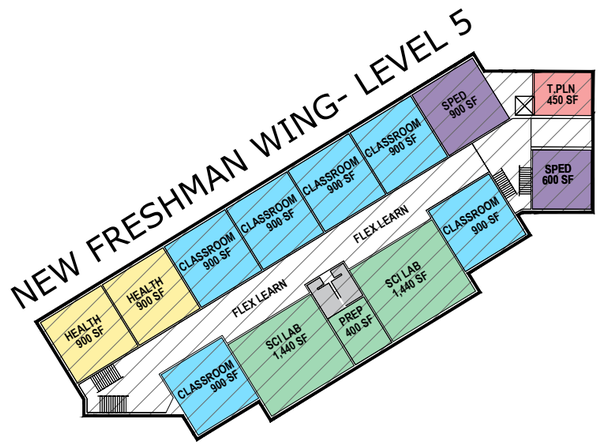
1922 BUILDING

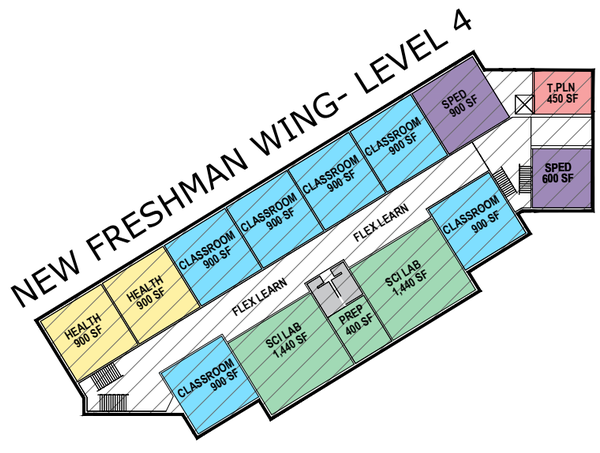
Add/Reno - Opt. 2A

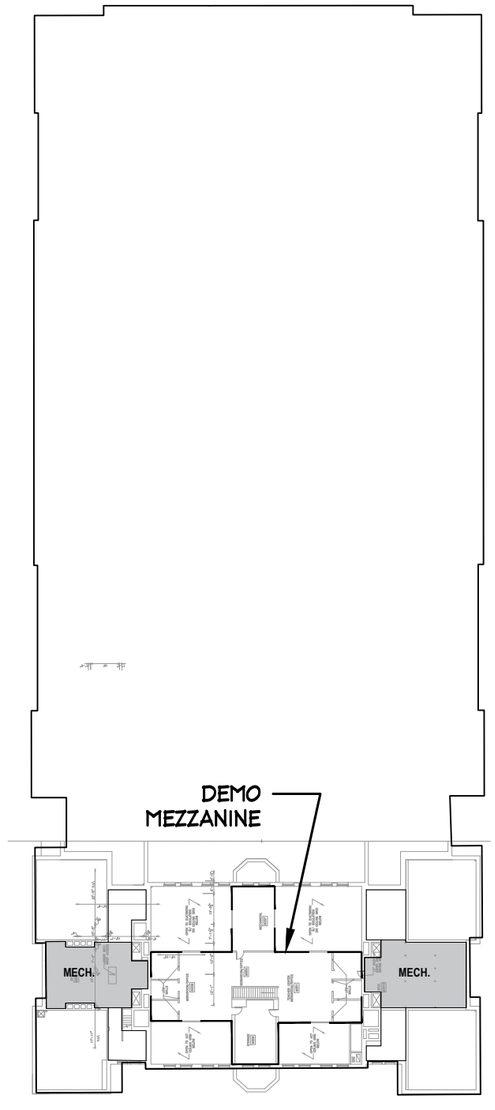
Level 4/5

May 1, 2018

1/64" = 1'-0"







1922 BUILDING



New Option A- BASEMENT

May 1, 2018

1/64" = 1'-0"

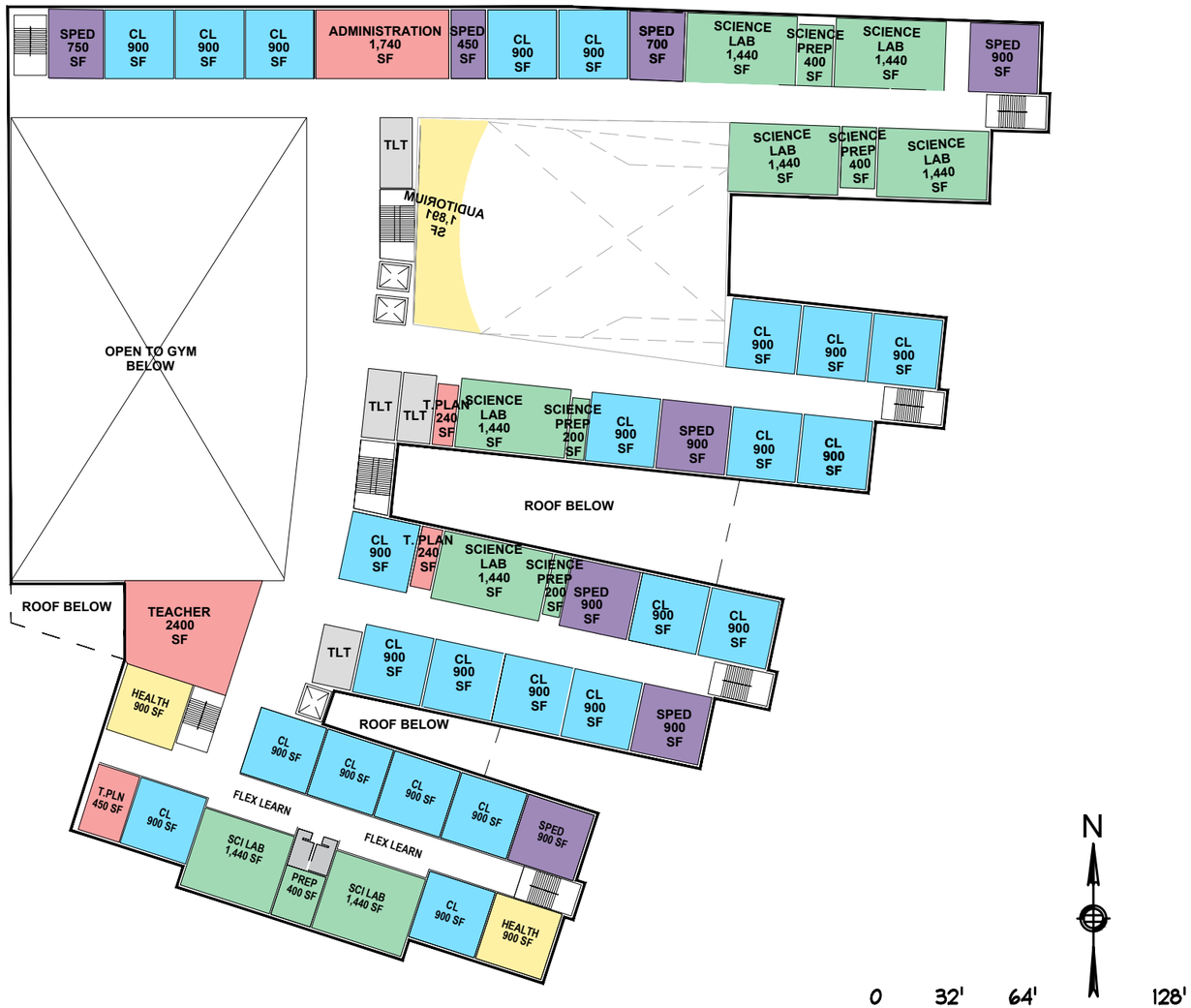
- ADMIN/TEACHER AREAS
- GENERAL CLASSROOMS
- SPECIAL EDUCATION
- SCIENCE
- CAREER/TECHNOLOGY
- GYM/CAF/LIBRARY/OTHER
- MECH/CUST, TLTS, STOR.
- NEW CONSTRUCTION
- DEMO



New Option A- LEVEL 1

May 1, 2018

1/64" = 1'-0"



New Option A- LEVEL 2

May 1, 2018

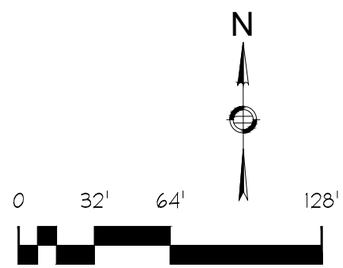
1/64" = 1'-0"



New Option A- LEVEL 3

May 1, 2018

1/64" = 1'-0"

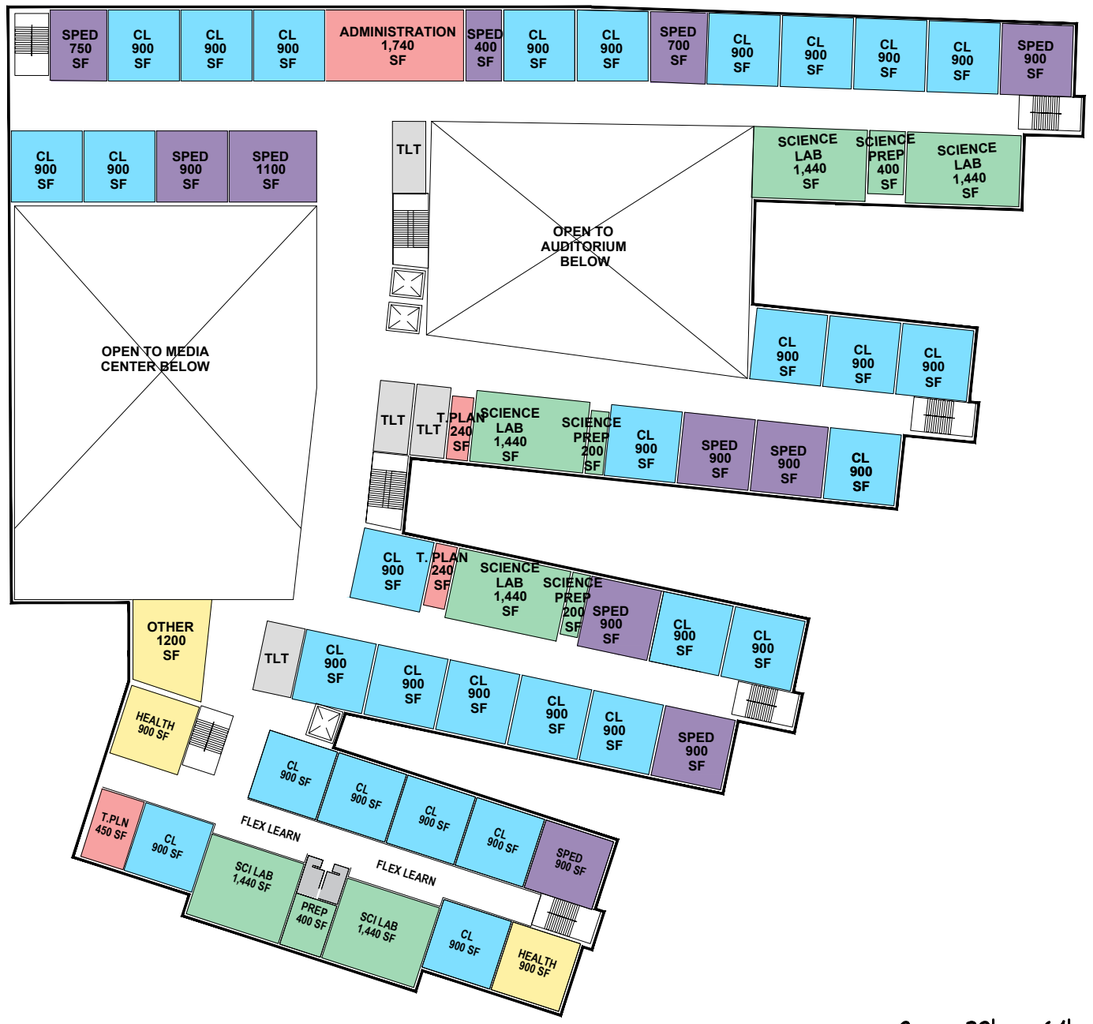




New Option A- LEVEL 4

May 1, 2018

1/64" = 1'-0"

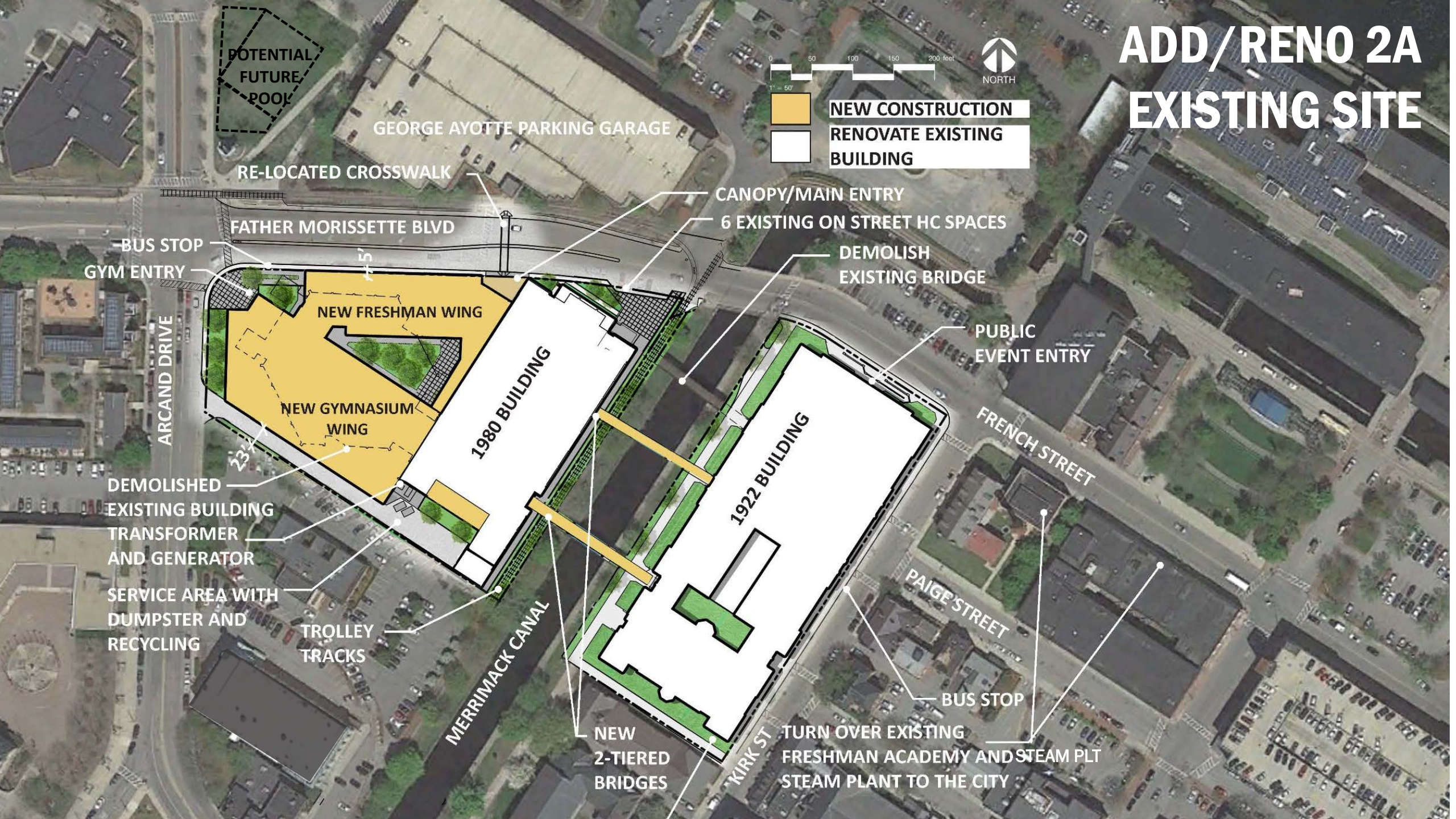


New Option A- LEVEL 5

May 1, 2018

1/64" = 1'-0"

ADD/RENO 2A
EXISTING SITE




NEW OPTION A
EXPANDED SITE
POTENTIAL FUTURE POOL
GEORGE AYOTTE PARKING GARAGE
NEW CONSTRUCTION
RENOVATE EXISTING BUILDING
NORTH
FATHER MORISSETTE BLVD
BUS STOP
CANOPY MAIN ENTRANCE
EXISTING BUILDING
NEW 5 STORY SCHOOL
16'
30'
20'
ARCAND DRIVE
FRESHMAN WING
CANOPY
GYM ENTRANCE
TRANSFORMER AND GENERATOR
SCHOOL PROPERTIES ZONE DMU
SERVICE AREA WITH DUMPSTER AND RECYCLING
EXISTING ON STREET HC SPACES
DEMOLISH EXISTING BRIDGES
MERRIMACK CANAL
UNUSED 1922 BUILING
FRENCH STREET
PAIGE STREET
BUS STOP
KIRK ST
TURN OVER EXISTING FRESHMAN ACADEMY, 1922 BUILDING AND STEAM PLANT TO THE CITY

Nitsch Engineering

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www.nitscheng.com

MEMORANDUM

TO: Alicia Caritano, Senior Associate, Perkins Eastman

FROM: William R. Maher, PE

DATE: May 3, 2017 (Revised)

RE: Existing Lowell High School Civil Soils Test Pits

EXISTING CONDITION

The existing Lowell High School Site is comprised of four (4) buildings which are located at 50 Father Morissette Boulevard (Field House and Lord Buildings), 38 Kirk Street (1922 Building) and 55 French Street (Freshman Academy) in downtown Lowell (Figures 1 and 2). Please note that the Steam Plant Building was excluded from this study because it was not within the scope of the Design Options under consideration for the Preferred Option.

The existing Lowell High School (for the purpose of soil testing) is bounded by Father Morissette Boulevard and French Street to the north, Kirk Street to the east, private properties to the couth and Arnand Drive to the west. No test pits were conducted at Freshman Academy since the building occupies the lots the building sits on. No wetland resource areas were observed on the properties. The Merrimack Canal bisects the 1922 Building and the Lord Building.

NRSC Soil Designations

The Soil Classification Summary (Table 1) outlines the Natural Resources Conservation Services (NRCS) designation of the soil series at the existing Lowell High School Site (refer to FIGURE 1 in Appendix A). The area that comprises of and surrounds the existing Lowell High School is classified as Urban Land with an unclassified hydrologic soil group (HSG).

Table 1. NRCS Soil Classification Summary

Soil Unit	Soil Series	Hydrologic Soil Group
602	Urban Land	---

On-Site Soil Investigations

Nitsch Engineering, Inc. performed ten (10) test pits (refer to FIGURE 2 in Appendix A) at the existing High School Site on Saturday, April 8, 2017. These test pits were located at 3 of the 4 school buildings (no test pits were conducted at Freshman Academy and at the Steam Plant). The results of the soil testing indicated fill material observed in each test pit of varying depths. No groundwater or soil mottling was observed in any of the test pits. Ledge was not encountered in the test pits performed by Nitsch Engineering. These test pit logs are provided in Appendix A.

RECOMMENDATIONS/CONCLUSIONS

In 1997, the Massachusetts Department of Environmental Protection (the "Department" or "MassDEP") published the Massachusetts Stormwater Handbook as guidance on the Stormwater Policy. MassDEP has revised the Stormwater Management Standards and Massachusetts Stormwater Handbook (2008) to promote increased stormwater recharge, the treatment of more runoff from polluting land uses, low impact development (LID) techniques, pollution prevention, the removal of illicit discharges to stormwater management systems, and improved operation and maintenance of stormwater best management practices (BMPs). MassDEP applies the Stormwater Management Standards pursuant to its authority under the Wetlands Protection Act, M.G.L. c. 131, § 40, and the Massachusetts Clean Waters Act, M.G.L .c. 21, §§ 26-53.

The Stormwater Management Standards address water quality (pollutants) and water quantity (flooding, low base flow and recharge) by establishing standards that require the implementation of a wide variety of stormwater management strategies. These strategies include environmentally sensitive site design and LID techniques to minimize impervious surface and land disturbance, source control and pollution prevention, structural BMPs, construction period erosion and sedimentation control, and the long-term operation and maintenance of stormwater management systems.

The intent of this standard is to ensure that the infiltration volume of precipitation into the ground under post-development conditions is at least as much as the infiltration volume under pre-development conditions. Standard 3 requires the restoration of recharge, using infiltration measures and careful site design. Through judicious use of low impact development techniques and other approaches that minimize impervious surfaces and mimic natural conditions, new developments can approximate pre-development recharge for most storms. This standard must be met as the existing high school site will require compliance with the Wetlands Protection Act due to its proximity to a wetland resource area (Merrimack Canal) and the expected permitting (filing of a Notice Intent [NOI] to receive an Order of Conditions) from the Lowell Conservation Commission should this site be chosen.

When designing infiltration BMPs, adequate subsurface information needs to be obtained. Infiltration systems must be installed in soils capable of absorbing the recharge volume (i.e. not D soils). Infiltration structures must be able to drain fully within 72 hours. In addition, there must be at least a 2-foot separation between the bottom of the infiltration structure and the seasonal high groundwater table.

Based on the soil data, Nitsch Engineering would recommend; should the site be selected to maintain the existing Lowell High School; that additional test pits be performed to determine the location of and design of a proposed drainage recharge system (subsurface) for the site to comply with the Wetlands Protection Act and the Massachusetts Stormwater Handbook for the renovated Lowell High School.

SOIL TEST PIT PHOTOGRAPHS



PHOTOGRAPH NO. 1 – Test Pit #101



PHOTOGRAPH NO. 2 – Test Pit



PHOTOGRAPH NO. 3 – Test Pit #102



PHOTOGRAPH NO. 4



PHOTOGRAPH NO. 5 – Test Pit #103



PHOTOGRAPH NO. 6



PHOTOGRAPH NO. 7 – Test Pit #104



PHOTOGRAPH NO. 8



PHOTOGRAPH NO. 9 – Test Pit #105



PHOTOGRAPH NO. 10



PHOTOGRAPH NO. 11 – Test Pit #106



PHOTOGRAPH NO. 12



PHOTOGRAPH NO. 13 – Test Pit #107



PHOTOGRAPH NO. 14



PHOTOGRAPH NO. 15 – Test Pit #108



PHOTOGRAPH NO. 16



PHOTOGRAPH NO. 17 – Test Pit #109



PHOTOGRAPH NO. 18



PHOTOGRAPH NO. 19 – Test Pit #110



PHOTOGRAPH NO. 20

APPENDIX A

Soil Investigations

NRCS Soil Map and Description (FIGURE 1)
Soil Test Pit Location Map (FIGURES 2-5)
Soil Test Pit Logs

Soil Map—Middlesex County, Massachusetts
(Existing Lowell High School Site)

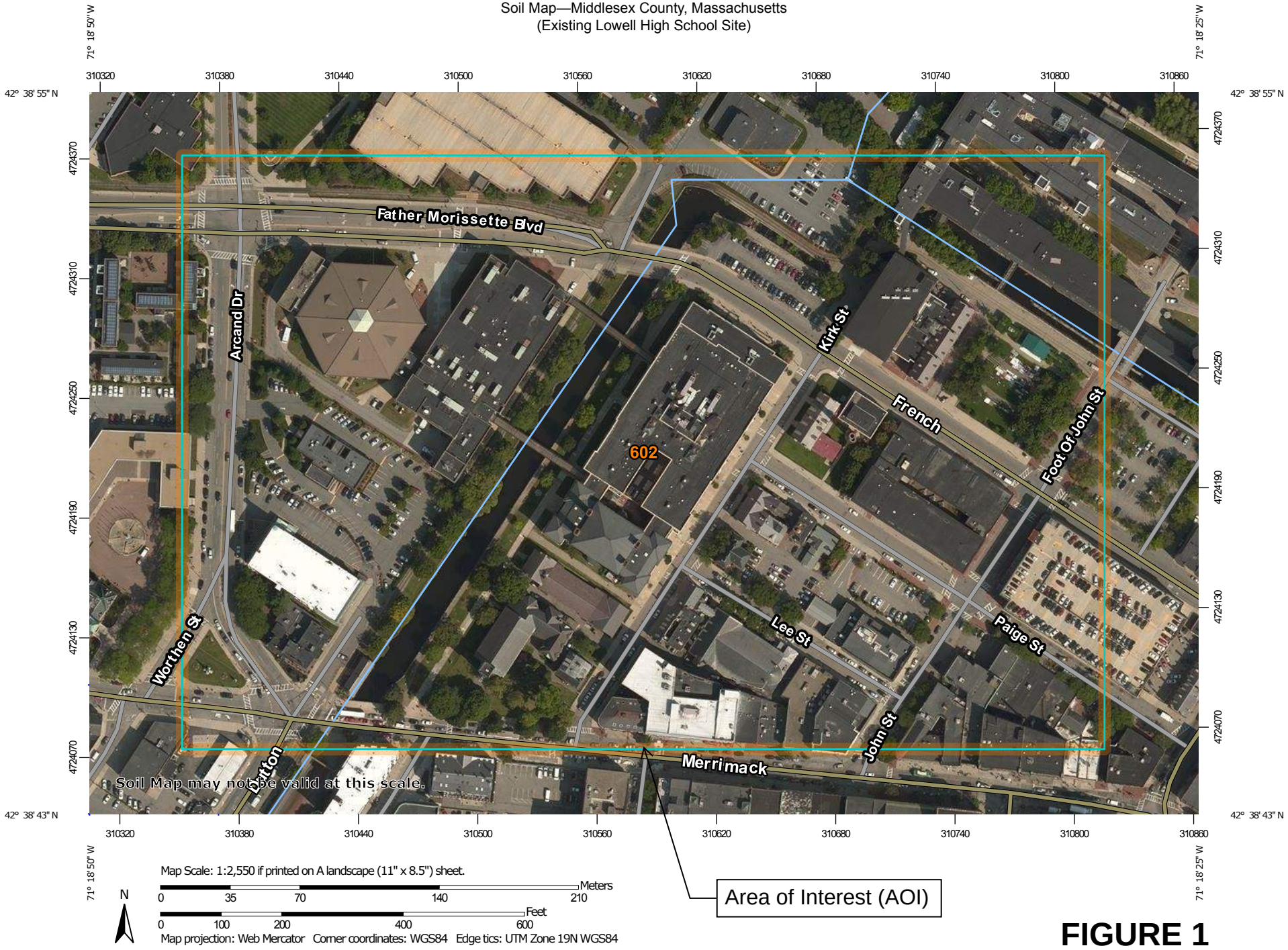

FIGURE 1

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 16, Sep 14, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 29, 2014—Sep 19, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Middlesex County, Massachusetts (MA017)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
602	Urban land	34.2	100.0%
Totals for Area of Interest		**34.2**	**100.0%**

UTILITY INFORMATION STATEMENT

1. THE SUB-SURFACE UTILITY INFORMATION SHOWN HEREON IS COMPILED BASED ON FIELD SURVEY INFORMATION, RECORD INFORMATION AS SUPPLIED BY THE APPROPRIATE UTILITY COMPANIES, AND PLAN INFORMATION SUPPLIED BY THE CLIENT, IF ANY; THEREFORE WE CANNOT GUARANTEE THE ACCURACY OF SAID COMPILED SUB-SURFACE INFORMATION TO ANY CERTAIN DEGREE OF STATED TOLERANCE. ONLY PHYSICALLY LOCATED SUB-SURFACE UTILITY FEATURES FALL WITHIN NORMAL STANDARD OF CARE ACCURACIES.

2. THE LOCATIONS OF UNDERGROUND PIPES, CONDUITS, AND STRUCTURES HAVE BEEN DETERMINED FROM SAID INFORMATION, AND ARE APPROXIMATE ONLY. COMPILED LOCATIONS OF ANY UNDERGROUND STRUCTURES, NOT VISIBLY OBSERVED AND LOCATED, CAN VARY FROM THEIR ACTUAL LOCATIONS.

3. ADDITIONAL BURIED UTILITIES/STRUCTURES MAY BE ENCOUNTERED.

4. THE STATUS OF UTILITIES, WHETHER ACTIVE, ABANDONED, OR REMOVED, IS AN UNKNOWN CONDITION AS FAR AS OUR COMPILATION OF THIS INFORMATION.

5. IT IS INCUMBENT UPON INDIVIDUALS USING THIS INFORMATION TO UNDERSTAND THAT COMPILING UTILITY INFORMATION IS NOT EXACT, AND IS SUBJECT TO CHANGE BASED UPON VARYING PLAN INFORMATION RECEIVED AND ACTUAL LOCATIONS.

6. THE ACCURACY OF MEASURED UTILITY INVERTS AND PIPE SIZES IS SUBJECT TO FIELD CONDITIONS, THE ABILITY TO MAKE VISUAL OBSERVATIONS, DIRECT ACCESS TO THE VARIOUS ELEMENTS AND OTHER MATTERS.

7. THE PROPER UTILITY ENGINEERING/COMPANY SHOULD BE CONSULTED AND THE ACTUAL LOCATIONS OF SUBSURFACE STRUCTURES SHOULD BE VERIFIED IN THE FIELD (V.I.F.) BEFORE PLANNING FUTURE CONNECTIONS. CONTACT THE DIG SAFE CALL CENTER AT 1-888-344-7233, SEVENTY-TWO HOURS PRIOR TO EXCAVATION, BLASTING, GRADING, AND/OR PAVING.

8. AS OF THE DATE OF THIS PLAN RECORD INFORMATION HAS NOT BEEN RECEIVED BY NITSCH ENGINEERING FOR THE FOLLOWING UTILITIES:

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2. THE PURPOSE OF THIS PLAN IS TO SHOW EXISTING CONDITIONS SURVEY AS THE RESULT OF AN ON-THE-GROUND INSTRUMENT SURVEY WHICH OCCURRED BETWEEN AUGUST 24 AND OCTOBER 11 OF 2016.

3. HORIZONTAL COORDINATES REFER TO NAD83 BASE ON RTK GPS OBSERVATION.

4. ELEVATION REFERS TO CITY OF LOWELL VERTICAL DATUM BASED ON RTK GPS OBSERVATION AND CHECKING BENCHMARKS..

5. THE INFORMATION CONTAINED ON THE DISK OR ELECTRONIC DRAWING FILE ACCOMPANYING THIS PLAN MUST BE COMPARED TO THE SEALED AND SIGNED HARD COPY OF THE PLAN TO ENSURE THE ACCURACY OF ALL INFORMATION AND TO ENSURE NO CHANGES, ALTERATIONS, OR MODIFICATIONS HAVE BEEN MADE. RELIANCE SHALL NOT BE MADE ON A DOCUMENT TRANSMITTED BY COMPUTER OR OTHER ELECTRONIC MEANS UNLESS FIRST COMPARED TO THE ORIGINAL SEALED DOCUMENT ISSUED AT THE TIME OF THE SURVEY. DUE TO THE CRITICAL NATURE OF SURVEYING, DATA ACQUISITION, AND AUTOCAD PLAN DEVELOPMENT, IF CRITICAL DIMENSIONAL INFORMATION IS NEEDED AND IS NOT SPECIFICALLY SHOWN ON THE ELECTRONIC DRAWING FILE, PLEASE CONTACT NITSCH ENGINEERING.

MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NAD 83

BENCH MARK: TBM-A
X-CUT ON BOLT OF LIGHT POLE BASE NO. 40
ELEVATION=31.48(L.C.B)
FIELD BOOK 645A PAGE 44
SET ON (09/20/16)

FATHER MORISSETTE BOULEVARD
(PUBLIC - 80' WIDE)

ARCAND DRIVE
(PUBLIC - 75' WIDE)

MERRIMACK CANAL

N/F
CITY OF LOWELL
SCHOOL DEPARTMENT
GI PARCEL ID#2450-50
BOOK 2313 PAGE 190

"FIELD HOUSE"
NO. 50 FATHER
MORISSETTE BOULEVARD

N/F
CITY OF LOWELL
SCHOOL DEPARTMENT
GIS PARCEL ID#2405-50
BOOK 2313 PAGE 190

"LORD BUILDING"
NO. 50 FATHER
MORISSETTE BOULEVARD

LOT AREA
143,982 SQ. FT.
OR 3.3 ACRES

3 STORY BRICK

TP-102
TP-103
TP-104
TP-105
TP-106

N:3,061,235.3121
E:708,526.3629

N:3,061,063.8847
E:706,476.7586

S88°08'10"E 313.32'

N15°15'30"E 129.03'

N15°15'30"E 187.05'

N56°56'17"W 214.81'

N:3,061,276.1107
E:708,737.4102

N37°59'37"E 418.62'

S37°59'37"W 445.07'

N56°59'37"W 146.09'

R=44.00'
L=69.12'
Δ=90°00'00"
CH B=N46°51'50"E
CH D=62.23'

R=1260.00'
L=194.85'
Δ=8°51'37"
CH B=S83°42'22"E
CH D=194.65'

10' WIDE UTILITY EASEMENT

10' WIDE TEMPORARY CONSTRUCTION EASEMENT

20' RAILROAD EASEMENT

LINE OF RAILROAD EASEMENT

30' WIDE EASEMENT FOR OVERHEAD PEDESTRIAN WALKWAY TO THE CITY OF LOWELL, BOOK 2405 PAGE 382

30' WIDE EASEMENT FOR OVERHEAD PEDESTRIAN WALKWAY TO THE CITY OF LOWELL BOOK 2416 PAGE 310

2nd STORY PEDESTRIAN BRIDGE (ENCLOSED)

LEGEND

- CATCH BASIN
- CABLE TELEVISION MANHOLE
- DRAIN MANHOLE
- ELECTRIC MANHOLE
- MISCELLANEOUS MANHOLE
- SEWER MANHOLE
- TELEPHONE MANHOLE
- WATER MANHOLE
- GSO GAS SHUT-OFF
- WSO WATER SHUT-OFF
- GG GAS GATE
- WG WATER GATE
- ICV IRRIGATION CONTROL VALVE
- CLEANOUT CLEANOUT
- SIA SIAMESE SPRINKLER HEAD
- FIRE HYDRANT
- DS DOWN SPOUT
- UP UTILITY POLE
- UP W/ UE UTILITY POLE WITH CONDUIT LINE TO GROUND
- LIGHT POLE
- LB LIGHT BOLLARD
- LL LANDSCAPE LIGHT
- HH HAND HOLE
- TC TRASH CAN
- CAT CATENARY POLE
- FACB FIRE ALARM CALL BOX
- FP FLAG POLE
- PM PARKING METER
- S SIGN POST
- 12" DECIDUOUS TREE WITH TRUNK DIAMETER
- 12" CONIFEROUS TREE WITH TRUNK DIAMETER
- HANDICAP PARKING
- 31+43 SPOT ELEVATION
- CLF CHAIN LINK FENCE
- SGC SLOPED GRANITE CURB
- VGC VERTICAL GRANITE CURB
- VCC VERTICAL CONCRETE CURB
- WCR WHEELCHAIR RAMP
- R= RIM ELEVATION EQUALS
- I= INVERT ELEVATION EQUALS
- TH= TOP OF HOOD ELEVATION EQUALS
- NPV NO PIPES VISIBLE
- TOW= TOP OF WATER
- TW TOP OF WALL ELEVATION
- CATV UNDERGROUND CABLE TELEVISION LINE
- D UNDERGROUND DRAIN LINE
- UD UNDERGROUND UNDER DRAIN LINE
- E UNDERGROUND ELECTRIC LINE
- G UNDERGROUND GAS LINE
- S UNDERGROUND SEWER LINE
- T UNDERGROUND TELEPHONE LINE
- W UNDERGROUND WATER LINE
- OHW OVERHEAD WIRES
- BENCH MARK
- TEST PIT & NUMBER
- TP-XXX

GRAPHIC SCALE
20 10 0 20 40 60
SCALE: 1"=20'

MATCH LINE - SEE SHEET EX.1
MATCH LINE - SEE SHEET EX.3

MATCH LINE - SEE SHEET EX.1
MATCH LINE - SEE SHEET EX.2

Nitsch Engineering
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Boston, MA 02108
T: (617) 338-0063
F: (617) 338-6472

- [redacted]
- Land Surveying
- Transportation Engineering
- Structural Engineering
- Green Infrastructure
- Planning
- [redacted]

EXISTING CONDITIONS SURVEY

LOWELL HIGH SCHOOL

50 FATHER MORISSETTE BOULEVARD, LOWELL, MA 01852

[redacted]

PERKINS EASTMAN, AIA

50 FRANKLIN STREET, SUITE 203, BOSTON, MA 02110

REV.	COMMENTS	DATE
	REVISIONS	

PROJECT #	11601
FILE:	11601_TOPO1.dwg
SCALE:	1"= 20'
DATE:	OCTOBER 20, 2016
DES./COMP:	ALEX A. DIOTTE
FIELD BOOK:	645A
DRAFTED BY:	TI
CHECKED BY:	

SHEET: 1

FIGURE 2

OF 4 REV.

J:\11601 Lowell, MA HS\Plans\Topo\11601_Topo1.dwg 10/6/2017 1:19 PM

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LEGEND

	CATCH BASIN
C	CABLE TELEVISION MANHOLE
D	DRAIN MANHOLE
E	ELECTRIC MANHOLE
M	MISCELLANEOUS MANHOLE
S	SEWER MANHOLE
T	TELEPHONE MANHOLE
W	WATER MANHOLE
GSO	GAS SHUT-OFF
WSO	WATER SHUT-OFF
GG	GAS GATE
WG	WATER GATE
ICV	IRRIGATION CONTROL VALVE
CLEANOUT	CLEANOUT
SIA	SIAMESE SPRINKLER HEAD
	FIRE HYDRANT
DS	DOWN SPOUT
UP	UTILITY POLE
UP W/ UE	UTILITY POLE WITH CONDUIT LINE TO GROUND
	LIGHT POLE
LB	LIGHT BOLLARD
LL	LANDSCAPE LIGHT
HH	HAND HOLE
TC	TRASH CAN
CAT	CATENARY POLE
FACB	FIRE ALARM CALL BOX
FP	FLAG POLE
PM	PARKING METER
S	SIGN POST
12"	DECIDUOUS TREE WITH TRUNK DIAMETER
12"	CONIFEROUS TREE WITH TRUNK DIAMETER
	HANDICAP PARKING
31x43	SPOT ELEVATION
CLF	CHAIN LINK FENCE
SCC	SLOPED GRANITE CURB
VGC	VERTICAL GRANITE CURB
VCC	VERTICAL CONCRETE CURB
WCR	WHEELCHAIR RAMP
R=	RIM ELEVATION EQUALS
I=	INVERT ELEVATION EQUALS
TH=	TOP OF HOOD ELEVATION EQUALS
NPV	NO PIPES VISIBLE
TOW=	TOP OF WATER
TW	TOP OF WALL ELEVATION
CATV	UNDERGROUND CABLE TELEVISION LINE
D	UNDERGROUND DRAIN LINE
UD	UNDERGROUND UNDER DRAIN LINE
E	UNDERGROUND ELECTRIC LINE
G	UNDERGROUND GAS LINE
S	UNDERGROUND SEWER LINE
T	UNDERGROUND TELEPHONE LINE
W	UNDERGROUND WATER LINE
OHW	OVERHEAD WIRES
	BENCH MARK
	TEST PIT & NUMBER
TP-XXX	

MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NAD 83

MERRIMACK CANAL

LUCY LARCOM PARK
N/F CITY OF LOWELL PARK DEPARTMENT
AND GIS PARCEL ID#M05-276

KIRK STREET
(PUBLIC - 50' WIDE)

FRENCH STREET
(PUBLIC - 59' WIDE SECTION)

PAIGE STREET
(PUBLIC - 50' WIDE)

N/F CITY OF LOWELL SCHOOL DEPARTMENT GIS PARCEL ID#M10-38 "KOALOGERAS BUILDING" NO. 38 KIRK STREET
LOT AREA = 117,670.2 SQ.FT. OR 2.7 ACRES

N/F CITY OF LOWELL SCHOOL DEPARTMENT GIS PARCEL #2485-55 BOOK 2350 PAGE 137 NO. 35 FRENCH STREET
LOT AREA = 567,150 SQ. FT. OR 0.2 ACRES
2 STORY BRICK "POWER PLANT"

N/F UNITED STATES OF AMERICA GIS PARCEL #3410-53 BOOK 2350 PAGE 137 NO. 67 KIRK STREET
LOT AREA = 161440 SQ.FT. OR 0.4 ACRES

N/F CITY OF LOWELL SCHOOL DEPARTMENT GIS PARCEL #2485-55 BOOK 924 PAGE 374 NO. 35 FRENCH STREET

2 1/2 STORY "NATIONAL PARK HEAD QUARTER"

3 STORY BRICK WITH BASEMENT

TP-109

TP-110

MATCH LINE - SEE SHEET EX.1
MATCH LINE - SEE SHEET EX.2

MATCH LINE - SEE SHEET EX.2
MATCH LINE - SEE SHEET EX.4

GRAPHIC SCALE
20 10 0 20 40 60
SCALE: 1"=20'

Nitsch Engineering
www.nitscheng.com
2 [redacted] 430
Boston, MA 02108
T: (617) 338-0063
F: (617) 338-6472

- [redacted]
- Land Surveying
- Transportation Engineering
- Structural Engineering
- Green Infrastructure
- Planning
- [redacted]

EXISTING CONDITIONS SURVEY

LOWELL HIGH SCHOOL
50 FATHER MORISSETTE BOULEVARD, LOWELL, MA 01852

[redacted]

PERKINS EASTMAN, AIA
50 FRANKLIN STREET, SUITE 203, BOSTON, MA 02110

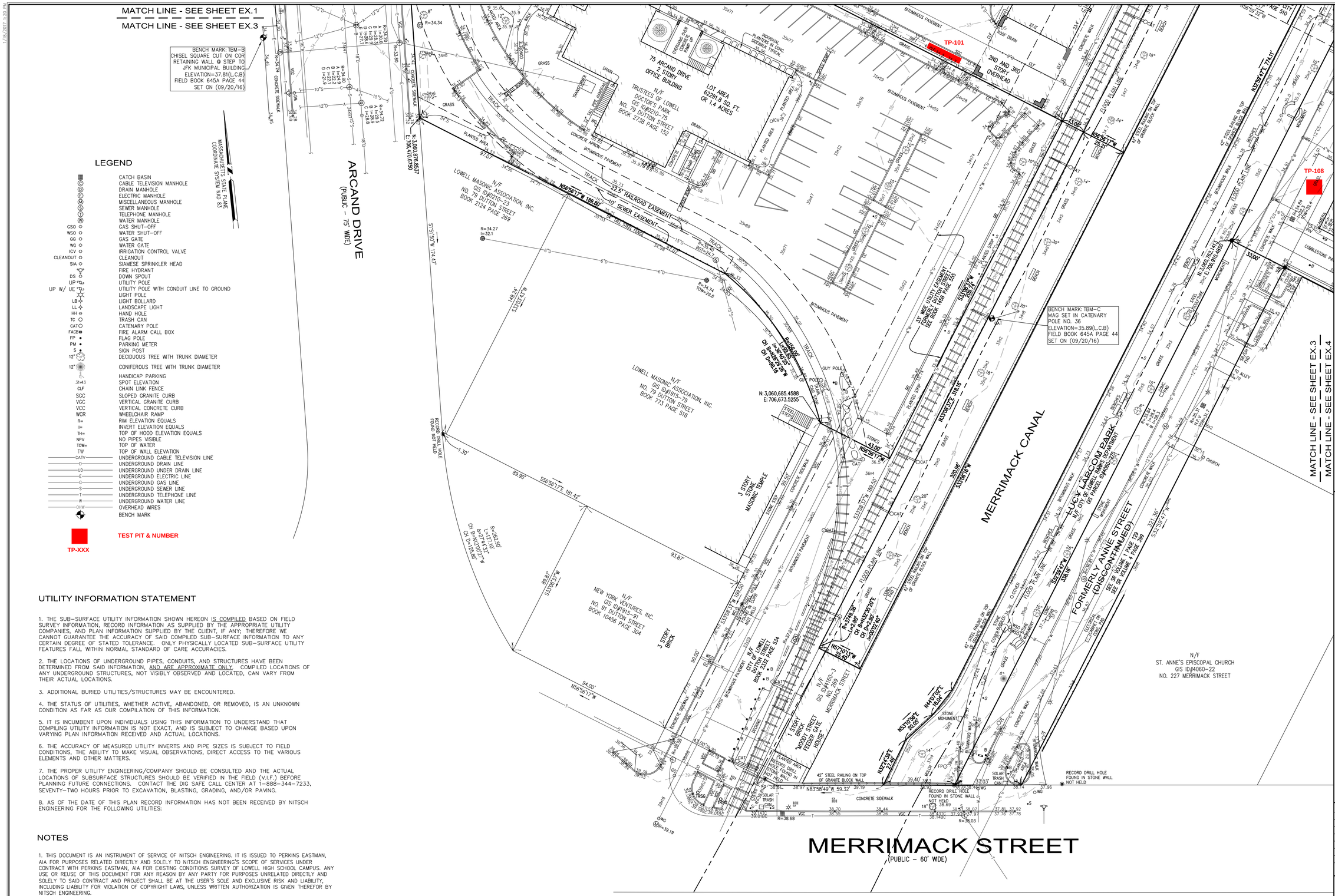
REV.	COMMENTS	DATE
	REVISIONS	

PROJECT #	11601
FILE:	11601_TOPO1.dwg
SCALE:	1"= 20'
DATE:	OCTOBER 20, 2016
DES./COMP:	ALEX A. DIOTTE
FIELD BOOK:	645A
DRAFTED BY:	TI
CHECKED BY:	

SHEET: 2

FIGURE 3

OF 4 REV.



UTILITY INFORMATION STATEMENT

1. THE SUB-SURFACE UTILITY INFORMATION SHOWN HEREON IS COMPILED BASED ON FIELD SURVEY INFORMATION, RECORD INFORMATION AS SUPPLIED BY THE APPROPRIATE UTILITY COMPANIES, AND PLAN INFORMATION SUPPLIED BY THE CLIENT, IF ANY; THEREFORE WE CANNOT GUARANTEE THE ACCURACY OF SAID COMPILED SUB-SURFACE INFORMATION TO ANY CERTAIN DEGREE OF STATED TOLERANCE. ONLY PHYSICALLY LOCATED SUB-SURFACE UTILITY FEATURES FALL WITHIN NORMAL STANDARD OF CARE ACCURACIES.

2. THE LOCATIONS OF UNDERGROUND PIPES, CONDUITS, AND STRUCTURES HAVE BEEN DETERMINED FROM SAID INFORMATION, AND ARE APPROXIMATE ONLY. COMPILED LOCATIONS OF ANY UNDERGROUND STRUCTURES, NOT VISIBLY OBSERVED AND LOCATED, CAN VARY FROM THEIR ACTUAL LOCATIONS.

3. ADDITIONAL BURIED UTILITIES/STRUCTURES MAY BE ENCOUNTERED.

4. THE STATUS OF UTILITIES, WHETHER ACTIVE, ABANDONED, OR REMOVED, IS AN UNKNOWN CONDITION AS FAR AS OUR COMPILATION OF THIS INFORMATION.

5. IT IS INCUMBENT UPON INDIVIDUALS USING THIS INFORMATION TO UNDERSTAND THAT COMPILING UTILITY INFORMATION IS NOT EXACT, AND IS SUBJECT TO CHANGE BASED UPON VARYING PLAN INFORMATION RECEIVED AND ACTUAL LOCATIONS.

6. THE ACCURACY OF MEASURED UTILITY INVERTS AND PIPE SIZES IS SUBJECT TO FIELD CONDITIONS, THE ABILITY TO MAKE VISUAL OBSERVATIONS, DIRECT ACCESS TO THE VARIOUS ELEMENTS AND OTHER MATTERS.

7. THE PROPER UTILITY ENGINEERING/COMPANY SHOULD BE CONSULTED AND THE ACTUAL LOCATIONS OF SUBSURFACE STRUCTURES SHOULD BE VERIFIED IN THE FIELD (V.I.F.) BEFORE PLANNING FUTURE CONNECTIONS. CONTACT THE DIG SAFE CALL CENTER AT 1-888-344-7233, SEVENTY-TWO HOURS PRIOR TO EXCAVATION, BLASTING, GRADING, AND/OR PAVING.

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F: (617) 338-6472
- [illegible]
- Land Surveying
- Transportation Engineering
- Structural Engineering
- Green Infrastructure
- Planning
- [illegible]

EXISTING CONDITIONS SURVEY

LOWELL HIGH SCHOOL

50 FATHER MORISSETTE BOULEVARD, LOWELL, MA 01852

PERKINS EASTMAN, AIA

50 FRANKLIN STREET, SUITE 203, BOSTON, MA 02110

REV.	COMMENTS	DATE
	REVISIONS	

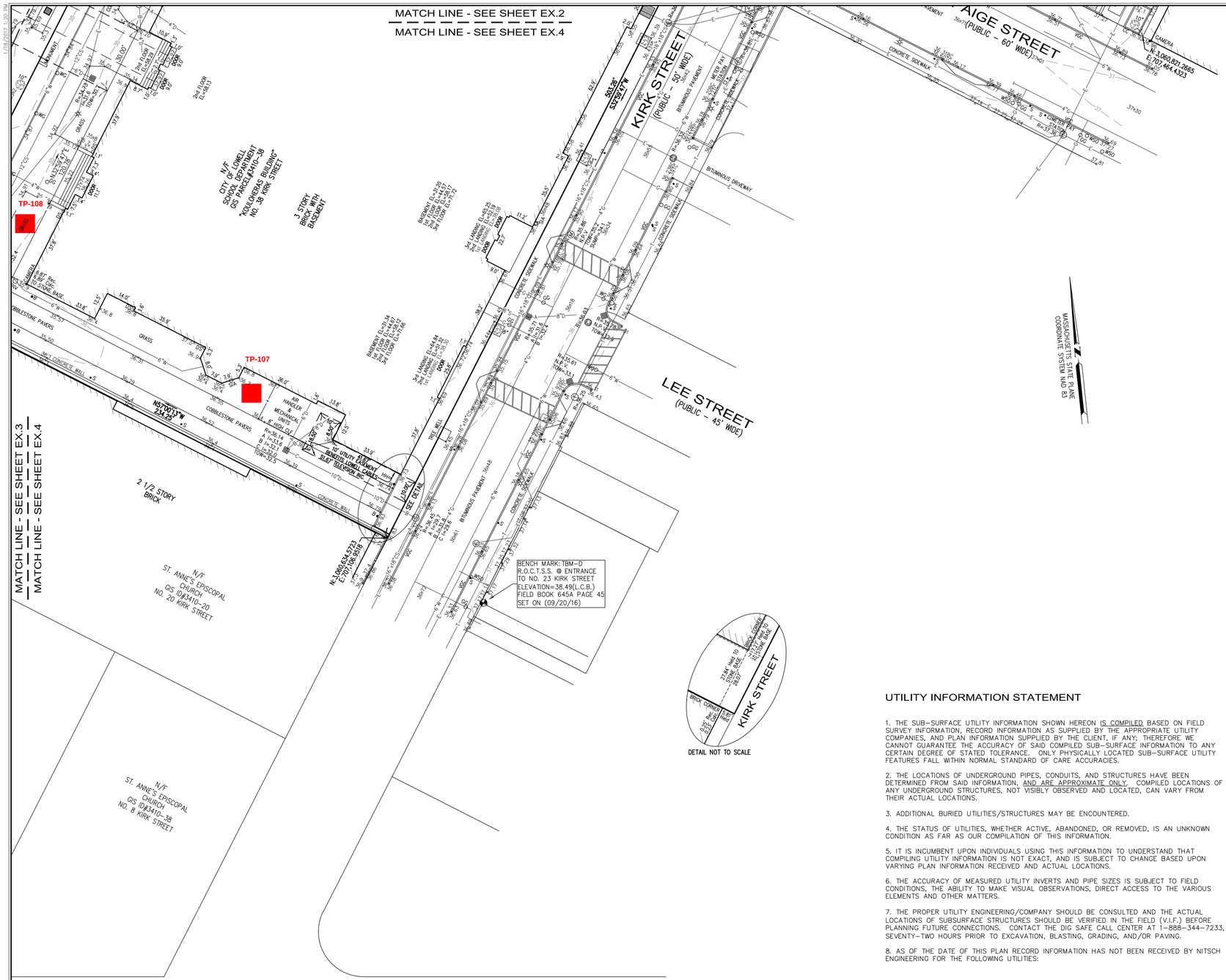
PROJECT #	11601
FILE:	11601_TOP01.dwg
SCALE:	1"= 20'
DATE:	OCTOBER 20, 2016
DES./COMP:	ALEX A. DIOTTE
FIELD BOOK:	645A
DRAFTED BY:	TI
CHECKED BY:	

SHEET: 3

FIGURE 4

OF 4 REV.

J:\11601 lowell hs study\Survey\Dwg\11601_topo1.dwg



LEGEND

	CATCH BASIN
C	CABLE TELEVISION MANHOLE
D	DRAIN MANHOLE
E	ELECTRIC MANHOLE
M	MISCELLANEOUS MANHOLE
S	SEWER MANHOLE
T	TELEPHONE MANHOLE
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T	UNDERGROUND TELEPHONE LINE
W	UNDERGROUND WATER LINE
OHW	OVERHEAD WIRES
	BENCH MARK
	TEST PIT & NUMBER
TP-XXX	

PLAN REFERENCES:
MIDDLESEX (NORTH) COUNTY REGISTRY OF DEEDS

PLAN BOOK 176 PLAN 17
PLAN BOOK 186 PLAN 121
PLAN BOOK 180 PLAN 45
PLAN BOOK 108 PLAN 36
PLAN BOOK 107 PLAN 41
PLAN BOOK 126 PLAN 142
PLAN BOOK 130 PLAN 80
PLAN BOOK 16 PLAN 38
PLAN BOOK 33 PLAN 70
PLAN BOOK 109 PLAN 63A
PLAN BOOK 119 PLAN 100A
PLAN BOOK 220 PLAN 44
PLAN BOOK 163 PLAN 99
PLAN BOOK 130 PLAN 80
PLAN BOOK 128 PLAN 25
PLAN BOOK 136 PLAN 136A
PLAN BOOK 107 PLAN 41
PLAN BOOK 109 PLAN 54A
PLAN BOOK 63 PLAN 9

LAND COURT PLAN 5011A

CITY OF LOWELL STREET RECORDS
SR VOLUME 1 PAGE 129
SR VOLUME 4 PAGE 399

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NOTES

PROPERTY PLAN BY YALE SURVEY, INC.
STONEHAM, MASS AND IS SHOWN IN SHEET X/02
"ADDITIONS, THE LOWELL HIGH SCHOOL" BY
PERLEY F. GILBERT ASSOCIATES, INC.
ARCHITECTS & ENGINEERS, LOWELL, MA
SUN BUILDING. (RE: PEDESTRIAN BRIDGE
EASEMENTS ACROSS MERRIMACK CANAL)

GRAPHIC SCALE
20 10 0 20 40 60
SCALE: 1"=20'

Nitsch Engineering
www.nitscheng.com
2 [redacted] 430
Boston, MA 02108
T: (617) 338-0063
F: (617) 338-6472
► [redacted]
► Land Surveying
► Transportation Engineering
► Structural Engineering
► Green Infrastructure
► Planning
► [redacted]

EXISTING CONDITIONS SURVEY

LOWELL HIGH SCHOOL
50 FATHER MORISSETTE BOULEVARD, LOWELL, MA 01852

[redacted]
PERKINS EASTMAN, AIA
50 FRANKLIN STREET, SUITE 203, BOSTON, MA 02110

REV.	COMMENTS	DATE
	REVISIONS	

PROJECT #	11601
FILE:	11601_TOP01.dwg
SCALE:	1"= 20'
DATE:	OCTOBER 20, 2016
DES./COMP:	ALEX A. DIOTTE
FIELD BOOK:	645A
DRAFTED BY:	TI
CHECKED BY:	

SHEET: 4

FIGURE 5

OF 4 REV.

Commonwealth of Massachusetts
City of Lowell

Form 11 - Soil Suitability Assessment

FOR DRAINAGE SYSTEM ONLY

Date: April 8, 2017
Location: Lowell High School,
50 Father Morissette Boulevard
38 French Street
Lowell, MA
40º, M. Sunny

XXX.X± Elevation

Deep Observation Hole Number: **101**

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-4	FILL	-	-	-	-	-	-	-	-	-	LOAM
4-36	C1 (FILL)	-	-	-	-	-	-	-	-	-	FILL (BRICK, METAL)
36-40	Ao	-	-	-	-	-	-	-	-	-	(ORIGINAL LOAM LAYER)
40-90	C2	2.5Y 6/2	-	-	-	F-M SAND	10%	10%	GRANULAR	FRIABLE	-

Additional Notes: NO GROUND WATER/SEEPAGE OBSERVED, NO REDOX VISIBLE.

Commonwealth of Massachusetts
City of Lowell

Form 11 - Soil Suitability Assessment

FOR DRAINAGE SYSTEM ONLY

Date: April 8, 2017
Location: Lowell High School,
50 Father Morissette Boulevard
38 French Street
Lowell, MA
40º, M. Sunny

XXX.X± Elevation

Deep Observation Hole Number: **102**

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-7	FILL	-	-	-	-	-	-	-	-	-	LOAM
7-50	FILL	-	-	-	-	-	-	-	-	-	-
50-55	Ao	-	-	-	-	-	-	-	-	-	(ORIGINAL LOAM LAYER)
55-108	C	2.5Y 6/2	-	-	-	FINE-MED SAND	<5	<5	MASSIVE	LOOSE	-

Additional Notes: NO GROUND WATER/SEEPAGE OBSERVED, NO REDOX VISIBLE.

Commonwealth of Massachusetts
City of Lowell

Form 11 - Soil Suitability Assessment

FOR DRAINAGE SYSTEM ONLY

Date: April 8, 2017
Location: Lowell High School,
50 Father Morissette Boulevard
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40º, M. Sunny

XXX.X± Elevation

Deep Observation Hole Number: **103**

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-6	A	FILL	-	-	-	-	-	-	-	-	LOAM
6-48	Bw	FILL	-	-	-		-	-	-	-	-
48-54	Ao	-	-	-	-	-	-	-	-	-	(ORIGINAL LOAM LAYER)
54-86	C1	2.5Y 6/2	-	-	-	FINE SAND	10%	<5%	MASSIVE	VERY FRIABLE	-
86-116	C2	2.5Y 6/3	-	-	-	FINE COMPACT SILTY SAND	<5	<5	-	-	-

Additional Notes: NO GROUND WATER/SEEPAGE VISIBLE. NO REDOX VISIBLE.

Commonwealth of Massachusetts
City of Lowell

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FOR DRAINAGE SYSTEM ONLY

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Location: Lowell High School,
50 Father Morissette Boulevard
38 French Street
Lowell, MA
40º, M. Sunny

XXX.X± Elevation

Deep Observation Hole Number: **104**

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-6	(FILL)	-	-	-	-	-	-	-	-	-	LOAM
6-17	(FILL)	-	-	-	-	-	-	-	-	-	-
17-21	Ao	-	-	-	-	-	-	-	-	-	(ORIGINAL LOAM LAYER)
21-117	C	2.5Y 6/3	-	-	-	TIGHT FINE-MED SAND, SOME SILT	-	-	MASSIVE	VERY FRIABLE	-

Additional Notes: NO GROUND WATER/SEEPAGE VISIBLE. NO REDOX VISIBLE.

Commonwealth of Massachusetts
City of Lowell

Form 11 - Soil Suitability Assessment

FOR DRAINAGE SYSTEM ONLY

XXX.X± Elevation

Date: April 8, 2017
Location: Lowell High School,
50 Father Morissette Boulevard
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Lowell, MA
40º, M. Sunny

Deep Observation Hole Number: **105**

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-24	A (FILL)	-	-	-	-	-	-	-	-	-	LOAM
24-36	B (FILL)	-	-	-	-	-	-	-	-	-	-
36-118	C1	2.5Y 6/2	-	-	-	FINE-MED SAND & GRAVEL	-	-	-	-	-
118-124	C2	2.5Y 7/4	-	-	-	GLACIAL TILL	-	-	MASSIVE	VERY FRIABLE	-

Additional Notes: NO GROUND WATER/SEEPAGE VISIBLE. NO REDOX VISIBLE.

Commonwealth of Massachusetts
City of Lowell

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Deep Observation Hole Number: **106**

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-6	A (FILL)	-	-	-	-	-	-	-	-	-	FILL-LOAM
6-10	(FILL)	-	-	-	-	-	-	-	-	-	FILL-BRICK, CONCRETE, METAL, ETC.
10-48	(FILL)	-	-	-	-	-	-	-	-	-	
48-53	Ao	-	-	-	-	-	-	-	-	-	
53-61	C	2.5Y 6/4	-	-	-	-	-	-	-	-	
61-90	(FILL)	-	-	-	-	-	-	-	-	-	

Additional Notes: NO GROUND WATER/SEEPAGE OBSERVED, NO REDOX VISIBLE.

Commonwealth of Massachusetts
City of Lowell

Form 11 - Soil Suitability Assessment

FOR DRAINAGE SYSTEM ONLY

XXX.X± Elevation

Date: April 8, 2017
Location: Lowell High School,
50 Father Morissette Boulevard
38 French Street
Lowell, MA
40º, M. Sunny

Deep Observation Hole Number: **107**

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-4	A (FILL)	-	-	-	-	-	-	-	-	-	LOAM
4-30	FILL	-	-	-	-	-	-	-	-	-	FILL-BRICK, METAL, WOOD
30-90	FILL	-	-	-	-	-	-	-	-	-	FILL-BRICK, PLASTER

Additional Notes: NO GROUND WATER/SEEPAGE OBSERVED. NO REDOX VISIBLE.

Commonwealth of Massachusetts
City of Lowell

Form 11 - Soil Suitability Assessment

FOR DRAINAGE SYSTEM ONLY

Date: April 8, 2017
Location: Lowell High School,
50 Father Morissette Boulevard
38 French Street
Lowell, MA
40º, M. Sunny

XXX.X± Elevation

Deep Observation Hole Number: **108**

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-6	A (FILL)	-	-	-	-	-	-	-	-	-	FILL-LOAM
6-18	FILL	-	-	-	-	-	-	-	-	-	FILL-BRICK, CONCRETE, METAL, ETC.
18-70	FILL	-	-	-	-	-	-	-	-	-	FILL
70-101	FILL	-	-	-	-	-	-	-	-	-	BRICKS

Additional Notes: NO GROUND WATER/SEEPAGE OBSERVED. NO REDOX VISIBLE. 2' STEEL PIPE FOUND 41" BELOW THE SURFACE.

Commonwealth of Massachusetts
City of Lowell

Form 11 - Soil Suitability Assessment

FOR DRAINAGE SYSTEM ONLY

Date: April 8, 2017
Location: Lowell High School,
50 Father Morissette Boulevard
38 French Street
Lowell, MA
40º, M. Sunny

XXX.X± Elevation

Deep Observation Hole Number: **109**

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12	A (FILL)	10YR 3/2	-	-	-	-	-	-	-	-	FILL-LOAM
12-72	FILL	-	-	-	-	-	-	-	-	-	FILL-BRICK, CONCRETE, METAL, ETC.
72-98	-	-	-	-	-	-	-	-	-	-	LOAM, ROOTS, GLACIAL TILL

Additional Notes: NO GROUND WATER/SEEPAGE VISIBLE. NO REDOX VISIBLE. 2" STEEL PIPE FOUND 28" BELOW THE SURFACE.

Commonwealth of Massachusetts
City of Lowell

Form 11 - Soil Suitability Assessment

FOR DRAINAGE SYSTEM ONLY

XXX.X± Elevation

Date: April 8, 2017
Location: Lowell High School,
50 Father Morissette Boulevard
38 French Street
Lowell, MA
40º, M. Sunny

Deep Observation Hole Number: **110**

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10	(FILL)	-	-	-	-	-	-	-	-	-	FILL - LOAM
10-18	(FILL)	-	-	-	-	-	-	-	-	-	-
18-45	(FILL)	-	-	-	-	-	-	-	-	-	-
45-54	C1	10YR 6/4	-	-	-	CLAY/SILT LAYER	-	-	-	-	-
54-112	C2	2.5Y 6/2	-	-	-	GLACIAL TILL	-	-	-	-	GLACIAL TILL

Additional Notes: NO GROUND WATER/SEEPAGE VISIBLE. NO REDOX VISIBLE.

MASSWILDLIFE

DIVISION OF
FISHERIES & WILDLIFE

1 Rabbit Hill Road, Westborough, MA 01581
p: (508) 389-6300 | f: (508) 389-7890
MASS.GOV/MASSWILDLIFE

Jack Buckley, *Director*

April 4, 2017

Kevin Murphy
Lowell City Manager
375 Merrimack Street
2nd Floor, Room 43
Lowell MA 01852

RE: Existing Lowell High School- 50 Father Morissette Boulevard, 38 Kirk Street, 55 French Street

Dear Applicant:

Thank you for submitting a MESA Project Review Checklist and other information regarding your project to the Natural Heritage & Endangered Species Program of the Massachusetts Division of Fisheries & Wildlife (the "Division").

Based on a review of the information that was provided and the information that is currently contained in our database, the Division has determined that this project, as currently proposed, **does not occur within Estimated Habitat of Rare Wildlife or Priority Habitat** as indicated in the *Massachusetts Natural Heritage Atlas* (13th Edition). Therefore, the project is not required to be reviewed for compliance with the rare wildlife species section of the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.37, 10.59 & 10.58(4)(b)) or the MA Endangered Species Act Regulations (321 CMR 10.18). Any additional work beyond that shown on the site plans may require a filing with the Division.

Please note that this determination addresses only the matter of **rare** wildlife habitat and does not pertain to other wildlife habitat issues that may be pertinent to the proposed project. If you have any questions regarding this letter please contact Daisy Medeiros, Endangered Species Review Assistant, at (508) 389-6357.

Sincerely,

Thomas W. French

Thomas W. French, Ph.D.
Assistant Director

cc: William R. Maher, PE, Nitsch Engineering

LOWELL HIGH SCHOOL

FEASIBILITY PHASE ENERGY ANALYSIS - REVISED PSR

Prepared for
Perkins Eastman
20 Ashburton Place
Boston, MA 02108

Prepared by
Elsa Mullin

Reviewed by
Vamshi Gooje

Thornton Tomasetti
386 Fore Street, #405
Portland, ME 04101

April 27, 2018

01	ANALYSIS DESCRIPTION & SUMMARY	P03
02	ENERGY END USE PROFILES BY SECTOR	P04
03	ENERGY END USE PROFILES	P04
04	ENERGY COST PROFILES BY SYSTEM	P05
05	INPUT TABLE	P06-P07

01 ANALYSIS DESCRIPTION & SUMMARY

Thornton Tomasetti, Inc. (TT) has performed whole building energy analysis for Lowell High School to evaluate the relative energy performance of the proposed design cases. The energy models were created using eQuest v3.65.

The analysis presented in this report should be used for comparative analysis to assist in selecting a preferred option rather than predicting actual energy use. Once a preferred option is selected energy conservation measures (ECMs) will be studied to achieve improved performance targets while respecting the project budget.

The three different design options analyzed in this study are listed below:

DESIGN OPTIONS:

- Addition/Renovation - Option 2A (Add/Reno 2A)
- Addition/Renovation - Option 3A Expanded Site (Add/Reno 3A)
- New Option A – Expanded Site (New Option A)

The results demonstrate that each design option can significantly reduce the overall EUI of Lowell High School from existing conditions with careful selection of ECMs. The savings can be achieved with ECMs such as improved envelope, LED lighting fixtures, and high efficiency HVAC systems. The New Option A design shows the greatest Energy Use Intensity (EUI) savings from the existing building. This is due to the more efficient space layout, and a higher performance envelope than the renovation design options.

One key difference in the design options versus the existing case is the cooling load. In the design options, it is assumed that cooling will be provided to all regularly occupied spaces, while the existing building has limited functioning cooling, therefore increasing the cooling energy use from the existing building to the design option.

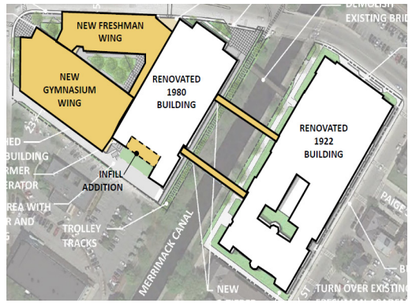
Utility bills of the existing high school were provided by the the city of Lowell, Department of Planning & Development. The existing building EUI was determined from the bills.

The New Option A at the expanded site performs best among all options with an EUI of 36.23 kBtu/sf-yr. The renovation options can achieve better performance than the existing building. However, the limited scope to envelope upgrades does not allow for a significant reduction in energy use. For the renovation options moisture issues must be considered for envelope upgrades in conjunction with energy performance.

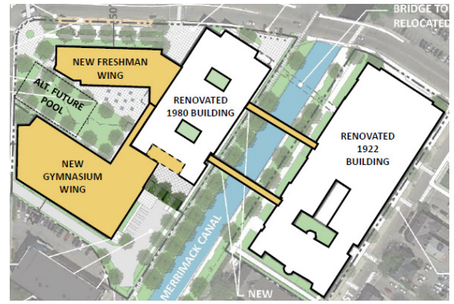


Figure 01. Lowell High School (Existing)

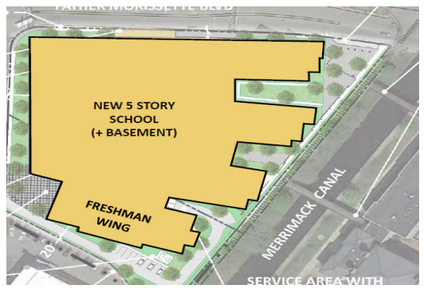
Photo Credit: Panoramo.com



Add/Reno 2A



Add/Reno Option 3A



New Option A

02 ENERGY END USE PROFILES BY SECTOR

Figure 02. shows the annual aggregate energy end-use breakdown for each of the design options. Each color in the pie charts denotes various end-uses. The largest end-use for each options is heating, followed by internal loads and cooling energy use. Although the New Option A has heating as the predominant load, it is smaller than the renovation options.

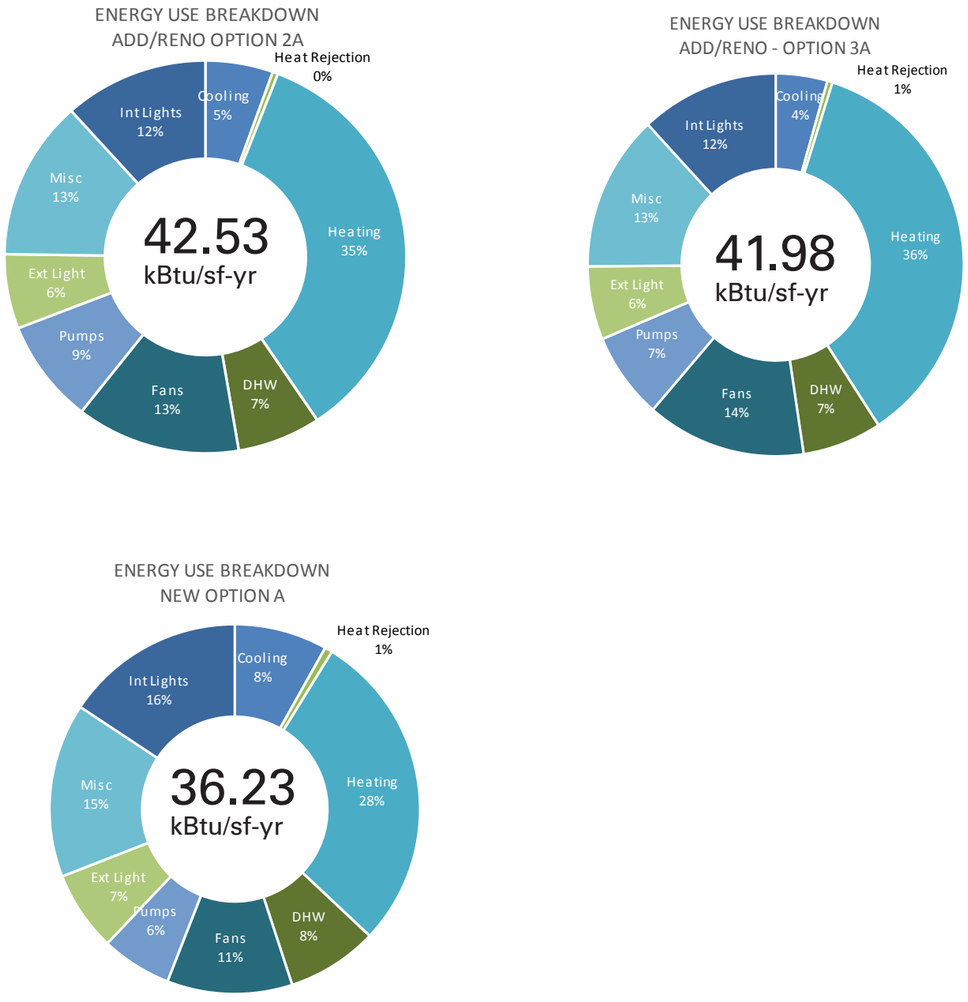


Figure 02. EUI Comparison by Design Options

03 ENERGY END USE PROFILE

Figure 03. shows the annual aggregate energy end-use breakdown for each design case. Each color in the bar chart denotes various end-uses.

The results illustrate that all the design options have a lower EUI than the existing building. The Add/Reno 2A and 3A have similar savings, and the New Option A has the most compared to the existing building. The greatest savings in the New Option A is from heating.

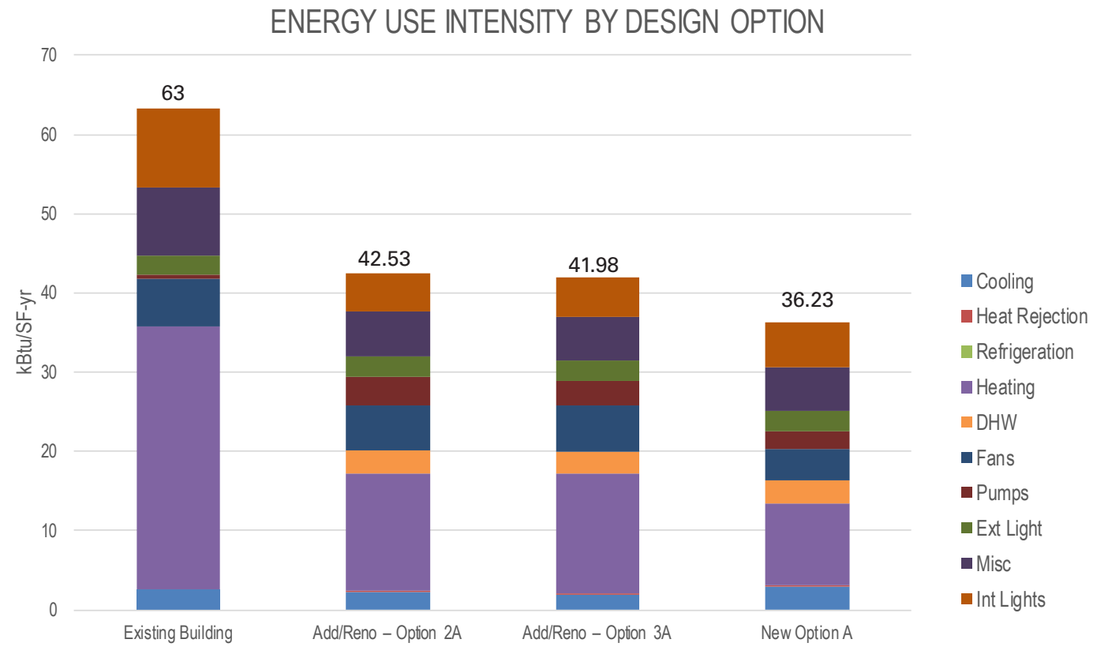


Figure 03. Annual Energy Use Profile by Design Options

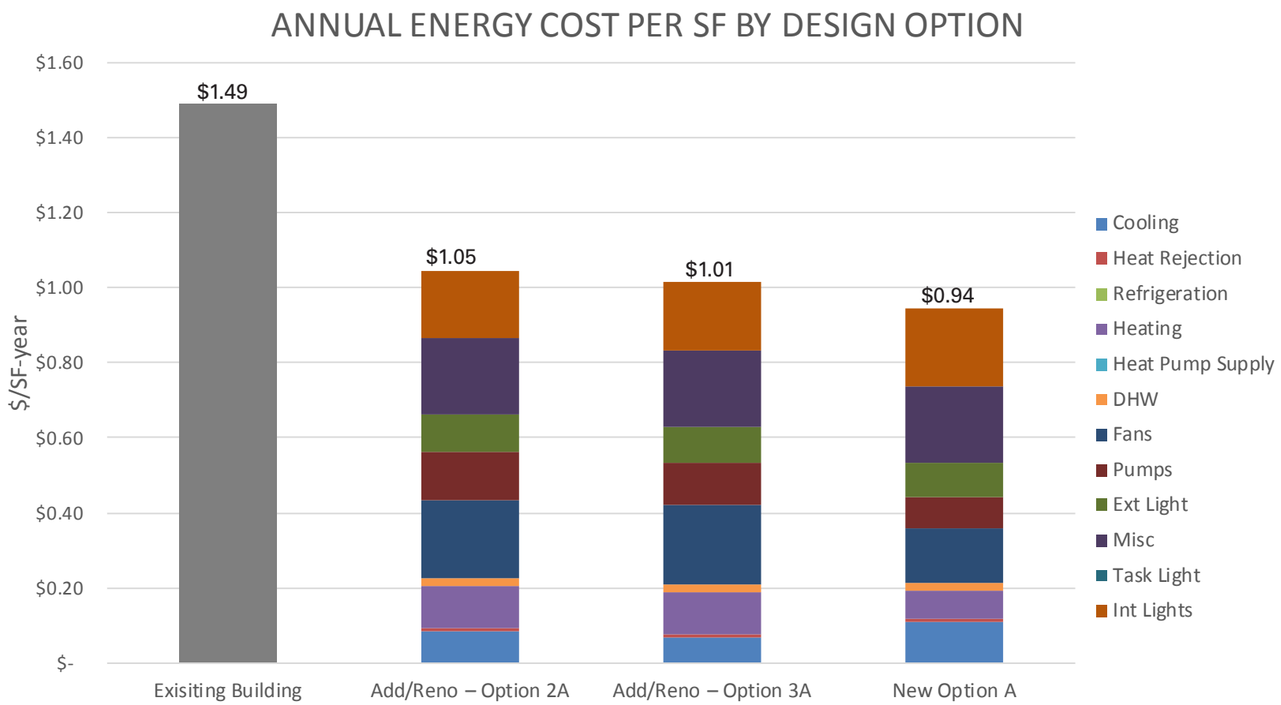


Figure 04. Annual Energy Cost Profile by Design Options

04 ENERGY COST PROFILE BY SYSTEM

The energy cost breakdown demonstrates the relative cost of energy per design option against the existing building. Figure 04. highlights the reduction of energy cost for each design option from the existing building. The New Option A design has the greatest savings, due to the improved envelope and space layout.

Model Input Parameter	Add/ Reno 2A	Add/ Reno 3A	New Option A
Utility			
Electric Rates	$0.13/KWH	$0.13/KWH	$0.13/KWH
Natural Gas Rates	$1.10/therm	$1.10/therm	$1.10/therm
Number of Floors	1922 Building: 1 below grade + 3 above grade 1980 Building: 3 above grade + 2 additional floors of Freshman Academy	1922 Building: 1 below grade + 3 above grade 1980 Building: 3 above grade + 2 additional floors of Freshman Academy	1 below grade level + 5 above grade levels
Flr to Flr Height	1980 Building: • Floor 1: 18' • Floor 2-5: 12'-8" 1922 Building: • Floors Ground, 1, 2: +/- 13'-6" • Flr 3: +/- 16'-4"	1980 Building: • Floor 1: 18' • Floor 2-5: 12'-8" 1922 Building: • Floors Ground, 1, 2: +/- 13'-6" • Flr 3: +/- 16'-4"	• Floor 1: 18' • Floors 2-5: 12'-8"
Climate Zone	5A	5A	5A
Model Input Parameter	Add/ Reno 2A	Add/ Reno 3A	New Option A
Building Envelope (Construction Assemblies)			
Roofs Construction/Exterior insulation/Additional insulation * The 1922 Roof will be replaced in Options 2A and 3A	Assembly: U-0.032 (R-31.3) • Membrane SRI 0.3 • ½" protection board • 7" polyisocyanurate + tapered • Vapor barrier • Metal deck on steel frame 1922 Roof Replacement Assembly: • EPDM Roof Membrane • ½" high density cover board • 5" flat stock insulation (R-20) • Air/Vapor retarder • Existing bituminous coating • Existing structurally sloped concrete deck	Assembly: U-0.032 (R-31.3) • Membrane SRI 0.3 • ½" protection board • 7" polyisocyanurate + tapered • Vapor barrier • Metal deck on steel frame 1922 Roof Replacement Assembly: • EPDM Roof Membrane • ½" high density cover board • 5" flat stock insulation (R-20) • Air/Vapor retarder • Existing bituminous coating • Existing structurally sloped concrete deck	Assembly: U-0.032 (R-31.3) • Membrane SRI 0.3 • ½" protection board • 7" polyisocyanurate + tapered • Vapor barrier • Metal deck on steel frame
Walls (Above Grade) construction/Exterior insulation/Additional Insulation/Interior insulation	1980: U-0.162 (R-6.2): • 4" Brick veneer • 1" Air space • 1 ¼" Insulation • 8" CMU 1922: U-0.14 (R-7.1): • 12 -16" Brick masonry walls • 3/4" furring over 1" polystyrene insulation • 5/8" Gypsum wall board Addition: U-0.03 (R-33.3): • Masonry veneer rain screen (25%) and metal panel rain screen (50%) • 4" mineral wool insulation • Thermally broken Z – girts • AVB • 5/8" exterior gyp. Board • 6" metal studs • 4" spray cellulous insulation (in stud cavity) • ½" gypsum board	1980: U-0.162 (R-6.2): • 4" Brick veneer • 1" Air space • 1 ¼" Insulation • 8" CMU 1922: U-0.14 (R-7.1): 12 -16" Brick masonry walls • 3/4" furring over 1" polystyrene insulation • 5/8" Gypsum wall board Addition: U-0.03 (R-33.3): • Masonry veneer rain screen (25%) and metal panel rain screen (50%) • 4" mineral wool insulation • Thermally broken Z – girts • AVB • 5/8" exterior gyp. Board • 6" metal studs • 4" spray cellulous insulation (in stud cavity) • ½" gypsum board	New Construction: U-0.03 (R-33.3) • Masonry veneer rain screen (25%) and metal panel rain screen (50%) • 4" mineral wool insulation • Thermally broken Z – girts • AVB • 5/8" exterior gyp. Board • 6" metal studs • 4" spray cellulous insulation (in stud cavity) • ½" gypsum board

ASHRAE 90.1 2013 Assembly Requirements for new construction: Roof: R-31.3, Exterior Walls: R-18.2, Slab: F-0.52)

Model Input Parameter	Add/ Reno 2A	Add/ Reno 3A	New Option A
Ground Floor construction/insulation	1980: • Concrete Slab • Vapor Barrier • 2" Rigid insulation (underside of slab) 1922: • Concrete slab on grade • No insulation • No vapor barrier Addition • Concrete Slab • Vapor Barrier • 2" Rigid insulation (on inside face of exterior foundation wall)	1980: • Concrete Slab • Vapor Barrier • 2" Rigid insulation (underside of slab) 1922: • Concrete slab on grade • No insulation • No vapor barrier Addition • Concrete Slab • Vapor Barrier • 2" Rigid insulation (on inside face of exterior foundation wall)	• Concrete Slab • Vapor Barrier • 2" Rigid insulation (on inside face of exterior foundation wall)
Perimeter Zone Infiltration	1980: 0.076 CFM/SF of exterior wall 1922: 0.057 CFM/SF of exterior wall Addition:0.038 CFM/SF of exterior wall	1980: 0.076 CFM/SF of exterior wall 1922: 0.057 CFM/SF of exterior wall Addition:0.038 CFM/SF of exterior wall	0.038 CFM/SF of exterior wall
Core Zone Infiltration	0.001 CFM/SF	0.001 CFM/SF	0.001 CFM/SF
Vertical fenestration Area (% of Wall area)	1922 Building/Lord: 40% Addition: 25%	1922 Building/Lord: 40% Addition: 25%	25% Gymnasium: 20%
Vertical Glazing (Assembly)	Thermally broken aluminum windows w/ insulated glass U= 0.34	Thermally broken aluminum windows w/ insulated glass U= 0.34	Thermally broken aluminum windows w/ insulated glass U= 0.34
Vertical Glazing SHGC	0.38	0.38	0.38
Glazing Tvis	0.6	0.6	0.6
Shading Devices	No	No	No
Building Operation Schedule	Add/ Reno 2A	Add/ Reno 3A	New Option A
Occupancy	4,020 Students+ Staff	4,020 Students+ Staff	4,020 Students+ Staff
Schedule	Typical school year: 90% occupancy 8am-4pm Summer & Breaks: 15% occupancy 8am-4pm, 4 days/wk	Typical school year: 90% occupancy 8am-4pm Summer & Breaks: 15% occupancy 8am-4pm, 4 days/wk	Typical school year: 90% occupancy 8am-4pm Summer & Breaks: 15% occupancy 8am-4pm, 4 days/wk
Annual Days of Operation	365	365	365

Model Input Parameter			
HVAC (Air-Side)	Add/ Reno 2A	Add/ Reno 3A	New Option A
Primary HVAC Type[1]	Full Air Conditioning Variable Air Volume Displacement System in classrooms Overhead ventilation system in: • Gym • Locker rooms • Auditorium and stage • Admin and media • Kitchen, Custodial Support, Receiving • Cafeteria • Studios • Corridors	Full Air Conditioning Variable Air Volume Displacement System in classrooms Overhead ventilation system in: • Gym • Locker rooms • Auditorium and stage • Admin and media • Kitchen, Custodial Support, Receiving • Cafeteria • Studios • Corridors	Full Air Conditioning Variable Air Volume Displacement System in classrooms Overhead ventilation system in: • Gym • Locker rooms • Auditorium and stage • Admin and media • Kitchen, Custodial Support, Receiving • Cafeteria • Studios • Corridors
Cooling Source	1992: (2) 215 ton high efficiency water cooled chillers 1980: (2) 310 ton high efficiency water cooled chillers	1992: (2) 215 ton high efficiency water cooled chillers 1980: (2) 310 ton high efficiency water cooled chillers	High efficiency central chilled water cooling plant - (3) 310 ton water cooled chillers
Heating Source	1922 Building - High efficiency gas-fired condensing boiler plant (3) 5400 MBH 1980:(3) 5400 MBH output boilers	1922 Building - High efficiency gas-fired condensing boiler plant (3) 5400 MBH 1980:(3) 5400 MBH output boilers	High efficiency gas-fired condensing boiler plant (5) 4500 MBH
Seasonal Thermostat setpoints			
- Heating (occupied/unoccupied)	70 F ; 60 F	70 F ; 60 F	70 F ; 60 F
- Cooling (occupied/unoccupied)	75 F ; 85 F	75 F ; 85 F	75 F ; 85 F
Outside Air System			
Heat Recovery Device Type	Enthalpy Wheel	Enthalpy Wheel	Enthalpy Wheel
Effectiveness	74%	74%	74%
Domestic Water Heating	Add/ Reno 2A	Add/ Reno 3A	New Option A
Heater Fuel	Gas	Gas	Gas
Tank Volume	5,500 gal	5,500 gal	5,500 gal
Supply water Temp	135F	135F	135F
Lighting	Add/ Reno 2A	Add/ Reno 3A	New Option A
Lighting Power Density (LPD) for all activity areas	0.5 W/SF: Classroom 0.6 W/SF: Gymnasium 0.5 W/SF: Office 0.6 W/SF: Library 0.4 W/SF: Corridor 0.6 W/SF: Kitchen 0.65 W/SF: Dining 0.63 W/SF: Auditorium	0.5 W/SF: Classroom 0.6 W/SF: Gymnasium 0.5 W/SF: Office 0.6 W/SF: Library 0.4 W/SF: Corridor 0.6 W/SF: Kitchen 0.65 W/SF: Dining 0.63 W/SF: Auditorium	0.5 W/SF: Classroom 0.6 W/SF: Gymnasium 0.5 W/SF: Office 0.6 W/SF: Library 0.4 W/SF: Corridor 0.6 W/SF: Kitchen 0.65 W/SF: Dining 0.63 W/SF: Auditorium
Daylighting Controls	Continuous dimming in classroom spaces	Continuous dimming in classroom spaces	Continuous dimming in classroom spaces
Miscellaneous	Add/ Reno 2A	Add/ Reno 3A	New Option A
Miscellaneous equipment	Classrooms - 0.85 W/sf Core/transition spaces - 0.165 - 0.316 W/sf	Classrooms - 0.85 W/sf Core/transition spaces - 0.165 - 0.316 W/sf	Classrooms - 0.85 W/sf Core/transition spaces - 0.165 - 0.316 W/sf

Nobis
Engineering a Sustainable Future

MEMORANDUM

To:	Alicia Caritano, Perkins-Eastman
From:	Jeff Brunelle, Nobis Engineering
Subject:	Lowell High School, Lowell MA PSR Pricing Narrative – Geoenvironmental
Date:	March 28, 2018

As requested by the MSBA, Nobis has prepared this memorandum to provide an updated pricing narrative for the current options (Option 2A, Option 3A, and New Option A) considered for the Existing Downtown Site.

Previous geoenvironmental investigations determined that the existing high school is underlain by 5 to 8 feet of historical fill material consisting of sand and gravel with traces of brick, concrete, coal, and ash. This material contains anthropogenic contaminants such as polycyclic aromatic hydrocarbons (PAHs) and heavy metals that are ubiquitous in urban areas because of the combustion of wood or coal (i.e. wood ash or coal ash), as a component of asphalt pavement, or from the burning of fossil fuels.

Site-specific soil sampling results suggest that the existing high school site contains levels of PAHs and lead that would not permit unrestricted use of any excess soils that must be taken off site during construction. In addition, soil sampling previously identified arsenic in shallow soils (since removed and disposed of off-site) at levels that are above those suitable for a school campus.

Since similar historical fill materials are located where demolition and construction would occur under the proposed Addition/Renovation Options included in the Revised Preferred Schematic Report, and since unrestricted re-use of Site soils is not permitted, there will likely be additional costs associated with the reuse or disposal of excess soils generated during construction activities at the existing high school site.

Budgeting for a school addition/renovation project on the existing high school site should include provisions for the handling and management of contaminated soils, since it is likely that fill materials in the upper 5 to 8 feet contain PAHs and metals typical of urban fill. Estimated geoenvironmental cost ranges for each current option are as follows:

- Addition/Renovation 2A: $75K-$150K;
- Addition/Renovation 3A: $90K-$180K;
- New Option A: $150K-$300K.

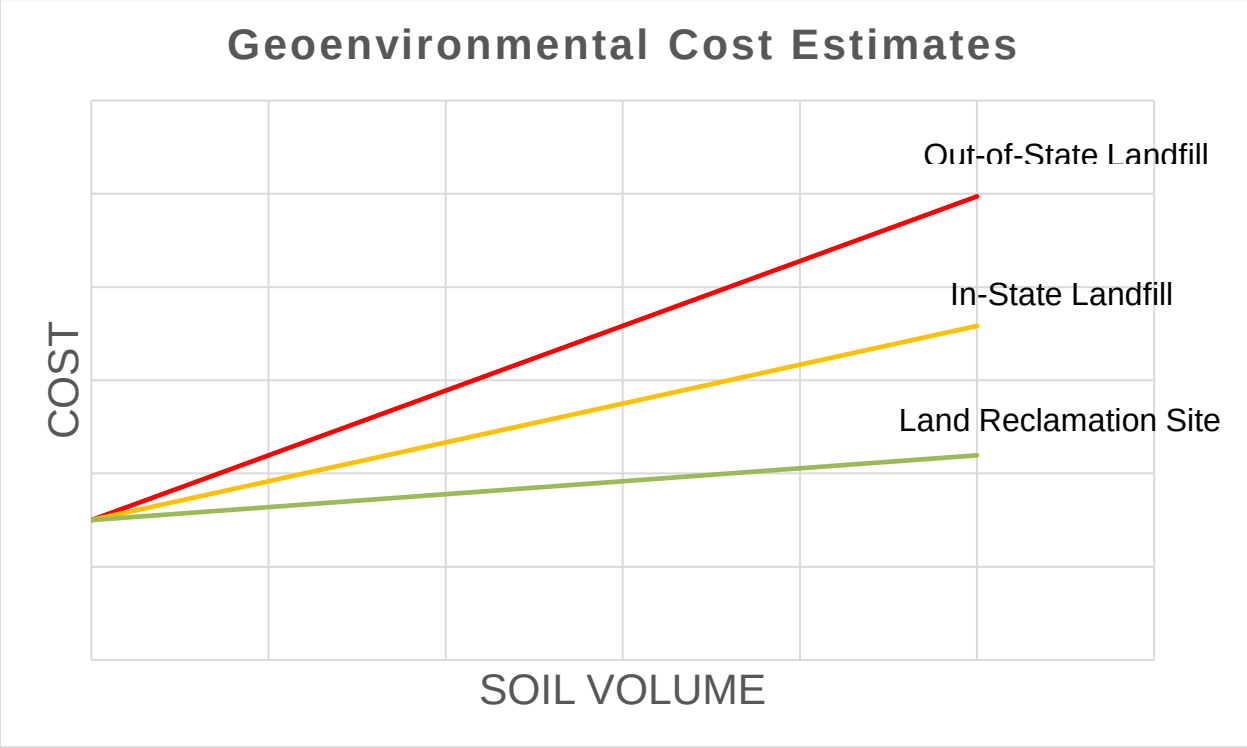
Nobis Engineering, Inc.
585 Middlesex Street
Lowell, MA 01851
T (978) 683-0891

All cost estimates should be considered order-of-magnitude budgetary estimates based on the information available to the project team. Cost estimates assume that excess soil to be disposed of off-site will not require management pursuant to the Toxic Substance Control Act (TSCA), is not a federal or state hazardous waste, and is not otherwise regulated. Potentially significant additional cost would be incurred manage, handle, and dispose of such materials.

These budgetary estimates are based on a preliminary estimate of the potential volume of soil that might be removed from each site during construction of new buildings under each scenario. The volume of soil removed from the site during construction is dependent upon the design of the new buildings and the extent to which the existing soil is suitable to support new construction. Costs could be mitigated through the on-site reuse of fill material beneath new buildings, to the extent feasible based on the space available and the structural suitability of the material.

The cost calculations are based on estimated volumes of soil to be disturbed during construction of the selected option, and assumes that historical fill was removed from areas beneath existing structures during construction of the existing buildings. This volume of soil is converted to a tonnage, then multiplied by a range of potential off-site reuse/disposal costs (per ton) based on the laboratory data from soil samples collected during the Phase II investigations. The price per ton to reuse or dispose of excess soils generated during the project is dependent upon the types and concentrations of contaminants present in the soil.

The following graphic provides a general illustration of the sensitivity of these cost estimates to changes in volume or reuse/disposal costs.



Nobis
Engineering a Sustainable Future

May 9, 2017
File No. 91830.01

Ms. Alicia Caritano
Senior Associate
Perkins Eastman
50 Franklin Street, Suite 203
Boston, Massachusetts 02110

Re: Transmittal of Phase II Environmental Site Assessment
Existing Lowell High School
Perkins Eastman Project #67150.00
Lowell, Massachusetts

Dear Ms. Caritano:

Nobis Engineering, Inc. (Nobis) completed a Phase II Site Assessment (Phase II) in support of a Feasibility Study being performed by Perkins Eastman on behalf of the City of Lowell under a grant provided by the Massachusetts School Building Authority (MSBA). The Phase II was conducted on a portion of the existing Lowell High School campus, specifically the 50 Father Morissette Boulevard parcel (the Site). The Phase II was conducted to address the recommendations provided by Nobis in a Phase I Environmental Site Assessment (ESA) prepared in January 2017, which identified Recognized Environmental Conditions (RECs) associated with the historical use of the property that could potentially have resulted in the release of contaminants to the environment.

OBJECTIVE OF THE PHASE II

The objective of the Phase II was to characterize soils in potential future school demolition and/or construction areas so that soil management procedures could be developed for the project and potential cost impacts from soil remediation could be evaluated. Therefore, the scope of the Phase II investigation was limited to the 50 Father Morissette Boulevard parcel, where the February 24, 2017 *Preliminary Design Program* has contemplated extensive demolition and construction work under the Existing Lowell High School Addition/Renovation Options. RECs that were identified on other parcels, where new construction is not being considered and extensive management of soil is not anticipated, were beyond the scope of the Phase II and excluded from the assessment.

PHASE II SITE ASSESSMENT FINDINGS

Nobis advanced five soil borings at the Site in areas potentially impacted by historical industrial use. Geological descriptions of soil cores indicated that historical fill overlies native soils at the

Nobis Engineering, Inc.
585 Middlesex Street
Lowell, MA 01851

Site. The presence of historical fill material in the top 5 to 8 feet of soil suggests that any soils removed or displaced during future earthwork activities should be considered potentially contaminated with urban fill constituents such as polycyclic aromatic hydrocarbons (PAHs) and metals.

Ten soil samples were collected for laboratory analysis during the Phase II investigation. Two metals, arsenic and lead, were detected in soil samples at concentrations above Massachusetts Contingency Plan (MCP) "reportable concentrations", triggering notification requirements to MassDEP and suggesting the potential need for soil remediation. The concentration of arsenic detected in a soil sample collected adjacent to the National Park Service trolley tracks triggered a 2-hour notification obligation due to its proximity to the school and location within 12 inches of the ground surface. The City has undertaken an Immediate Response Action (IRA) to mitigate potential risks associated with direct contact with arsenic-impacted soils, and characterized the extent of arsenic contamination on the City property adjacent to the trolley tracks. Removal and off-site disposal of this soil is in the planning stages. The concentration of lead detected in one soil sample collected from 5.0 to 5.5 feet below ground surface exceeded reportable concentrations, triggering a 120-day notification obligation for the City.

Soil contamination observed during the Phase II can be attributed to the presence of historical fill material and historical releases from the trolley tracks that run parallel to the east wall of the Lord Building. Historical fill material typically contains elevated levels of PAHs and metals. Arsenic is commonly detected in areas where historical railroad operations have occurred, either as a constituent of pesticides, pressure treated lumber, or coal/coal ash.

POTENTIAL COST IMPACTS FROM SUBSURFACE ENVIRONMENTAL CONTAMINATION

Based on the information collected to date from the existing Lowell High School site during the Feasibility Study, it is reasonable to assume that any earthwork required to construct a new high school building on the 50 Father Morissette Boulevard parcel will involve handling of potentially contaminated soils. Soil borings advanced during the Phase II site assessment revealed the presence of 5 to 8 feet of urban fill material containing brick, concrete, coal, and ash. Fill material was observed in all five soil borings advanced during the Phase II and in all ten test pits excavated as part of the civil engineering investigation completed by others in April 2017.

Any excess soils generated during future construction activities on the 50 Father Morissette Boulevard parcel should be presumed contaminated and pre-characterized in order to determine off-site reuse/disposal options and develop appropriate health and safety protocols for construction workers. The number and location of samples should be determined based on the anticipated volume of soil expected to be managed and the anticipated locations of earthwork operations. The estimated cost associated with pre-construction environmental services including the collection and analysis of pre-characterization samples, preparation of a Soil Management Plan, and preparation of a site-specific Health and Safety Plan compliant with OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) would be $10,000 to $20,000.

Construction-phase environmental services including oversight of earth moving activities, on-site management of contaminated soil during construction, and soil shipment documentation should be provided by a Licensed Site Professional (LSP). The estimated cost for construction-phase services will vary based on the volume of soil to be managed, but is likely to be in the range of $25,000 to $50,000.

Depending upon the type of contaminants detected in pre-characterization soil samples, the levels of contamination present, and the volume of soil expected to be disturbed during construction activities, the cost of transportation and off-site reuse/disposal of excess soils is likely to be on the order of $30,000 to $300,000. On the lower end of this cost range, low levels of contamination are present (approaching background), a small volume of soil would need to be handled, and excess soils can be either reused on site or relocated to another location within the City at no cost for disposal. At the higher end of this cost range would be high concentrations of persistent contaminants such as heavy metals or polychlorinated biphenyls (PCBs) and a large volume of soil that would need to be transported to an out-of-state landfill for disposal. This order-of-magnitude cost estimate can be refined with additional data collection. This estimate is in addition to the $20,000 to $40,000 anticipated for the removal of arsenic-impacted soils identified along the railroad tracks during the Phase II.

If you have any questions on the content of this letter or the attached Phase II report, please do not hesitate to contact me at (978) 703-6029 or by email at *svetere@nobiseng.com*.

Very truly yours,

Nobis Engineering, Inc.

Stephen Vetere, PE, LSP
Director of Environmental Services

Attachments: Phase II Environmental Site Assessment, Existing Lowell High School

PHASE II ENVIRONMENTAL SITE ASSESSMENT

LOWELL HIGH SCHOOL EXISTING CONDITIONS EVALUATION
MSBA FEASIBILITY STUDY

50 FATHER MORISSETTE BOULEVARD,
LOWELL, MASSACHUSETTS

FOR

PERKINS EASTMAN
PROJECT NUMBER 67150.00

BY

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Nobis Project No. 91830.01
May 9, 2017

Nobis
Engineering a Sustainable Future

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LOWELL HIGH SCHOOL
50 FATHER MORISSETTE BOULEVARD
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1.0 INTRODUCTION

Nobis Engineering, Inc. (Nobis) completed a Phase II Site Assessment (Phase II) in support of a Feasibility Study being performed by Perkins Eastman on behalf of the City of Lowell under a grant provided by the Massachusetts School Building Authority (MSBA). The Phase II was conducted on a portion of the existing Lowell High School campus (Figure 1), specifically the 50 Father Morissette Boulevard parcel (the Site), which is occupied by the Lord Building and an adjacent Field House (Figure 2). The Phase II was conducted to address the recommendations provided by Nobis in a Phase I Environmental Site Assessment (ESA) prepared in January 2017, which identified Recognized Environmental Conditions (RECs) associated with the historical use of the property that could potentially have resulted in the release of contaminants to the environment.

The objective of the Phase II was to characterize soils in potential future school demolition and/or construction areas so that soil management procedures could be developed for the project and potential cost impacts from soil remediation could be evaluated. Therefore, the scope of the Phase II investigation was limited to the 50 Father Morissette Boulevard parcel, where the February 24, 2017 *Preliminary Design Program* has contemplated extensive demolition and construction work under the Existing Lowell High School Addition/Renovation Options. RECs that were identified on other parcels, where new construction is not being considered and extensive management of soil is not anticipated, were beyond the scope of the Phase II and excluded from the assessment.

2.0 GENERAL SITE INFORMATION

The following sections describe the Site and surrounding properties, and include a summary of ownership history and previous environmental investigations. This discussion focuses on the 50 Father Morissette Boulevard parcel. Equivalent information about the other parcels on the existing high school campus can be found in the January 2017 Phase I ESA.

2.1 Site Location and Description

The Site is a portion of the existing Lowell High School campus located at 50 Father Morissette Boulevard in Lowell, Massachusetts. The Lowell High School campus consists of five major building/facilities, which include the Lord Building and the adjacent Field House (which are the

subject of this Phase II), the Freshman Academy, the 1922 Building, and the Steam Plant. The high school campus is bisected by the Merrimack Canal, which runs roughly southwest-northeast between the Lord Building and the 1922 Building. The Lord Building and Field House are the only buildings located northwest of the canal, on the 50 Father Morissette Boulevard parcel. As described previously, the other three parcels that comprise the high school campus were excluded from the Phase II scope of work.

The a 3.29-acre 50 Father Morissette Boulevard parcel is improved with two buildings, the approximately 143,250 square foot Lord Building and the approximately 73,310 square foot Field House (square footage as reported on property cards on file with the Lowell Assessor's Office). The two buildings are connected by a central lobby area and are both concrete block/masonry frames. The buildings are heated with natural gas via a forced hot air system. Both buildings were constructed in 1980.

The Lord Building is a slab-on-grade, three-story rectangular-shaped educational building comprised of classrooms, laboratories, a cafeteria, a kitchen, conference space, the Creegan Media Center, bathrooms, nurse's offices, Jeanne D'Arc Credit Union and ATM, storage space, a school store, a theatre, and administrative offices. The roof is steel frame with rolled composite roofing. Air handling units for the HVAC system are present on the roof of the building.

The Field House is a two-story hexagonal building with a multi-sport gymnasium, a pool, wrestling room, weight rooms, locker rooms, and furnace rooms. The basement contains a pool pump area where chlorine and carbon dioxide for the pool are stored. The Field House is located west of the Lord Building. The roof is steel frame with enamel metal shingles.

A paved access road leads from Father Morissette Boulevard on the western portion of the property to a loading dock and small parking area on the southern side of the Lord Building. The loading dock is primarily used for offloading trucks carrying food and drinks for the cafeteria.

Portions of the property that are not paved for walkways or the access road are landscaped.

According to the City of Lowell Assessor's Department, the Site is currently zoned "DMU", which is defined in Article 3 of the City of Lowell Zoning Book (adopted December 7, 2004) as a "downtown mixed-use district". The Site is located within an urban area of the City of Lowell with

mixed residential, commercial, and recreational uses. Adjacent parcels are generally commercial in nature. The topography of the Site and surrounding environs is relatively flat. According to the Site Locus Map (Figure 1), the topographic gradient decreases slightly to north/northeast. The Merrimack River is located approximately 650 feet from the Site.

2.2 Site Ownership and Usage

The Phase I ESA prepared by Nobis, dated January 2017 (Nobis, 2017), indicated that the City of Lowell School Department was the owner of the property at that time. It is Nobis' understanding that the City of Lowell School Department continues to own the parcel. The Site is operated as part of the Lowell High School, an educational institution for the City of Lowell residents. The Field House is a school-owned and operated recreational facility for physical education classes as well as intramural and interscholastic sports competition.

2.3 Site Operations History

The 50 Father Morissette Boulevard parcel, located to the northwest of the canal, was first developed in the 1820s concurrent with the development of the Merrimack Canal and the Merrimack Manufacturing Company, a former textile mill. A portion of the Merrimack Manufacturing Company mill complex occupied the northwest corner of the Site, and the remaining Site area west of the canal was occupied by tenement homes associated with the mill. A rail line entered the Site from the south, running parallel to the canal, and a spur was built running perpendicular to the canal along the southern boundary of the Site (currently the dentistry office at 75 Arcand Drive). In the 1960s, an urban renewal program resulted in the demolition of the mill and associated housing, and the streets to the west of the canal were completely reconfigured to resemble the present day layout. In 1980, the Lord Building and Field House were constructed on vacant land as improvements to the existing high school, which before this time was entirely located on the east side of the canal.

2.4 Previous Investigations and Recognized Environmental Conditions

Nobis completed a Phase I ESA of the entire Lowell High School campus in January 2017. The Phase I ESA included assessment of six parcels of land (five on the current school campus and a sixth parcel being considered for potential acquisition) located in the downtown area of Lowell,

Massachusetts, including 50 Father Morissette Boulevard. This Phase I ESA was conducted to support the MSBA Feasibility Study.

Based on the review of historical records, observations made during the site reconnaissance, and information provided in interviews with City personnel, Nobis identified the following RECs in the 2017 Phase I ESA:

- City of Lowell Fire Department records contained one index card file for Lowell High School, which indicated that the facility had a 12,600-gallon “below grade” “Faber Burner” tank located on French Street. The tank’s contents were not listed, nor was the installation date, removal date, or any sort of inspection date. The record does not provide any additional details regarding the tank. This tank may have been a storage vessel for oil that was used to fuel the boilers in the Steam Plant before it was converted to natural gas, or used to heat one of the school buildings. The exact location of this tank is unknown, but is likely to be near the Steam Plant along French Street. This REC was excluded from the Phase II investigation because it is beyond the limits of proposed demolition and construction that is currently being considered for the existing high school site, therefore potential exposure to environmental media during renovation, and costs associated with soil remediation, are expected to be minimal, if any.

- Sanborn Fire Insurance Maps show a “coal bin” in the 1950, 1952, and 1977 maps in what is now the alley between the Freshman Academy and the Steam Plant. The historical storage of coal in this vicinity may have resulted in the release of coal or coal ash to the environment. A release of coal and/or coal ash could result in detectable concentrations of semi-volatile organic compounds (SVOCs) and polycyclic aromatic hydrocarbons (PAHs) in soil. This REC was excluded from the Phase II investigation because it is beyond the limits of proposed demolition and construction that is currently being considered for the existing high school site, therefore potential exposure to environmental media during renovation, and costs associated with soil remediation, are expected to be minimal, if any.

- 50 Father Morissette Boulevard was historically part of the Merrimack Manufacturing Company property. Most of the property was used for tenement housing; however, the

northwestern corner of the property contained two buildings used as an “Old Packing Building” and “Finishing Mill”. It is possible that dyes, solvents, or other chemicals used in textile processing were used, stored, or released in this portion of the Site. Nobis advanced three soil borings in the northwestern portion of the 50 Father Morissette Boulevard parcel to investigate potential contamination resulting from the former industrial use of the Site.

- A railroad spur leading into the Merrimack Manufacturing Company was present along the southern border of the current 75 Arcand Drive property from the early 1900s until at least 1952. The railroad is not shown on the 1977 Sanborn fire insurance maps. Additionally, the rail line from which this spur originated directly abuts the Lord Building to the east. This line is still used for trolley services. Former railroad activities likely transported and handled raw materials, chemicals, and hazardous materials associated with the operation of area industry. In addition, railroad operations and maintenance activities themselves may have impacted the Site, as creosote or arsenic-laced railroad ties, herbicides, lubricating oils, diesel fuel, and diesel exhaust commonly result in releases of heavy metals, pesticides/herbicides, and petroleum-related contamination along railroad corridors. Nobis advanced two soil borings along the railroad tracks to investigate potential contamination resulting from historical operation of railroad tracks adjacent to the eastern wall of the Lord Building.

The Phase I ESA report recommended implementation of a limited subsurface investigation prior to any pre-design or construction work to evaluate whether the identified RECs have resulted in a release of contamination to the environment. The Phase II investigation was intended to provide information to assist with soil management and health and safety planning for Site workers in the event that one of the existing high school addition/renovation options were to be implemented.

3.0 2017 PHASE II FIELD INVESTIGATION PROGRAM

The 2017 Phase II field investigation included the advancement of five soil borings, classification and field screening of soil samples, collection of soil samples for laboratory analysis, and evaluation of laboratory data. The sections below summarize the field investigation activities performed in March and April 2017. Limitations of the assessment are provided in Appendix A.

3.1 DigSafe Utility Clearance

On the morning of March 17, 2017, Nobis mobilized to the Site to pre-mark drilling locations for the Phase II site assessment. Later that day, at 13:00 Nobis notified DigSafe to initiate utility clearance activities in anticipation of commencing drilling activities before the end of March. DigSafe assigned Ticket Number 20171104598 to the notification, and with the 72-hour notification requirement, a potential start date of March 22, 2017 at 13:00 was established.

3.2 Soil Boring Pre-Clearing

Prior to commencing drilling operations, Nobis reviewed historical and existing plans illustrating subsurface utility systems including water, sewer, natural gas, electrical, and fiber optic lines connected to the Lord Building and Field House. On March 28 2017, Drilex Environmental of West Boylston, Massachusetts (Drilex) pre-cleared four of the five soil boring locations using a VacMaster 4000 vacuum truck and an air knife. Soil was removed from the top 5 to 6 feet using the air knife and consolidated with the VacMaster 4000 vehicle. The cuttings were characterized by a Nobis field geologist, who oversaw the pre-clearing event. Any notable observations were recorded on the soil boring logs attached in Appendix B.

One of the soil borings was not pre-cleared. Boring location NOB-106 was not pre-cleared, as all of the subsurface utilities in the area southeast of the Lord Building follow a similar east-west orientation adjacent to the National Park Service (NPS) trolley line. By pre-clearing the location at NOB-105, also adjacent to the active NPS trolley line, Nobis and Drilex concluded that the proposed NOB-106 drilling location was clear of utilities.

Once the soil borings were adequately pre-cleared, soil cuttings were deposited back down into the borehole annulus. No excess soil cuttings were generated during the pre-clearing event.

3.3 Soil Boring Advancement and Soil Sampling

On March 29, 2017, Drilex advanced 5 overburden soil borings at the Site. Drilling activities were directed by a Nobis field geologist, who was responsible for characterizing soils and collecting soil samples for laboratory analysis. The borings were advanced using a Geoprobe® 6620 track-mounted drill rig. Borings were located on exterior portions of the 50 Father Morissette Boulevard

parcel, as shown on Figure 2. The proposed soil boring location NOB-103 was not advanced due to inability to adequately identify the locations of subsurface utilities.

During drilling activities, soil samples were collected from each boring continuously using dedicated macro-core acetate sampling sleeves. All borings were advanced from the ground surface until either a maximum depth of 15 feet was achieved, or subsurface refusal was encountered. All soil samples were characterized in the field by a Nobis geologist and screened for the presence of volatile organic compounds (VOCs) using a photo-ionization detector (PID). Field screening, geological classification, and any other pertinent observations made during soil boring advancement were recorded on boring log forms, which are included in Appendix B.

Two soil samples were collected for laboratory analysis from each soil boring: the first sample was collected from approximately 0-2 feet below ground surface (bgs), and a second sample was collected from a deeper interval either exhibiting evidence of contamination such as elevated PID field screening readings or material representative of historical fill, or a sample from the water table interface (if no evidence of contamination was observed). Soil samples were kept chilled on ice and transported under chain-of-custody until received by Con-Test Analytical Laboratories of East Longmeadow, Massachusetts for analysis. Laboratory samples were collected for VOC analysis by EPA Method 8260, volatile petroleum hydrocarbons (VPH) by the MassDEP Method, extractable petroleum hydrocarbons (EPH) and PAHs by the MassDEP Method, and Massachusetts Contingency Plan (MCP) metals analysis by EPA Methods 6010/6020.

4.0 SITE HYDROGEOLOGICAL OBSERVATIONS

Based on observations made during the 2017 subsurface soil characterization, both historical fill material and naturally-occurring soil deposits are present at the Site. Historical fill material observed at the Site generally consists of brown to dark grayish-brown poorly sorted silty sands, with varying amounts of debris materials encountered (brick, coal fragments, concrete fragments, ash, cobbles). Generally, historical building debris was not encountered as distinct lenses, but appeared in small amounts commingled with soil. Underlying native deposits were generally characterized as brown, light brown, orange, or tan sand, with low levels of silts and gravels.

Boring NOB-104 encountered refusal at 5.5 feet bgs on what appeared to be a concrete slab or foundation. This would suggest that historical building foundations or slabs could be intact below the Lord Building and adjacent Field House.

Based on soil boring moisture and/or soil staining observations, the groundwater table appears to be approximately 10-12 feet bgs. Several pockets of shallow, wet soil were observed in borings NOB-105 and NOB-106, both of which are located closest to the adjacent canal to the south. Nobis did not observe any odors, stains, or sheen on any of the saturated soil that might suggest groundwater contamination at the Site. The groundwater flow direction is believed to be toward the northeast in the direction of the Merrimack River.

5.0 2017 SOIL ANALYTICAL RESULTS

The following section presents a summary of the laboratory analytical data collected during the 2017 Phase II field investigation. Samples were collected for laboratory analysis of VOCs, VPH, EPH, PAHs, and MCP Metals. Analytical results were compared to MassDEP criteria to evaluate potential human health risks associated with the contaminant levels detected. A summary of soil analytical results is provided on Table 1. Laboratory data reports for soil samples collected during the March/April 2017 investigation are provided in Appendix C.

5.1 Applicable Regulatory Criteria

The soil sampling data were compared to several applicable state regulatory criteria, which are established in the MCP.

- Pursuant to 310 CMR 40.0361, the soil analytical results were initially screened against the MCP Reportable Concentrations of Oil and Hazardous Material in Soil (RCS-1) to establish whether the results triggered any 120-day reporting obligations to MassDEP. RCS-1 is considered applicable to the Site because it is located within 500 feet of a school.

- If a contaminant was determined to exceed RCS-1, the result was also screened against the Imminent Hazard threshold concentrations provided in 310 CMR 40.0321(2) to determine whether the results triggered a 2-hour reporting obligation to MassDEP. This requirement is considered applicable to soil samples collected from the Site between 0

and 12 inches below ground surface because it is located within 500 feet of a school and access to soils is not restricted by a fence or the presence of asphalt/concrete pavement.

Table 1 provides a comparison of analytical data to these MCP criteria.

5.2 VOC Analytical Results

Only one sample collected during the March 29, 2017 investigation contained VOC concentrations above laboratory detection limits. The soil sample collected from NOB-102 at a depth of 7-8 feet bgs was the only sample with a detection of a VOC (0.0095 mg/kg of naphthalene), significantly lower than RCS-1.

5.3 VPH Analytical Results

Only one sample collected during the March 29, 2017 investigation contained any VPH compounds above laboratory reporting limits. The soil sample collected from boring NOB-105 from a depth of 0-2 feet bgs contained low detected concentrations of C9-C12 aliphatic and C9-C10 aromatic hydrocarbon fractions. The concentrations detected are significantly lower than RCS-1.

5.4 EPH/PAH Analytical Results

Nine of the eleven soil samples collected during the March 29, 2017 investigation contained EPH hydrocarbon ranges and/or PAHs above laboratory detection limits. Most of the detected concentrations were low (above laboratory detections limits but below applicable MCP soil standards). However, three soil samples contained concentrations above RCS-1:

- The soil samples collected from NOB-102 (7-8 feet bgs), NOB-104 (5-5.5 feet bgs), and NOB-106 (0-2 feet bgs) all contained benzo(a)pyrene above RCS-1. The highest benzo(a)pyrene concentration was detected in the surface sample (0-2 feet bgs) collected from NOB-106. This soil boring was advanced adjacent to the trolley tracks at the south end of the Lord Building.

- The soil sample collected from NOB-106 (0-2 feet bgs) also contained concentrations of benzo(b)fluoranthene and dibenz(a,h)anthracene above RCS-1.

5.5 MCP Metals Analytical Results

The MCP metals analysis includes antimony, arsenic, barium, beryllium, cadmium, chromium, lead, mercury, nickel, selenium, silver, thallium, vanadium, and zinc. Each of the eleven samples collected for metals analysis during the March 29, 2017 investigation contained at least one of these metals above laboratory detection limits. The results are summarized below:

- Antimony, selenium, silver, and thallium were not detected in any of the samples analyzed.

- Lead was detected in two soil samples above RCS-1 (NOB-104 from 5-5.5 feet bgs and NOB-106 from 0-2 feet bgs). The highest lead concentration was detected in the sample collected from NOB-104 at 5-5.5 feet bgs (780 mg/kg).

- Arsenic was detected in two soil samples above RCS-1 (NOB-105 from 0-2 feet bgs and NOB-106 from 0-2 feet bgs). The highest arsenic concentration was detected in the sample collected from NOB-106 at 0-2 feet bgs (190 mg/kg). Both of these soil borings are located adjacent to the trolley tracks just south of the Lord Building.

The detection of arsenic in a surficial soil sample (0 to 2 feet below ground surface) at a concentration greater than 40 mg/kg, located adjacent to a school, in an area with unrestricted access to surficial soil, presented a potential Imminent Hazard condition and potential 2-hour release notification obligation. See Section 6.0 for a discussion of the Imminent Hazard Evaluation conducted upon receipt of the March 29, 2017 analytical data.

6.0 IMMINENT HAZARD EVALUATION

As stated previously, the arsenic concentration (190 mg/kg) detected in the surface soil sample collected from NOB-106 (0-2 feet) on March 29, 2017 presented a potential Imminent Hazard condition due to its concentration relative to the Imminent Hazard threshold established in the MCP (40 mg/kg arsenic), the fact that is was collected from a surficial sampling interval, and the fact that it is in a location within 500 feet of a school.

On April 10, 2017, immediately upon receipt of the laboratory data report for the March 29, 2017 soil samples, Nobis notified Perkins Eastman and the City of Lowell about the elevated arsenic

concentration from the sample collected from NOB-106. Based on the 0-2 foot sample interval, it could not be definitively determined whether this detection of arsenic was in the top 0-1 foot of soil, and therefore met the criteria established in 310 CMR 40.0321(2)(b) for a 2-hour release notification obligation.

Nobis returned to the Site on the morning of April 11, 2017 to collect two confirmation samples from 0-1 foot bgs in the immediate vicinity of NOB-106 (NOB-106N and NOB-106S). These soil samples were submitted to Con-Test for laboratory analysis of arsenic with a 24-hour turnaround time. On April 12, 2017 at approximately 1:00 PM, Nobis received the analytical results from NOB-106N and NOB-106S, which confirmed that the concentration of arsenic in soil within 12 inches of the ground surface exceeded the Imminent Hazard threshold, and a 2-hour reporting condition was triggered.

After consultation with the City of Lowell, Nobis provided oral notification to MassDEP at 2:21 PM on April 12, 2017. MassDEP assigned Release Tracking Number (RTN) 3-34180 and orally approved an Immediate Response Action (IRA) consisting of installation of a 6-foot high chain-link fence with signage, and additional assessment to determine the extent of arsenic contamination in soil.

7.0 PHASE II CONCLUSIONS

Nobis completed a Phase II site assessment for a portion of the existing Lowell High School campus located on 50 Father Morissette Boulevard in Lowell, Massachusetts. The following summarizes the results of subsurface investigation activities performed by Nobis.

- Nobis performed a Phase II site assessment for a portion of the existing Lowell High School campus, specifically the 50 Father Morissette Boulevard parcel, which is occupied by the Lord Building and adjacent Field House. The objective of the Phase II was to evaluate subsurface environmental conditions in portions of the existing high school site that could be impacted by potential future construction activities.

- Nobis advanced five soil borings around the north, east, and southeast perimeters of the Lord Building and Field House in areas potentially impacted by historical industrial use

(specifically near the former Merrimack Manufacturing Company mill building and the existing railroad tracks along the southern property boundary).

- Nobis field personnel recorded geological descriptions, field screened subsurface soils, and collected soil samples for laboratory analysis of VOCs, VPH, EPH, PAHs, and MCP metals. Two soil samples were collected from each soil boring for laboratory analysis: one soil sample from 0 to 2 feet bgs, and another soil sample from a deeper interval where historical fill material was encountered. If no evidence of contamination or historical fill was observed below the surface interval, Nobis collected the second soil sample from the approximate depth of the water table.

- Geological descriptions of soil samples indicate that both historical fill material and native soils exist at the Site. Several borings contained small amounts of debris, including brick, concrete fragments, coal fragments, and cobble. Boring NOB-104 encountered refusal on what is believed to be a concrete foundation or slab still in place. The presence of historical fill material in the top 5 to 8 feet of soil at the Site suggests that any soils removed or displaced during future earthwork activities should be considered potentially contaminated with urban fill constituents such as PAHs and metals.

- Soil sampling results indicate that trace to non-detect levels of volatile contamination (both VOCs and VPH) exist in the areas sampled. Therefore, no potential threat of vapor intrusion into school buildings was identified during the investigation, and volatile contaminants are unlikely to be of concern during potential future construction activities.

- The concentrations of arsenic detected in the soil samples collected from NOB-106N and NOB-106S represent a potential Imminent Hazard condition. As of the writing of this report, Nobis has notified MassDEP of this hazard on behalf of the City and IRA activities have commenced. Additional details are provided in Section 8.0.

- The concentrations of lead and arsenic detected in soil samples collected from NOB-104, NOB-105, and NOB-106 require the City to notify MassDEP of this release within 120 days of gaining knowledge.

- The concentrations of PAHs detected above RCS-1 are exempt from reporting because they can be attributed to the presence of coal fragments in the urban fill material from which the samples were collected. The concentrations of PAHs detected in soil samples collected during the Phase II are consistent with MassDEP anthropogenic background levels is soil containing coal ash associated with fill material (Table 1, MassDEP Technical Update "Background Levels of PAHs and Metals in Soil", 2002).

- Soil contamination observed during the Phase II can be attributed to the presence of historical fill material and historical releases from the trolley tracks that run parallel to the east wall of the Lord Building. Historical fill material typically contains elevated levels of PAHs and metals. Arsenic is commonly detected in areas where historical railroad operations have occurred, either as a constituent of pesticides, pressure treated lumber, or coal/coal ash.

8.0 RECOMMENDATIONS AND REQUIREMENTS

The following subsections summarize the recommendations and/or any regulatory requirements resulting from the detection of contamination at the Site.

8.1 Regulatory Reporting Requirements

2-Hour Reporting. As stated previously, on April 12, 2017, Nobis notified MassDEP of the potential Imminent Hazard condition associated with the detection of arsenic on the Lowell High School campus in a soil sample collected within 12 inches of the ground surface. MassDEP provided oral approval of an IRA consisting of the installation of a 6-foot high chain-link fence with signage and implementation of additional assessment activities. The Release Log Form posted by MassDEP to their on-line Reportable Release File Viewer is provided in Appendix D.

As of the writing of this report, IRA activities have been completed:

- On April 18, 2017, Nobis mobilized to the Site to advance 11 shallow soil borings along the east wall of the Lord Building between NOB-105 and the southeast corner of the Lord Building. Soil samples were collected from three depth intervals in each soil boring: 0-1 foot bgs, 1-3 feet bgs, and 4-5 feet bgs. Each of the 33 soil samples collected during this

investigation was submitted for laboratory analysis of arsenic. The objective of this sampling event was to delineate the vertical and horizontal extent of arsenic contamination in soil in order to develop the scope of a future Release Abatement Measure (RAM) to remove contaminated soils from the Site and achieve a Condition of No Significant Risk and a Permanent Solution. The analytical results of soil samples collected during the IRA indicate that arsenic contamination is present in soils along the entire length of the railroad corridor, but the vertical extent of arsenic contamination above RCS-1 is limited to the top 12 inches of soil.

- On April 19, 2017, the City of Lowell erected a chain-link fence to restrict access to the soils that triggered the potential Imminent Hazard condition. As a conservative measure, the City installed the fence along the entire length of the Lord Building, as opposed to restricting the fenced area to the NOB-106 area.

Nobis anticipates submittal of an IRA Completion Report after the review and evaluation of the April 18, 2017 soil sample analytical data is complete. The IRA Completion Report must be submitted to MassDEP within 60 days of notification (June 11, 2017) pursuant to 310 CMR 40.0420(8) of the MCP. Once the extent of contamination is identified, a RAM Plan must be submitted to MassDEP to describe the procedures for the removal and off-site disposal of contaminated soil, as well as the sampling plan proposed to verify the removal of arsenic contamination. Nobis recommends completion of soil remediation in time to allow for submittal of a RAM Completion Report before April 12, 2018. Submittal of the RAM Completion Report after this date will subject the City to additional MCP requirements and fees.

120-Day Reporting. As stated previously, the concentrations of lead and arsenic detected in soil samples collected from NOB-104, NOB-105, and NOB-106 exceeded RCS-1, triggering a requirement for the City to notify MassDEP within 120-days of obtaining knowledge of the release (August 10, 2017). The contamination associated with NOB-105 and NOB-106 is likely to be addressed by the RAM. The contamination associated with NOB-104 appears to be associated with the presence of historical fill material, but additional assessment is warranted to develop lines of evidence to confirm that lead contamination does not pose a significant risk to human health.

The concentrations of PAHs detected above RCS-1 are exempt from reporting because they can be attributed to the presence of coal fragments in the urban fill material from which the samples were collected.

8.2 Recommendations for Soil Remediation

In the near term, Nobis recommends excavation and off-site disposal of arsenic-contaminated soil along the southern property boundary. After removal of these soils, the arsenic, lead, and PAH contamination associated with shallow soils along the trolley tracks would be eliminated, and the Imminent Hazard would be mitigated, permitting the chain-link fence to be removed. Nobis recommends incorporating National Grid personnel into the excavation plans to ensure the adjacent natural gas line to the excavated corridor is not undermined or compromised. Close coordination with the National Park Service will also be necessary to maintain the structural integrity of the tracks and minimize interruptions in trolley service.

8.3 Recommendations for Soil Management

In the long term, in the event that one of the Existing Lowell High School Addition/Renovation Options is implemented, any soil that is removed or displaced during construction should be considered potentially contaminated. The construction cost estimate for the project should include provisions for worker safety, soil stockpiling in accordance with Section 310 CMR 40.0030 of the MCP, soil pre-characterization, and transportation/disposal of soils under the MassDEP Bill of Lading (BOL) process at an appropriately licensed facility. Any soil remediation made necessary by the renovation/construction of a new Lowell High School can likely be implemented under a Construction RAM Plan.

In areas where soils are expected to be displaced by construction activities, pre-characterization soil samples should be collected to identify potential off-site reuse or disposal options. The results of these laboratory analyses will assist the Environmental Professional with recommendations for soil handling and off-site reuse/disposal, as well as identify any health and safety protocols that should be incorporated into earthwork operations. In a very general sense, the types of soils that might be encountered at the Site during construction will fall into the following classifications:

- Class A-1: Soils meet the definition of background and are suitable for reuse without restrictions. Typically this means that there are no detectable concentrations of VOCs, PCBs, or TPH; and that SVOCs and metals are present at concentrations lower than the values published in Table 1 of the MassDEP Technical Guidance Document *Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil* (May 2002).

- Class A-2: Soils contain detectable concentrations of some contaminants above background, but all contaminants are present below RCS-1. This soil is not regulated for disposal under the MCP, and is therefore eligible for off-site reuse provided that the material meets the MassDEP's anti-degradation or "similar soils" provision (310 CMR 40.0032[3][b]). This section of the MCP states that soils must not be reused at a location where "existing concentrations of oil and/or hazardous material…are significantly lower than the levels of those oil and/or hazardous materials present in the soil being disposed or reused." In other words, the soils cannot be reused at a location where they would increase the level of contamination already present at the receiving site.

- Class B-1: Soils contain concentrations of at least one contaminant above RCS-1. These soils are regulated under the MCP and, in many cases, require reporting to MassDEP (although not if the release has already been reported). These soils may be disposed in a lined or unlined landfill within Massachusetts provided that they meet the criteria established in MassDEP Policy #COMM-97-001, *Reuse and Disposal of Contaminated Soil in Massachusetts Landfills* (August 1997).

- Class B-2: Soils contain concentrations of at least one contaminant above RCS-1 and the COMM-97 reuse criteria. These soils must be transported to an out-of-state landfill for disposal.

The general information included in the section above is provided as guidance for planning purposes during the feasibility stage of this project. There are several nuances, including exemptions and variances that can be applied if specific observations of urban fill materials are made, that might be applicable to the Site as subsurface information is collected and evaluated. A Licensed Site Professional (LSP) should be involved with any soil management evaluations

that are made during pre-design or construction, to ensure compliance with all applicable environmental laws and regulations.

TABLES

Table 1
Summary of Soil Analytical Results
Lowell High School - 50 Father Morissette Blvd
Lowell, Massachusetts

SAMPLE LOCATION			NOB-101	FD-01	NOB-101	NOB-102	NOB-102	NOB-104	NOB-104	NOB-105	NOB-105	NOB-106	NOB-106	NOB-106N	NOB-106S
SAMPLE DATE			3/29/2017	3/29/2017	3/29/2017	3/29/2017	3/29/2017	3/29/2017	3/29/2017	3/29/2017	3/29/2017	3/29/2017	3/29/2017	4/11/2017	4/11/2017
SAMPLE DEPTH (feet bgs)			0-2 Feet	0-2 Feet	6-8 Feet	0-2 Feet	7-8 Feet	0-2 Feet	5-5.5 Feet	0-2 Feet	11-12 Feet	0-2 Feet	4-5 Feet	0-1 Foot	0-1 Foot
	RCS-1	**IH**													
MADEP-EPH-04-1.1 (mg/Kg dry)															
C9-C18 ALIPHATICS	1000		ND (11)	ND (11)	ND (12)	ND (22)	ND (11)	ND (11)	ND (11)	ND (11)	ND (16)	28	ND (11)	NT	NT
C19-C36 ALIPHATICS	3000		28	32	24	90	ND (11)	ND (11)	ND (11)	ND (11)	ND (16)	100	ND (11)	NT	NT
UNADJUSTED C11-C22 AROMATICS	~		31	33	21	76	95	21	150	55	ND (16)	320	ND (11)	NT	NT
C11-C22 AROMATICS	1000		27	29	19	71	66	18	99	45	ND (16)	260	ND (11)	NT	NT
ACENAPHTHENE	4		ND (0.11)	ND (0.11)	ND (0.12)	ND (0.22)	0.15	ND (0.11)	0.98	ND (0.11)	ND (0.16)	ND (0.23)	ND (0.11)	NT	NT
ACENAPHTHYLENE	1		ND (0.11)	ND (0.11)	ND (0.12)	ND (0.22)	0.30	ND (0.11)	0.11	0.19	ND (0.16)	0.92	ND (0.11)	NT	NT
ANTHRACENE	1000		ND (0.11)	ND (0.11)	ND (0.12)	ND (0.22)	0.54	ND (0.11)	2.0	0.14	ND (0.16)	0.73	ND (0.11)	NT	NT
BENZO(A)ANTHRACENE	7		0.24	0.29	0.15	0.37	2.3	0.23	3.7	0.68	ND (0.16)	5.1	ND (0.11)	NT	NT
BENZO(A)PYRENE	2		0.34	0.40	0.14	0.49	**2.6**	0.27	**3.2**	0.99	ND (0.16)	**4.7**	ND (0.11)	NT	NT
BENZO(B)FLUORANTHENE	7		0.35	0.39	0.20	0.58	3.3	0.33	3.7	1.5	ND (0.16)	**9.1**	ND (0.11)	NT	NT
BENZO(G,H,I)PERYLENE	1000		0.25	0.29	1.3	0.40	1.7	0.25	1.6	0.62	ND (0.16)	2.2	ND (0.11)	NT	NT
BENZO(K)FLUORANTHENE	70		0.12	0.15	ND (0.12)	ND (0.22)	1.2	0.12	1.3	0.54	ND (0.16)	3.4	ND (0.11)	NT	NT
CHRYSENE	70		0.30	0.36	0.18	0.46	2.5	0.28	4.0	0.96	ND (0.16)	6.4	ND (0.11)	NT	NT
DIBENZ(A,H)ANTHRACENE	0.7		ND (0.11)	ND (0.11)	ND (0.12)	ND (0.22)	0.41	ND (0.11)	0.51	0.19	ND (0.16)	**0.93**	ND (0.11)	NT	NT
FLUORANTHENE	1000		0.57	0.57	0.34	0.91	4.8	0.51	8.5	1.3	ND (0.16)	9.6	ND (0.11)	NT	NT
FLUORENE	1000		ND (0.11)	ND (0.11)	ND (0.12)	ND (0.22)	0.22	ND (0.11)	1.0	ND (0.11)	ND (0.16)	ND (0.23)	ND (0.11)	NT	NT
INDENO(1,2,3-CD)PYRENE	7		0.16	0.20	ND (0.12)	0.31	1.7	0.19	1.7	0.65	ND (0.16)	2.7	ND (0.11)	NT	NT
2-METHYLNAPHTHALENE	0.7		ND (0.11)	ND (0.11)	ND (0.12)	ND (0.22)	ND (0.11)	ND (0.11)	0.35	ND (0.11)	ND (0.16)	0.32	ND (0.11)	NT	NT
NAPHTHALENE	4		ND (0.11)	ND (0.11)	ND (0.12)	ND (0.22)	0.24	ND (0.11)	0.60	ND (0.11)	ND (0.16)	0.36	ND (0.11)	NT	NT
PHENANTHRENE	10		0.37	0.35	0.23	0.55	2.5	0.32	9.2	0.48	ND (0.16)	1.7	ND (0.11)	NT	NT
PYRENE	1000		0.58	0.65	0.35	0.89	4.9	0.53	8.6	1.4	ND (0.16)	11	ND (0.11)	NT	NT
MADEP-VPH-04-1.1 (mg/Kg dry)															
UNADJUSTED C5-C8 ALIPHATICS	~		ND (9.3)	ND (8.7)	ND (13)	ND (8.7)	ND (9.0)	ND (9.7)	ND (12)	ND (8.9)	ND (18)	ND (11)	ND (8.0)	NT	NT
C5-C8 ALIPHATICS	100		ND (9.3)	ND (8.7)	ND (13)	ND (8.7)	ND (9.0)	ND (9.7)	ND (12)	ND (8.9)	ND (18)	ND (11)	ND (8.0)	NT	NT
UNADJUSTED C9-C12 ALIPHATICS	~		ND (9.3)	ND (8.7)	ND (13)	ND (8.7)	ND (9.0)	ND (9.7)	ND (12)	19	ND (18)	ND (11)	ND (8.0)	NT	NT
C9-C12 ALIPHATICS	1000		ND (9.3)	ND (8.7)	ND (13)	ND (8.7)	ND (9.0)	ND (9.7)	ND (12)	9.7	ND (18)	ND (11)	ND (8.0)	NT	NT
C9-C10 AROMATICS	100		ND (9.3)	ND (8.7)	ND (13)	ND (8.7)	ND (9.0)	ND (9.7)	ND (12)	9.2	ND (18)	ND (11)	ND (8.0)	NT	NT
SW-846 6010C-D (mg/Kg dry) Metals															
ANTIMONY	20		ND (2.6)	ND (2.8)	ND (2.9)	ND (2.6)	ND (2.7)	ND (2.8)	ND (2.7)	ND (2.8)	ND (3.9)	ND (2.9)	ND (2.7)	NT	NT
ARSENIC	20	40	8.4	7.1	6.4	6.3	8.9	9.2	19	**24**	ND (3.9)	**190**	8.2	**180**	**140**
BARIUM	1000		41	35	49	53	25	30	130	28	26	31	26	NT	NT
BERYLLIUM	90		0.40	0.40	0.56	0.40	0.40	0.48	0.48	0.43	0.94	0.49	0.53	NT	NT
CADMIUM	70	60	0.37	0.36	0.30	0.52	0.37	0.43	0.80	1.0	ND (0.39)	6.6	0.34	NT	NT
CHROMIUM	100	200	15	14	10	14	12	14	31	14	9.1	18	22	NT	NT
LEAD	200		73	56	79	35	43	62	**780**	67	9.2	**230**	27	NT	NT
NICKEL	600		11	11	6.1	12	9.1	12	17	12	4.5	12	21	NT	NT
SELENIUM	400		ND (5.1)	ND (5.7)	ND (5.8)	ND (5.2)	ND (5.4)	ND (5.6)	ND (5.5)	ND (5.6)	ND (7.8)	ND (5.8)	ND (5.5)	NT	NT
SILVER	100		ND (0.51)	ND (0.57)	ND (0.58)	ND (0.52)	ND (0.54)	ND (0.56)	ND (0.55)	ND (0.56)	ND (0.78)	ND (0.58)	ND (0.55)	NT	NT
THALLIUM	8		ND (2.6)	ND (2.8)	ND (2.9)	ND (2.6)	ND (2.7)	ND (2.8)	ND (2.7)	ND (2.8)	ND (3.9)	ND (2.9)	ND (2.7)	NT	NT
VANADIUM	400		14	13	13	22	12	14	27	15	14	31	18	NT	NT
ZINC	1000		55	62	43	55	26	40	100	76	10	51	28	NT	NT
SW-846 7471B (mg/Kg dry) Metals															
MERCURY	20	300	0.040	0.032	0.074	0.045	0.062	0.073	0.67	0.085	ND (0.038)	0.26	0.027	NT	NT
SW-846 8260C (mg/Kg wet)															
ACETONE	6		ND (0.13)	ND (0.071)	ND (0.086)	ND (0.073)	ND (0.076)	ND (0.082)	ND (0.090)	ND (0.075)	ND (0.13)	ND (3.0)	ND (0.12)	NT	NT
TERT-AMYL METHYL ETHER	~		ND (0.0013)	ND (0.00071)	ND (0.00086)	ND (0.00073)	ND (0.00076)	ND (0.00082)	ND (0.00090)	ND (0.00075)	ND (0.0013)	ND (0.030)	ND (0.0012)	NT	NT
BENZENE	2		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
BROMOBENZENE	100		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
BROMOCHLOROMETHANE	~		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT

Table 1
Summary of Soil Analytical Results
Lowell High School - 50 Father Morissette Blvd
Lowell, Massachusetts

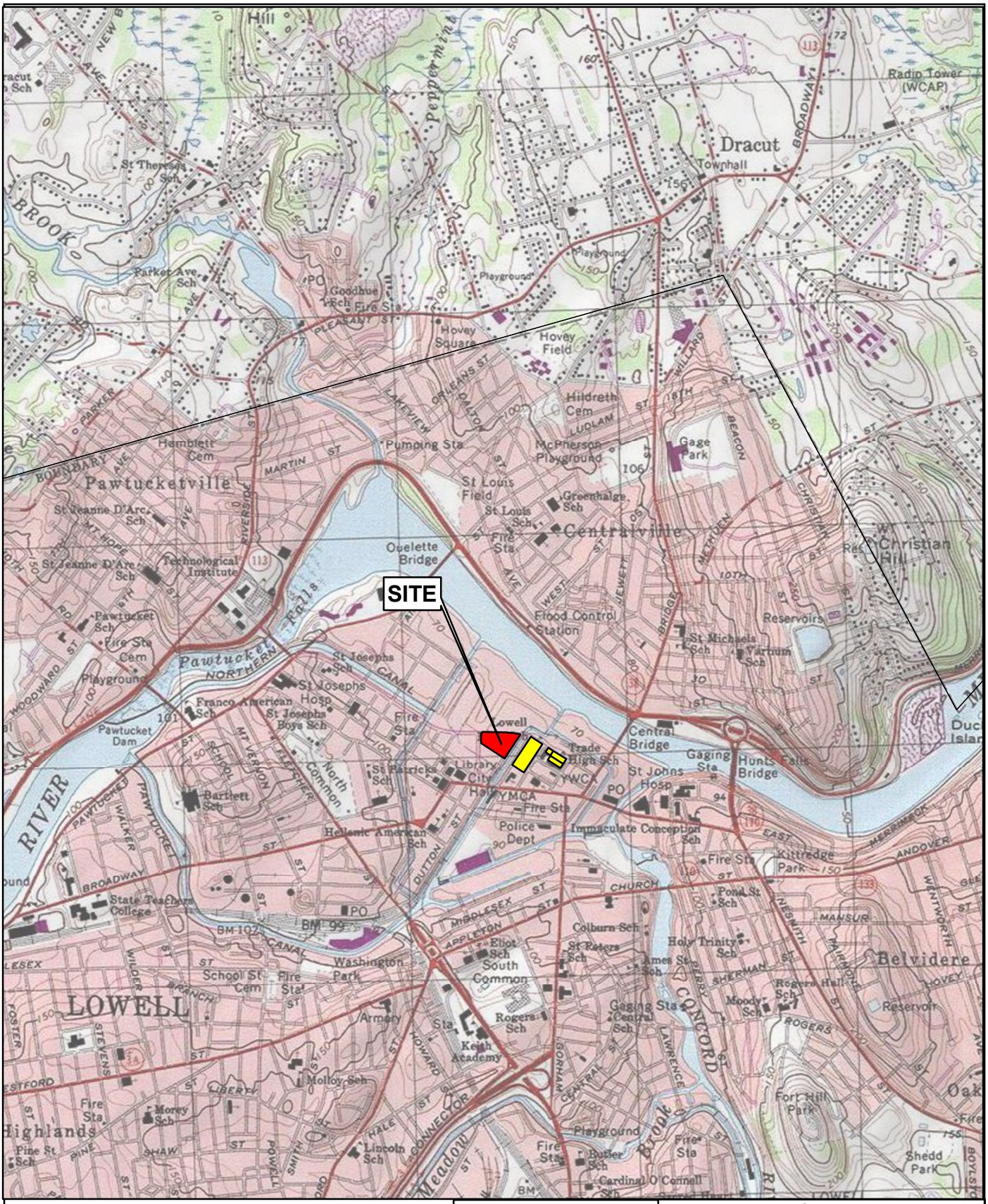
SAMPLE LOCATION			NOB-101	FD-01	NOB-101	NOB-102	NOB-102	NOB-104	NOB-104	NOB-105	NOB-105	NOB-106	NOB-106	NOB-106N	NOB-106S
SAMPLE DATE			3/29/2017	3/29/2017	3/29/2017	3/29/2017	3/29/2017	3/29/2017	3/29/2017	3/29/2017	3/29/2017	3/29/2017	3/29/2017	4/11/2017	4/11/2017
SAMPLE DEPTH (feet bgs)			0-2 Feet	0-2 Feet	6-8 Feet	0-2 Feet	7-8 Feet	0-2 Feet	5-5.5 Feet	0-2 Feet	11-12 Feet	0-2 Feet	4-5 Feet	0-1 Foot	0-1 Foot
	RCS-1	IH													
SW-846 8260C (mg/Kg wet)															
BROMODICHLOROMETHANE	0.1		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
BROMOFORM	0.1		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.12) *	ND (0.0023)	NT	NT
BROMOMETHANE	0.5		ND (0.013)	ND (0.0071)	ND (0.0086)	ND (0.0073)	ND (0.0076)	ND (0.0082)	ND (0.0090)	ND (0.0075)	ND (0.013)	ND (0.30)	ND (0.012)	NT	NT
2-BUTANONE (MEK)	4		ND (0.053)	ND (0.028)	ND (0.034)	ND (0.029)	ND (0.031)	ND (0.033)	ND (0.036)	ND (0.030)	ND (0.052)	ND (1.2)	ND (0.047)	NT	NT
N-BUTYLBENZENE	~		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
SEC-BUTYLBENZENE	~		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
TERT-BUTYLBENZENE	100		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
TERT-BUTYLETHYL ETHER	~		ND (0.0013)	ND (0.00071)	ND (0.00086)	ND (0.00073)	ND (0.00076)	ND (0.00082)	ND (0.00090)	ND (0.00075)	ND (0.0013)	ND (0.030)	ND (0.0012)	NT	NT
CARBON DISULFIDE	100		ND (0.0079)	ND (0.0043)	ND (0.0051)	ND (0.0044)	ND (0.0046)	ND (0.0049)	ND (0.0054)	ND (0.0045)	ND (0.0077)	ND (0.61)	ND (0.0070)	NT	NT
CARBON TETRACHLORIDE	5		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
CHLOROBENZENE	1		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
CHLORODIBROMOMETHANE	0.005		ND (0.0013)	ND (0.0014)	ND (0.00086)	ND (0.00073)	ND (0.00076)	ND (0.00082)	ND (0.00090)	ND (0.00075)	ND (0.0026)	ND (0.061) *	ND (0.0023)	NT	NT
CHLOROETHANE	100		ND (0.013)	ND (0.0071)	ND (0.0086)	ND (0.0073)	ND (0.0076)	ND (0.0082)	ND (0.0090)	ND (0.0075)	ND (0.013)	ND (0.12)	ND (0.012)	NT	NT
CHLOROFORM	0.2		ND (0.0053)	ND (0.0028)	ND (0.0034)	ND (0.0029)	ND (0.0031)	ND (0.0033)	ND (0.0036)	ND (0.0030)	ND (0.0052)	ND (0.12)	ND (0.0047)	NT	NT
CHLOROMETHANE	100		ND (0.013)	ND (0.0071)	ND (0.0086)	ND (0.0073)	ND (0.0076)	ND (0.0082)	ND (0.0090)	ND (0.0075)	ND (0.013)	ND (0.12)	ND (0.012)	NT	NT
2-CHLOROTOLUENE	100		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
4-CHLOROTOLUENE	~		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
1,2-DIBROMO-3-CHLOROPROPANE	10		ND (0.0026)	ND (0.0028)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0052)	ND (0.24)	ND (0.0047)	NT	NT
1,2-DIBROMOETHANE (EDB)	0.1		ND (0.0013)	ND (0.0014)	ND (0.00086)	ND (0.00073)	ND (0.00076)	ND (0.00082)	ND (0.00090)	ND (0.00075)	ND (0.0026)	ND (0.030)	ND (0.0023)	NT	NT
DIBROMOMETHANE	500		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
1,2-DICHLOROBENZENE	9		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
1,3-DICHLOROBENZENE	3		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
1,4-DICHLOROBENZENE	0.7		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
DICHLORODIFLUOROMETHANE	1000		ND (0.013)	ND (0.0071)	ND (0.0086)	ND (0.0073)	ND (0.0076)	ND (0.0082)	ND (0.0090)	ND (0.0075)	ND (0.013)	ND (0.12)	ND (0.012)	NT	NT
1,1-DICHLOROETHANE	0.4		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
1,2-DICHLOROETHANE	0.1		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
1,1-DICHLOROETHYLENE	3		ND (0.0053)	ND (0.0028)	ND (0.0034)	ND (0.0029)	ND (0.0031)	ND (0.0033)	ND (0.0036)	ND (0.0030)	ND (0.0052)	ND (0.061)	ND (0.0047)	NT	NT
CIS-1,2-DICHLOROETHYLENE	0.1		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
TRANS-1,2-DICHLOROETHYLENE	1		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
1,2-DICHLOROPROPANE	0.1		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
1,3-DICHLOROPROPANE	500		ND (0.0013)	ND (0.00071)	ND (0.00086)	ND (0.00073)	ND (0.00076)	ND (0.00082)	ND (0.00090)	ND (0.00075)	ND (0.0013)	ND (0.030)	ND (0.0012)	NT	NT
2,2-DICHLOROPROPANE	~		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
1,1-DICHLOROPROPENE	~		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.12)	ND (0.0023)	NT	NT
CIS-1,3-DICHLOROPROPENE	~		ND (0.0013)	ND (0.00071)	ND (0.00086)	ND (0.00073)	ND (0.00076)	ND (0.00082)	ND (0.00090)	ND (0.00075)	ND (0.0013)	ND (0.030)	ND (0.0012)	NT	NT
TRANS-1,3-DICHLOROPROPENE	~		ND (0.0013)	ND (0.00071)	ND (0.00086)	ND (0.00073)	ND (0.00076)	ND (0.00082)	ND (0.00090)	ND (0.00075)	ND (0.0013)	ND (0.030)	ND (0.0012)	NT	NT
DIETHYL ETHER	100		ND (0.013)	ND (0.0071)	ND (0.0086)	ND (0.0073)	ND (0.0076)	ND (0.0082)	ND (0.0090)	ND (0.0075)	ND (0.013)	ND (0.12)	ND (0.012)	NT	NT
DIISOPROPYL ETHER	100		ND (0.0013)	ND (0.00071)	ND (0.00086)	ND (0.00073)	ND (0.00076)	ND (0.00082)	ND (0.00090)	ND (0.00075)	ND (0.0013)	ND (0.030)	ND (0.0012)	NT	NT
1,4-DIOXANE	0.2		ND (0.26) *	ND (0.14)	ND (0.17)	ND (0.15)	ND (0.15)	ND (0.16)	ND (0.18)	ND (0.15)	ND (0.26) *	ND (3.0) *	ND (0.23) *	NT	NT
ETHYLBENZENE	40		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
HEXACHLOROBUTADIENE	30		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
2-HEXANONE	100		ND (0.026)	ND (0.014)	ND (0.017)	ND (0.015)	ND (0.015)	ND (0.016)	ND (0.018)	ND (0.015)	ND (0.026)	ND (0.61)	ND (0.023)	NT	NT
ISOPROPYLBENZENE	1000		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
P-ISOPROPYLTOLUENE	100		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
METHYL TERT-BUTYL ETHER (MTBE)	0.1		ND (0.0053)	ND (0.0028)	ND (0.0034)	ND (0.0029)	ND (0.0031)	ND (0.0033)	ND (0.0036)	ND (0.0030)	ND (0.0052)	ND (0.061)	ND (0.0047)	NT	NT
METHYLENE CHLORIDE	0.1		ND (0.013)	ND (0.0071)	ND (0.0086)	ND (0.0073)	ND (0.0076)	ND (0.0082)	ND (0.0090)	ND (0.0075)	ND (0.013)	ND (0.30) *	ND (0.012)	NT	NT
4-METHYL-2-PENTANONE (MIBK)	0.4		ND (0.026)	ND (0.014)	ND (0.017)	ND (0.015)	ND (0.015)	ND (0.016)	ND (0.018)	ND (0.015)	ND (0.026)	ND (0.61) *	ND (0.023)	NT	NT
NAPHTHALENE	4		ND (0.0053)	ND (0.0071)	ND (0.0034)	ND (0.0029)	0.0095	ND (0.0033)	ND (0.0036)	ND (0.0030)	ND (0.013)	ND (0.12)	ND (0.012)	NT	NT
N-PROPYLBENZENE	100		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
STYRENE	3		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT

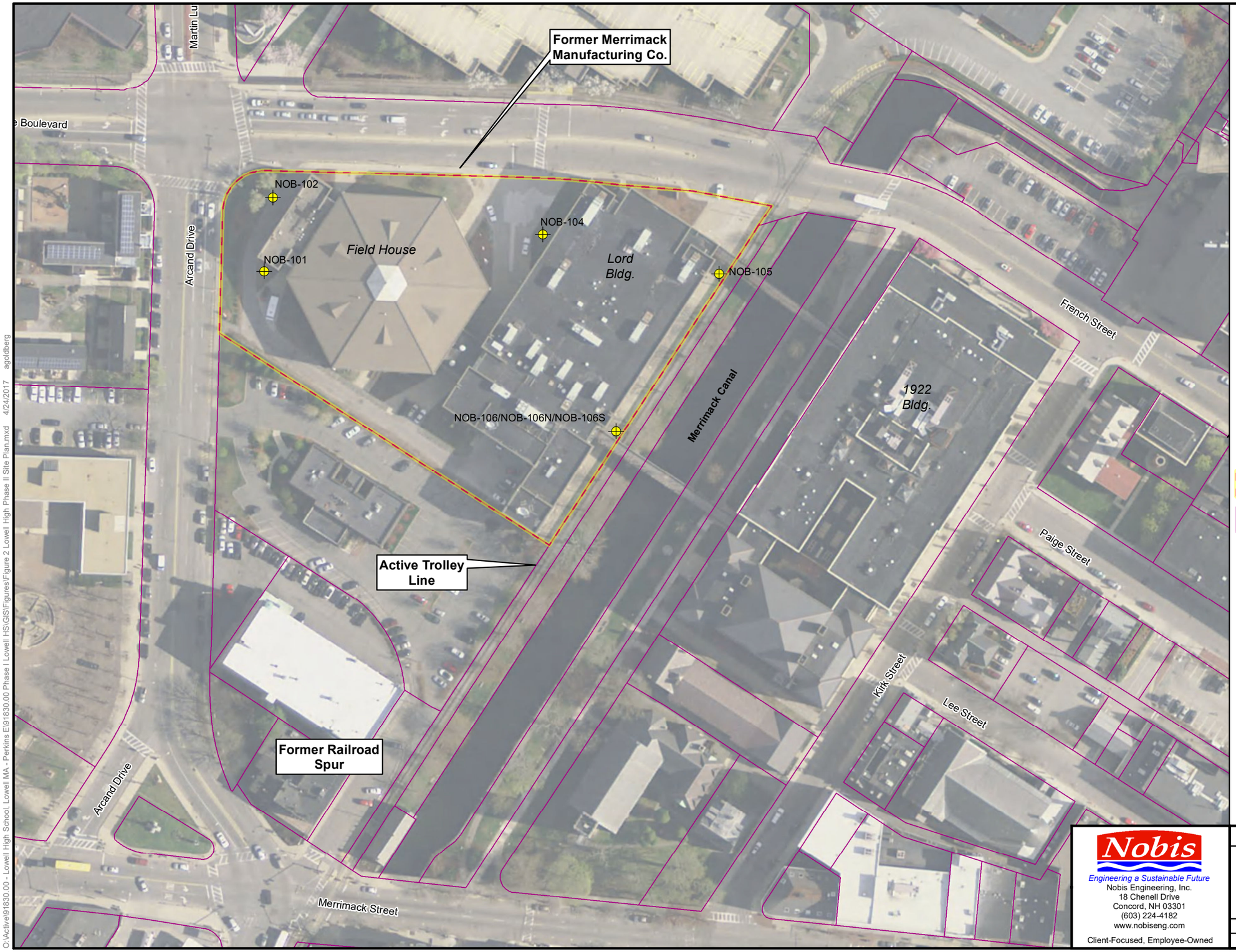
Table 1
Summary of Soil Analytical Results
Lowell High School - 50 Father Morissette Blvd
Lowell, Massachusetts

SAMPLE LOCATION			NOB-101	FD-01	NOB-101	NOB-102	NOB-102	NOB-104	NOB-104	NOB-105	NOB-105	NOB-106	NOB-106	NOB-106N	NOB-106S
SAMPLE DATE			3/29/2017	3/29/2017	3/29/2017	3/29/2017	3/29/2017	3/29/2017	3/29/2017	3/29/2017	3/29/2017	3/29/2017	3/29/2017	4/11/2017	4/11/2017
SAMPLE DEPTH (feet bgs)			0-2 Feet	0-2 Feet	6-8 Feet	0-2 Feet	7-8 Feet	0-2 Feet	5-5.5 Feet	0-2 Feet	11-12 Feet	0-2 Feet	4-5 Feet	0-1 Foot	0-1 Foot
	RCS-1	**IH**													
SW-846 8260C (mg/Kg wet)															
1,1,1,2-TETRACHLOROETHANE	0.1		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
1,1,2,2-TETRACHLOROETHANE	0.005		ND (0.0053) *	ND (0.00071)	ND (0.0034)	ND (0.0029)	ND (0.0031)	ND (0.0033)	ND (0.0018)	ND (0.0030)	ND (0.0013)	ND (0.030) *	ND (0.0012)	NT	NT
TETRACHLOROETHYLENE	1		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
TETRAHYDROFURAN	500		ND (0.013)	ND (0.0071)	ND (0.0086)	ND (0.0073)	ND (0.0076)	ND (0.0082)	ND (0.0090)	ND (0.0075)	ND (0.013)	ND (0.24)	ND (0.012)	NT	NT
TOLUENE	30		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
1,2,3-TRICHLOROBENZENE	~		ND (0.0026)	ND (0.0071)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.013)	ND (0.24)	ND (0.012)	NT	NT
1,2,4-TRICHLOROBENZENE	2		ND (0.0026)	ND (0.0071)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.013)	ND (0.061)	ND (0.012)	NT	NT
1,1,1-TRICHLOROETHANE	30		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
1,1,2-TRICHLOROETHANE	0.1		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
TRICHLOROETHYLENE	0.3		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
TRICHLOROFLUOROMETHANE	1000		ND (0.013)	ND (0.0071)	ND (0.0086)	ND (0.0073)	ND (0.0076)	ND (0.0082)	ND (0.0090)	ND (0.0075)	ND (0.013)	ND (0.12)	ND (0.012)	NT	NT
1,2,3-TRICHLOROPROPANE	100		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.12)	ND (0.0023)	NT	NT
1,2,4-TRIMETHYLBENZENE	1000		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
1,3,5-TRIMETHYLBENZENE	10		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
VINYL CHLORIDE	0.7		ND (0.013)	ND (0.0071)	ND (0.0086)	ND (0.0073)	ND (0.0076)	ND (0.0082)	ND (0.0090)	ND (0.0075)	ND (0.013)	ND (0.12)	ND (0.012)	NT	NT
M/P-XYLENE	100		ND (0.0053)	ND (0.0028)	ND (0.0034)	ND (0.0029)	ND (0.0031)	ND (0.0033)	ND (0.0036)	ND (0.0030)	ND (0.0052)	ND (0.12)	ND (0.0047)	NT	NT
O-XYLENE	100		ND (0.0026)	ND (0.0014)	ND (0.0017)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0018)	ND (0.0015)	ND (0.0026)	ND (0.061)	ND (0.0023)	NT	NT
SM 2540G (% Wt)															
% Solids	~		89.9	90.8	84.6	90.6	90.7	88.8	91.3	89.7	63.1	86.0	87.3	90.7	89.3

NOTES:
1. RCS-1 = Reportable Concentrations for Category S-1 Soil
2. RCS-2 = Reportable Concentrations for Category S-2 Soil
3. IH = Imminent Hazard Threshold established in Section 310 CMR 40.0321 of the MCP.
4. An asterisk (*) following a detection limit indicates that the minimum laboratory reporting limit exceeds one or more of the regulatory criteria.
5. ND = Not detected above the lab reporting limits shown in parenthesis.
6. NT = Not tested.
7. ~ = No RCS-1 available
8. Shaded values exceed the applicable MCP Reportable Concentrations (RCs).
9. Black shaded values exceed the Imminent Hazard threshold and meet the other criteria for Imminent Hazard.

FIGURES


SITE
Dracut
Townhall
Radio Tower (WCAP)
Pawtucketville
Centralville
Christian Hill
Belvidere
LOWELL
Highlands
Hovey Square
Hovey Field
Pumping Sta
McPherson Playground
Gage Park
St Louis Field
Ouellette Bridge
Technological Institute
Flood Control Station
Reservoirs
Pawtucket Dam
Pawtucket NORTHERN CANAL
Franco American Hosp
St Josephs Boys Sch
Lowell Trade High Sch
Central Bridge
Gaging Sta
Hunts Falls Bridge
St Johns Hosp
YWCA
YMCA
Fire Sta
Police Dept
City Hall
Library
Immaculate Conception Sch
Kittredge Park
Barnett Sch
Hellenic American Sch
State Teachers College
Washington Park
School St Cem
Armory
Rogers Sch
Keith Academy
South Common
Colburn Sch
Holy Trinity Sch
Moody Sch
Rogers Hall Sch
Reservoir
Fort Hill Park
Shedd Park
Playground
Butler Sch
Cardinal O'Connell
Lincoln Sch
Molloy Sch
Morey Sch
Fine St Sch
Parker Ave Sch
Goodhue Sch
St Theresa Sch
Hamblett Cem
Hildreth Cem
St Jeanne D'Arc Sch
Pawtucket Sch
Greenhalge Sch
St Louis Sch
St Michaels Sch
Varnum Sch
St Josephs Sch
St Patricks Sch
Pond St Sch
James St Sch
St Peters Sch
Eliot Sch
Gaging Sta
Central Sch
Pawtucket
Broadway
Middlesex
Church
Merrimack
Andover
Nesmith
Mansur
Wentworth
Rogers
Concord
Gorham
Central
Lawrence
Howard
Liberty
Stevens
Foster
Lesex
Wilder
Walker
Dutton
Fletcher
Mt Vernon
School
Canal
Meadow
Connector
Bridge
Beacon
Christian
Methuen
Jewett
West
Lakeview
Orleans
Dalton
Willard
Luolam
Riverside
Boundary
Martin
Pleasant
Parker
Woodward
Mt Hope
Fairmount
Sherman
Berry
Hovey
Smith
Powell
Hale
Shaw
Pine
Stafford
Broadway
Peppermint
Playground
Fire Sta
PO
BM 102
BM 99
BM
Falls
River
Brook
Hill
Ave
St
Rd
Pl
Ln
Dr
Ct
Cir
Sq
Bridge
Common
Cem
Sch
Hosp
Sta
Park
Dept
Hall
Reservoir
Playground
Flood Control Station
Map Location
USGS Topographic Map
Lowell, Mass.
Revised 1987
0 500 1,000 2,000
Feet 1 inch = 2,000 feet
N
Nobis
Engineering a Sustainable Future
Nobis Engineering, Inc.
585 Middlesex Street
Lowell, MA 01851
T(978) 683-0891
www.nobiseng.com
Client-Focused, Employee-Owned
FIGURE 1
LOCUS MAP
LOWELL HIGH SCHOOL
PHASE I INVESTIGATION
LOWELL, MASSACHUSETTS
PREPARED BY: AG
CHECKED BY: EJ
PROJECT NO. 91830.01
DATE: APRIL 2017
Path: O:\Active\91830.00 - Lowell High School, Lowell MA - Perkins E\91830.01 Phase II Lowell HS-Phase I Cawley\GIS\Figures\Figure 1 Locus.mxd
Date Printed: 4/24/2017



Notes:

1. Locations of site features depicted hereon are approximate and given for illustrative purposes only.

Legend

- Existing Soil Borings
- 50 Father Morissette Blv. Parcel
- Parcels

N

0 50 100 200

Feet

1 inch = 100 feet

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FIGURE 2

PHASE II INVESTIGATION
LOWELL HIGH SCHOOL
PHASE I INVESTIGATION
LOWELL, MASSACHUSETTS

PREPARED BY: JH	CHECKED BY: EJ
PROJECT NO. 91830.00	DATE: MARCH 2017

O:\Active\91830.00 - Lowell High School, Lowell MA - Perkins E\91830.00 Phase I Lowell HS\GIS\Figures\Figure 2 Lowell High Phase II Site Plan.mxd 4/24/2017 agoldberg

APPENDIX A

APPENDIX A
LIMITATIONS

1) These environmental services were performed in accordance with generally accepted practices of other consultants undertaking similar assessments at the same time and in the same geographical area. The results of this assessment are based on our professional judgment and are not scientific certainties. Specifically, Nobis Engineering, Inc. does not and cannot represent that the site contains no hazardous wastes, oil or other latent conditions beyond those observed during this assessment. No other warranty, express or implied, is made.

2) The observations and conclusions presented in this report were made solely on the basis of conditions described in the report and not on scientific tasks or procedures beyond the scope of described services or the budgetary and time constraints imposed by the client.

3) Observations were made of the site as indicated in this report. Where access to portions of the site was unavailable or limited, Nobis Engineering, Inc. renders no opinion as to the presence of hazardous wastes or the presence of indirect evidence of hazardous wastes in that portion of the site.

4) No property boundary, site feature or topographic surveys of the site were performed by Nobis Engineering, Inc. unless specifically indicated in the text of the report.

5) No sampling or testing was performed for the presence of dioxins, furans, pesticides, herbicides, radon, lead paint, urea-formaldehyde, asbestos or polychlorinated biphenyls (PCBs) at the site unless specifically indicated in the text of the report.

6) Chemical analyses have been performed for specific parameters during this assessment, as described in the text of the report. Additional chemical constituents not searched for during the current study may be present in soil and/or groundwater at the site. In addition, where such analyses have been conducted by an outside laboratory, Nobis Engineering, Inc. has relied upon the data provided and has not conducted an independent evaluation of the reliability of these data.

7) This report has been prepared for the exclusive use of Perkins Eastman and the City of Lowell solely for use in an environmental evaluation of the site. This report shall not, in whole or in part, be conveyed to any other party, other than Perkins Eastman or the City of Lowell without prior written consent of Nobis Engineering, Inc.

APPENDIX B

BORING LOG

Nobis — Engineering a Sustainable Future

Project: Lowell High School Phase II ESA

Location: 50 Father Morissette Blvd, Lowell, MA

Nobis Project No.: 91830.01

Boring No.: **NOB-101**

Boring Location: See Site Plan

Checked by: S. Vetere

Date Start: March 29, 2017

Date Finish: March 29, 2017

Contractor: Drilex Environmental, Inc.

Driller: T. LaFleche

Nobis Rep.: E. Johnson

Rig Type / Model: Geoprobe 6620DT

Hammer Type: N/A

Hammer Hoist: N/A

Ground Surface Elev.:

Datum:

	Drilling Method	Sampler
Type	Geoprobe	Macro-Core Liners
Size ID (in.)	1 3/4"	1.75 x 60
Advancement	Push	Push

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	LITHOLOGY Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
1							FILL	First 5 feet pre-cleared using vacuum excavation to avoid subsurface utilities. Excavated cuttings observed to be brown, fine to medium SAND, some cobbles, brick, and concrete fragments..	
2									
3									
4									
5									
6	S-1	36	5-10					S-1A (8"): Brown, medium SAND, little Gravel. moist. S-1B (10"): Dark brown/black, fine to medium SAND, some Silt, little Gravel, trace Brick fragments. moist.	
7							/ 6.5	S-1C (18"): Light brown, fine to medium SAND, some Silt. moist. Percentage of silt decreases with increased depth.	
8									
9							SILTY SAND		
10									
11	S-2	52	10-15				/ 11.0	S-2A (12"): Collapse material. S-2B (8"): Light brown/tan/gray, fine SAND, some Silt. wet. Orange banding observed every 2" to 3".	
12								S-2C (32"): Orange brown, fine to medium SAND. wet.	
13							SAND		
14									
15							/ 15.0		
16								Boring terminated at 15 feet.	

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:

1) Samples collected from 0' - 2' and 6' - 8' for laboratory analysis. Shallow sample collected from side of pre-cleared borehole.

Soil descriptions are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

ENVIRONMENTAL LOG - NOBIS GINT DATA TEMPLATE OCT 7 2011.GDT - 3/31/17 15:57 - O:\ACTIVE\91830.00 - LOWELL HIGH SCHOOL, LOWELL MA - PERKINS E\91830.01 PHASE II LOWELL HS-PHASE I CAWLEY\ENVIRONMENTAL\TECHNICAL DATA\91830.01 - BORING

BORING LOG

Nobis — Engineering a Sustainable Future

Project: Lowell High School Phase II ESA

Location: 50 Father Morissette Blvd, Lowell, MA

Nobis Project No.: 91830.01

Boring No.: **NOB-102**

Boring Location: See Site Plan

Checked by: S. Vetere

Date Start: March 29, 2017

Date Finish: March 29, 2017

Contractor: Drilex Environmental, Inc.

Driller: T. LaFleche

Nobis Rep.: E. Johnson

Rig Type / Model: Geoprobe 6620DT

Hammer Type: N/A

Hammer Hoist: N/A

Ground Surface Elev.:

Datum:

	Drilling Method	Sampler
Type	Geoprobe	Macro-Core Liners
Size ID (in.)	1 3/4"	1.75 x 60
Advancement	Push	Push

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	LITHOLOGY Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
1								First 5 feet pre-cleared using vacuum excavation to avoid subsurface utilities. Excavated cuttings observed to be brown, fine to medium SAND.	
2									
3									
4									
5							FILL		
6	S-1	29	5-10					S-1A (22"): Brown/dark brown, fine to coarse SAND, some Gravel, trace Debris (brick, mortar, coal fragments), trace Silt. moist. (FILL).	
7								S-1B (7"): Tan, fine to medium SAND. moist. Well sorted.	
8							/ 8.0		
9									
10									
11	S-2	3	10-15					S-2: Minimal recovery, tan homogeneous fine to medium SAND. wet.	
12							SAND		
13									
14									
15							/ 15.0		
16								Boring terminated at 15 feet.	

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:

1) Samples collected from 0' - 2' and 7' - 8' for laboratory analysis. Shallow sample collected from side of pre-cleared borehole.

Soil descriptions are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

ENVIRONMENTAL LOG - NOBIS GINT DATA TEMPLATE OCT 7 2011.GDT - 3/31/17 15:57 - O:\ACTIVE\91830.00 - LOWELL HIGH SCHOOL, LOWELL MA - PERKINS E\91830.01 PHASE II LOWELL HS-PHASE I CAWLEY\ENVIRONMENTAL\TECHNICAL DATA\91830.01 - BORING

BORING LOG

Nobis — Engineering a Sustainable Future

Project: Lowell High School Phase II ESA

Location: 50 Father Morissette Blvd, Lowell, MA

Nobis Project No.: 91830.01

Boring No.: **NOB-104**

Boring Location: See Site Plan

Checked by: S. Vetere

Date Start: March 29, 2017

Date Finish: March 29, 2017

Contractor: Drilex Environmental, Inc.

Driller: T. LaFleche

Nobis Rep.: E. Johnson

Rig Type / Model: Geoprobe 6620DT

Hammer Type: N/A

Hammer Hoist: N/A

Ground Surface Elev.:

Datum:

	Drilling Method	Sampler
Type	Geoprobe	Macro-Core Liners
Size ID (in.)	1 3/4"	1.75 x 60
Advancement	Push	Push

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	LITHOLOGY Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
1								First 4 feet pre-cleared using vacuum excavation to avoid subsurface utilities. Excavated cuttings observed to be brown, fine to medium SAND. Preclearing terminated prior to 5 feet when gravel/cobbles encountered.	
2									
3							FILL		
4									
5									
6	S-1	12	5-5.5				/ 5.5	S-1A (4"): Collapse material, brown medium Sand. S-1B (8"): Dark brownish gray, fine to coarse SAND and Silt. and Cobbles/Concrete fragments. moist. (FILL). Final 3-4" concrete fragments/dust. Refusal on concrete former slab or foundation. Boring terminated at 5.5 feet.	
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:

1) Samples collected from 0' - 2' and 5' - 5.5' for laboratory analysis. Shallow sample collected from side of pre-cleared borehole.

Soil descriptions are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

ENVIRONMENTAL LOG - NOBIS GINT DATA TEMPLATE OCT 7 2011.GDT - 3/31/17 15:57 - O:\ACTIVE\91830.00 - LOWELL HIGH SCHOOL, LOWELL MA - PERKINS E\91830.01 PHASE II LOWELL HS-PHASE I CAWLEY\ENVIRONMENTAL\TECHNICAL DATA\91830.01 - BORING

BORING LOG

Engineering a Sustainable Future

Project: Lowell High School Phase II ESA

Location: 50 Father Morissette Blvd, Lowell, MA

Nobis Project No.: 91830.01

Boring No.: **NOB-105**

Boring Location: See Site Plan

Checked by: S. Vetere

Date Start: March 29, 2017

Date Finish: March 29, 2017

Contractor: Drilex Environmental, Inc.

Driller: T. LaFleche

Nobis Rep.: E. Johnson

Rig Type / Model: Geoprobe 6620DT

Hammer Type: N/A

Hammer Hoist: N/A

Ground Surface Elev.:

Datum:

	Drilling Method	Sampler
Type	Geoprobe	Macro-Core Liners
Size ID (in.)	1 3/4"	1.75 x 60
Advancement	Push	Push

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	LITHOLOGY Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
1								First 5 feet pre-cleared using vacuum excavation to avoid subsurface utilities. Excavated cuttings observed to be dark brown, fine SAND, some Silt, little medium to coarse Sand, trace Gravel.	
2									
3									
4									
5									
6	S-1	23	5-10				FILL	S-1: Light brown, fine to coarse SAND, little Silt, little Gravel. wet. Two pockets of dark brown/black SILT, potentially organic deposits at 11-12" and 16-18". Gray coarse GRAVEL observed 20"-22".	
7									
8									
9									
10									
11	S-2	29	10-15				SANDY SILT	S-2A (2"): Light brown, fine to coarse SAND, little Silt, little Gravel. S-2B (8"): Dark brown, SILT, little fine Sand, trace Clay, trace Organics. wet. Swamp odor detected. S-2C (19"): Light gray, fine SAND. wet. Well sorted. Iron/orange banding observed.	
12							/ 12.0		
13							SAND		
14									
15							/ 15.0		
16								Boring terminated at 15 feet.	

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:

1) Samples collected from 0' - 2' and 11' - 12' for laboratory analysis. Shallow sample collected from side of pre-cleared borehole.

Soil descriptions are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

ENVIRONMENTAL LOG - NOBIS GINT DATA TEMPLATE OCT 7 2011.GDT - 3/31/17 15:57 - O:\ACTIVE\91830.00 - LOWELL HIGH SCHOOL, LOWELL MA - PERKINS E\91830.01 PHASE II LOWELL HS-PHASE I CAWLEY\ENVIRONMENTAL\TECHNICAL DATA\91830.01 - BORING

BORING LOG

Nobis — Engineering a Sustainable Future

Project: Lowell High School Phase II ESA

Location: 50 Father Morissette Blvd, Lowell, MA

Nobis Project No.: 91830.01

Boring No.: **NOB-106**

Boring Location: See Site Plan

Checked by: S. Vetere

Date Start: March 29, 2017

Date Finish: March 29, 2017

Contractor: Drilex Environmental, Inc.

Driller: T. LaFleche

Nobis Rep.: E. Johnson

Rig Type / Model: Geoprobe 6620DT

Hammer Type: N/A

Hammer Hoist: N/A

Ground Surface Elev.:

Datum:

	Drilling Method	Sampler
Type	Geoprobe	Macro-Core Liners
Size ID (in.)	1 3/4"	1.75 x 60
Advancement	Push	Push

Groundwater Observations

Date	Time	Depth Below Ground (ft.)	Depth of Casing (ft.)	Depth to Bottom of Hole (ft.)	Stabilization Time

Depth (ft.)	SAMPLE INFORMATION Type & No.	Rec (in.)	Depth (ft.)	Blows/ 6 in.	Ground Water	LITHOLOGY Graphic	Stratum Elev. / Depth (ft.)	SAMPLE DESCRIPTION AND REMARKS (Classification System: Modified Burmister)	NOTES
1	S-1	26	0-5					S-1A (7"): Dark brown/black, fine to medium SAND, little Organics (grass), trace Brick fragments, trace Gravel. moist. S-1B (19"): Light brown, fine to coarse SAND, little Gravel, trace Silt. moist. Material becomes wet at approximately 4 feet below grade.	
2									
3									
4							FILL		
5									
6	S-2	36	5-10					S-2A (29"): Light brown with brown lenses, fine to medium SAND, little Silt, little Gravel.	
7									
8							/ 8.0	S-2B (3"): Dark brown/black, SILT. wet. S-2C (4"): Orange, fine SAND and Silt. moist.	
9							ORGANIC DEPOSIT / 8.3		
10							SILTY SAND		
11	S-3	44	10-15				/ 10.5	S-3A (6"): Orange, fine SAND and Silt. moist. S-3B (38"): Light tan, almost white, fine to coarse SAND, little Gravel, trace Silt. wet.	
12									
13							SAND		
14									
15							/ 15.0		
16								Boring terminated at 15 feet.	

Soil	Percentage	Non-Soil
trace	5 - 10	very few
little	10 - 20	few
some	20 - 35	several
and	35 - 50	numerous

NOTES:

1) Samples collected from 0' - 2' and 6' - 8' for laboratory analysis. Shallow sample collected from side of pre-cleared borehole.

Soil descriptions are based on visual classifications and should be considered approximate. Stratification lines are approximate boundaries between stratums; transitions may be gradual.

ENVIRONMENTAL LOG - NOBIS GINT DATA TEMPLATE OCT 7 2011.GDT - 3/31/17 15:57 - O:\ACTIVE\91830.00 - LOWELL HIGH SCHOOL, LOWELL MA - PERKINS E\91830.01 PHASE II LOWELL HS-PHASE I CAWLEY\ENVIRONMENTAL\TECHNICAL DATA\91830.01 - BORING

APPENDIX C

con-test® ANALYTICAL LABORATORY
39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

April 10, 2017

Eric Johnson
Nobis Engineering
585 Middlesex Street
Lowell, MA 01851

Project Location: Lowell, MA
Client Job Number:
Project Number: 91830.01
Laboratory Work Order Number: 17C1191

Enclosed are results of analyses for samples received by the laboratory on March 30, 2017. If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Meghan E. Kelley
Project Manager

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Nobis Engineering
585 Middlesex Street
Lowell, MA 01851
ATTN: Eric Johnson

REPORT DATE: 4/10/2017

PURCHASE ORDER NUMBER: MO 16-008

PROJECT NUMBER: 91830.01

ANALYTICAL SUMMARY

WORK ORDER NUMBER: 17C1191

The results of analyses performed on the following samples submitted to the CON-TEST Analytical Laboratory are found in this report.

PROJECT LOCATION: Lowell, MA

FIELD SAMPLE #	LAB ID:	MATRIX	SAMPLE DESCRIPTION	TEST	SUB LAB
NOB-101 0-2	17C1191-01	Soil		MADEP-EPH-04-1.1	
				MADEP-VPH-04-1.1	
				SM 2540G	
				SW-846 6010C-D	
				SW-846 7471B	
				SW-846 8260C	
NOB-101 6-8	17C1191-02	Soil		MADEP-EPH-04-1.1	
				MADEP-VPH-04-1.1	
				SM 2540G	
				SW-846 6010C-D	
				SW-846 7471B	
				SW-846 8260C	
NOB-102 0-2	17C1191-03	Soil		MADEP-EPH-04-1.1	
				MADEP-VPH-04-1.1	
				SM 2540G	
				SW-846 6010C-D	
				SW-846 7471B	
				SW-846 8260C	
NOB-102 7-8	17C1191-04	Soil		MADEP-EPH-04-1.1	
				MADEP-VPH-04-1.1	
				SM 2540G	
				SW-846 6010C-D	
				SW-846 7471B	
				SW-846 8260C	
NOB-104 0-2	17C1191-05	Soil		MADEP-EPH-04-1.1	
				MADEP-VPH-04-1.1	
				SM 2540G	
				SW-846 6010C-D	
				SW-846 7471B	
				SW-846 8260C	
NOB-104 5-5.5	17C1191-06	Soil		MADEP-EPH-04-1.1	
				MADEP-VPH-04-1.1	
				SM 2540G	
				SW-846 6010C-D	
				SW-846 7471B	
				SW-846 8260C	

con-test® ANALYTICAL LABORATORY
39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Nobis Engineering
585 Middlesex Street
Lowell, MA 01851
ATTN: Eric Johnson

REPORT DATE: 4/10/2017

PURCHASE ORDER NUMBER: MO 16-008

PROJECT NUMBER: 91830.01

ANALYTICAL SUMMARY

WORK ORDER NUMBER: 17C1191

The results of analyses performed on the following samples submitted to the CON-TEST Analytical Laboratory are found in this report.

PROJECT LOCATION: Lowell, MA

FIELD SAMPLE #	LAB ID:	MATRIX	SAMPLE DESCRIPTION	TEST	SUB LAB
NOB-105 0-2	17C1191-07	Soil		MADEP-EPH-04-1.1	
				MADEP-VPH-04-1.1	
				SM 2540G	
				SW-846 6010C-D	
				SW-846 7471B	
				SW-846 8260C	
NOB-105 11-12	17C1191-08	Soil		MADEP-EPH-04-1.1	
				MADEP-VPH-04-1.1	
				SM 2540G	
				SW-846 6010C-D	
				SW-846 7471B	
				SW-846 8260C	
NOB-106 0-2	17C1191-09	Soil		MADEP-EPH-04-1.1	
				MADEP-VPH-04-1.1	
				SM 2540G	
				SW-846 6010C-D	
				SW-846 7471B	
				SW-846 8260C	
NOB-106 4-5	17C1191-10	Soil		MADEP-EPH-04-1.1	
				MADEP-VPH-04-1.1	
				SM 2540G	
				SW-846 6010C-D	
				SW-846 7471B	
				SW-846 8260C	
FD-01	17C1191-11	Soil		MADEP-EPH-04-1.1	
				MADEP-VPH-04-1.1	
				SM 2540G	
				SW-846 6010C-D	
				SW-846 7471B	
				SW-846 8260C	
TB-01	17C1191-12	Trip Blank Soil		SW-846 8260C	

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

CASE NARRATIVE SUMMARY

All reported results are within defined laboratory quality control objectives unless listed below or otherwise qualified in this report.

For method MA VPH, only hydrocarbon ranges were requested and reported.

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MADEP-VPH-04-1.1

Qualifications:

O-01

Soil/methanol ratio does not meet method specifications. Excess amount of soil. Sample was completely covered with methanol, but with less than the method-specified amount.

Analyte & Samples(s) Qualified:

17C1191-01[NOB-101 0-2], 17C1191-03[NOB-102 0-2], 17C1191-04[NOB-102 7-8], 17C1191-05[NOB-104 0-2], 17C1191-07[NOB-105 0-2], 17C1191-08[NOB-105 11-12], 17C1191-09[NOB-106 0-2], 17C1191-10[NOB-106 4-5], 17C1191-11[FD-01]

SW-846 6010C-D

Qualifications:

MS-19

Sample to spike ratio is greater than or equal to 4:1. Spiked amount is not representative of the native amount in the sample. Appropriate or meaningful recoveries cannot be calculated.

Analyte & Samples(s) Qualified:

Barium

17C1191-06[NOB-104 5-5.5], B173743-MS1

Lead

17C1191-06[NOB-104 5-5.5], B173743-MS1

SW-846 7471B

Qualifications:

R-02

Duplicate RPD is outside of control limits. Outlier can be attributed to sample non-homogeneity encountered during sample prep.

Analyte & Samples(s) Qualified:

Mercury

17C1191-09[NOB-106 0-2], B173810-DUP1

SW-846 8260C

Qualifications:

L-07

Either laboratory fortified blank/laboratory control sample or duplicate recovery is outside of control limits, but the other is within limits. RPD between the two LFB/LCS results is within method specified criteria.

Analyte & Samples(s) Qualified:

Bromochloromethane

B173594-BSD1

Hexachlorobutadiene

B173594-BSD1

Isopropylbenzene (Cumene)

B173524-BSD1, B173594-BSD1

sec-Butylbenzene

B173594-BSD1

Vinyl Chloride

B173532-BSD1

R-05

Laboratory fortified blank duplicate RPD is outside of control limits. Reduced precision is anticipated for any reported value for this compound.

Analyte & Samples(s) Qualified:

1,4-Dioxane

17C1191-08[NOB-105 11-12], 17C1191-10[NOB-106 4-5], 17C1191-11[FD-01], 17C1191-12[TB-01], B173635-BLK1, B173635-BS1, B173635-BSD1

Chloroethane

17C1191-01[NOB-101 0-2], 17C1191-02[NOB-101 6-8], 17C1191-03[NOB-102 0-2], 17C1191-04[NOB-102 7-8], 17C1191-05[NOB-104 0-2], 17C1191-07[NOB-105 0-2], B173524-BLK1, B173524-BS1, B173524-BSD1

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RL-07

Elevated reporting limit based on lowest point in calibration.
MA CAM reporting limit not met.

Analyte & Samples(s) Qualified:

Bromomethane
17C1191-09[NOB-106 0-2]

Carbon Disulfide
17C1191-09[NOB-106 0-2]

Methylene Chloride
17C1191-09[NOB-106 0-2]

V-05

Continuing calibration did not meet method specifications and was biased on the low side for this compound. Increased uncertainty is associated with the reported value which is likely to be biased on the low side.

Analyte & Samples(s) Qualified:

1,1,1,2-Tetrachloroethane
17C1191-08[NOB-105 11-12], 17C1191-10[NOB-106 4-5], 17C1191-11[FD-01], 17C1191-12[TB-01], B173635-BLK1, B173635-BS1, B173635-BSD1

1,2-Dibromo-3-chloropropane (DB
17C1191-01[NOB-101 0-2], 17C1191-02[NOB-101 6-8], 17C1191-03[NOB-102 0-2], 17C1191-04[NOB-102 7-8], 17C1191-05[NOB-104 0-2], 17C1191-07[NOB-105 0-2], B173524-BLK1, B173524-BS1, B173524-BSD1

Bromoform
17C1191-08[NOB-105 11-12], 17C1191-10[NOB-106 4-5], 17C1191-11[FD-01], 17C1191-12[TB-01], B173635-BLK1, B173635-BS1, B173635-BSD1

Chlorodibromomethane
17C1191-08[NOB-105 11-12], 17C1191-10[NOB-106 4-5], 17C1191-11[FD-01], 17C1191-12[TB-01], B173635-BLK1, B173635-BS1, B173635-BSD1

Naphthalene
17C1191-01[NOB-101 0-2], 17C1191-02[NOB-101 6-8], 17C1191-03[NOB-102 0-2], 17C1191-04[NOB-102 7-8], 17C1191-05[NOB-104 0-2], 17C1191-07[NOB-105 0-2], B173524-BLK1, B173524-BS1, B173524-BSD1

V-16

Response factor is less than method specified minimum acceptable value. Reduced precision and accuracy may be associated with reported result.

Analyte & Samples(s) Qualified:

1,4-Dioxane
17C1191-01[NOB-101 0-2], 17C1191-02[NOB-101 6-8], 17C1191-03[NOB-102 0-2], 17C1191-04[NOB-102 7-8], 17C1191-05[NOB-104 0-2], 17C1191-06[NOB-104 5-5.5], 17C1191-07[NOB-105 0-2], 17C1191-08[NOB-105 11-12], 17C1191-09[NOB-106 0-2], 17C1191-10[NOB-106 4-5], 17C1191-11[FD-01], 17C1191-12[TB-01], B173524-BLK1, B173524-BS1, B173524-BSD1, B173532-BLK1, B173532-BS1, B173532-BSD1, B173594-BLK1, B173594-BS1, B173594-BSD1, B173635-BLK1, B173635-BS1, B173635-BSD1

Tetrahydrofuran
17C1191-01[NOB-101 0-2], 17C1191-02[NOB-101 6-8], 17C1191-03[NOB-102 0-2], 17C1191-04[NOB-102 7-8], 17C1191-05[NOB-104 0-2], 17C1191-06[NOB-104 5-5.5], 17C1191-07[NOB-105 0-2], B173524-BLK1, B173524-BS1, B173524-BSD1, B173594-BLK1, B173594-BS1, B173594-BSD1

V-20

Continuing calibration did not meet method specifications and was biased on the high side. Data validation is not affected since sample result was "not detected" for this compound.

Analyte & Samples(s) Qualified:

Acetone
B173594-BS1, B173594-BSD1

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MADEP-EPH-04-1.1

SPE cartridge contamination with non-petroleum compounds, if present, is verified by GC/MS in each method blank per extraction batch and excluded from C11-C22 aromatic range fraction in all samples in the batch. No significant modifications were made to the method.

MADEP-VPH-04-1.1

No significant modifications were made to the method. All VPH samples were received preserved properly in methanol with a soil/methanol ratio of 1:1 +/- 25% completely covered by methanol in the proper containers specified on the chain-of-custody form unless specified in this narrative.

SW-846 6010C/D SW-846 6020A/B

For NC, Metals methods SW-846 6010D and SW-846 6020B are followed, and for all other states methods SW-846 6010C and SW-846 6020A are followed.

SW-846 8260C

Laboratory control sample recoveries for required MCP Data Enhancement 8260 compounds were all within limits specified by the method except for “difficult analytes” where recovery control limits of 40-160% are used and/or unless otherwise listed in this narrative. Difficult analytes: MIBK, MEK, acetone, 1,4-dioxane, chloromethane, dichlorodifluoromethane, 2-hexanone, and bromomethane.

The results of analyses reported only relate to samples submitted to the Con-Test Analytical Laboratory for testing.
I certify that the analyses listed above, unless specifically listed as subcontracted, if any, were performed under my direction according to the approved methodologies listed in this document, and that based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.



Lisa A. Worthington
Project Manager

con-test® ANALYTICAL LABORATORY
39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-101 0-2 | Sampled: 3/29/2017 12:15

Sample ID: 17C1191-01

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acetone	ND	0.13	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
tert-Amyl Methyl Ether (TAME)	ND	0.0013	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Benzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Bromobenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Bromochloromethane	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Bromodichloromethane	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Bromoform	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Bromomethane	ND	0.013	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
2-Butanone (MEK)	ND	0.053	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
n-Butylbenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
sec-Butylbenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
tert-Butylbenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
tert-Butyl Ethyl Ether (TBEE)	ND	0.0013	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Carbon Disulfide	ND	0.0079	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Carbon Tetrachloride	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Chlorobenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Chlorodibromomethane	ND	0.0013	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Chloroethane	ND	0.013	mg/Kg dry	1	R-05	SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Chloroform	ND	0.0053	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Chloromethane	ND	0.013	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
2-Chlorotoluene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
4-Chlorotoluene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0026	mg/Kg dry	1	V-05	SW-846 8260C	3/31/17	3/31/17 13:42	MFF
1,2-Dibromoethane (EDB)	ND	0.0013	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Dibromomethane	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
1,2-Dichlorobenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
1,3-Dichlorobenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
1,4-Dichlorobenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Dichlorodifluoromethane (Freon 12)	ND	0.013	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
1,1-Dichloroethane	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
1,2-Dichloroethane	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
1,1-Dichloroethylene	ND	0.0053	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
cis-1,2-Dichloroethylene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
trans-1,2-Dichloroethylene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
1,2-Dichloropropane	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
1,3-Dichloropropane	ND	0.0013	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
2,2-Dichloropropane	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
1,1-Dichloropropene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
cis-1,3-Dichloropropene	ND	0.0013	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
trans-1,3-Dichloropropene	ND	0.0013	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Diethyl Ether	ND	0.013	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Diisopropyl Ether (DIPE)	ND	0.0013	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
1,4-Dioxane	ND	0.26	mg/Kg dry	1	V-16	SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Ethylbenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-101 0-2 | Sampled: 3/29/2017 12:15

Sample ID: 17C1191-01

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Hexachlorobutadiene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
2-Hexanone (MBK)	ND	0.026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Isopropylbenzene (Cumene)	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
p-Isopropyltoluene (p-Cymene)	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Methyl tert-Butyl Ether (MTBE)	ND	0.0053	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Methylene Chloride	ND	0.013	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
4-Methyl-2-pentanone (MIBK)	ND	0.026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Naphthalene	ND	0.0053	mg/Kg dry	1	V-05	SW-846 8260C	3/31/17	3/31/17 13:42	MFF
n-Propylbenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Styrene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
1,1,1,2-Tetrachloroethane	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
1,1,2,2-Tetrachloroethane	ND	0.0053	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Tetrachloroethylene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Tetrahydrofuran	ND	0.013	mg/Kg dry	1	V-16	SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Toluene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
1,2,3-Trichlorobenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
1,2,4-Trichlorobenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
1,1,1-Trichloroethane	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
1,1,2-Trichloroethane	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Trichloroethylene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Trichlorofluoromethane (Freon 11)	ND	0.013	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
1,2,3-Trichloropropane	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
1,2,4-Trimethylbenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
1,3,5-Trimethylbenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
Vinyl Chloride	ND	0.013	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
m+p Xylene	ND	0.0053	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF
o-Xylene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 13:42	MFF

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
1,2-Dichloroethane-d4	99.9	70-130		3/31/17 13:42
Toluene-d8	107	70-130		3/31/17 13:42
4-Bromofluorobenzene	102	70-130		3/31/17 13:42

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-101 0-2 | Sampled: 3/29/2017 12:15

Sample ID: 17C1191-01

Sample Matrix: Soil

Petroleum Hydrocarbons Analyses - EPH

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
C9-C18 Aliphatics	ND	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/5/17 23:49	SCS
C19-C36 Aliphatics	28	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/5/17 23:49	SCS
Unadjusted C11-C22 Aromatics	31	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/5/17 23:49	SCS
C11-C22 Aromatics	27	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/5/17 23:49	SCS
Acenaphthene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/5/17 23:49	SCS
Acenaphthylene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/5/17 23:49	SCS
Anthracene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/5/17 23:49	SCS
Benzo(a)anthracene	0.24	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/5/17 23:49	SCS
Benzo(a)pyrene	0.34	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/5/17 23:49	SCS
Benzo(b)fluoranthene	0.35	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/5/17 23:49	SCS
Benzo(g,h,i)perylene	0.25	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/5/17 23:49	SCS
Benzo(k)fluoranthene	0.12	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/5/17 23:49	SCS
Chrysene	0.30	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/5/17 23:49	SCS
Dibenz(a,h)anthracene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/5/17 23:49	SCS
Fluoranthene	0.57	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/5/17 23:49	SCS
Fluorene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/5/17 23:49	SCS
Indeno(1,2,3-cd)pyrene	0.16	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/5/17 23:49	SCS
2-Methylnaphthalene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/5/17 23:49	SCS
Naphthalene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/5/17 23:49	SCS
Phenanthrene	0.37	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/5/17 23:49	SCS
Pyrene	0.58	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/5/17 23:49	SCS

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
Chlorooctadecane (COD)	55.5	40-140		4/5/17 23:49
o-Terphenyl (OTP)	69.8	40-140		4/5/17 23:49
2-Bromonaphthalene	79.8	40-140		4/5/17 23:49
2-Fluorobiphenyl	82.8	40-140		4/5/17 23:49

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-101 0-2 | Sampled: 3/29/2017 12:15

Sample ID: 17C1191-01

Sample Matrix: Soil

Sample Flags: O-01

Soil/Methanol Preservation Ratio: 1.37

Petroleum Hydrocarbons Analyses - VPH

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Unadjusted C5-C8 Aliphatics	ND	9.3	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 16:48	EEH
C5-C8 Aliphatics	ND	9.3	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 16:48	EEH
Unadjusted C9-C12 Aliphatics	ND	9.3	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 16:48	EEH
C9-C12 Aliphatics	ND	9.3	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 16:48	EEH
C9-C10 Aromatics	ND	9.3	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 16:48	EEH

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
2,5-Dibromotoluene (FID)	91.3	70-130		4/4/17 16:48
2,5-Dibromotoluene (PID)	82.2	70-130		4/4/17 16:48

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-101 0-2 | Sampled: 3/29/2017 12:15

Sample ID: 17C1191-01

Sample Matrix: Soil

Metals Analyses (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Antimony	ND	2.6	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:16	QNW
Arsenic	8.4	2.6	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:16	QNW
Barium	41	2.6	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:16	QNW
Beryllium	0.40	0.26	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:16	QNW
Cadmium	0.37	0.26	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:16	QNW
Chromium	15	0.51	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:16	QNW
Lead	73	0.77	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:16	QNW
Mercury	0.040	0.027	mg/Kg dry	1		SW-846 7471B	4/6/17	4/7/17 9:35	TJK
Nickel	11	0.51	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:16	QNW
Selenium	ND	5.1	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:16	QNW
Silver	ND	0.51	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:16	QNW
Thallium	ND	2.6	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:16	QNW
Vanadium	14	1.0	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:16	QNW
Zinc	55	1.0	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:16	QNW

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-101 0-2 | Sampled: 3/29/2017 12:15

Sample ID: 17C1191-01

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	89.9		% Wt	1		SM 2540G	3/31/17	4/3/17 7:52	MRL

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-101 6-8 | Sampled: 3/29/2017 12:00

Sample ID: 17C1191-02

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acetone	ND	0.086	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
tert-Amyl Methyl Ether (TAME)	ND	0.00086	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Benzene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Bromobenzene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Bromochloromethane	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Bromodichloromethane	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Bromoform	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Bromomethane	ND	0.0086	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
2-Butanone (MEK)	ND	0.034	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
n-Butylbenzene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
sec-Butylbenzene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
tert-Butylbenzene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
tert-Butyl Ethyl Ether (TBEE)	ND	0.00086	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Carbon Disulfide	ND	0.0051	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Carbon Tetrachloride	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Chlorobenzene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Chlorodibromomethane	ND	0.00086	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Chloroethane	ND	0.0086	mg/Kg dry	1	R-05	SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Chloroform	ND	0.0034	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Chloromethane	ND	0.0086	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
2-Chlorotoluene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
4-Chlorotoluene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0017	mg/Kg dry	1	V-05	SW-846 8260C	3/31/17	3/31/17 14:10	MFF
1,2-Dibromoethane (EDB)	ND	0.00086	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Dibromomethane	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
1,2-Dichlorobenzene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
1,3-Dichlorobenzene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
1,4-Dichlorobenzene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Dichlorodifluoromethane (Freon 12)	ND	0.0086	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
1,1-Dichloroethane	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
1,2-Dichloroethane	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
1,1-Dichloroethylene	ND	0.0034	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
cis-1,2-Dichloroethylene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
trans-1,2-Dichloroethylene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
1,2-Dichloropropane	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
1,3-Dichloropropane	ND	0.00086	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
2,2-Dichloropropane	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
1,1-Dichloropropene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
cis-1,3-Dichloropropene	ND	0.00086	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
trans-1,3-Dichloropropene	ND	0.00086	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Diethyl Ether	ND	0.0086	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Diisopropyl Ether (DIPE)	ND	0.00086	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
1,4-Dioxane	ND	0.17	mg/Kg dry	1	V-16	SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Ethylbenzene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF

con-test® ANALYTICAL LABORATORY
39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-101 6-8 | Sampled: 3/29/2017 12:00

Sample ID: 17C1191-02

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Hexachlorobutadiene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
2-Hexanone (MBK)	ND	0.017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Isopropylbenzene (Cumene)	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
p-Isopropyltoluene (p-Cymene)	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Methyl tert-Butyl Ether (MTBE)	ND	0.0034	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Methylene Chloride	ND	0.0086	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
4-Methyl-2-pentanone (MIBK)	ND	0.017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Naphthalene	ND	0.0034	mg/Kg dry	1	V-05	SW-846 8260C	3/31/17	3/31/17 14:10	MFF
n-Propylbenzene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Styrene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
1,1,1,2-Tetrachloroethane	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
1,1,2,2-Tetrachloroethane	ND	0.0034	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Tetrachloroethylene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Tetrahydrofuran	ND	0.0086	mg/Kg dry	1	V-16	SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Toluene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
1,2,3-Trichlorobenzene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
1,2,4-Trichlorobenzene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
1,1,1-Trichloroethane	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
1,1,2-Trichloroethane	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Trichloroethylene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Trichlorofluoromethane (Freon 11)	ND	0.0086	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
1,2,3-Trichloropropane	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
1,2,4-Trimethylbenzene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
1,3,5-Trimethylbenzene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
Vinyl Chloride	ND	0.0086	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
m+p Xylene	ND	0.0034	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF
o-Xylene	ND	0.0017	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:10	MFF

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
1,2-Dichloroethane-d4	99.5	70-130		3/31/17 14:10
Toluene-d8	105	70-130		3/31/17 14:10
4-Bromofluorobenzene	96.9	70-130		3/31/17 14:10

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-101 6-8 | Sampled: 3/29/2017 12:00

Sample ID: 17C1191-02

Sample Matrix: Soil

Petroleum Hydrocarbons Analyses - EPH

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
C9-C18 Aliphatics	ND	12	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:09	SCS
C19-C36 Aliphatics	24	12	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:09	SCS
Unadjusted C11-C22 Aromatics	21	12	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:09	SCS
C11-C22 Aromatics	19	12	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:09	SCS
Acenaphthene	ND	0.12	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:09	SCS
Acenaphthylene	ND	0.12	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:09	SCS
Anthracene	ND	0.12	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:09	SCS
Benzo(a)anthracene	0.15	0.12	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:09	SCS
Benzo(a)pyrene	0.14	0.12	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:09	SCS
Benzo(b)fluoranthene	0.20	0.12	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:09	SCS
Benzo(g,h,i)perylene	1.3	0.12	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:09	SCS
Benzo(k)fluoranthene	ND	0.12	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:09	SCS
Chrysene	0.18	0.12	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:09	SCS
Dibenz(a,h)anthracene	ND	0.12	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:09	SCS
Fluoranthene	0.34	0.12	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:09	SCS
Fluorene	ND	0.12	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:09	SCS
Indeno(1,2,3-cd)pyrene	ND	0.12	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:09	SCS
2-Methylnaphthalene	ND	0.12	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:09	SCS
Naphthalene	ND	0.12	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:09	SCS
Phenanthrene	0.23	0.12	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:09	SCS
Pyrene	0.35	0.12	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:09	SCS

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
Chlorooctadecane (COD)	43.1	40-140		4/6/17 0:09
o-Terphenyl (OTP)	48.9	40-140		4/6/17 0:09
2-Bromonaphthalene	82.4	40-140		4/6/17 0:09
2-Fluorobiphenyl	86.9	40-140		4/6/17 0:09

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-101 6-8 | Sampled: 3/29/2017 12:00

Sample ID: 17C1191-02

Sample Matrix: Soil

Petroleum Hydrocarbons Analyses - VPH

Soil/Methanol Preservation Ratio: 1.09

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Unadjusted C5-C8 Aliphatics	ND	13	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 17:17	EEH
C5-C8 Aliphatics	ND	13	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 17:17	EEH
Unadjusted C9-C12 Aliphatics	ND	13	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 17:17	EEH
C9-C12 Aliphatics	ND	13	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 17:17	EEH
C9-C10 Aromatics	ND	13	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 17:17	EEH

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
2,5-Dibromotoluene (FID)	102	70-130		4/4/17 17:17
2,5-Dibromotoluene (PID)	93.3	70-130		4/4/17 17:17

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-101 6-8 | Sampled: 3/29/2017 12:00

Sample ID: 17C1191-02

Sample Matrix: Soil

Metals Analyses (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Antimony	ND	2.9	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:21	QNW
Arsenic	6.4	2.9	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:21	QNW
Barium	49	2.9	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:21	QNW
Beryllium	0.56	0.29	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:21	QNW
Cadmium	0.30	0.29	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:21	QNW
Chromium	10	0.58	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:21	QNW
Lead	79	0.86	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:21	QNW
Mercury	0.074	0.029	mg/Kg dry	1		SW-846 7471B	4/6/17	4/7/17 9:37	TJK
Nickel	6.1	0.58	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:21	QNW
Selenium	ND	5.8	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:21	QNW
Silver	ND	0.58	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:21	QNW
Thallium	ND	2.9	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:21	QNW
Vanadium	13	1.2	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:21	QNW
Zinc	43	1.2	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:21	QNW

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-101 6-8 | Sampled: 3/29/2017 12:00

Sample ID: 17C1191-02

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	84.6		% Wt	1		SM 2540G	3/31/17	4/3/17 7:52	MRL

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-102 0-2 | Sampled: 3/29/2017 10:35

Sample ID: 17C1191-03

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acetone	ND	0.073	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
tert-Amyl Methyl Ether (TAME)	ND	0.00073	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Benzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Bromobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Bromochloromethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Bromodichloromethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Bromoform	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Bromomethane	ND	0.0073	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
2-Butanone (MEK)	ND	0.029	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
n-Butylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
sec-Butylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
tert-Butylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
tert-Butyl Ethyl Ether (TBEE)	ND	0.00073	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Carbon Disulfide	ND	0.0044	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Carbon Tetrachloride	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Chlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Chlorodibromomethane	ND	0.00073	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Chloroethane	ND	0.0073	mg/Kg dry	1	R-05	SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Chloroform	ND	0.0029	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Chloromethane	ND	0.0073	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
2-Chlorotoluene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
4-Chlorotoluene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0015	mg/Kg dry	1	V-05	SW-846 8260C	3/31/17	3/31/17 14:38	MFF
1,2-Dibromoethane (EDB)	ND	0.00073	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Dibromomethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
1,2-Dichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
1,3-Dichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
1,4-Dichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Dichlorodifluoromethane (Freon 12)	ND	0.0073	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
1,1-Dichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
1,2-Dichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
1,1-Dichloroethylene	ND	0.0029	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
cis-1,2-Dichloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
trans-1,2-Dichloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
1,2-Dichloropropane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
1,3-Dichloropropane	ND	0.00073	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
2,2-Dichloropropane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
1,1-Dichloropropene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
cis-1,3-Dichloropropene	ND	0.00073	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
trans-1,3-Dichloropropene	ND	0.00073	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Diethyl Ether	ND	0.0073	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Diisopropyl Ether (DIPE)	ND	0.00073	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
1,4-Dioxane	ND	0.15	mg/Kg dry	1	V-16	SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Ethylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-102 0-2 | Sampled: 3/29/2017 10:35

Sample ID: 17C1191-03

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Hexachlorobutadiene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
2-Hexanone (MBK)	ND	0.015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Isopropylbenzene (Cumene)	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
p-Isopropyltoluene (p-Cymene)	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Methyl tert-Butyl Ether (MTBE)	ND	0.0029	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Methylene Chloride	ND	0.0073	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
4-Methyl-2-pentanone (MIBK)	ND	0.015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Naphthalene	ND	0.0029	mg/Kg dry	1	V-05	SW-846 8260C	3/31/17	3/31/17 14:38	MFF
n-Propylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Styrene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
1,1,1,2-Tetrachloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
1,1,2,2-Tetrachloroethane	ND	0.0029	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Tetrachloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Tetrahydrofuran	ND	0.0073	mg/Kg dry	1	V-16	SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Toluene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
1,2,3-Trichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
1,2,4-Trichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
1,1,1-Trichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
1,1,2-Trichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Trichloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Trichlorofluoromethane (Freon 11)	ND	0.0073	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
1,2,3-Trichloropropane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
1,2,4-Trimethylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
1,3,5-Trimethylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
Vinyl Chloride	ND	0.0073	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
m+p Xylene	ND	0.0029	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF
o-Xylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 14:38	MFF

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
1,2-Dichloroethane-d4	99.0	70-130		3/31/17 14:38
Toluene-d8	104	70-130		3/31/17 14:38
4-Bromofluorobenzene	97.5	70-130		3/31/17 14:38

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-102 0-2 | Sampled: 3/29/2017 10:35

Sample ID: 17C1191-03

Sample Matrix: Soil

Petroleum Hydrocarbons Analyses - EPH

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
C9-C18 Aliphatics	ND	22	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:29	SCS
C19-C36 Aliphatics	90	22	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:29	SCS
Unadjusted C11-C22 Aromatics	76	22	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:29	SCS
C11-C22 Aromatics	71	22	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:29	SCS
Acenaphthene	ND	0.22	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:29	SCS
Acenaphthylene	ND	0.22	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:29	SCS
Anthracene	ND	0.22	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:29	SCS
Benzo(a)anthracene	0.37	0.22	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:29	SCS
Benzo(a)pyrene	0.49	0.22	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:29	SCS
Benzo(b)fluoranthene	0.58	0.22	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:29	SCS
Benzo(g,h,i)perylene	0.40	0.22	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:29	SCS
Benzo(k)fluoranthene	ND	0.22	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:29	SCS
Chrysene	0.46	0.22	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:29	SCS
Dibenz(a,h)anthracene	ND	0.22	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:29	SCS
Fluoranthene	0.91	0.22	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:29	SCS
Fluorene	ND	0.22	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:29	SCS
Indeno(1,2,3-cd)pyrene	0.31	0.22	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:29	SCS
2-Methylnaphthalene	ND	0.22	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:29	SCS
Naphthalene	ND	0.22	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:29	SCS
Phenanthrene	0.55	0.22	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:29	SCS
Pyrene	0.89	0.22	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:29	SCS

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
Chlorooctadecane (COD)	55.3	40-140		4/6/17 0:29
o-Terphenyl (OTP)	64.4	40-140		4/6/17 0:29
2-Bromonaphthalene	85.1	40-140		4/6/17 0:29
2-Fluorobiphenyl	88.6	40-140		4/6/17 0:29

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-102 0-2 | Sampled: 3/29/2017 10:35

Sample ID: 17C1191-03

Sample Matrix: Soil

Sample Flags: O-01

Soil/Methanol Preservation Ratio: 1.44

Petroleum Hydrocarbons Analyses - VPH

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Unadjusted C5-C8 Aliphatics	ND	8.7	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 17:46	EEH
C5-C8 Aliphatics	ND	8.7	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 17:46	EEH
Unadjusted C9-C12 Aliphatics	ND	8.7	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 17:46	EEH
C9-C12 Aliphatics	ND	8.7	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 17:46	EEH
C9-C10 Aromatics	ND	8.7	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 17:46	EEH

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
2,5-Dibromotoluene (FID)	98.3	70-130		4/4/17 17:46
2,5-Dibromotoluene (PID)	88.9	70-130		4/4/17 17:46

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-102 0-2 | Sampled: 3/29/2017 10:35

Sample ID: 17C1191-03

Sample Matrix: Soil

Metals Analyses (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Antimony	ND	2.6	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:26	QNW
Arsenic	6.3	2.6	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:26	QNW
Barium	53	2.6	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:26	QNW
Beryllium	0.40	0.26	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:26	QNW
Cadmium	0.52	0.26	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:26	QNW
Chromium	14	0.52	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:26	QNW
Lead	35	0.79	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:26	QNW
Mercury	0.045	0.027	mg/Kg dry	1		SW-846 7471B	4/6/17	4/7/17 9:38	TJK
Nickel	12	0.52	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:26	QNW
Selenium	ND	5.2	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:26	QNW
Silver	ND	0.52	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:26	QNW
Thallium	ND	2.6	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:26	QNW
Vanadium	22	1.0	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:26	QNW
Zinc	55	1.0	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:26	QNW

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-102 0-2 | Sampled: 3/29/2017 10:35

Sample ID: 17C1191-03

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	90.6		% Wt	1		SM 2540G	3/31/17	4/3/17 7:52	MRL

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-102 7-8 | Sampled: 3/29/2017 10:55

Sample ID: 17C1191-04

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acetone	ND	0.076	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
tert-Amyl Methyl Ether (TAME)	ND	0.00076	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Benzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Bromobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Bromochloromethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Bromodichloromethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Bromoform	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Bromomethane	ND	0.0076	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
2-Butanone (MEK)	ND	0.031	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
n-Butylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
sec-Butylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
tert-Butylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
tert-Butyl Ethyl Ether (TBEE)	ND	0.00076	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Carbon Disulfide	ND	0.0046	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Carbon Tetrachloride	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Chlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Chlorodibromomethane	ND	0.00076	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Chloroethane	ND	0.0076	mg/Kg dry	1	R-05	SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Chloroform	ND	0.0031	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Chloromethane	ND	0.0076	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
2-Chlorotoluene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
4-Chlorotoluene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0015	mg/Kg dry	1	V-05	SW-846 8260C	3/31/17	3/31/17 15:07	MFF
1,2-Dibromoethane (EDB)	ND	0.00076	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Dibromomethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
1,2-Dichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
1,3-Dichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
1,4-Dichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Dichlorodifluoromethane (Freon 12)	ND	0.0076	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
1,1-Dichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
1,2-Dichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
1,1-Dichloroethylene	ND	0.0031	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
cis-1,2-Dichloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
trans-1,2-Dichloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
1,2-Dichloropropane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
1,3-Dichloropropane	ND	0.00076	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
2,2-Dichloropropane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
1,1-Dichloropropene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
cis-1,3-Dichloropropene	ND	0.00076	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
trans-1,3-Dichloropropene	ND	0.00076	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Diethyl Ether	ND	0.0076	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Diisopropyl Ether (DIPE)	ND	0.00076	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
1,4-Dioxane	ND	0.15	mg/Kg dry	1	V-16	SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Ethylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-102 7-8 | Sampled: 3/29/2017 10:55

Sample ID: 17C1191-04

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Hexachlorobutadiene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
2-Hexanone (MBK)	ND	0.015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Isopropylbenzene (Cumene)	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
p-Isopropyltoluene (p-Cymene)	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Methyl tert-Butyl Ether (MTBE)	ND	0.0031	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Methylene Chloride	ND	0.0076	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
4-Methyl-2-pentanone (MIBK)	ND	0.015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Naphthalene	0.0095	0.0031	mg/Kg dry	1	V-05	SW-846 8260C	3/31/17	3/31/17 15:07	MFF
n-Propylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Styrene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
1,1,1,2-Tetrachloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
1,1,2,2-Tetrachloroethane	ND	0.0031	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Tetrachloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Tetrahydrofuran	ND	0.0076	mg/Kg dry	1	V-16	SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Toluene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
1,2,3-Trichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
1,2,4-Trichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
1,1,1-Trichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
1,1,2-Trichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Trichloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Trichlorofluoromethane (Freon 11)	ND	0.0076	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
1,2,3-Trichloropropane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
1,2,4-Trimethylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
1,3,5-Trimethylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
Vinyl Chloride	ND	0.0076	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
m+p Xylene	ND	0.0031	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF
o-Xylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:07	MFF

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
1,2-Dichloroethane-d4	99.1	70-130		3/31/17 15:07
Toluene-d8	106	70-130		3/31/17 15:07
4-Bromofluorobenzene	97.3	70-130		3/31/17 15:07

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-102 7-8 | Sampled: 3/29/2017 10:55

Sample ID: 17C1191-04

Sample Matrix: Soil

Petroleum Hydrocarbons Analyses - EPH

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
C9-C18 Aliphatics	ND	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:48	SCS
C19-C36 Aliphatics	ND	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:48	SCS
Unadjusted C11-C22 Aromatics	95	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:48	SCS
C11-C22 Aromatics	66	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:48	SCS
Acenaphthene	0.15	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:48	SCS
Acenaphthylene	0.30	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:48	SCS
Anthracene	0.54	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:48	SCS
Benzo(a)anthracene	2.3	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:48	SCS
Benzo(a)pyrene	2.6	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:48	SCS
Benzo(b)fluoranthene	3.3	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:48	SCS
Benzo(g,h,i)perylene	1.7	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:48	SCS
Benzo(k)fluoranthene	1.2	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:48	SCS
Chrysene	2.5	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:48	SCS
Dibenz(a,h)anthracene	0.41	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:48	SCS
Fluoranthene	4.8	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:48	SCS
Fluorene	0.22	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:48	SCS
Indeno(1,2,3-cd)pyrene	1.7	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:48	SCS
2-Methylnaphthalene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:48	SCS
Naphthalene	0.24	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:48	SCS
Phenanthrene	2.5	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:48	SCS
Pyrene	4.9	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 0:48	SCS

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
Chlorooctadecane (COD)	52.6	40-140		4/6/17 0:48
o-Terphenyl (OTP)	65.0	40-140		4/6/17 0:48
2-Bromonaphthalene	91.3	40-140		4/6/17 0:48
2-Fluorobiphenyl	94.3	40-140		4/6/17 0:48

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-102 7-8 | Sampled: 3/29/2017 10:55

Sample ID: 17C1191-04

Sample Matrix: Soil

Sample Flags: O-01

Soil/Methanol Preservation Ratio: 1.39

Petroleum Hydrocarbons Analyses - VPH

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Unadjusted C5-C8 Aliphatics	ND	9.0	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 18:15	EEH
C5-C8 Aliphatics	ND	9.0	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 18:15	EEH
Unadjusted C9-C12 Aliphatics	ND	9.0	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 18:15	EEH
C9-C12 Aliphatics	ND	9.0	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 18:15	EEH
C9-C10 Aromatics	ND	9.0	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 18:15	EEH

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
2,5-Dibromotoluene (FID)	99.3	70-130		4/4/17 18:15
2,5-Dibromotoluene (PID)	89.0	70-130		4/4/17 18:15

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-102 7-8 | Sampled: 3/29/2017 10:55

Sample ID: 17C1191-04

Sample Matrix: Soil

Metals Analyses (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Antimony	ND	2.7	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:31	QNW
Arsenic	8.9	2.7	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:31	QNW
Barium	25	2.7	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:31	QNW
Beryllium	0.40	0.27	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:31	QNW
Cadmium	0.37	0.27	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:31	QNW
Chromium	12	0.54	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:31	QNW
Lead	43	0.81	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:31	QNW
Mercury	0.062	0.027	mg/Kg dry	1		SW-846 7471B	4/6/17	4/7/17 9:39	TJK
Nickel	9.1	0.54	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:31	QNW
Selenium	ND	5.4	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:31	QNW
Silver	ND	0.54	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:31	QNW
Thallium	ND	2.7	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:31	QNW
Vanadium	12	1.1	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:31	QNW
Zinc	26	1.1	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:31	QNW

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-102 7-8 | Sampled: 3/29/2017 10:55

Sample ID: 17C1191-04

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	90.7		% Wt	1		SM 2540G	3/31/17	4/3/17 7:52	MRL

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-104 0-2 | Sampled: 3/29/2017 09:45

Sample ID: 17C1191-05

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acetone	ND	0.082	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
tert-Amyl Methyl Ether (TAME)	ND	0.00082	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Benzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Bromobenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Bromochloromethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Bromodichloromethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Bromoform	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Bromomethane	ND	0.0082	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
2-Butanone (MEK)	ND	0.033	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
n-Butylbenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
sec-Butylbenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
tert-Butylbenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
tert-Butyl Ethyl Ether (TBEE)	ND	0.00082	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Carbon Disulfide	ND	0.0049	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Carbon Tetrachloride	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Chlorobenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Chlorodibromomethane	ND	0.00082	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Chloroethane	ND	0.0082	mg/Kg dry	1	R-05	SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Chloroform	ND	0.0033	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Chloromethane	ND	0.0082	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
2-Chlorotoluene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
4-Chlorotoluene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0016	mg/Kg dry	1	V-05	SW-846 8260C	3/31/17	3/31/17 15:35	MFF
1,2-Dibromoethane (EDB)	ND	0.00082	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Dibromomethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
1,2-Dichlorobenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
1,3-Dichlorobenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
1,4-Dichlorobenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Dichlorodifluoromethane (Freon 12)	ND	0.0082	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
1,1-Dichloroethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
1,2-Dichloroethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
1,1-Dichloroethylene	ND	0.0033	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
cis-1,2-Dichloroethylene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
trans-1,2-Dichloroethylene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
1,2-Dichloropropane	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
1,3-Dichloropropane	ND	0.00082	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
2,2-Dichloropropane	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
1,1-Dichloropropene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
cis-1,3-Dichloropropene	ND	0.00082	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
trans-1,3-Dichloropropene	ND	0.00082	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Diethyl Ether	ND	0.0082	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Diisopropyl Ether (DIPE)	ND	0.00082	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
1,4-Dioxane	ND	0.16	mg/Kg dry	1	V-16	SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Ethylbenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-104 0-2 | Sampled: 3/29/2017 09:45

Sample ID: 17C1191-05

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Hexachlorobutadiene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
2-Hexanone (MBK)	ND	0.016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Isopropylbenzene (Cumene)	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
p-Isopropyltoluene (p-Cymene)	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Methyl tert-Butyl Ether (MTBE)	ND	0.0033	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Methylene Chloride	ND	0.0082	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
4-Methyl-2-pentanone (MIBK)	ND	0.016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Naphthalene	ND	0.0033	mg/Kg dry	1	V-05	SW-846 8260C	3/31/17	3/31/17 15:35	MFF
n-Propylbenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Styrene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
1,1,1,2-Tetrachloroethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
1,1,2,2-Tetrachloroethane	ND	0.0033	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Tetrachloroethylene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Tetrahydrofuran	ND	0.0082	mg/Kg dry	1	V-16	SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Toluene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
1,2,3-Trichlorobenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
1,2,4-Trichlorobenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
1,1,1-Trichloroethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
1,1,2-Trichloroethane	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Trichloroethylene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Trichlorofluoromethane (Freon 11)	ND	0.0082	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
1,2,3-Trichloropropane	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
1,2,4-Trimethylbenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
1,3,5-Trimethylbenzene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
Vinyl Chloride	ND	0.0082	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
m+p Xylene	ND	0.0033	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF
o-Xylene	ND	0.0016	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 15:35	MFF

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
1,2-Dichloroethane-d4	102	70-130		3/31/17 15:35
Toluene-d8	105	70-130		3/31/17 15:35
4-Bromofluorobenzene	94.9	70-130		3/31/17 15:35

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-104 0-2 | Sampled: 3/29/2017 09:45

Sample ID: 17C1191-05

Sample Matrix: Soil

Petroleum Hydrocarbons Analyses - EPH

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
C9-C18 Aliphatics	ND	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:08	SCS
C19-C36 Aliphatics	ND	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:08	SCS
Unadjusted C11-C22 Aromatics	21	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:08	SCS
C11-C22 Aromatics	18	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:08	SCS
Acenaphthene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:08	SCS
Acenaphthylene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:08	SCS
Anthracene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:08	SCS
Benzo(a)anthracene	0.23	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:08	SCS
Benzo(a)pyrene	0.27	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:08	SCS
Benzo(b)fluoranthene	0.33	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:08	SCS
Benzo(g,h,i)perylene	0.25	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:08	SCS
Benzo(k)fluoranthene	0.12	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:08	SCS
Chrysene	0.28	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:08	SCS
Dibenz(a,h)anthracene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:08	SCS
Fluoranthene	0.51	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:08	SCS
Fluorene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:08	SCS
Indeno(1,2,3-cd)pyrene	0.19	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:08	SCS
2-Methylnaphthalene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:08	SCS
Naphthalene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:08	SCS
Phenanthrene	0.32	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:08	SCS
Pyrene	0.53	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:08	SCS

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
Chlorooctadecane (COD)	62.1	40-140		4/6/17 1:08
o-Terphenyl (OTP)	73.6	40-140		4/6/17 1:08
2-Bromonaphthalene	82.5	40-140		4/6/17 1:08
2-Fluorobiphenyl	85.0	40-140		4/6/17 1:08

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-104 0-2 | Sampled: 3/29/2017 09:45

Sample ID: 17C1191-05

Sample Matrix: Soil

Sample Flags: O-01

Soil/Methanol Preservation Ratio: 1.44

Petroleum Hydrocarbons Analyses - VPH

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Unadjusted C5-C8 Aliphatics	ND	9.7	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 18:44	EEH
C5-C8 Aliphatics	ND	9.7	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 18:44	EEH
Unadjusted C9-C12 Aliphatics	ND	9.7	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 18:44	EEH
C9-C12 Aliphatics	ND	9.7	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 18:44	EEH
C9-C10 Aromatics	ND	9.7	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 18:44	EEH

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
2,5-Dibromotoluene (FID)	85.5	70-130		4/4/17 18:44
2,5-Dibromotoluene (PID)	77.6	70-130		4/4/17 18:44

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-104 0-2 | Sampled: 3/29/2017 09:45

Sample ID: 17C1191-05

Sample Matrix: Soil

Metals Analyses (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Antimony	ND	2.8	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:11	QNW
Arsenic	9.2	2.8	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:11	QNW
Barium	30	2.8	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:11	QNW
Beryllium	0.48	0.28	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:11	QNW
Cadmium	0.43	0.28	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:11	QNW
Chromium	14	0.56	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:11	QNW
Lead	62	0.84	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:11	QNW
Mercury	0.073	0.027	mg/Kg dry	1		SW-846 7471B	4/6/17	4/7/17 9:44	TJK
Nickel	12	0.56	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:11	QNW
Selenium	ND	5.6	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:11	QNW
Silver	ND	0.56	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:11	QNW
Thallium	ND	2.8	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:11	QNW
Vanadium	14	1.1	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:11	QNW
Zinc	40	1.1	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:11	QNW

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-104 0-2 | Sampled: 3/29/2017 09:45

Sample ID: 17C1191-05

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	88.8		% Wt	1		SM 2540G	3/31/17	4/3/17 7:52	MRL

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-104 5-5.5 | Sampled: 3/29/2017 09:55

Sample ID: 17C1191-06

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acetone	ND	0.090	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
tert-Amyl Methyl Ether (TAME)	ND	0.00090	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Benzene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Bromobenzene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Bromochloromethane	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Bromodichloromethane	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Bromoform	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Bromomethane	ND	0.0090	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
2-Butanone (MEK)	ND	0.036	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
n-Butylbenzene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
sec-Butylbenzene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
tert-Butylbenzene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
tert-Butyl Ethyl Ether (TBEE)	ND	0.00090	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Carbon Disulfide	ND	0.0054	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Carbon Tetrachloride	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Chlorobenzene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Chlorodibromomethane	ND	0.00090	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Chloroethane	ND	0.0090	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Chloroform	ND	0.0036	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Chloromethane	ND	0.0090	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
2-Chlorotoluene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
4-Chlorotoluene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
1,2-Dibromoethane (EDB)	ND	0.00090	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Dibromomethane	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
1,2-Dichlorobenzene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
1,3-Dichlorobenzene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
1,4-Dichlorobenzene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Dichlorodifluoromethane (Freon 12)	ND	0.0090	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
1,1-Dichloroethane	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
1,2-Dichloroethane	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
1,1-Dichloroethylene	ND	0.0036	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
cis-1,2-Dichloroethylene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
trans-1,2-Dichloroethylene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
1,2-Dichloropropane	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
1,3-Dichloropropane	ND	0.00090	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
2,2-Dichloropropane	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
1,1-Dichloropropene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
cis-1,3-Dichloropropene	ND	0.00090	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
trans-1,3-Dichloropropene	ND	0.00090	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Diethyl Ether	ND	0.0090	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Diisopropyl Ether (DIPE)	ND	0.00090	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
1,4-Dioxane	ND	0.18	mg/Kg dry	1	V-16	SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Ethylbenzene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-104 5-5.5 | Sampled: 3/29/2017 09:55

Sample ID: 17C1191-06

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Hexachlorobutadiene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
2-Hexanone (MBK)	ND	0.018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Isopropylbenzene (Cumene)	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
p-Isopropyltoluene (p-Cymene)	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Methyl tert-Butyl Ether (MTBE)	ND	0.0036	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Methylene Chloride	ND	0.0090	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
4-Methyl-2-pentanone (MIBK)	ND	0.018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Naphthalene	ND	0.0036	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
n-Propylbenzene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Styrene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
1,1,1,2-Tetrachloroethane	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
1,1,2,2-Tetrachloroethane	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Tetrachloroethylene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Tetrahydrofuran	ND	0.0090	mg/Kg dry	1	V-16	SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Toluene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
1,2,3-Trichlorobenzene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
1,2,4-Trichlorobenzene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
1,1,1-Trichloroethane	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
1,1,2-Trichloroethane	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Trichloroethylene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Trichlorofluoromethane (Freon 11)	ND	0.0090	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
1,2,3-Trichloropropane	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
1,2,4-Trimethylbenzene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
1,3,5-Trimethylbenzene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
Vinyl Chloride	ND	0.0090	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
m+p Xylene	ND	0.0036	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF
o-Xylene	ND	0.0018	mg/Kg dry	1		SW-846 8260C	3/31/17	4/3/17 10:33	MFF

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
1,2-Dichloroethane-d4	97.5	70-130		4/3/17 10:33
Toluene-d8	105	70-130		4/3/17 10:33
4-Bromofluorobenzene	91.0	70-130		4/3/17 10:33

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-104 5-5.5 | Sampled: 3/29/2017 09:55

Sample ID: 17C1191-06

Sample Matrix: Soil

Petroleum Hydrocarbons Analyses - EPH

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
C9-C18 Aliphatics	ND	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:28	SCS
C19-C36 Aliphatics	ND	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:28	SCS
Unadjusted C11-C22 Aromatics	150	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:28	SCS
C11-C22 Aromatics	99	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:28	SCS
Acenaphthene	0.98	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:28	SCS
Acenaphthylene	0.11	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:28	SCS
Anthracene	2.0	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:28	SCS
Benzo(a)anthracene	3.7	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:28	SCS
Benzo(a)pyrene	3.2	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:28	SCS
Benzo(b)fluoranthene	3.7	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:28	SCS
Benzo(g,h,i)perylene	1.6	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:28	SCS
Benzo(k)fluoranthene	1.3	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:28	SCS
Chrysene	4.0	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:28	SCS
Dibenz(a,h)anthracene	0.51	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:28	SCS
Fluoranthene	8.5	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:28	SCS
Fluorene	1.0	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:28	SCS
Indeno(1,2,3-cd)pyrene	1.7	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:28	SCS
2-Methylnaphthalene	0.35	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:28	SCS
Naphthalene	0.60	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:28	SCS
Phenanthrene	9.2	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:28	SCS
Pyrene	8.6	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:28	SCS

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
Chlorooctadecane (COD)	56.6	40-140		4/6/17 1:28
o-Terphenyl (OTP)	66.1	40-140		4/6/17 1:28
2-Bromonaphthalene	85.4	40-140		4/6/17 1:28
2-Fluorobiphenyl	86.8	40-140		4/6/17 1:28

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-104 5-5.5 | Sampled: 3/29/2017 09:55

Sample ID: 17C1191-06

Sample Matrix: Soil

Petroleum Hydrocarbons Analyses - VPH

Soil/Methanol Preservation Ratio: 1.04

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Unadjusted C5-C8 Aliphatics	ND	12	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 19:14	EEH
C5-C8 Aliphatics	ND	12	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 19:14	EEH
Unadjusted C9-C12 Aliphatics	ND	12	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 19:14	EEH
C9-C12 Aliphatics	ND	12	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 19:14	EEH
C9-C10 Aromatics	ND	12	mg/Kg dry	1		MADEP-VPH-04-1.1	4/4/17	4/4/17 19:14	EEH

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
2,5-Dibromotoluene (FID)	82.6	70-130		4/4/17 19:14
2,5-Dibromotoluene (PID)	71.6	70-130		4/4/17 19:14

con-test® ANALYTICAL LABORATORY
39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-104 5-5.5 | Sampled: 3/29/2017 09:55

Sample ID: 17C1191-06

Sample Matrix: Soil

Metals Analyses (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Antimony	ND	2.7	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:11	QNW
Arsenic	19	2.7	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:11	QNW
Barium	130	2.7	mg/Kg dry	1	MS-19	SW-846 6010C-D	4/4/17	4/5/17 16:11	QNW
Beryllium	0.48	0.27	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:11	QNW
Cadmium	0.80	0.27	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:11	QNW
Chromium	31	0.55	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:11	QNW
Lead	780	0.82	mg/Kg dry	1	MS-19	SW-846 6010C-D	4/4/17	4/5/17 16:11	QNW
Mercury	0.67	0.14	mg/Kg dry	5		SW-846 7471B	4/6/17	4/7/17 10:33	TJK
Nickel	17	0.55	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:11	QNW
Selenium	ND	5.5	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:11	QNW
Silver	ND	0.55	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:11	QNW
Thallium	ND	2.7	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:11	QNW
Vanadium	27	1.1	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:11	QNW
Zinc	100	1.1	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 16:11	QNW

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-104 5-5.5 | Sampled: 3/29/2017 09:55

Sample ID: 17C1191-06

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	91.3		% Wt	1		SM 2540G	3/31/17	4/3/17 7:52	MRL

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-105 0-2 | Sampled: 3/29/2017 08:40

Sample ID: 17C1191-07

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acetone	ND	0.075	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
tert-Amyl Methyl Ether (TAME)	ND	0.00075	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Benzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Bromobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Bromochloromethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Bromodichloromethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Bromoform	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Bromomethane	ND	0.0075	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
2-Butanone (MEK)	ND	0.030	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
n-Butylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
sec-Butylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
tert-Butylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
tert-Butyl Ethyl Ether (TBEE)	ND	0.00075	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Carbon Disulfide	ND	0.0045	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Carbon Tetrachloride	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Chlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Chlorodibromomethane	ND	0.00075	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Chloroethane	ND	0.0075	mg/Kg dry	1	R-05	SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Chloroform	ND	0.0030	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Chloromethane	ND	0.0075	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
2-Chlorotoluene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
4-Chlorotoluene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0015	mg/Kg dry	1	V-05	SW-846 8260C	3/31/17	3/31/17 16:32	MFF
1,2-Dibromoethane (EDB)	ND	0.00075	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Dibromomethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
1,2-Dichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
1,3-Dichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
1,4-Dichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Dichlorodifluoromethane (Freon 12)	ND	0.0075	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
1,1-Dichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
1,2-Dichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
1,1-Dichloroethylene	ND	0.0030	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
cis-1,2-Dichloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
trans-1,2-Dichloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
1,2-Dichloropropane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
1,3-Dichloropropane	ND	0.00075	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
2,2-Dichloropropane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
1,1-Dichloropropene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
cis-1,3-Dichloropropene	ND	0.00075	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
trans-1,3-Dichloropropene	ND	0.00075	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Diethyl Ether	ND	0.0075	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Diisopropyl Ether (DIPE)	ND	0.00075	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
1,4-Dioxane	ND	0.15	mg/Kg dry	1	V-16	SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Ethylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-105 0-2 | Sampled: 3/29/2017 08:40

Sample ID: 17C1191-07

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Hexachlorobutadiene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
2-Hexanone (MBK)	ND	0.015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Isopropylbenzene (Cumene)	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
p-Isopropyltoluene (p-Cymene)	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Methyl tert-Butyl Ether (MTBE)	ND	0.0030	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Methylene Chloride	ND	0.0075	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
4-Methyl-2-pentanone (MIBK)	ND	0.015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Naphthalene	ND	0.0030	mg/Kg dry	1	V-05	SW-846 8260C	3/31/17	3/31/17 16:32	MFF
n-Propylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Styrene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
1,1,1,2-Tetrachloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
1,1,2,2-Tetrachloroethane	ND	0.0030	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Tetrachloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Tetrahydrofuran	ND	0.0075	mg/Kg dry	1	V-16	SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Toluene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
1,2,3-Trichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
1,2,4-Trichlorobenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
1,1,1-Trichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
1,1,2-Trichloroethane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Trichloroethylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Trichlorofluoromethane (Freon 11)	ND	0.0075	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
1,2,3-Trichloropropane	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
1,2,4-Trimethylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
1,3,5-Trimethylbenzene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
Vinyl Chloride	ND	0.0075	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
m+p Xylene	ND	0.0030	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF
o-Xylene	ND	0.0015	mg/Kg dry	1		SW-846 8260C	3/31/17	3/31/17 16:32	MFF

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
1,2-Dichloroethane-d4	102	70-130		3/31/17 16:32
Toluene-d8	103	70-130		3/31/17 16:32
4-Bromofluorobenzene	92.4	70-130		3/31/17 16:32

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-105 0-2 | Sampled: 3/29/2017 08:40

Sample ID: 17C1191-07

Sample Matrix: Soil

Petroleum Hydrocarbons Analyses - EPH

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
C9-C18 Aliphatics	ND	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:48	SCS
C19-C36 Aliphatics	ND	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:48	SCS
Unadjusted C11-C22 Aromatics	55	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:48	SCS
C11-C22 Aromatics	45	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:48	SCS
Acenaphthene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:48	SCS
Acenaphthylene	0.19	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:48	SCS
Anthracene	0.14	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:48	SCS
Benzo(a)anthracene	0.68	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:48	SCS
Benzo(a)pyrene	0.99	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:48	SCS
Benzo(b)fluoranthene	1.5	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:48	SCS
Benzo(g,h,i)perylene	0.62	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:48	SCS
Benzo(k)fluoranthene	0.54	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:48	SCS
Chrysene	0.96	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:48	SCS
Dibenz(a,h)anthracene	0.19	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:48	SCS
Fluoranthene	1.3	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:48	SCS
Fluorene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:48	SCS
Indeno(1,2,3-cd)pyrene	0.65	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:48	SCS
2-Methylnaphthalene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:48	SCS
Naphthalene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:48	SCS
Phenanthrene	0.48	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:48	SCS
Pyrene	1.4	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 1:48	SCS

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
Chlorooctadecane (COD)	51.3	40-140		4/6/17 1:48
o-Terphenyl (OTP)	64.3	40-140		4/6/17 1:48
2-Bromonaphthalene	86.8	40-140		4/6/17 1:48
2-Fluorobiphenyl	92.6	40-140		4/6/17 1:48

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-105 0-2 | Sampled: 3/29/2017 08:40

Sample ID: 17C1191-07

Sample Matrix: Soil

Sample Flags: O-01

Soil/Methanol Preservation Ratio: 1.46

Petroleum Hydrocarbons Analyses - VPH

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Unadjusted C5-C8 Aliphatics	ND	8.9	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 15:16	EEH
C5-C8 Aliphatics	ND	8.9	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 15:16	EEH
Unadjusted C9-C12 Aliphatics	19	8.9	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 15:16	EEH
C9-C12 Aliphatics	9.7	8.9	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 15:16	EEH
C9-C10 Aromatics	9.2	8.9	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 15:16	EEH

Surrogates	% Recovery	Recovery Limits	Flag/Qual		
2,5-Dibromotoluene (FID)	104	70-130		4/5/17	15:16
2,5-Dibromotoluene (PID)	92.3	70-130		4/5/17	15:16

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-105 0-2 | Sampled: 3/29/2017 08:40

Sample ID: 17C1191-07

Sample Matrix: Soil

Metals Analyses (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Antimony	ND	2.8	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:16	QNW
Arsenic	24	2.8	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:16	QNW
Barium	28	2.8	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:16	QNW
Beryllium	0.43	0.28	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:16	QNW
Cadmium	1.0	0.28	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:16	QNW
Chromium	14	0.56	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:16	QNW
Lead	67	0.84	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:16	QNW
Mercury	0.085	0.027	mg/Kg dry	1		SW-846 7471B	4/6/17	4/7/17 9:47	TJK
Nickel	12	0.56	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:16	QNW
Selenium	ND	5.6	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:16	QNW
Silver	ND	0.56	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:16	QNW
Thallium	ND	2.8	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:16	QNW
Vanadium	15	1.1	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:16	QNW
Zinc	76	1.1	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:16	QNW

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-105 0-2 | Sampled: 3/29/2017 08:40

Sample ID: 17C1191-07

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	89.7		% Wt	1		SM 2540G	3/31/17	4/3/17 7:52	MRL

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-105 11-12 | Sampled: 3/29/2017 09:30

Sample ID: 17C1191-08

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acetone	ND	0.13	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
tert-Amyl Methyl Ether (TAME)	ND	0.0013	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Benzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Bromobenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Bromochloromethane	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Bromodichloromethane	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Bromoform	ND	0.0026	mg/Kg dry	1	V-05	SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Bromomethane	ND	0.013	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
2-Butanone (MEK)	ND	0.052	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
n-Butylbenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
sec-Butylbenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
tert-Butylbenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
tert-Butyl Ethyl Ether (TBEE)	ND	0.0013	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Carbon Disulfide	ND	0.0077	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Carbon Tetrachloride	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Chlorobenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Chlorodibromomethane	ND	0.0026	mg/Kg dry	1	V-05	SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Chloroethane	ND	0.013	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Chloroform	ND	0.0052	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Chloromethane	ND	0.013	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
2-Chlorotoluene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
4-Chlorotoluene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0052	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
1,2-Dibromoethane (EDB)	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Dibromomethane	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
1,2-Dichlorobenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
1,3-Dichlorobenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
1,4-Dichlorobenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Dichlorodifluoromethane (Freon 12)	ND	0.013	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
1,1-Dichloroethane	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
1,2-Dichloroethane	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
1,1-Dichloroethylene	ND	0.0052	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
cis-1,2-Dichloroethylene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
trans-1,2-Dichloroethylene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
1,2-Dichloropropane	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
1,3-Dichloropropane	ND	0.0013	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
2,2-Dichloropropane	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
1,1-Dichloropropene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
cis-1,3-Dichloropropene	ND	0.0013	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
trans-1,3-Dichloropropene	ND	0.0013	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Diethyl Ether	ND	0.013	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Diisopropyl Ether (DIPE)	ND	0.0013	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
1,4-Dioxane	ND	0.26	mg/Kg dry	1	R-05, V-16	SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Ethylbenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-105 11-12 | Sampled: 3/29/2017 09:30

Sample ID: 17C1191-08

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Hexachlorobutadiene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
2-Hexanone (MBK)	ND	0.026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Isopropylbenzene (Cumene)	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
p-Isopropyltoluene (p-Cymene)	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Methyl tert-Butyl Ether (MTBE)	ND	0.0052	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Methylene Chloride	ND	0.013	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
4-Methyl-2-pentanone (MIBK)	ND	0.026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Naphthalene	ND	0.013	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
n-Propylbenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Styrene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
1,1,1,2-Tetrachloroethane	ND	0.0026	mg/Kg dry	1	V-05	SW-846 8260C	4/3/17	4/3/17 14:21	MFF
1,1,2,2-Tetrachloroethane	ND	0.0013	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Tetrachloroethylene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Tetrahydrofuran	ND	0.013	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Toluene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
1,2,3-Trichlorobenzene	ND	0.013	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
1,2,4-Trichlorobenzene	ND	0.013	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
1,1,1-Trichloroethane	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
1,1,2-Trichloroethane	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Trichloroethylene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Trichlorofluoromethane (Freon 11)	ND	0.013	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
1,2,3-Trichloropropane	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
1,2,4-Trimethylbenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
1,3,5-Trimethylbenzene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
Vinyl Chloride	ND	0.013	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
m+p Xylene	ND	0.0052	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF
o-Xylene	ND	0.0026	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 14:21	MFF

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
1,2-Dichloroethane-d4	103	70-130		4/3/17 14:21
Toluene-d8	98.2	70-130		4/3/17 14:21
4-Bromofluorobenzene	99.1	70-130		4/3/17 14:21

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-105 11-12 | Sampled: 3/29/2017 09:30

Sample ID: 17C1191-08

Sample Matrix: Soil

Petroleum Hydrocarbons Analyses - EPH

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
C9-C18 Aliphatics	ND	16	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:25	SCS
C19-C36 Aliphatics	ND	16	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:25	SCS
Unadjusted C11-C22 Aromatics	ND	16	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:25	SCS
C11-C22 Aromatics	ND	16	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:25	SCS
Acenaphthene	ND	0.16	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:25	SCS
Acenaphthylene	ND	0.16	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:25	SCS
Anthracene	ND	0.16	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:25	SCS
Benzo(a)anthracene	ND	0.16	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:25	SCS
Benzo(a)pyrene	ND	0.16	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:25	SCS
Benzo(b)fluoranthene	ND	0.16	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:25	SCS
Benzo(g,h,i)perylene	ND	0.16	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:25	SCS
Benzo(k)fluoranthene	ND	0.16	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:25	SCS
Chrysene	ND	0.16	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:25	SCS
Dibenz(a,h)anthracene	ND	0.16	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:25	SCS
Fluoranthene	ND	0.16	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:25	SCS
Fluorene	ND	0.16	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:25	SCS
Indeno(1,2,3-cd)pyrene	ND	0.16	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:25	SCS
2-Methylnaphthalene	ND	0.16	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:25	SCS
Naphthalene	ND	0.16	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:25	SCS
Phenanthrene	ND	0.16	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:25	SCS
Pyrene	ND	0.16	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:25	SCS

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
Chlorooctadecane (COD)	47.8	40-140		4/6/17 11:25
o-Terphenyl (OTP)	52.5	40-140		4/6/17 11:25
2-Bromonaphthalene	82.8	40-140		4/6/17 11:25
2-Fluorobiphenyl	90.9	40-140		4/6/17 11:25

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-105 11-12 | Sampled: 3/29/2017 09:30

Sample ID: 17C1191-08

Sample Matrix: Soil

Sample Flags: O-01

Soil/Methanol Preservation Ratio: 1.35

Petroleum Hydrocarbons Analyses - VPH

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Unadjusted C5-C8 Aliphatics	ND	18	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 15:45	EEH
C5-C8 Aliphatics	ND	18	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 15:45	EEH
Unadjusted C9-C12 Aliphatics	ND	18	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 15:45	EEH
C9-C12 Aliphatics	ND	18	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 15:45	EEH
C9-C10 Aromatics	ND	18	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 15:45	EEH

Surrogates	% Recovery	Recovery Limits	Flag/Qual		
2,5-Dibromotoluene (FID)	107	70-130		4/5/17 15:45	
2,5-Dibromotoluene (PID)	95.2	70-130		4/5/17 15:45	

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-105 11-12 | Sampled: 3/29/2017 09:30

Sample ID: 17C1191-08

Sample Matrix: Soil

Metals Analyses (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Antimony	ND	3.9	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:21	QNW
Arsenic	ND	3.9	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:21	QNW
Barium	26	3.9	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:21	QNW
Beryllium	0.94	0.39	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:21	QNW
Cadmium	ND	0.39	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:21	QNW
Chromium	9.1	0.78	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:21	QNW
Lead	9.2	1.2	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:21	QNW
Mercury	ND	0.038	mg/Kg dry	1		SW-846 7471B	4/6/17	4/7/17 9:48	TJK
Nickel	4.5	0.78	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:21	QNW
Selenium	ND	7.8	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:21	QNW
Silver	ND	0.78	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:21	QNW
Thallium	ND	3.9	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:21	QNW
Vanadium	14	1.6	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:21	QNW
Zinc	10	1.6	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:21	QNW

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-105 11-12 | Sampled: 3/29/2017 09:30

Sample ID: 17C1191-08

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	63.1		% Wt	1		SM 2540G	3/31/17	4/3/17 7:52	MRL

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-106 0-2 | Sampled: 3/29/2017 09:10

Sample ID: 17C1191-09

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acetone	ND	3.0	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
tert-Amyl Methyl Ether (TAME)	ND	0.030	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Benzene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Bromobenzene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Bromochloromethane	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Bromodichloromethane	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Bromoform	ND	0.12	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Bromomethane	ND	0.30	mg/Kg dry	1	RL-07	SW-846 8260C	3/31/17	4/5/17 14:46	EEH
2-Butanone (MEK)	ND	1.2	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
n-Butylbenzene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
sec-Butylbenzene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
tert-Butylbenzene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
tert-Butyl Ethyl Ether (TBEE)	ND	0.030	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Carbon Disulfide	ND	0.61	mg/Kg dry	1	RL-07	SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Carbon Tetrachloride	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Chlorobenzene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Chlorodibromomethane	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Chloroethane	ND	0.12	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Chloroform	ND	0.12	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Chloromethane	ND	0.12	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
2-Chlorotoluene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
4-Chlorotoluene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.24	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
1,2-Dibromoethane (EDB)	ND	0.030	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Dibromomethane	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
1,2-Dichlorobenzene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
1,3-Dichlorobenzene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
1,4-Dichlorobenzene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Dichlorodifluoromethane (Freon 12)	ND	0.12	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
1,1-Dichloroethane	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
1,2-Dichloroethane	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
1,1-Dichloroethylene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
cis-1,2-Dichloroethylene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
trans-1,2-Dichloroethylene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
1,2-Dichloropropane	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
1,3-Dichloropropane	ND	0.030	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
2,2-Dichloropropane	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
1,1-Dichloropropene	ND	0.12	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
cis-1,3-Dichloropropene	ND	0.030	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
trans-1,3-Dichloropropene	ND	0.030	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Diethyl Ether	ND	0.12	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Diisopropyl Ether (DIPE)	ND	0.030	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
1,4-Dioxane	ND	3.0	mg/Kg dry	1	V-16	SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Ethylbenzene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-106 0-2 | Sampled: 3/29/2017 09:10

Sample ID: 17C1191-09

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Hexachlorobutadiene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
2-Hexanone (MBK)	ND	0.61	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Isopropylbenzene (Cumene)	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
p-Isopropyltoluene (p-Cymene)	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Methyl tert-Butyl Ether (MTBE)	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Methylene Chloride	ND	0.30	mg/Kg dry	1	RL-07	SW-846 8260C	3/31/17	4/5/17 14:46	EEH
4-Methyl-2-pentanone (MIBK)	ND	0.61	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Naphthalene	ND	0.12	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
n-Propylbenzene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Styrene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
1,1,1,2-Tetrachloroethane	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
1,1,2,2-Tetrachloroethane	ND	0.030	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Tetrachloroethylene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Tetrahydrofuran	ND	0.24	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Toluene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
1,2,3-Trichlorobenzene	ND	0.24	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
1,2,4-Trichlorobenzene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
1,1,1-Trichloroethane	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
1,1,2-Trichloroethane	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Trichloroethylene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Trichlorofluoromethane (Freon 11)	ND	0.12	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
1,2,3-Trichloropropane	ND	0.12	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
1,2,4-Trimethylbenzene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
1,3,5-Trimethylbenzene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
Vinyl Chloride	ND	0.12	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
m+p Xylene	ND	0.12	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH
o-Xylene	ND	0.061	mg/Kg dry	1		SW-846 8260C	3/31/17	4/5/17 14:46	EEH

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
1,2-Dichloroethane-d4	104	70-130		4/5/17 14:46
Toluene-d8	101	70-130		4/5/17 14:46
4-Bromofluorobenzene	98.8	70-130		4/5/17 14:46

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-106 0-2 | Sampled: 3/29/2017 09:10

Sample ID: 17C1191-09

Sample Matrix: Soil

Petroleum Hydrocarbons Analyses - EPH

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
C9-C18 Aliphatics	28	23	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:45	SCS
C19-C36 Aliphatics	100	23	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:45	SCS
Unadjusted C11-C22 Aromatics	320	23	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:45	SCS
C11-C22 Aromatics	260	23	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:45	SCS
Acenaphthene	ND	0.23	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:45	SCS
Acenaphthylene	0.92	0.23	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:45	SCS
Anthracene	0.73	0.23	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:45	SCS
Benzo(a)anthracene	5.1	0.23	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:45	SCS
Benzo(a)pyrene	4.7	0.23	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:45	SCS
Benzo(b)fluoranthene	9.1	0.23	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:45	SCS
Benzo(g,h,i)perylene	2.2	0.23	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:45	SCS
Benzo(k)fluoranthene	3.4	0.23	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:45	SCS
Chrysene	6.4	0.23	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:45	SCS
Dibenz(a,h)anthracene	0.93	0.23	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:45	SCS
Fluoranthene	9.6	0.23	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:45	SCS
Fluorene	ND	0.23	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:45	SCS
Indeno(1,2,3-cd)pyrene	2.7	0.23	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:45	SCS
2-Methylnaphthalene	0.32	0.23	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:45	SCS
Naphthalene	0.36	0.23	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:45	SCS
Phenanthrene	1.7	0.23	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:45	SCS
Pyrene	11	0.23	mg/Kg dry	2		MADEP-EPH-04-1.1	3/31/17	4/6/17 11:45	SCS

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
Chlorooctadecane (COD)	48.9	40-140		4/6/17 11:45
o-Terphenyl (OTP)	53.6	40-140		4/6/17 11:45
2-Bromonaphthalene	80.7	40-140		4/6/17 11:45
2-Fluorobiphenyl	86.4	40-140		4/6/17 11:45

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-106 0-2 | Sampled: 3/29/2017 09:10

Sample ID: 17C1191-09

Sample Matrix: Soil

Sample Flags: O-01

Soil/Methanol Preservation Ratio: 1.28

Petroleum Hydrocarbons Analyses - VPH

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Unadjusted C5-C8 Aliphatics	ND	11	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 16:14	EEH
C5-C8 Aliphatics	ND	11	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 16:14	EEH
Unadjusted C9-C12 Aliphatics	ND	11	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 16:14	EEH
C9-C12 Aliphatics	ND	11	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 16:14	EEH
C9-C10 Aromatics	ND	11	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 16:14	EEH

Surrogates	% Recovery	Recovery Limits	Flag/Qual		
2,5-Dibromotoluene (FID)	98.4	70-130		4/5/17	16:14
2,5-Dibromotoluene (PID)	88.2	70-130		4/5/17	16:14

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-106 0-2 | Sampled: 3/29/2017 09:10

Sample ID: 17C1191-09

Sample Matrix: Soil

Metals Analyses (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Antimony	ND	2.9	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:26	QNW
Arsenic	190	2.9	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:26	QNW
Barium	31	2.9	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:26	QNW
Beryllium	0.49	0.29	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:26	QNW
Cadmium	6.6	0.29	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:26	QNW
Chromium	18	0.58	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:26	QNW
Lead	230	0.88	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:26	QNW
Mercury	0.26	0.029	mg/Kg dry	1	R-02	SW-846 7471B	4/6/17	4/7/17 10:07	TJK
Nickel	12	0.58	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:26	QNW
Selenium	ND	5.8	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:26	QNW
Silver	ND	0.58	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:26	QNW
Thallium	ND	2.9	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:26	QNW
Vanadium	31	1.2	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:26	QNW
Zinc	51	1.2	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:26	QNW

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-106 0-2 | Sampled: 3/29/2017 09:10

Sample ID: 17C1191-09

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	86.0		% Wt	1		SM 2540G	3/31/17	4/3/17 7:52	MRL

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Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-106 4-5 | Sampled: 3/29/2017 09:20

Sample ID: 17C1191-10

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acetone	ND	0.12	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
tert-Amyl Methyl Ether (TAME)	ND	0.0012	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Benzene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Bromobenzene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Bromochloromethane	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Bromodichloromethane	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Bromoform	ND	0.0023	mg/Kg dry	1	V-05	SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Bromomethane	ND	0.012	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
2-Butanone (MEK)	ND	0.047	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
n-Butylbenzene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
sec-Butylbenzene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
tert-Butylbenzene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
tert-Butyl Ethyl Ether (TBEE)	ND	0.0012	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Carbon Disulfide	ND	0.0070	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Carbon Tetrachloride	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Chlorobenzene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Chlorodibromomethane	ND	0.0023	mg/Kg dry	1	V-05	SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Chloroethane	ND	0.012	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Chloroform	ND	0.0047	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Chloromethane	ND	0.012	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
2-Chlorotoluene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
4-Chlorotoluene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0047	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
1,2-Dibromoethane (EDB)	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Dibromomethane	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
1,2-Dichlorobenzene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
1,3-Dichlorobenzene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
1,4-Dichlorobenzene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Dichlorodifluoromethane (Freon 12)	ND	0.012	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
1,1-Dichloroethane	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
1,2-Dichloroethane	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
1,1-Dichloroethylene	ND	0.0047	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
cis-1,2-Dichloroethylene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
trans-1,2-Dichloroethylene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
1,2-Dichloropropane	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
1,3-Dichloropropane	ND	0.0012	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
2,2-Dichloropropane	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
1,1-Dichloropropene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
cis-1,3-Dichloropropene	ND	0.0012	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
trans-1,3-Dichloropropene	ND	0.0012	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Diethyl Ether	ND	0.012	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Diisopropyl Ether (DIPE)	ND	0.0012	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
1,4-Dioxane	ND	0.23	mg/Kg dry	1	R-05, V-16	SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Ethylbenzene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF

con-test® ANALYTICAL LABORATORY
39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-106 4-5 | Sampled: 3/29/2017 09:20

Sample ID: 17C1191-10

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Hexachlorobutadiene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
2-Hexanone (MBK)	ND	0.023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Isopropylbenzene (Cumene)	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
p-Isopropyltoluene (p-Cymene)	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Methyl tert-Butyl Ether (MTBE)	ND	0.0047	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Methylene Chloride	ND	0.012	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
4-Methyl-2-pentanone (MIBK)	ND	0.023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Naphthalene	ND	0.012	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
n-Propylbenzene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Styrene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
1,1,1,2-Tetrachloroethane	ND	0.0023	mg/Kg dry	1	V-05	SW-846 8260C	4/3/17	4/3/17 15:15	MFF
1,1,2,2-Tetrachloroethane	ND	0.0012	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Tetrachloroethylene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Tetrahydrofuran	ND	0.012	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Toluene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
1,2,3-Trichlorobenzene	ND	0.012	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
1,2,4-Trichlorobenzene	ND	0.012	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
1,1,1-Trichloroethane	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
1,1,2-Trichloroethane	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Trichloroethylene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Trichlorofluoromethane (Freon 11)	ND	0.012	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
1,2,3-Trichloropropane	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
1,2,4-Trimethylbenzene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
1,3,5-Trimethylbenzene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
Vinyl Chloride	ND	0.012	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
m+p Xylene	ND	0.0047	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF
o-Xylene	ND	0.0023	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:15	MFF

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
1,2-Dichloroethane-d4	101	70-130		4/3/17 15:15
Toluene-d8	98.2	70-130		4/3/17 15:15
4-Bromofluorobenzene	98.3	70-130		4/3/17 15:15

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-106 4-5 | Sampled: 3/29/2017 09:20

Sample ID: 17C1191-10

Sample Matrix: Soil

Petroleum Hydrocarbons Analyses - EPH

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
C9-C18 Aliphatics	ND	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:05	SCS
C19-C36 Aliphatics	ND	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:05	SCS
Unadjusted C11-C22 Aromatics	ND	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:05	SCS
C11-C22 Aromatics	ND	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:05	SCS
Acenaphthene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:05	SCS
Acenaphthylene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:05	SCS
Anthracene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:05	SCS
Benzo(a)anthracene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:05	SCS
Benzo(a)pyrene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:05	SCS
Benzo(b)fluoranthene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:05	SCS
Benzo(g,h,i)perylene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:05	SCS
Benzo(k)fluoranthene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:05	SCS
Chrysene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:05	SCS
Dibenz(a,h)anthracene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:05	SCS
Fluoranthene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:05	SCS
Fluorene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:05	SCS
Indeno(1,2,3-cd)pyrene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:05	SCS
2-Methylnaphthalene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:05	SCS
Naphthalene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:05	SCS
Phenanthrene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:05	SCS
Pyrene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:05	SCS

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
Chlorooctadecane (COD)	69.9	40-140		4/6/17 12:05
o-Terphenyl (OTP)	77.0	40-140		4/6/17 12:05
2-Bromonaphthalene	86.1	40-140		4/6/17 12:05
2-Fluorobiphenyl	86.9	40-140		4/6/17 12:05

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-106 4-5 | Sampled: 3/29/2017 09:20

Sample ID: 17C1191-10

Sample Matrix: Soil

Sample Flags: O-01

Soil/Methanol Preservation Ratio: 1.75

Petroleum Hydrocarbons Analyses - VPH

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Unadjusted C5-C8 Aliphatics	ND	8.0	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 16:43	EEH
C5-C8 Aliphatics	ND	8.0	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 16:43	EEH
Unadjusted C9-C12 Aliphatics	ND	8.0	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 16:43	EEH
C9-C12 Aliphatics	ND	8.0	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 16:43	EEH
C9-C10 Aromatics	ND	8.0	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 16:43	EEH

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
2,5-Dibromotoluene (FID)	117	70-130		4/5/17 16:43
2,5-Dibromotoluene (PID)	104	70-130		4/5/17 16:43

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-106 4-5 | Sampled: 3/29/2017 09:20

Sample ID: 17C1191-10

Sample Matrix: Soil

Metals Analyses (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Antimony	ND	2.7	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:31	QNW
Arsenic	8.2	2.7	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:31	QNW
Barium	26	2.7	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:31	QNW
Beryllium	0.53	0.27	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:31	QNW
Cadmium	0.34	0.27	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:31	QNW
Chromium	22	0.55	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:31	QNW
Lead	27	0.82	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:31	QNW
Mercury	0.027	0.027	mg/Kg dry	1		SW-846 7471B	4/6/17	4/7/17 9:49	TJK
Nickel	21	0.55	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:31	QNW
Selenium	ND	5.5	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:31	QNW
Silver	ND	0.55	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:31	QNW
Thallium	ND	2.7	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:31	QNW
Vanadium	18	1.1	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:31	QNW
Zinc	28	1.1	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:31	QNW

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: NOB-106 4-5 | Sampled: 3/29/2017 09:20

Sample ID: 17C1191-10

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	87.3		% Wt	1		SM 2540G	3/31/17	4/3/17 7:52	MRL

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: FD-01 | Sampled: 3/29/2017 15:00

Sample ID: 17C1191-11

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acetone	ND	0.071	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
tert-Amyl Methyl Ether (TAME)	ND	0.00071	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Benzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Bromobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Bromochloromethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Bromodichloromethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Bromoform	ND	0.0014	mg/Kg dry	1	V-05	SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Bromomethane	ND	0.0071	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
2-Butanone (MEK)	ND	0.028	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
n-Butylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
sec-Butylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
tert-Butylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
tert-Butyl Ethyl Ether (TBEE)	ND	0.00071	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Carbon Disulfide	ND	0.0043	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Carbon Tetrachloride	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Chlorobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Chlorodibromomethane	ND	0.0014	mg/Kg dry	1	V-05	SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Chloroethane	ND	0.0071	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Chloroform	ND	0.0028	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Chloromethane	ND	0.0071	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
2-Chlorotoluene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
4-Chlorotoluene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0028	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
1,2-Dibromoethane (EDB)	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Dibromomethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
1,2-Dichlorobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
1,3-Dichlorobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
1,4-Dichlorobenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Dichlorodifluoromethane (Freon 12)	ND	0.0071	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
1,1-Dichloroethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
1,2-Dichloroethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
1,1-Dichloroethylene	ND	0.0028	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
cis-1,2-Dichloroethylene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
trans-1,2-Dichloroethylene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
1,2-Dichloropropane	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
1,3-Dichloropropane	ND	0.00071	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
2,2-Dichloropropane	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
1,1-Dichloropropene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
cis-1,3-Dichloropropene	ND	0.00071	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
trans-1,3-Dichloropropene	ND	0.00071	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Diethyl Ether	ND	0.0071	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Diisopropyl Ether (DIPE)	ND	0.00071	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
1,4-Dioxane	ND	0.14	mg/Kg dry	1	R-05, V-16	SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Ethylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: FD-01 | Sampled: 3/29/2017 15:00

Sample ID: 17C1191-11

Sample Matrix: Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Hexachlorobutadiene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
2-Hexanone (MBK)	ND	0.014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Isopropylbenzene (Cumene)	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
p-Isopropyltoluene (p-Cymene)	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Methyl tert-Butyl Ether (MTBE)	ND	0.0028	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Methylene Chloride	ND	0.0071	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
4-Methyl-2-pentanone (MIBK)	ND	0.014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Naphthalene	ND	0.0071	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
n-Propylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Styrene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
1,1,1,2-Tetrachloroethane	ND	0.0014	mg/Kg dry	1	V-05	SW-846 8260C	4/3/17	4/3/17 15:42	MFF
1,1,2,2-Tetrachloroethane	ND	0.00071	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Tetrachloroethylene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Tetrahydrofuran	ND	0.0071	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Toluene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
1,2,3-Trichlorobenzene	ND	0.0071	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
1,2,4-Trichlorobenzene	ND	0.0071	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
1,1,1-Trichloroethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
1,1,2-Trichloroethane	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Trichloroethylene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Trichlorofluoromethane (Freon 11)	ND	0.0071	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
1,2,3-Trichloropropane	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
1,2,4-Trimethylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
1,3,5-Trimethylbenzene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
Vinyl Chloride	ND	0.0071	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
m+p Xylene	ND	0.0028	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF
o-Xylene	ND	0.0014	mg/Kg dry	1		SW-846 8260C	4/3/17	4/3/17 15:42	MFF

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
1,2-Dichloroethane-d4	103	70-130		4/3/17 15:42
Toluene-d8	100	70-130		4/3/17 15:42
4-Bromofluorobenzene	101	70-130		4/3/17 15:42

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: FD-01 | Sampled: 3/29/2017 15:00

Sample ID: 17C1191-11

Sample Matrix: Soil

Petroleum Hydrocarbons Analyses - EPH

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
C9-C18 Aliphatics	ND	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:25	SCS
C19-C36 Aliphatics	32	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:25	SCS
Unadjusted C11-C22 Aromatics	33	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:25	SCS
C11-C22 Aromatics	29	11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:25	SCS
Acenaphthene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:25	SCS
Acenaphthylene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:25	SCS
Anthracene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:25	SCS
Benzo(a)anthracene	0.29	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:25	SCS
Benzo(a)pyrene	0.40	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:25	SCS
Benzo(b)fluoranthene	0.39	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:25	SCS
Benzo(g,h,i)perylene	0.29	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:25	SCS
Benzo(k)fluoranthene	0.15	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:25	SCS
Chrysene	0.36	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:25	SCS
Dibenz(a,h)anthracene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:25	SCS
Fluoranthene	0.57	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:25	SCS
Fluorene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:25	SCS
Indeno(1,2,3-cd)pyrene	0.20	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:25	SCS
2-Methylnaphthalene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:25	SCS
Naphthalene	ND	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:25	SCS
Phenanthrene	0.35	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:25	SCS
Pyrene	0.65	0.11	mg/Kg dry	1		MADEP-EPH-04-1.1	3/31/17	4/6/17 12:25	SCS

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
Chlorooctadecane (COD)	68.5	40-140		4/6/17 12:25
o-Terphenyl (OTP)	79.4	40-140		4/6/17 12:25
2-Bromonaphthalene	86.5	40-140		4/6/17 12:25
2-Fluorobiphenyl	90.6	40-140		4/6/17 12:25

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: FD-01 | Sampled: 3/29/2017 15:00

Sample ID: 17C1191-11

Sample Matrix: Soil

Sample Flags: O-01

Soil/Methanol Preservation Ratio: 1.44

Petroleum Hydrocarbons Analyses - VPH

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Unadjusted C5-C8 Aliphatics	ND	8.7	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 17:12	EEH
C5-C8 Aliphatics	ND	8.7	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 17:12	EEH
Unadjusted C9-C12 Aliphatics	ND	8.7	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 17:12	EEH
C9-C12 Aliphatics	ND	8.7	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 17:12	EEH
C9-C10 Aromatics	ND	8.7	mg/Kg dry	1		MADEP-VPH-04-1.1	4/5/17	4/5/17 17:12	EEH

Surrogates	% Recovery	Recovery Limits	Flag/Qual		
2,5-Dibromotoluene (FID)	103	70-130		4/5/17	17:12
2,5-Dibromotoluene (PID)	93.1	70-130		4/5/17	17:12

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: FD-01 | Sampled: 3/29/2017 15:00

Sample ID: 17C1191-11

Sample Matrix: Soil

Metals Analyses (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Antimony	ND	2.8	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:36	QNW
Arsenic	7.1	2.8	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:36	QNW
Barium	35	2.8	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:36	QNW
Beryllium	0.40	0.28	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:36	QNW
Cadmium	0.36	0.28	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:36	QNW
Chromium	14	0.57	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:36	QNW
Lead	56	0.85	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:36	QNW
Mercury	0.032	0.027	mg/Kg dry	1		SW-846 7471B	4/6/17	4/7/17 9:51	TJK
Nickel	11	0.57	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:36	QNW
Selenium	ND	5.7	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:36	QNW
Silver	ND	0.57	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:36	QNW
Thallium	ND	2.8	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:36	QNW
Vanadium	13	1.1	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:36	QNW
Zinc	62	1.1	mg/Kg dry	1		SW-846 6010C-D	4/4/17	4/5/17 17:36	QNW

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Project Location: Lowell, MA
Sample Description:
Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: FD-01
Sampled: 3/29/2017 15:00

Sample ID: 17C1191-11

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	90.8		% Wt	1		SM 2540G	3/31/17	4/3/17 7:52	MRL

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: TB-01 | Sampled: 3/29/2017 07:00

Sample ID: 17C1191-12

Sample Matrix: Trip Blank Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Acetone	ND	0.10	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
tert-Amyl Methyl Ether (TAME)	ND	0.0010	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Benzene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Bromobenzene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Bromochloromethane	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Bromodichloromethane	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Bromoform	ND	0.0020	mg/Kg wet	1	V-05	SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Bromomethane	ND	0.010	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
2-Butanone (MEK)	ND	0.040	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
n-Butylbenzene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
sec-Butylbenzene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
tert-Butylbenzene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
tert-Butyl Ethyl Ether (TBEE)	ND	0.0010	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Carbon Disulfide	ND	0.0060	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Carbon Tetrachloride	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Chlorobenzene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Chlorodibromomethane	ND	0.0020	mg/Kg wet	1	V-05	SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Chloroethane	ND	0.010	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Chloroform	ND	0.0040	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Chloromethane	ND	0.010	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
2-Chlorotoluene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
4-Chlorotoluene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0040	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
1,2-Dibromoethane (EDB)	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Dibromomethane	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
1,2-Dichlorobenzene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
1,3-Dichlorobenzene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
1,4-Dichlorobenzene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Dichlorodifluoromethane (Freon 12)	ND	0.010	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
1,1-Dichloroethane	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
1,2-Dichloroethane	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
1,1-Dichloroethylene	ND	0.0040	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
cis-1,2-Dichloroethylene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
trans-1,2-Dichloroethylene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
1,2-Dichloropropane	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
1,3-Dichloropropane	ND	0.0010	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
2,2-Dichloropropane	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
1,1-Dichloropropene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
cis-1,3-Dichloropropene	ND	0.0010	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
trans-1,3-Dichloropropene	ND	0.0010	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Diethyl Ether	ND	0.010	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Diisopropyl Ether (DIPE)	ND	0.0010	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
1,4-Dioxane	ND	0.20	mg/Kg wet	1	R-05, V-16	SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Ethylbenzene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17C1191

Date Received: 3/30/2017

Field Sample #: TB-01 | Sampled: 3/29/2017 07:00

Sample ID: 17C1191-12

Sample Matrix: Trip Blank Soil

Volatile Organic Compounds by GC/MS

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Hexachlorobutadiene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
2-Hexanone (MBK)	ND	0.020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Isopropylbenzene (Cumene)	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
p-Isopropyltoluene (p-Cymene)	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Methyl tert-Butyl Ether (MTBE)	ND	0.0040	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Methylene Chloride	ND	0.010	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
4-Methyl-2-pentanone (MIBK)	ND	0.020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Naphthalene	ND	0.010	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
n-Propylbenzene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Styrene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
1,1,1,2-Tetrachloroethane	ND	0.0020	mg/Kg wet	1	V-05	SW-846 8260C	4/3/17	4/3/17 16:09	MFF
1,1,2,2-Tetrachloroethane	ND	0.0010	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Tetrachloroethylene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Tetrahydrofuran	ND	0.010	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Toluene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
1,2,3-Trichlorobenzene	ND	0.010	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
1,2,4-Trichlorobenzene	ND	0.010	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
1,1,1-Trichloroethane	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
1,1,2-Trichloroethane	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Trichloroethylene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Trichlorofluoromethane (Freon 11)	ND	0.010	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
1,2,3-Trichloropropane	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
1,2,4-Trimethylbenzene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
1,3,5-Trimethylbenzene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
Vinyl Chloride	ND	0.010	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
m+p Xylene	ND	0.0040	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF
o-Xylene	ND	0.0020	mg/Kg wet	1		SW-846 8260C	4/3/17	4/3/17 16:09	MFF

Surrogates	% Recovery	Recovery Limits	Flag/Qual	
1,2-Dichloroethane-d4	81.5	70-130		4/3/17 16:09
Toluene-d8	99.2	70-130		4/3/17 16:09
4-Bromofluorobenzene	92.5	70-130		4/3/17 16:09

con-test® ANALYTICAL LABORATORY
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Sample Extraction Data

Prep Method: SW-846 3546-MADEP-EPH-04-1.1

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
17C1191-01 [NOB-101 0-2]	B173507	20.0	2.00	03/31/17
17C1191-02 [NOB-101 6-8]	B173507	20.0	2.00	03/31/17
17C1191-03 [NOB-102 0-2]	B173507	20.0	2.00	03/31/17
17C1191-04 [NOB-102 7-8]	B173507	20.0	2.00	03/31/17
17C1191-05 [NOB-104 0-2]	B173507	20.0	2.00	03/31/17
17C1191-06 [NOB-104 5-5.5]	B173507	20.0	2.00	03/31/17
17C1191-07 [NOB-105 0-2]	B173507	20.0	2.00	03/31/17
17C1191-08 [NOB-105 11-12]	B173507	20.0	2.00	03/31/17
17C1191-09 [NOB-106 0-2]	B173507	20.0	2.00	03/31/17
17C1191-10 [NOB-106 4-5]	B173507	20.0	2.00	03/31/17
17C1191-11 [FD-01]	B173507	20.0	2.00	03/31/17

Prep Method: MA VPH-MADEP-VPH-04-1.1

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
17C1191-01 [NOB-101 0-2]	B173753	20.5	17.2	04/04/17
17C1191-02 [NOB-101 6-8]	B173753	16.4	17.6	04/04/17
17C1191-03 [NOB-102 0-2]	B173753	21.6	17.1	04/04/17
17C1191-04 [NOB-102 7-8]	B173753	20.9	17.0	04/04/17
17C1191-05 [NOB-104 0-2]	B173753	6.70	5.80	04/04/17
17C1191-06 [NOB-104 5-5.5]	B173753	5.20	5.50	04/04/17

Prep Method: MA VPH-MADEP-VPH-04-1.1

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
17C1191-07 [NOB-105 0-2]	B173829	7.30	5.80	04/05/17
17C1191-08 [NOB-105 11-12]	B173829	6.70	7.50	04/05/17
17C1191-09 [NOB-106 0-2]	B173829	6.40	6.10	04/05/17
17C1191-10 [NOB-106 4-5]	B173829	8.70	6.10	04/05/17
17C1191-11 [FD-01]	B173829	7.20	5.70	04/05/17

Prep Method: % Solids-SM 2540G

Lab Number [Field ID]	Batch	Date
17C1191-01 [NOB-101 0-2]	B173503	03/31/17
17C1191-02 [NOB-101 6-8]	B173503	03/31/17
17C1191-03 [NOB-102 0-2]	B173503	03/31/17
17C1191-04 [NOB-102 7-8]	B173503	03/31/17
17C1191-05 [NOB-104 0-2]	B173503	03/31/17
17C1191-06 [NOB-104 5-5.5]	B173503	03/31/17
17C1191-07 [NOB-105 0-2]	B173503	03/31/17
17C1191-08 [NOB-105 11-12]	B173503	03/31/17
17C1191-09 [NOB-106 0-2]	B173503	03/31/17
17C1191-10 [NOB-106 4-5]	B173503	03/31/17
17C1191-11 [FD-01]	B173503	03/31/17

Prep Method: SW-846 3051-SW-846 6010C-D

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
17C1191-01 [NOB-101 0-2]	B173743	1.08	50.0	04/04/17

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Sample Extraction Data

Prep Method: SW-846 3051-SW-846 6010C-D

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
17C1191-02 [NOB-101 6-8]	B173743	1.03	50.0	04/04/17
17C1191-03 [NOB-102 0-2]	B173743	1.05	50.0	04/04/17
17C1191-04 [NOB-102 7-8]	B173743	1.02	50.0	04/04/17
17C1191-05 [NOB-104 0-2]	B173743	1.01	50.0	04/04/17
17C1191-06 [NOB-104 5-5.5]	B173743	1.00	50.0	04/04/17
17C1191-07 [NOB-105 0-2]	B173743	0.998	50.0	04/04/17
17C1191-08 [NOB-105 11-12]	B173743	1.02	50.0	04/04/17
17C1191-09 [NOB-106 0-2]	B173743	0.994	50.0	04/04/17
17C1191-10 [NOB-106 4-5]	B173743	1.04	50.0	04/04/17
17C1191-11 [FD-01]	B173743	0.969	50.0	04/04/17

Prep Method: SW-846 7471-SW-846 7471B

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
17C1191-01 [NOB-101 0-2]	B173810	0.609	50.0	04/06/17
17C1191-02 [NOB-101 6-8]	B173810	0.611	50.0	04/06/17
17C1191-03 [NOB-102 0-2]	B173810	0.620	50.0	04/06/17
17C1191-04 [NOB-102 7-8]	B173810	0.609	50.0	04/06/17
17C1191-05 [NOB-104 0-2]	B173810	0.616	50.0	04/06/17
17C1191-06 [NOB-104 5-5.5]	B173810	0.593	50.0	04/06/17
17C1191-07 [NOB-105 0-2]	B173810	0.617	50.0	04/06/17
17C1191-08 [NOB-105 11-12]	B173810	0.620	50.0	04/06/17
17C1191-09 [NOB-106 0-2]	B173810	0.594	50.0	04/06/17
17C1191-10 [NOB-106 4-5]	B173810	0.629	50.0	04/06/17
17C1191-11 [FD-01]	B173810	0.609	50.0	04/06/17

Prep Method: SW-846 5035-SW-846 8260C

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
17C1191-01 [NOB-101 0-2]	B173524	4.23	10.0	03/31/17
17C1191-02 [NOB-101 6-8]	B173524	6.89	10.0	03/31/17
17C1191-03 [NOB-102 0-2]	B173524	7.56	10.0	03/31/17
17C1191-04 [NOB-102 7-8]	B173524	7.21	10.0	03/31/17
17C1191-05 [NOB-104 0-2]	B173524	6.87	10.0	03/31/17
17C1191-07 [NOB-105 0-2]	B173524	7.46	10.0	03/31/17

Prep Method: SW-846 5035-SW-846 8260C

Lab Number [Field ID]	Batch	Sample Amount(g)	Methanol Volume(mL)	Methanol Aliquot(mL)	Final Volume(mL)	Date
17C1191-09 [NOB-106 0-2]	B173532	16.6	17.3	1	50	03/31/17

Prep Method: SW-846 5035-SW-846 8260C

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
17C1191-06 [NOB-104 5-5.5]	B173594	6.08	10.0	03/31/17

Prep Method: SW-846 5035-SW-846 8260C

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date

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Sample Extraction Data

Prep Method: SW-846 5035-SW-846 8260C

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
17C1191-08 [NOB-105 11-12]	B173635	6.14	10.0	04/03/17
17C1191-10 [NOB-106 4-5]	B173635	4.90	10.0	04/03/17
17C1191-11 [FD-01]	B173635	7.74	10.0	04/03/17
17C1191-12 [TB-01]	B173635	5.00	10.0	04/03/17

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QUALITY CONTROL

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B173524 - SW-846 5035										
Blank (B173524-BLK1)				Prepared & Analyzed: 03/31/17						
Acetone	ND	0.10	mg/Kg wet							
tert-Amyl Methyl Ether (TAME)	ND	0.0010	mg/Kg wet							
Benzene	ND	0.0020	mg/Kg wet							
Bromobenzene	ND	0.0020	mg/Kg wet							
Bromochloromethane	ND	0.0020	mg/Kg wet							
Bromodichloromethane	ND	0.0020	mg/Kg wet							
Bromoform	ND	0.0020	mg/Kg wet							
Bromomethane	ND	0.010	mg/Kg wet							
2-Butanone (MEK)	ND	0.040	mg/Kg wet							
n-Butylbenzene	ND	0.0020	mg/Kg wet							
sec-Butylbenzene	ND	0.0020	mg/Kg wet							
tert-Butylbenzene	ND	0.0020	mg/Kg wet							
tert-Butyl Ethyl Ether (TBEE)	ND	0.0010	mg/Kg wet							
Carbon Disulfide	ND	0.0060	mg/Kg wet							
Carbon Tetrachloride	ND	0.0020	mg/Kg wet							
Chlorobenzene	ND	0.0020	mg/Kg wet							
Chlorodibromomethane	ND	0.0010	mg/Kg wet							
Chloroethane	ND	0.010	mg/Kg wet							R-05
Chloroform	ND	0.0040	mg/Kg wet							
Chloromethane	ND	0.010	mg/Kg wet							
2-Chlorotoluene	ND	0.0020	mg/Kg wet							
4-Chlorotoluene	ND	0.0020	mg/Kg wet							
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0020	mg/Kg wet							V-05
1,2-Dibromoethane (EDB)	ND	0.0010	mg/Kg wet							
Dibromomethane	ND	0.0020	mg/Kg wet							
1,2-Dichlorobenzene	ND	0.0020	mg/Kg wet							
1,3-Dichlorobenzene	ND	0.0020	mg/Kg wet							
1,4-Dichlorobenzene	ND	0.0020	mg/Kg wet							
Dichlorodifluoromethane (Freon 12)	ND	0.010	mg/Kg wet							
1,1-Dichloroethane	ND	0.0020	mg/Kg wet							
1,2-Dichloroethane	ND	0.0020	mg/Kg wet							
1,1-Dichloroethylene	ND	0.0040	mg/Kg wet							
cis-1,2-Dichloroethylene	ND	0.0020	mg/Kg wet							
trans-1,2-Dichloroethylene	ND	0.0020	mg/Kg wet							
1,2-Dichloropropane	ND	0.0020	mg/Kg wet							
1,3-Dichloropropane	ND	0.0010	mg/Kg wet							
2,2-Dichloropropane	ND	0.0020	mg/Kg wet							
1,1-Dichloropropene	ND	0.0020	mg/Kg wet							
cis-1,3-Dichloropropene	ND	0.0010	mg/Kg wet							
trans-1,3-Dichloropropene	ND	0.0010	mg/Kg wet							
Diethyl Ether	ND	0.010	mg/Kg wet							
Diisopropyl Ether (DIPE)	ND	0.0010	mg/Kg wet							
1,4-Dioxane	ND	0.10	mg/Kg wet							V-16
Ethylbenzene	ND	0.0020	mg/Kg wet							
Hexachlorobutadiene	ND	0.0020	mg/Kg wet							
2-Hexanone (MBK)	ND	0.020	mg/Kg wet							
Isopropylbenzene (Cumene)	ND	0.0020	mg/Kg wet							
p-Isopropyltoluene (p-Cymene)	ND	0.0020	mg/Kg wet							
Methyl tert-Butyl Ether (MTBE)	ND	0.0040	mg/Kg wet							
Methylene Chloride	ND	0.010	mg/Kg wet							
4-Methyl-2-pentanone (MIBK)	ND	0.020	mg/Kg wet							
Naphthalene	ND	0.0040	mg/Kg wet							V-05

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QUALITY CONTROL

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes	
Batch B173524 - SW-846 5035											
Blank (B173524-BLK1)				Prepared & Analyzed: 03/31/17							
n-Propylbenzene	ND	0.0020	mg/Kg wet								
Styrene	ND	0.0020	mg/Kg wet								
1,1,1,2-Tetrachloroethane	ND	0.0020	mg/Kg wet								
1,1,2,2-Tetrachloroethane	ND	0.0010	mg/Kg wet								
Tetrachloroethylene	ND	0.0020	mg/Kg wet								
Tetrahydrofuran	ND	0.010	mg/Kg wet							V-16	
Toluene	ND	0.0020	mg/Kg wet								
1,2,3-Trichlorobenzene	ND	0.0020	mg/Kg wet								
1,2,4-Trichlorobenzene	ND	0.0020	mg/Kg wet								
1,1,1-Trichloroethane	ND	0.0020	mg/Kg wet								
1,1,2-Trichloroethane	ND	0.0020	mg/Kg wet								
Trichloroethylene	ND	0.0020	mg/Kg wet								
Trichlorofluoromethane (Freon 11)	ND	0.010	mg/Kg wet								
1,2,3-Trichloropropane	ND	0.0020	mg/Kg wet								
1,2,4-Trimethylbenzene	ND	0.0020	mg/Kg wet								
1,3,5-Trimethylbenzene	ND	0.0020	mg/Kg wet								
Vinyl Chloride	ND	0.010	mg/Kg wet								
m+p Xylene	ND	0.0040	mg/Kg wet								
o-Xylene	ND	0.0020	mg/Kg wet								
Surrogate: 1,2-Dichloroethane-d4	*0.0473*		mg/Kg wet	0.0500		94.5	70-130				
Surrogate: Toluene-d8	*0.0508*		mg/Kg wet	0.0500		102	70-130				
Surrogate: 4-Bromofluorobenzene	*0.0499*		mg/Kg wet	0.0500		99.8	70-130				
LCS (B173524-BS1)				Prepared & Analyzed: 03/31/17							
Acetone	0.186	0.10	mg/Kg wet	0.200		93.2	40-160				†
tert-Amyl Methyl Ether (TAME)	0.0196	0.0010	mg/Kg wet	0.0200		97.8	70-130				
Benzene	0.0205	0.0020	mg/Kg wet	0.0200		102	70-130				
Bromobenzene	0.0183	0.0020	mg/Kg wet	0.0200		91.6	70-130				
Bromochloromethane	0.0235	0.0020	mg/Kg wet	0.0200		118	70-130				
Bromodichloromethane	0.0195	0.0020	mg/Kg wet	0.0200		97.4	70-130				
Bromoform	0.0203	0.0020	mg/Kg wet	0.0200		101	70-130				
Bromomethane	0.0171	0.010	mg/Kg wet	0.0200		85.5	40-160				†
2-Butanone (MEK)	0.172	0.040	mg/Kg wet	0.200		86.0	40-160				†
n-Butylbenzene	0.0187	0.0020	mg/Kg wet	0.0200		93.4	70-130				
sec-Butylbenzene	0.0212	0.0020	mg/Kg wet	0.0200		106	70-130				
tert-Butylbenzene	0.0198	0.0020	mg/Kg wet	0.0200		99.0	70-130				
tert-Butyl Ethyl Ether (TBEE)	0.0193	0.0010	mg/Kg wet	0.0200		96.5	70-130				
Carbon Disulfide	0.0224	0.0060	mg/Kg wet	0.0200		112	70-130				
Carbon Tetrachloride	0.0215	0.0020	mg/Kg wet	0.0200		108	70-130				
Chlorobenzene	0.0198	0.0020	mg/Kg wet	0.0200		99.0	70-130				
Chlorodibromomethane	0.0221	0.0010	mg/Kg wet	0.0200		110	70-130				
Chloroethane	0.0169	0.010	mg/Kg wet	0.0200		84.6	70-130			R-05	
Chloroform	0.0196	0.0040	mg/Kg wet	0.0200		98.0	70-130				
Chloromethane	0.0146	0.010	mg/Kg wet	0.0200		73.1	40-160				†
2-Chlorotoluene	0.0202	0.0020	mg/Kg wet	0.0200		101	70-130				
4-Chlorotoluene	0.0194	0.0020	mg/Kg wet	0.0200		96.8	70-130				
1,2-Dibromo-3-chloropropane (DBCP)	0.0198	0.0020	mg/Kg wet	0.0200		98.8	70-130			V-05	
1,2-Dibromoethane (EDB)	0.0211	0.0010	mg/Kg wet	0.0200		106	70-130				
Dibromomethane	0.0208	0.0020	mg/Kg wet	0.0200		104	70-130				
1,2-Dichlorobenzene	0.0195	0.0020	mg/Kg wet	0.0200		97.6	70-130				
1,3-Dichlorobenzene	0.0201	0.0020	mg/Kg wet	0.0200		100	70-130				
1,4-Dichlorobenzene	0.0194	0.0020	mg/Kg wet	0.0200		96.8	70-130				

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QUALITY CONTROL

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes	
Batch B173524 - SW-846 5035											
LCS (B173524-BS1)				Prepared & Analyzed: 03/31/17							
Dichlorodifluoromethane (Freon 12)	0.0188	0.010	mg/Kg wet	0.0200		94.1	40-160				†
1,1-Dichloroethane	0.0201	0.0020	mg/Kg wet	0.0200		101	70-130				
1,2-Dichloroethane	0.0212	0.0020	mg/Kg wet	0.0200		106	70-130				
1,1-Dichloroethylene	0.0208	0.0040	mg/Kg wet	0.0200		104	70-130				
cis-1,2-Dichloroethylene	0.0188	0.0020	mg/Kg wet	0.0200		93.9	70-130				
trans-1,2-Dichloroethylene	0.0228	0.0020	mg/Kg wet	0.0200		114	70-130				
1,2-Dichloropropane	0.0206	0.0020	mg/Kg wet	0.0200		103	70-130				
1,3-Dichloropropane	0.0205	0.0010	mg/Kg wet	0.0200		102	70-130				
2,2-Dichloropropane	0.0195	0.0020	mg/Kg wet	0.0200		97.7	70-130				
1,1-Dichloropropene	0.0204	0.0020	mg/Kg wet	0.0200		102	70-130				
cis-1,3-Dichloropropene	0.0191	0.0010	mg/Kg wet	0.0200		95.6	70-130				
trans-1,3-Dichloropropene	0.0204	0.0010	mg/Kg wet	0.0200		102	70-130				
Diethyl Ether	0.0209	0.010	mg/Kg wet	0.0200		104	70-130				
Diisopropyl Ether (DIPE)	0.0174	0.0010	mg/Kg wet	0.0200		87.0	70-130				
1,4-Dioxane	0.227	0.10	mg/Kg wet	0.200		113	40-160			V-16	†
Ethylbenzene	0.0192	0.0020	mg/Kg wet	0.0200		95.8	70-130				
Hexachlorobutadiene	0.0200	0.0020	mg/Kg wet	0.0200		100	70-130				
2-Hexanone (MBK)	0.190	0.020	mg/Kg wet	0.200		94.8	40-160				†
Isopropylbenzene (Cumene)	0.0226	0.0020	mg/Kg wet	0.0200		113	70-130				
p-Isopropyltoluene (p-Cymene)	0.0193	0.0020	mg/Kg wet	0.0200		96.5	70-130				
Methyl tert-Butyl Ether (MTBE)	0.0199	0.0040	mg/Kg wet	0.0200		99.6	70-130				
Methylene Chloride	0.0199	0.010	mg/Kg wet	0.0200		99.4	70-130				
4-Methyl-2-pentanone (MIBK)	0.190	0.020	mg/Kg wet	0.200		94.9	40-160				†
Naphthalene	0.0179	0.0040	mg/Kg wet	0.0200		89.5	70-130			V-05	
n-Propylbenzene	0.0200	0.0020	mg/Kg wet	0.0200		100	70-130				
Styrene	0.0193	0.0020	mg/Kg wet	0.0200		96.7	70-130				
1,1,1,2-Tetrachloroethane	0.0210	0.0020	mg/Kg wet	0.0200		105	70-130				
1,1,2,2-Tetrachloroethane	0.0201	0.0010	mg/Kg wet	0.0200		101	70-130				
Tetrachloroethylene	0.0224	0.0020	mg/Kg wet	0.0200		112	70-130				
Tetrahydrofuran	0.0180	0.010	mg/Kg wet	0.0200		90.2	70-130			V-16	
Toluene	0.0215	0.0020	mg/Kg wet	0.0200		108	70-130				
1,2,3-Trichlorobenzene	0.0190	0.0020	mg/Kg wet	0.0200		95.2	70-130				
1,2,4-Trichlorobenzene	0.0186	0.0020	mg/Kg wet	0.0200		92.8	70-130				
1,1,1-Trichloroethane	0.0213	0.0020	mg/Kg wet	0.0200		107	70-130				
1,1,2-Trichloroethane	0.0206	0.0020	mg/Kg wet	0.0200		103	70-130				
Trichloroethylene	0.0208	0.0020	mg/Kg wet	0.0200		104	70-130				
Trichlorofluoromethane (Freon 11)	0.0220	0.010	mg/Kg wet	0.0200		110	70-130				
1,2,3-Trichloropropane	0.0204	0.0020	mg/Kg wet	0.0200		102	70-130				
1,2,4-Trimethylbenzene	0.0190	0.0020	mg/Kg wet	0.0200		94.9	70-130				
1,3,5-Trimethylbenzene	0.0199	0.0020	mg/Kg wet	0.0200		99.5	70-130				
Vinyl Chloride	0.0177	0.010	mg/Kg wet	0.0200		88.7	70-130				
m+p Xylene	0.0395	0.0040	mg/Kg wet	0.0400		98.6	70-130				
o-Xylene	0.0196	0.0020	mg/Kg wet	0.0200		97.8	70-130				
Surrogate: 1,2-Dichloroethane-d4	*0.0465*		mg/Kg wet	0.0500		93.0	70-130				
Surrogate: Toluene-d8	*0.0511*		mg/Kg wet	0.0500		102	70-130				
Surrogate: 4-Bromofluorobenzene	*0.0496*		mg/Kg wet	0.0500		99.3	70-130				

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QUALITY CONTROL

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC		%REC Limits	RPD		RPD Limit	Notes	
Batch B173524 - SW-846 5035													
LCS Dup (B173524-BSD1)				Prepared & Analyzed: 03/31/17									
Acetone	0.195	0.10	mg/Kg wet	0.200		97.4		40-160	4.45		20		†
tert-Amyl Methyl Ether (TAME)	0.0197	0.0010	mg/Kg wet	0.0200		98.5		70-130	0.713		20		
Benzene	0.0211	0.0020	mg/Kg wet	0.0200		105		70-130	2.99		20		
Bromobenzene	0.0209	0.0020	mg/Kg wet	0.0200		105		70-130	13.3		20		
Bromochloromethane	0.0248	0.0020	mg/Kg wet	0.0200		124		70-130	5.22		20		
Bromodichloromethane	0.0203	0.0020	mg/Kg wet	0.0200		102		70-130	4.32		20		
Bromoform	0.0244	0.0020	mg/Kg wet	0.0200		122		70-130	18.7		20		
Bromomethane	0.0184	0.010	mg/Kg wet	0.0200		92.1		40-160	7.43		20		†
2-Butanone (MEK)	0.185	0.040	mg/Kg wet	0.200		92.5		40-160	7.32		20		†
n-Butylbenzene	0.0198	0.0020	mg/Kg wet	0.0200		99.1		70-130	5.92		20		
sec-Butylbenzene	0.0227	0.0020	mg/Kg wet	0.0200		114		70-130	6.93		20		
tert-Butylbenzene	0.0207	0.0020	mg/Kg wet	0.0200		103		70-130	4.35		20		
tert-Butyl Ethyl Ether (TBEE)	0.0201	0.0010	mg/Kg wet	0.0200		100		70-130	3.86		20		
Carbon Disulfide	0.0230	0.0060	mg/Kg wet	0.0200		115		70-130	2.82		20		
Carbon Tetrachloride	0.0215	0.0020	mg/Kg wet	0.0200		107		70-130	0.186		20		
Chlorobenzene	0.0209	0.0020	mg/Kg wet	0.0200		105		70-130	5.60		20		
Chlorodibromomethane	0.0235	0.0010	mg/Kg wet	0.0200		117		70-130	6.15		20		
Chloroethane	0.0220	0.010	mg/Kg wet	0.0200		110		70-130	**26.3**	*	20	R-05	
Chloroform	0.0206	0.0040	mg/Kg wet	0.0200		103		70-130	5.17		20		
Chloromethane	0.0146	0.010	mg/Kg wet	0.0200		72.9		40-160	0.274		20		†
2-Chlorotoluene	0.0218	0.0020	mg/Kg wet	0.0200		109		70-130	7.81		20		
4-Chlorotoluene	0.0207	0.0020	mg/Kg wet	0.0200		104		70-130	6.88		20		
1,2-Dibromo-3-chloropropane (DBCP)	0.0212	0.0020	mg/Kg wet	0.0200		106		70-130	6.84		20	V-05	
1,2-Dibromoethane (EDB)	0.0220	0.0010	mg/Kg wet	0.0200		110		70-130	4.17		20		
Dibromomethane	0.0219	0.0020	mg/Kg wet	0.0200		109		70-130	4.96		20		
1,2-Dichlorobenzene	0.0208	0.0020	mg/Kg wet	0.0200		104		70-130	6.45		20		
1,3-Dichlorobenzene	0.0212	0.0020	mg/Kg wet	0.0200		106		70-130	5.53		20		
1,4-Dichlorobenzene	0.0206	0.0020	mg/Kg wet	0.0200		103		70-130	6.11		20		
Dichlorodifluoromethane (Freon 12)	0.0170	0.010	mg/Kg wet	0.0200		85.2		40-160	9.93		20		†
1,1-Dichloroethane	0.0212	0.0020	mg/Kg wet	0.0200		106		70-130	5.04		20		
1,2-Dichloroethane	0.0213	0.0020	mg/Kg wet	0.0200		106		70-130	0.659		20		
1,1-Dichloroethylene	0.0211	0.0040	mg/Kg wet	0.0200		105		70-130	1.24		20		
cis-1,2-Dichloroethylene	0.0192	0.0020	mg/Kg wet	0.0200		95.8		70-130	2.00		20		
trans-1,2-Dichloroethylene	0.0232	0.0020	mg/Kg wet	0.0200		116		70-130	1.65		20		
1,2-Dichloropropane	0.0211	0.0020	mg/Kg wet	0.0200		106		70-130	2.50		20		
1,3-Dichloropropane	0.0209	0.0010	mg/Kg wet	0.0200		104		70-130	1.84		20		
2,2-Dichloropropane	0.0206	0.0020	mg/Kg wet	0.0200		103		70-130	5.48		20		
1,1-Dichloropropene	0.0209	0.0020	mg/Kg wet	0.0200		105		70-130	2.51		20		
cis-1,3-Dichloropropene	0.0200	0.0010	mg/Kg wet	0.0200		100		70-130	4.60		20		
trans-1,3-Dichloropropene	0.0217	0.0010	mg/Kg wet	0.0200		108		70-130	6.28		20		
Diethyl Ether	0.0213	0.010	mg/Kg wet	0.0200		107		70-130	2.09		20		
Diisopropyl Ether (DIPE)	0.0178	0.0010	mg/Kg wet	0.0200		89.2		70-130	2.50		20		
1,4-Dioxane	0.226	0.10	mg/Kg wet	0.200		113		40-160	0.495		20	V-16	†
Ethylbenzene	0.0206	0.0020	mg/Kg wet	0.0200		103		70-130	7.44		20		
Hexachlorobutadiene	0.0221	0.0020	mg/Kg wet	0.0200		110		70-130	9.79		20		
2-Hexanone (MBK)	0.203	0.020	mg/Kg wet	0.200		102		40-160	6.91		20		†
Isopropylbenzene (Cumene)	0.0267	0.0020	mg/Kg wet	0.0200		**134**	*	70-130	16.9		20	L-07	
p-Isopropyltoluene (p-Cymene)	0.0208	0.0020	mg/Kg wet	0.0200		104		70-130	7.39		20		
Methyl tert-Butyl Ether (MTBE)	0.0204	0.0040	mg/Kg wet	0.0200		102		70-130	2.48		20		
Methylene Chloride	0.0200	0.010	mg/Kg wet	0.0200		99.8		70-130	0.402		20		
4-Methyl-2-pentanone (MIBK)	0.205	0.020	mg/Kg wet	0.200		102		40-160	7.67		20		†
Naphthalene	0.0200	0.0040	mg/Kg wet	0.0200		100		70-130	11.3		20	V-05	

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B173524 - SW-846 5035										
LCS Dup (B173524-BSD1)				Prepared & Analyzed: 03/31/17						
n-Propylbenzene	0.0235	0.0020	mg/Kg wet	0.0200		117	70-130	15.8	20	
Styrene	0.0228	0.0020	mg/Kg wet	0.0200		114	70-130	16.4	20	
1,1,1,2-Tetrachloroethane	0.0217	0.0020	mg/Kg wet	0.0200		109	70-130	3.65	20	
1,1,2,2-Tetrachloroethane	0.0227	0.0010	mg/Kg wet	0.0200		113	70-130	11.9	20	
Tetrachloroethylene	0.0230	0.0020	mg/Kg wet	0.0200		115	70-130	2.73	20	
Tetrahydrofuran	0.0190	0.010	mg/Kg wet	0.0200		95.1	70-130	5.29	20	V-16
Toluene	0.0217	0.0020	mg/Kg wet	0.0200		109	70-130	0.925	20	
1,2,3-Trichlorobenzene	0.0204	0.0020	mg/Kg wet	0.0200		102	70-130	6.90	20	
1,2,4-Trichlorobenzene	0.0205	0.0020	mg/Kg wet	0.0200		102	70-130	9.84	20	
1,1,1-Trichloroethane	0.0219	0.0020	mg/Kg wet	0.0200		110	70-130	2.77	20	
1,1,2-Trichloroethane	0.0209	0.0020	mg/Kg wet	0.0200		105	70-130	1.64	20	
Trichloroethylene	0.0217	0.0020	mg/Kg wet	0.0200		108	70-130	4.05	20	
Trichlorofluoromethane (Freon 11)	0.0224	0.010	mg/Kg wet	0.0200		112	70-130	1.89	20	
1,2,3-Trichloropropane	0.0229	0.0020	mg/Kg wet	0.0200		115	70-130	11.9	20	
1,2,4-Trimethylbenzene	0.0199	0.0020	mg/Kg wet	0.0200		99.7	70-130	4.93	20	
1,3,5-Trimethylbenzene	0.0215	0.0020	mg/Kg wet	0.0200		107	70-130	7.54	20	
Vinyl Chloride	0.0180	0.010	mg/Kg wet	0.0200		90.0	70-130	1.45	20	
m+p Xylene	0.0416	0.0040	mg/Kg wet	0.0400		104	70-130	5.38	20	
o-Xylene	0.0222	0.0020	mg/Kg wet	0.0200		111	70-130	12.7	20	
Surrogate: 1,2-Dichloroethane-d4	*0.0471*		mg/Kg wet	0.0500		94.1	70-130			
Surrogate: Toluene-d8	*0.0511*		mg/Kg wet	0.0500		102	70-130			
Surrogate: 4-Bromofluorobenzene	*0.0544*		mg/Kg wet	0.0500		109	70-130			
Batch B173532 - SW-846 5035										
Blank (B173532-BLK1)				Prepared: 03/31/17 Analyzed: 04/05/17						
Acetone	ND	2.5	mg/Kg wet							
tert-Amyl Methyl Ether (TAME)	ND	0.025	mg/Kg wet							
Benzene	ND	0.050	mg/Kg wet							
Bromobenzene	ND	0.050	mg/Kg wet							
Bromochloromethane	ND	0.050	mg/Kg wet							
Bromodichloromethane	ND	0.050	mg/Kg wet							
Bromoform	ND	0.10	mg/Kg wet							
Bromomethane	ND	0.25	mg/Kg wet							
2-Butanone (MEK)	ND	1.0	mg/Kg wet							
n-Butylbenzene	ND	0.050	mg/Kg wet							
sec-Butylbenzene	ND	0.050	mg/Kg wet							
tert-Butylbenzene	ND	0.050	mg/Kg wet							
tert-Butyl Ethyl Ether (TBEE)	ND	0.025	mg/Kg wet							
Carbon Disulfide	ND	0.50	mg/Kg wet							
Carbon Tetrachloride	ND	0.050	mg/Kg wet							
Chlorobenzene	ND	0.050	mg/Kg wet							
Chlorodibromomethane	ND	0.050	mg/Kg wet							
Chloroethane	ND	0.10	mg/Kg wet							
Chloroform	ND	0.10	mg/Kg wet							
Chloromethane	ND	0.10	mg/Kg wet							
2-Chlorotoluene	ND	0.050	mg/Kg wet							
4-Chlorotoluene	ND	0.050	mg/Kg wet							
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.20	mg/Kg wet							
1,2-Dibromoethane (EDB)	ND	0.025	mg/Kg wet							
Dibromomethane	ND	0.050	mg/Kg wet							
1,2-Dichlorobenzene	ND	0.050	mg/Kg wet							
1,3-Dichlorobenzene	ND	0.050	mg/Kg wet							

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QUALITY CONTROL

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B173532 - SW-846 5035										
Blank (B173532-BLK1)				Prepared: 03/31/17 Analyzed: 04/05/17						
1,4-Dichlorobenzene	ND	0.050	mg/Kg wet							
Dichlorodifluoromethane (Freon 12)	ND	0.10	mg/Kg wet							
1,1-Dichloroethane	ND	0.050	mg/Kg wet							
1,2-Dichloroethane	ND	0.050	mg/Kg wet							
1,1-Dichloroethylene	ND	0.050	mg/Kg wet							
cis-1,2-Dichloroethylene	ND	0.050	mg/Kg wet							
trans-1,2-Dichloroethylene	ND	0.050	mg/Kg wet							
1,2-Dichloropropane	ND	0.050	mg/Kg wet							
1,3-Dichloropropane	ND	0.025	mg/Kg wet							
2,2-Dichloropropane	ND	0.050	mg/Kg wet							
1,1-Dichloropropene	ND	0.10	mg/Kg wet							
cis-1,3-Dichloropropene	ND	0.025	mg/Kg wet							
trans-1,3-Dichloropropene	ND	0.025	mg/Kg wet							
Diethyl Ether	ND	0.10	mg/Kg wet							
Diisopropyl Ether (DIPE)	ND	0.025	mg/Kg wet							
1,4-Dioxane	ND	2.5	mg/Kg wet							V-16
Ethylbenzene	ND	0.050	mg/Kg wet							
Hexachlorobutadiene	ND	0.050	mg/Kg wet							
2-Hexanone (MBK)	ND	0.50	mg/Kg wet							
Isopropylbenzene (Cumene)	ND	0.050	mg/Kg wet							
p-Isopropyltoluene (p-Cymene)	ND	0.050	mg/Kg wet							
Methyl tert-Butyl Ether (MTBE)	ND	0.050	mg/Kg wet							
Methylene Chloride	ND	0.25	mg/Kg wet							
4-Methyl-2-pentanone (MIBK)	ND	0.50	mg/Kg wet							
Naphthalene	ND	0.10	mg/Kg wet							
n-Propylbenzene	ND	0.050	mg/Kg wet							
Styrene	ND	0.050	mg/Kg wet							
1,1,1,2-Tetrachloroethane	ND	0.050	mg/Kg wet							
1,1,2,2-Tetrachloroethane	ND	0.025	mg/Kg wet							
Tetrachloroethylene	ND	0.050	mg/Kg wet							
Tetrahydrofuran	ND	0.20	mg/Kg wet							
Toluene	ND	0.050	mg/Kg wet							
1,2,3-Trichlorobenzene	ND	0.20	mg/Kg wet							
1,2,4-Trichlorobenzene	ND	0.050	mg/Kg wet							
1,1,1-Trichloroethane	ND	0.050	mg/Kg wet							
1,1,2-Trichloroethane	ND	0.050	mg/Kg wet							
Trichloroethylene	ND	0.050	mg/Kg wet							
Trichlorofluoromethane (Freon 11)	ND	0.10	mg/Kg wet							
1,2,3-Trichloropropane	ND	0.10	mg/Kg wet							
1,2,4-Trimethylbenzene	ND	0.050	mg/Kg wet							
1,3,5-Trimethylbenzene	ND	0.050	mg/Kg wet							
Vinyl Chloride	ND	0.10	mg/Kg wet							
m+p Xylene	ND	0.10	mg/Kg wet							
o-Xylene	ND	0.050	mg/Kg wet							
Surrogate: 1,2-Dichloroethane-d4	*0.0248*		mg/Kg wet	0.0250		99.2	70-130			
Surrogate: Toluene-d8	*0.0251*		mg/Kg wet	0.0250		101	70-130			
Surrogate: 4-Bromofluorobenzene	*0.0237*		mg/Kg wet	0.0250		94.8	70-130			

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QUALITY CONTROL

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes	
Batch B173532 - SW-846 5035											
LCS (B173532-BS1)				Prepared: 03/31/17 Analyzed: 04/05/17							
Acetone	0.0940	0.057	mg/Kg wet	0.113		83.0	40-160				†
tert-Amyl Methyl Ether (TAME)	0.0103	0.00057	mg/Kg wet	0.0113		91.3	70-130				
Benzene	0.0112	0.0011	mg/Kg wet	0.0113		98.8	70-130				
Bromobenzene	0.0116	0.0011	mg/Kg wet	0.0113		102	70-130				
Bromochloromethane	0.0121	0.0011	mg/Kg wet	0.0113		107	70-130				
Bromodichloromethane	0.0111	0.0011	mg/Kg wet	0.0113		98.0	70-130				
Bromoform	0.0113	0.0023	mg/Kg wet	0.0113		100	70-130				
Bromomethane	0.00479	0.0057	mg/Kg wet	0.0113		42.3	40-160			L-14	†
2-Butanone (MEK)	0.110	0.023	mg/Kg wet	0.113		96.7	40-160				†
n-Butylbenzene	0.0133	0.0011	mg/Kg wet	0.0113		117	70-130				
sec-Butylbenzene	0.0124	0.0011	mg/Kg wet	0.0113		110	70-130				
tert-Butylbenzene	0.0122	0.0011	mg/Kg wet	0.0113		108	70-130				
tert-Butyl Ethyl Ether (TBEE)	0.0113	0.00057	mg/Kg wet	0.0113		100	70-130				
Carbon Disulfide	0.0124	0.011	mg/Kg wet	0.0113		109	70-130				
Carbon Tetrachloride	0.0115	0.0011	mg/Kg wet	0.0113		101	70-130				
Chlorobenzene	0.0112	0.0011	mg/Kg wet	0.0113		98.5	70-130				
Chlorodibromomethane	0.0106	0.0011	mg/Kg wet	0.0113		93.4	70-130				
Chloroethane	0.00988	0.0023	mg/Kg wet	0.0113		87.2	70-130				
Chloroform	0.0111	0.0023	mg/Kg wet	0.0113		97.9	70-130				
Chloromethane	0.00491	0.0023	mg/Kg wet	0.0113		43.3	40-160			L-14	†
2-Chlorotoluene	0.00992	0.0011	mg/Kg wet	0.0113		87.5	70-130				
4-Chlorotoluene	0.0111	0.0011	mg/Kg wet	0.0113		97.7	70-130				
1,2-Dibromo-3-chloropropane (DBCP)	0.0107	0.0045	mg/Kg wet	0.0113		94.0	70-130				
1,2-Dibromoethane (EDB)	0.0112	0.00057	mg/Kg wet	0.0113		98.5	70-130				
Dibromomethane	0.0111	0.0011	mg/Kg wet	0.0113		98.0	70-130				
1,2-Dichlorobenzene	0.0119	0.0011	mg/Kg wet	0.0113		105	70-130				
1,3-Dichlorobenzene	0.0118	0.0011	mg/Kg wet	0.0113		104	70-130				
1,4-Dichlorobenzene	0.0112	0.0011	mg/Kg wet	0.0113		98.6	70-130				
Dichlorodifluoromethane (Freon 12)	0.00638	0.0023	mg/Kg wet	0.0113		56.3	40-160			L-14	†
1,1-Dichloroethane	0.0125	0.0011	mg/Kg wet	0.0113		110	70-130				
1,2-Dichloroethane	0.0103	0.0011	mg/Kg wet	0.0113		90.6	70-130				
1,1-Dichloroethylene	0.00933	0.0011	mg/Kg wet	0.0113		82.3	70-130				
cis-1,2-Dichloroethylene	0.0117	0.0011	mg/Kg wet	0.0113		103	70-130				
trans-1,2-Dichloroethylene	0.0115	0.0011	mg/Kg wet	0.0113		102	70-130				
1,2-Dichloropropane	0.0112	0.0011	mg/Kg wet	0.0113		99.0	70-130				
1,3-Dichloropropane	0.0107	0.00057	mg/Kg wet	0.0113		94.5	70-130				
2,2-Dichloropropane	0.0132	0.0011	mg/Kg wet	0.0113		116	70-130				
1,1-Dichloropropene	0.0115	0.0023	mg/Kg wet	0.0113		101	70-130				
cis-1,3-Dichloropropene	0.0122	0.00057	mg/Kg wet	0.0113		108	70-130				
trans-1,3-Dichloropropene	0.0116	0.00057	mg/Kg wet	0.0113		102	70-130				
Diethyl Ether	0.00994	0.0023	mg/Kg wet	0.0113		87.7	70-130				
Diisopropyl Ether (DIPE)	0.0118	0.00057	mg/Kg wet	0.0113		104	70-130				
1,4-Dioxane	0.114	0.057	mg/Kg wet	0.113		100	40-160			V-16	†
Ethylbenzene	0.0115	0.0011	mg/Kg wet	0.0113		101	70-130				
Hexachlorobutadiene	0.0135	0.0011	mg/Kg wet	0.0113		119	70-130				
2-Hexanone (MBK)	0.113	0.011	mg/Kg wet	0.113		99.3	40-160				†
Isopropylbenzene (Cumene)	0.0119	0.0011	mg/Kg wet	0.0113		105	70-130				
p-Isopropyltoluene (p-Cymene)	0.0124	0.0011	mg/Kg wet	0.0113		109	70-130				
Methyl tert-Butyl Ether (MTBE)	0.0111	0.0011	mg/Kg wet	0.0113		98.0	70-130				
Methylene Chloride	0.00923	0.0057	mg/Kg wet	0.0113		81.4	70-130				
4-Methyl-2-pentanone (MIBK)	0.110	0.011	mg/Kg wet	0.113		97.2	40-160				†
Naphthalene	0.0120	0.0023	mg/Kg wet	0.0113		106	70-130				

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QUALITY CONTROL

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes	
Batch B173532 - SW-846 5035											
LCS (B173532-BS1)				Prepared: 03/31/17 Analyzed: 04/05/17							
n-Propylbenzene	0.0117	0.0011	mg/Kg wet	0.0113		103	70-130				
Styrene	0.0114	0.0011	mg/Kg wet	0.0113		101	70-130				
1,1,1,2-Tetrachloroethane	0.0114	0.0011	mg/Kg wet	0.0113		101	70-130				
1,1,2,2-Tetrachloroethane	0.0115	0.00057	mg/Kg wet	0.0113		102	70-130				
Tetrachloroethylene	0.0116	0.0011	mg/Kg wet	0.0113		102	70-130				
Tetrahydrofuran	0.0113	0.0045	mg/Kg wet	0.0113		100	70-130				
Toluene	0.0112	0.0011	mg/Kg wet	0.0113		98.5	70-130				
1,2,3-Trichlorobenzene	0.0126	0.0045	mg/Kg wet	0.0113		111	70-130				
1,2,4-Trichlorobenzene	0.0124	0.0011	mg/Kg wet	0.0113		110	70-130				
1,1,1-Trichloroethane	0.0112	0.0011	mg/Kg wet	0.0113		99.0	70-130				
1,1,2-Trichloroethane	0.0111	0.0011	mg/Kg wet	0.0113		98.1	70-130				
Trichloroethylene	0.0115	0.0011	mg/Kg wet	0.0113		102	70-130				
Trichlorofluoromethane (Freon 11)	0.00806	0.0023	mg/Kg wet	0.0113		71.1	70-130				
1,2,3-Trichloropropane	0.0109	0.0023	mg/Kg wet	0.0113		95.9	70-130				
1,2,4-Trimethylbenzene	0.0120	0.0011	mg/Kg wet	0.0113		106	70-130				
1,3,5-Trimethylbenzene	0.0117	0.0011	mg/Kg wet	0.0113		104	70-130				
Vinyl Chloride	0.00793	0.0023	mg/Kg wet	0.0113		70.0	70-130				
m+p Xylene	0.0230	0.0023	mg/Kg wet	0.0227		101	70-130				
o-Xylene	0.0113	0.0011	mg/Kg wet	0.0113		100	70-130				
Surrogate: 1,2-Dichloroethane-d4	*0.0288*		mg/Kg wet	0.0283		102	70-130				
Surrogate: Toluene-d8	*0.0287*		mg/Kg wet	0.0283		101	70-130				
Surrogate: 4-Bromofluorobenzene	*0.0283*		mg/Kg wet	0.0283		100	70-130				
LCS Dup (B173532-BSD1)				Prepared: 03/31/17 Analyzed: 04/05/17							
Acetone	0.100	0.057	mg/Kg wet	0.113		88.3	40-160	6.20	20		†
tert-Amyl Methyl Ether (TAME)	0.0105	0.00057	mg/Kg wet	0.0113		92.3	70-130	1.09	20		
Benzene	0.0112	0.0011	mg/Kg wet	0.0113		98.9	70-130	0.101	20		
Bromobenzene	0.0114	0.0011	mg/Kg wet	0.0113		100	70-130	1.68	20		
Bromochloromethane	0.0120	0.0011	mg/Kg wet	0.0113		106	70-130	0.658	20		
Bromodichloromethane	0.0114	0.0011	mg/Kg wet	0.0113		101	70-130	2.82	20		
Bromoform	0.0109	0.0023	mg/Kg wet	0.0113		96.4	70-130	3.67	20		
Bromomethane	0.00511	0.0057	mg/Kg wet	0.0113		45.1	40-160	6.41	20	L-14	†
2-Butanone (MEK)	0.114	0.023	mg/Kg wet	0.113		101	40-160	4.24	20		†
n-Butylbenzene	0.0131	0.0011	mg/Kg wet	0.0113		115	70-130	1.72	20		
sec-Butylbenzene	0.0122	0.0011	mg/Kg wet	0.0113		108	70-130	1.56	20		
tert-Butylbenzene	0.0120	0.0011	mg/Kg wet	0.0113		106	70-130	1.59	20		
tert-Butyl Ethyl Ether (TBEE)	0.0113	0.00057	mg/Kg wet	0.0113		99.5	70-130	0.601	20		
Carbon Disulfide	0.0117	0.011	mg/Kg wet	0.0113		103	70-130	6.03	20		
Carbon Tetrachloride	0.0113	0.0011	mg/Kg wet	0.0113		99.9	70-130	1.19	20		
Chlorobenzene	0.0110	0.0011	mg/Kg wet	0.0113		97.1	70-130	1.43	20		
Chlorodibromomethane	0.0108	0.0011	mg/Kg wet	0.0113		95.2	70-130	1.91	20		
Chloroethane	0.0102	0.0023	mg/Kg wet	0.0113		90.2	70-130	3.38	20		
Chloroform	0.0109	0.0023	mg/Kg wet	0.0113		96.3	70-130	1.65	20		
Chloromethane	0.00510	0.0023	mg/Kg wet	0.0113		45.0	40-160	3.85	20	L-14	†
2-Chlorotoluene	0.00961	0.0011	mg/Kg wet	0.0113		84.8	70-130	3.13	20		
4-Chlorotoluene	0.0110	0.0011	mg/Kg wet	0.0113		96.9	70-130	0.822	20		
1,2-Dibromo-3-chloropropane (DBCP)	0.0114	0.0045	mg/Kg wet	0.0113		100	70-130	6.58	20		
1,2-Dibromoethane (EDB)	0.0110	0.00057	mg/Kg wet	0.0113		97.1	70-130	1.43	20		
Dibromomethane	0.0114	0.0011	mg/Kg wet	0.0113		100	70-130	2.22	20		
1,2-Dichlorobenzene	0.0119	0.0011	mg/Kg wet	0.0113		105	70-130	0.666	20		
1,3-Dichlorobenzene	0.0118	0.0011	mg/Kg wet	0.0113		104	70-130	0.00	20		
1,4-Dichlorobenzene	0.0116	0.0011	mg/Kg wet	0.0113		102	70-130	3.68	20		

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QUALITY CONTROL

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC		%REC Limits	RPD	RPD Limit	Notes	
Batch B173532 - SW-846 5035												
LCS Dup (B173532-BSD1)				Prepared: 03/31/17 Analyzed: 04/05/17								
Dichlorodifluoromethane (Freon 12)	0.00643	0.0023	mg/Kg wet	0.0113		56.7		40-160	0.708	20	L-14	†
1,1-Dichloroethane	0.0124	0.0011	mg/Kg wet	0.0113		110		70-130	0.636	20		
1,2-Dichloroethane	0.0102	0.0011	mg/Kg wet	0.0113		90.3		70-130	0.332	20		
1,1-Dichloroethylene	0.00921	0.0011	mg/Kg wet	0.0113		81.3		70-130	1.22	20		
cis-1,2-Dichloroethylene	0.0116	0.0011	mg/Kg wet	0.0113		102		70-130	1.27	20		
trans-1,2-Dichloroethylene	0.0117	0.0011	mg/Kg wet	0.0113		104		70-130	1.85	20		
1,2-Dichloropropane	0.0109	0.0011	mg/Kg wet	0.0113		96.1		70-130	2.97	20		
1,3-Dichloropropane	0.0109	0.00057	mg/Kg wet	0.0113		95.9		70-130	1.47	20		
2,2-Dichloropropane	0.0129	0.0011	mg/Kg wet	0.0113		114		70-130	2.09	20		
1,1-Dichloropropene	0.0112	0.0023	mg/Kg wet	0.0113		98.9		70-130	2.50	20		
cis-1,3-Dichloropropene	0.0122	0.00057	mg/Kg wet	0.0113		107		70-130	0.279	20		
trans-1,3-Dichloropropene	0.0114	0.00057	mg/Kg wet	0.0113		100		70-130	2.07	20		
Diethyl Ether	0.0103	0.0023	mg/Kg wet	0.0113		91.0		70-130	3.69	20		
Diisopropyl Ether (DIPE)	0.0117	0.00057	mg/Kg wet	0.0113		103		70-130	1.25	20		
1,4-Dioxane	0.118	0.057	mg/Kg wet	0.113		105		40-160	4.19	20	V-16	†
Ethylbenzene	0.0112	0.0011	mg/Kg wet	0.0113		98.7		70-130	2.70	20		
Hexachlorobutadiene	0.0131	0.0011	mg/Kg wet	0.0113		115		70-130	2.91	20		
2-Hexanone (MBK)	0.115	0.011	mg/Kg wet	0.113		101		40-160	1.72	20		†
Isopropylbenzene (Cumene)	0.0117	0.0011	mg/Kg wet	0.0113		103		70-130	1.63	20		
p-Isopropyltoluene (p-Cymene)	0.0122	0.0011	mg/Kg wet	0.0113		108		70-130	1.20	20		
Methyl tert-Butyl Ether (MTBE)	0.0111	0.0011	mg/Kg wet	0.0113		97.6		70-130	0.409	20		
Methylene Chloride	0.00949	0.0057	mg/Kg wet	0.0113		83.7		70-130	2.79	20		
4-Methyl-2-pentanone (MIBK)	0.112	0.011	mg/Kg wet	0.113		99.0		40-160	1.82	20		†
Naphthalene	0.0122	0.0023	mg/Kg wet	0.0113		108		70-130	1.78	20		
n-Propylbenzene	0.0116	0.0011	mg/Kg wet	0.0113		102		70-130	0.972	20		
Styrene	0.0111	0.0011	mg/Kg wet	0.0113		97.9		70-130	3.12	20		
1,1,1,2-Tetrachloroethane	0.0116	0.0011	mg/Kg wet	0.0113		102		70-130	1.28	20		
1,1,2,2-Tetrachloroethane	0.0114	0.00057	mg/Kg wet	0.0113		101		70-130	0.791	20		
Tetrachloroethylene	0.0113	0.0011	mg/Kg wet	0.0113		99.6		70-130	2.38	20		
Tetrahydrofuran	0.0119	0.0045	mg/Kg wet	0.0113		105		70-130	5.16	20		
Toluene	0.0112	0.0011	mg/Kg wet	0.0113		98.9		70-130	0.405	20		
1,2,3-Trichlorobenzene	0.0128	0.0045	mg/Kg wet	0.0113		113		70-130	1.16	20		
1,2,4-Trichlorobenzene	0.0125	0.0011	mg/Kg wet	0.0113		110		70-130	0.727	20		
1,1,1-Trichloroethane	0.0112	0.0011	mg/Kg wet	0.0113		98.9		70-130	0.101	20		
1,1,2-Trichloroethane	0.0113	0.0011	mg/Kg wet	0.0113		99.9		70-130	1.82	20		
Trichloroethylene	0.0111	0.0011	mg/Kg wet	0.0113		98.3		70-130	3.20	20		
Trichlorofluoromethane (Freon 11)	0.00797	0.0023	mg/Kg wet	0.0113		70.3		70-130	1.13	20		
1,2,3-Trichloropropane	0.0107	0.0023	mg/Kg wet	0.0113		94.7		70-130	1.26	20		
1,2,4-Trimethylbenzene	0.0120	0.0011	mg/Kg wet	0.0113		106		70-130	0.0941	20		
1,3,5-Trimethylbenzene	0.0113	0.0011	mg/Kg wet	0.0113		99.6		70-130	3.94	20		
Vinyl Chloride	0.00764	0.0023	mg/Kg wet	0.0113		**67.4**	*	70-130	3.78	20	L-07	
m+p Xylene	0.0228	0.0023	mg/Kg wet	0.0227		101		70-130	0.593	20		
o-Xylene	0.0111	0.0011	mg/Kg wet	0.0113		97.8		70-130	2.22	20		
Surrogate: 1,2-Dichloroethane-d4	*0.0294*		mg/Kg wet	0.0283		104		70-130				
Surrogate: Toluene-d8	*0.0282*		mg/Kg wet	0.0283		99.6		70-130				
Surrogate: 4-Bromofluorobenzene	*0.0280*		mg/Kg wet	0.0283		98.9		70-130				

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QUALITY CONTROL

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B173594 - SW-846 5035										
Blank (B173594-BLK1)				Prepared & Analyzed: 04/03/17						
Acetone	ND	0.10	mg/Kg wet							
tert-Amyl Methyl Ether (TAME)	ND	0.0010	mg/Kg wet							
Benzene	ND	0.0020	mg/Kg wet							
Bromobenzene	ND	0.0020	mg/Kg wet							
Bromochloromethane	ND	0.0020	mg/Kg wet							
Bromodichloromethane	ND	0.0020	mg/Kg wet							
Bromoform	ND	0.0020	mg/Kg wet							
Bromomethane	ND	0.010	mg/Kg wet							
2-Butanone (MEK)	ND	0.040	mg/Kg wet							
n-Butylbenzene	ND	0.0020	mg/Kg wet							
sec-Butylbenzene	ND	0.0020	mg/Kg wet							
tert-Butylbenzene	ND	0.0020	mg/Kg wet							
tert-Butyl Ethyl Ether (TBEE)	ND	0.0010	mg/Kg wet							
Carbon Disulfide	ND	0.0060	mg/Kg wet							
Carbon Tetrachloride	ND	0.0020	mg/Kg wet							
Chlorobenzene	ND	0.0020	mg/Kg wet							
Chlorodibromomethane	ND	0.0010	mg/Kg wet							
Chloroethane	ND	0.010	mg/Kg wet							
Chloroform	ND	0.0040	mg/Kg wet							
Chloromethane	ND	0.010	mg/Kg wet							
2-Chlorotoluene	ND	0.0020	mg/Kg wet							
4-Chlorotoluene	ND	0.0020	mg/Kg wet							
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0020	mg/Kg wet							
1,2-Dibromoethane (EDB)	ND	0.0010	mg/Kg wet							
Dibromomethane	ND	0.0020	mg/Kg wet							
1,2-Dichlorobenzene	ND	0.0020	mg/Kg wet							
1,3-Dichlorobenzene	ND	0.0020	mg/Kg wet							
1,4-Dichlorobenzene	ND	0.0020	mg/Kg wet							
Dichlorodifluoromethane (Freon 12)	ND	0.010	mg/Kg wet							
1,1-Dichloroethane	ND	0.0020	mg/Kg wet							
1,2-Dichloroethane	ND	0.0020	mg/Kg wet							
1,1-Dichloroethylene	ND	0.0040	mg/Kg wet							
cis-1,2-Dichloroethylene	ND	0.0020	mg/Kg wet							
trans-1,2-Dichloroethylene	ND	0.0020	mg/Kg wet							
1,2-Dichloropropane	ND	0.0020	mg/Kg wet							
1,3-Dichloropropane	ND	0.0010	mg/Kg wet							
2,2-Dichloropropane	ND	0.0020	mg/Kg wet							
1,1-Dichloropropene	ND	0.0020	mg/Kg wet							
cis-1,3-Dichloropropene	ND	0.0010	mg/Kg wet							
trans-1,3-Dichloropropene	ND	0.0010	mg/Kg wet							
Diethyl Ether	ND	0.010	mg/Kg wet							
Diisopropyl Ether (DIPE)	ND	0.0010	mg/Kg wet							
1,4-Dioxane	ND	0.10	mg/Kg wet							V-16
Ethylbenzene	ND	0.0020	mg/Kg wet							
Hexachlorobutadiene	ND	0.0020	mg/Kg wet							
2-Hexanone (MBK)	ND	0.020	mg/Kg wet							
Isopropylbenzene (Cumene)	ND	0.0020	mg/Kg wet							
p-Isopropyltoluene (p-Cymene)	ND	0.0020	mg/Kg wet							
Methyl tert-Butyl Ether (MTBE)	ND	0.0040	mg/Kg wet							
Methylene Chloride	ND	0.010	mg/Kg wet							
4-Methyl-2-pentanone (MIBK)	ND	0.020	mg/Kg wet							
Naphthalene	ND	0.0040	mg/Kg wet							

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QUALITY CONTROL

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes	
Batch B173594 - SW-846 5035											
Blank (B173594-BLK1)				Prepared & Analyzed: 04/03/17							
n-Propylbenzene	ND	0.0020	mg/Kg wet								
Styrene	ND	0.0020	mg/Kg wet								
1,1,1,2-Tetrachloroethane	ND	0.0020	mg/Kg wet								
1,1,2,2-Tetrachloroethane	ND	0.0010	mg/Kg wet								
Tetrachloroethylene	ND	0.0020	mg/Kg wet								
Tetrahydrofuran	ND	0.010	mg/Kg wet							V-16	
Toluene	ND	0.0020	mg/Kg wet								
1,2,3-Trichlorobenzene	ND	0.0020	mg/Kg wet								
1,2,4-Trichlorobenzene	ND	0.0020	mg/Kg wet								
1,1,1-Trichloroethane	ND	0.0020	mg/Kg wet								
1,1,2-Trichloroethane	ND	0.0020	mg/Kg wet								
Trichloroethylene	ND	0.0020	mg/Kg wet								
Trichlorofluoromethane (Freon 11)	ND	0.010	mg/Kg wet								
1,2,3-Trichloropropane	ND	0.0020	mg/Kg wet								
1,2,4-Trimethylbenzene	ND	0.0020	mg/Kg wet								
1,3,5-Trimethylbenzene	ND	0.0020	mg/Kg wet								
Vinyl Chloride	ND	0.010	mg/Kg wet								
m+p Xylene	ND	0.0040	mg/Kg wet								
o-Xylene	ND	0.0020	mg/Kg wet								
Surrogate: 1,2-Dichloroethane-d4	*0.0542*		mg/Kg wet	0.0500		108	70-130				
Surrogate: Toluene-d8	*0.0538*		mg/Kg wet	0.0500		108	70-130				
Surrogate: 4-Bromofluorobenzene	*0.0503*		mg/Kg wet	0.0500		101	70-130				
LCS (B173594-BS1)				Prepared & Analyzed: 04/03/17							
Acetone	0.197	0.10	mg/Kg wet	0.200		98.4	40-160			V-20	†
tert-Amyl Methyl Ether (TAME)	0.0209	0.0010	mg/Kg wet	0.0200		105	70-130				
Benzene	0.0221	0.0020	mg/Kg wet	0.0200		110	70-130				
Bromobenzene	0.0212	0.0020	mg/Kg wet	0.0200		106	70-130				
Bromochloromethane	0.0261	0.0020	mg/Kg wet	0.0200		130	70-130				
Bromodichloromethane	0.0205	0.0020	mg/Kg wet	0.0200		103	70-130				
Bromoform	0.0225	0.0020	mg/Kg wet	0.0200		112	70-130				
Bromomethane	0.0195	0.010	mg/Kg wet	0.0200		97.4	40-160				†
2-Butanone (MEK)	0.189	0.040	mg/Kg wet	0.200		94.6	40-160				†
n-Butylbenzene	0.0214	0.0020	mg/Kg wet	0.0200		107	70-130				
sec-Butylbenzene	0.0235	0.0020	mg/Kg wet	0.0200		118	70-130				
tert-Butylbenzene	0.0220	0.0020	mg/Kg wet	0.0200		110	70-130				
tert-Butyl Ethyl Ether (TBEE)	0.0213	0.0010	mg/Kg wet	0.0200		106	70-130				
Carbon Disulfide	0.0236	0.0060	mg/Kg wet	0.0200		118	70-130				
Carbon Tetrachloride	0.0236	0.0020	mg/Kg wet	0.0200		118	70-130				
Chlorobenzene	0.0222	0.0020	mg/Kg wet	0.0200		111	70-130				
Chlorodibromomethane	0.0235	0.0010	mg/Kg wet	0.0200		117	70-130				
Chloroethane	0.0211	0.010	mg/Kg wet	0.0200		105	70-130				
Chloroform	0.0217	0.0040	mg/Kg wet	0.0200		109	70-130				
Chloromethane	0.0155	0.010	mg/Kg wet	0.0200		77.7	40-160				†
2-Chlorotoluene	0.0221	0.0020	mg/Kg wet	0.0200		110	70-130				
4-Chlorotoluene	0.0215	0.0020	mg/Kg wet	0.0200		107	70-130				
1,2-Dibromo-3-chloropropane (DBCP)	0.0220	0.0020	mg/Kg wet	0.0200		110	70-130				
1,2-Dibromoethane (EDB)	0.0221	0.0010	mg/Kg wet	0.0200		110	70-130				
Dibromomethane	0.0214	0.0020	mg/Kg wet	0.0200		107	70-130				
1,2-Dichlorobenzene	0.0225	0.0020	mg/Kg wet	0.0200		112	70-130				
1,3-Dichlorobenzene	0.0218	0.0020	mg/Kg wet	0.0200		109	70-130				
1,4-Dichlorobenzene	0.0215	0.0020	mg/Kg wet	0.0200		108	70-130				

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QUALITY CONTROL

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes	
Batch B173594 - SW-846 5035											
LCS (B173594-BS1)				Prepared & Analyzed: 04/03/17							
Dichlorodifluoromethane (Freon 12)	0.0181	0.010	mg/Kg wet	0.0200		90.3	40-160				†
1,1-Dichloroethane	0.0230	0.0020	mg/Kg wet	0.0200		115	70-130				
1,2-Dichloroethane	0.0216	0.0020	mg/Kg wet	0.0200		108	70-130				
1,1-Dichloroethylene	0.0223	0.0040	mg/Kg wet	0.0200		111	70-130				
cis-1,2-Dichloroethylene	0.0211	0.0020	mg/Kg wet	0.0200		106	70-130				
trans-1,2-Dichloroethylene	0.0244	0.0020	mg/Kg wet	0.0200		122	70-130				
1,2-Dichloropropane	0.0219	0.0020	mg/Kg wet	0.0200		110	70-130				
1,3-Dichloropropane	0.0208	0.0010	mg/Kg wet	0.0200		104	70-130				
2,2-Dichloropropane	0.0226	0.0020	mg/Kg wet	0.0200		113	70-130				
1,1-Dichloropropene	0.0220	0.0020	mg/Kg wet	0.0200		110	70-130				
cis-1,3-Dichloropropene	0.0203	0.0010	mg/Kg wet	0.0200		102	70-130				
trans-1,3-Dichloropropene	0.0213	0.0010	mg/Kg wet	0.0200		106	70-130				
Diethyl Ether	0.0227	0.010	mg/Kg wet	0.0200		114	70-130				
Diisopropyl Ether (DIPE)	0.0192	0.0010	mg/Kg wet	0.0200		96.1	70-130				
1,4-Dioxane	0.269	0.10	mg/Kg wet	0.200		135	40-160			V-16, L-14	†
Ethylbenzene	0.0214	0.0020	mg/Kg wet	0.0200		107	70-130				
Hexachlorobutadiene	0.0239	0.0020	mg/Kg wet	0.0200		120	70-130				
2-Hexanone (MBK)	0.200	0.020	mg/Kg wet	0.200		99.9	40-160				†
Isopropylbenzene (Cumene)	0.0250	0.0020	mg/Kg wet	0.0200		125	70-130				
p-Isopropyltoluene (p-Cymene)	0.0214	0.0020	mg/Kg wet	0.0200		107	70-130				
Methyl tert-Butyl Ether (MTBE)	0.0216	0.0040	mg/Kg wet	0.0200		108	70-130				
Methylene Chloride	0.0215	0.010	mg/Kg wet	0.0200		108	70-130				
4-Methyl-2-pentanone (MIBK)	0.201	0.020	mg/Kg wet	0.200		101	40-160				†
Naphthalene	0.0209	0.0040	mg/Kg wet	0.0200		104	70-130				
n-Propylbenzene	0.0221	0.0020	mg/Kg wet	0.0200		110	70-130				
Styrene	0.0215	0.0020	mg/Kg wet	0.0200		107	70-130				
1,1,1,2-Tetrachloroethane	0.0231	0.0020	mg/Kg wet	0.0200		116	70-130				
1,1,2,2-Tetrachloroethane	0.0221	0.0010	mg/Kg wet	0.0200		111	70-130				
Tetrachloroethylene	0.0232	0.0020	mg/Kg wet	0.0200		116	70-130				
Tetrahydrofuran	0.0201	0.010	mg/Kg wet	0.0200		100	70-130			V-16	
Toluene	0.0223	0.0020	mg/Kg wet	0.0200		111	70-130				
1,2,3-Trichlorobenzene	0.0215	0.0020	mg/Kg wet	0.0200		108	70-130				
1,2,4-Trichlorobenzene	0.0219	0.0020	mg/Kg wet	0.0200		110	70-130				
1,1,1-Trichloroethane	0.0237	0.0020	mg/Kg wet	0.0200		118	70-130				
1,1,2-Trichloroethane	0.0209	0.0020	mg/Kg wet	0.0200		104	70-130				
Trichloroethylene	0.0222	0.0020	mg/Kg wet	0.0200		111	70-130				
Trichlorofluoromethane (Freon 11)	0.0239	0.010	mg/Kg wet	0.0200		119	70-130				
1,2,3-Trichloropropane	0.0224	0.0020	mg/Kg wet	0.0200		112	70-130				
1,2,4-Trimethylbenzene	0.0207	0.0020	mg/Kg wet	0.0200		104	70-130				
1,3,5-Trimethylbenzene	0.0224	0.0020	mg/Kg wet	0.0200		112	70-130				
Vinyl Chloride	0.0194	0.010	mg/Kg wet	0.0200		96.8	70-130				
m+p Xylene	0.0434	0.0040	mg/Kg wet	0.0400		108	70-130				
o-Xylene	0.0214	0.0020	mg/Kg wet	0.0200		107	70-130				
Surrogate: 1,2-Dichloroethane-d4	*0.0535*		mg/Kg wet	0.0500		107	70-130				
Surrogate: Toluene-d8	*0.0531*		mg/Kg wet	0.0500		106	70-130				
Surrogate: 4-Bromofluorobenzene	*0.0521*		mg/Kg wet	0.0500		104	70-130				

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QUALITY CONTROL

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC		%REC Limits	RPD	RPD Limit	Notes	
Batch B173594 - SW-846 5035												
LCS Dup (B173594-BSD1)				Prepared & Analyzed: 04/03/17								
Acetone	0.217	0.10	mg/Kg wet	0.200		109		40-160	9.93	20	V-20	†
tert-Amyl Methyl Ether (TAME)	0.0228	0.0010	mg/Kg wet	0.0200		114		70-130	8.68	20		
Benzene	0.0241	0.0020	mg/Kg wet	0.0200		121		70-130	8.83	20		
Bromobenzene	0.0227	0.0020	mg/Kg wet	0.0200		114		70-130	7.02	20		
Bromochloromethane	0.0293	0.0020	mg/Kg wet	0.0200		**146**	*	70-130	11.4	20	L-07	
Bromodichloromethane	0.0222	0.0020	mg/Kg wet	0.0200		111		70-130	7.68	20		
Bromoform	0.0254	0.0020	mg/Kg wet	0.0200		127		70-130	12.2	20		
Bromomethane	0.0192	0.010	mg/Kg wet	0.0200		96.2		40-160	1.24	20		†
2-Butanone (MEK)	0.215	0.040	mg/Kg wet	0.200		108		40-160	12.8	20		†
n-Butylbenzene	0.0235	0.0020	mg/Kg wet	0.0200		118		70-130	9.54	20		
sec-Butylbenzene	0.0261	0.0020	mg/Kg wet	0.0200		**131**	*	70-130	10.4	20	L-07	
tert-Butylbenzene	0.0249	0.0020	mg/Kg wet	0.0200		124		70-130	12.2	20		
tert-Butyl Ethyl Ether (TBEE)	0.0222	0.0010	mg/Kg wet	0.0200		111		70-130	4.32	20		
Carbon Disulfide	0.0235	0.0060	mg/Kg wet	0.0200		118		70-130	0.255	20		
Carbon Tetrachloride	0.0244	0.0020	mg/Kg wet	0.0200		122		70-130	3.58	20		
Chlorobenzene	0.0239	0.0020	mg/Kg wet	0.0200		119		70-130	7.29	20		
Chlorodibromomethane	0.0258	0.0010	mg/Kg wet	0.0200		129		70-130	9.58	20		
Chloroethane	0.0219	0.010	mg/Kg wet	0.0200		110		70-130	3.82	20		
Chloroform	0.0233	0.0040	mg/Kg wet	0.0200		116		70-130	6.93	20		
Chloromethane	0.0159	0.010	mg/Kg wet	0.0200		79.3		40-160	2.04	20		†
2-Chlorotoluene	0.0241	0.0020	mg/Kg wet	0.0200		121		70-130	8.92	20		
4-Chlorotoluene	0.0231	0.0020	mg/Kg wet	0.0200		115		70-130	7.27	20		
1,2-Dibromo-3-chloropropane (DBCP)	0.0249	0.0020	mg/Kg wet	0.0200		124		70-130	12.3	20		
1,2-Dibromoethane (EDB)	0.0243	0.0010	mg/Kg wet	0.0200		122		70-130	9.56	20		
Dibromomethane	0.0239	0.0020	mg/Kg wet	0.0200		119		70-130	11.1	20		
1,2-Dichlorobenzene	0.0247	0.0020	mg/Kg wet	0.0200		124		70-130	9.57	20		
1,3-Dichlorobenzene	0.0245	0.0020	mg/Kg wet	0.0200		123		70-130	11.6	20		
1,4-Dichlorobenzene	0.0242	0.0020	mg/Kg wet	0.0200		121		70-130	12.0	20		
Dichlorodifluoromethane (Freon 12)	0.0184	0.010	mg/Kg wet	0.0200		91.9		40-160	1.76	20		†
1,1-Dichloroethane	0.0229	0.0020	mg/Kg wet	0.0200		115		70-130	0.348	20		
1,2-Dichloroethane	0.0241	0.0020	mg/Kg wet	0.0200		120		70-130	11.0	20		
1,1-Dichloroethylene	0.0229	0.0040	mg/Kg wet	0.0200		114		70-130	2.66	20		
cis-1,2-Dichloroethylene	0.0222	0.0020	mg/Kg wet	0.0200		111		70-130	4.81	20		
trans-1,2-Dichloroethylene	0.0251	0.0020	mg/Kg wet	0.0200		125		70-130	2.58	20		
1,2-Dichloropropane	0.0231	0.0020	mg/Kg wet	0.0200		115		70-130	5.07	20		
1,3-Dichloropropane	0.0232	0.0010	mg/Kg wet	0.0200		116		70-130	10.9	20		
2,2-Dichloropropane	0.0231	0.0020	mg/Kg wet	0.0200		115		70-130	1.93	20		
1,1-Dichloropropene	0.0229	0.0020	mg/Kg wet	0.0200		115		70-130	4.27	20		
cis-1,3-Dichloropropene	0.0220	0.0010	mg/Kg wet	0.0200		110		70-130	7.76	20		
trans-1,3-Dichloropropene	0.0235	0.0010	mg/Kg wet	0.0200		118		70-130	9.99	20		
Diethyl Ether	0.0238	0.010	mg/Kg wet	0.0200		119		70-130	4.56	20		
Diisopropyl Ether (DIPE)	0.0204	0.0010	mg/Kg wet	0.0200		102		70-130	6.05	20		
1,4-Dioxane	0.269	0.10	mg/Kg wet	0.200		134		40-160	0.111	20	L-14, V-16	†
Ethylbenzene	0.0233	0.0020	mg/Kg wet	0.0200		116		70-130	8.24	20		
Hexachlorobutadiene	0.0269	0.0020	mg/Kg wet	0.0200		**134**	*	70-130	11.7	20	L-07	
2-Hexanone (MBK)	0.218	0.020	mg/Kg wet	0.200		109		40-160	8.83	20		†
Isopropylbenzene (Cumene)	0.0272	0.0020	mg/Kg wet	0.0200		**136**	*	70-130	8.44	20	L-07	
p-Isopropyltoluene (p-Cymene)	0.0243	0.0020	mg/Kg wet	0.0200		122		70-130	12.5	20		
Methyl tert-Butyl Ether (MTBE)	0.0227	0.0040	mg/Kg wet	0.0200		113		70-130	4.88	20		
Methylene Chloride	0.0219	0.010	mg/Kg wet	0.0200		110		70-130	1.66	20		
4-Methyl-2-pentanone (MIBK)	0.221	0.020	mg/Kg wet	0.200		110		40-160	9.37	20		†
Naphthalene	0.0229	0.0040	mg/Kg wet	0.0200		114		70-130	9.24	20		

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QUALITY CONTROL

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B173594 - SW-846 5035										
LCS Dup (B173594-BSD1)				Prepared & Analyzed: 04/03/17						
n-Propylbenzene	0.0241	0.0020	mg/Kg wet	0.0200		121	70-130	8.82	20	
Styrene	0.0238	0.0020	mg/Kg wet	0.0200		119	70-130	10.1	20	
1,1,1,2-Tetrachloroethane	0.0247	0.0020	mg/Kg wet	0.0200		123	70-130	6.53	20	
1,1,2,2-Tetrachloroethane	0.0243	0.0010	mg/Kg wet	0.0200		121	70-130	9.14	20	
Tetrachloroethylene	0.0254	0.0020	mg/Kg wet	0.0200		127	70-130	8.97	20	
Tetrahydrofuran	0.0208	0.010	mg/Kg wet	0.0200		104	70-130	3.72	20	V-16
Toluene	0.0240	0.0020	mg/Kg wet	0.0200		120	70-130	7.27	20	
1,2,3-Trichlorobenzene	0.0238	0.0020	mg/Kg wet	0.0200		119	70-130	10.1	20	
1,2,4-Trichlorobenzene	0.0237	0.0020	mg/Kg wet	0.0200		118	70-130	7.72	20	
1,1,1-Trichloroethane	0.0250	0.0020	mg/Kg wet	0.0200		125	70-130	5.26	20	
1,1,2-Trichloroethane	0.0234	0.0020	mg/Kg wet	0.0200		117	70-130	11.6	20	
Trichloroethylene	0.0236	0.0020	mg/Kg wet	0.0200		118	70-130	5.94	20	
Trichlorofluoromethane (Freon 11)	0.0242	0.010	mg/Kg wet	0.0200		121	70-130	1.25	20	
1,2,3-Trichloropropane	0.0246	0.0020	mg/Kg wet	0.0200		123	70-130	9.35	20	
1,2,4-Trimethylbenzene	0.0236	0.0020	mg/Kg wet	0.0200		118	70-130	13.1	20	
1,3,5-Trimethylbenzene	0.0244	0.0020	mg/Kg wet	0.0200		122	70-130	8.80	20	
Vinyl Chloride	0.0174	0.010	mg/Kg wet	0.0200		86.9	70-130	10.8	20	
m+p Xylene	0.0475	0.0040	mg/Kg wet	0.0400		119	70-130	9.15	20	
o-Xylene	0.0235	0.0020	mg/Kg wet	0.0200		117	70-130	9.28	20	
Surrogate: 1,2-Dichloroethane-d4	*0.0540*		mg/Kg wet	0.0500		108	70-130			
Surrogate: Toluene-d8	*0.0538*		mg/Kg wet	0.0500		108	70-130			
Surrogate: 4-Bromofluorobenzene	*0.0511*		mg/Kg wet	0.0500		102	70-130			
Batch B173635 - SW-846 5035										
Blank (B173635-BLK1)				Prepared & Analyzed: 04/03/17						
Acetone	ND	0.10	mg/Kg wet							
tert-Amyl Methyl Ether (TAME)	ND	0.0010	mg/Kg wet							
Benzene	ND	0.0020	mg/Kg wet							
Bromobenzene	ND	0.0020	mg/Kg wet							
Bromochloromethane	ND	0.0020	mg/Kg wet							
Bromodichloromethane	ND	0.0020	mg/Kg wet							
Bromoform	ND	0.0020	mg/Kg wet							V-05
Bromomethane	ND	0.010	mg/Kg wet							
2-Butanone (MEK)	ND	0.040	mg/Kg wet							
n-Butylbenzene	ND	0.0020	mg/Kg wet							
sec-Butylbenzene	ND	0.0020	mg/Kg wet							
tert-Butylbenzene	ND	0.0020	mg/Kg wet							
tert-Butyl Ethyl Ether (TBEE)	ND	0.0010	mg/Kg wet							
Carbon Disulfide	ND	0.0060	mg/Kg wet							
Carbon Tetrachloride	ND	0.0020	mg/Kg wet							
Chlorobenzene	ND	0.0020	mg/Kg wet							
Chlorodibromomethane	ND	0.0010	mg/Kg wet							V-05
Chloroethane	ND	0.010	mg/Kg wet							
Chloroform	ND	0.0040	mg/Kg wet							
Chloromethane	ND	0.010	mg/Kg wet							
2-Chlorotoluene	ND	0.0020	mg/Kg wet							
4-Chlorotoluene	ND	0.0020	mg/Kg wet							
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.0020	mg/Kg wet							
1,2-Dibromoethane (EDB)	ND	0.0010	mg/Kg wet							
Dibromomethane	ND	0.0020	mg/Kg wet							
1,2-Dichlorobenzene	ND	0.0020	mg/Kg wet							
1,3-Dichlorobenzene	ND	0.0020	mg/Kg wet							

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B173635 - SW-846 5035										
Blank (B173635-BLK1)				Prepared & Analyzed: 04/03/17						
1,4-Dichlorobenzene	ND	0.0020	mg/Kg wet							
Dichlorodifluoromethane (Freon 12)	ND	0.010	mg/Kg wet							
1,1-Dichloroethane	ND	0.0020	mg/Kg wet							
1,2-Dichloroethane	ND	0.0020	mg/Kg wet							
1,1-Dichloroethylene	ND	0.0040	mg/Kg wet							
cis-1,2-Dichloroethylene	ND	0.0020	mg/Kg wet							
trans-1,2-Dichloroethylene	ND	0.0020	mg/Kg wet							
1,2-Dichloropropane	ND	0.0020	mg/Kg wet							
1,3-Dichloropropane	ND	0.0010	mg/Kg wet							
2,2-Dichloropropane	ND	0.0020	mg/Kg wet							
1,1-Dichloropropene	ND	0.0020	mg/Kg wet							
cis-1,3-Dichloropropene	ND	0.0010	mg/Kg wet							
trans-1,3-Dichloropropene	ND	0.0010	mg/Kg wet							
Diethyl Ether	ND	0.010	mg/Kg wet							
Diisopropyl Ether (DIPE)	ND	0.0010	mg/Kg wet							
1,4-Dioxane	ND	0.10	mg/Kg wet							R-05, V-16
Ethylbenzene	ND	0.0020	mg/Kg wet							
Hexachlorobutadiene	ND	0.0020	mg/Kg wet							
2-Hexanone (MBK)	ND	0.020	mg/Kg wet							
Isopropylbenzene (Cumene)	ND	0.0020	mg/Kg wet							
p-Isopropyltoluene (p-Cymene)	ND	0.0020	mg/Kg wet							
Methyl tert-Butyl Ether (MTBE)	ND	0.0040	mg/Kg wet							
Methylene Chloride	ND	0.010	mg/Kg wet							
4-Methyl-2-pentanone (MIBK)	ND	0.020	mg/Kg wet							
Naphthalene	ND	0.0040	mg/Kg wet							
n-Propylbenzene	ND	0.0020	mg/Kg wet							
Styrene	ND	0.0020	mg/Kg wet							
1,1,1,2-Tetrachloroethane	ND	0.0020	mg/Kg wet							V-05
1,1,2,2-Tetrachloroethane	ND	0.0010	mg/Kg wet							
Tetrachloroethylene	ND	0.0020	mg/Kg wet							
Tetrahydrofuran	ND	0.010	mg/Kg wet							
Toluene	ND	0.0020	mg/Kg wet							
1,2,3-Trichlorobenzene	ND	0.0020	mg/Kg wet							
1,2,4-Trichlorobenzene	ND	0.0020	mg/Kg wet							
1,1,1-Trichloroethane	ND	0.0020	mg/Kg wet							
1,1,2-Trichloroethane	ND	0.0020	mg/Kg wet							
Trichloroethylene	ND	0.0020	mg/Kg wet							
Trichlorofluoromethane (Freon 11)	ND	0.010	mg/Kg wet							
1,2,3-Trichloropropane	ND	0.0020	mg/Kg wet							
1,2,4-Trimethylbenzene	ND	0.0020	mg/Kg wet							
1,3,5-Trimethylbenzene	ND	0.0020	mg/Kg wet							
Vinyl Chloride	ND	0.010	mg/Kg wet							
m+p Xylene	ND	0.0040	mg/Kg wet							
o-Xylene	ND	0.0020	mg/Kg wet							
Surrogate: 1,2-Dichloroethane-d4	*0.0504*		mg/Kg wet	0.0500		101	70-130			
Surrogate: Toluene-d8	*0.0496*		mg/Kg wet	0.0500		99.3	70-130			
Surrogate: 4-Bromofluorobenzene	*0.0505*		mg/Kg wet	0.0500		101	70-130			

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes	
Batch B173635 - SW-846 5035											
LCS (B173635-BS1)				Prepared & Analyzed: 04/03/17							
Acetone	0.140	0.10	mg/Kg wet	0.200		70.2	40-160				†
tert-Amyl Methyl Ether (TAME)	0.0180	0.0010	mg/Kg wet	0.0200		90.2	70-130				
Benzene	0.0186	0.0020	mg/Kg wet	0.0200		93.2	70-130				
Bromobenzene	0.0199	0.0020	mg/Kg wet	0.0200		99.7	70-130				
Bromochloromethane	0.0205	0.0020	mg/Kg wet	0.0200		103	70-130				
Bromodichloromethane	0.0184	0.0020	mg/Kg wet	0.0200		92.2	70-130				
Bromoform	0.0163	0.0020	mg/Kg wet	0.0200		81.7	70-130			V-05	
Bromomethane	0.0143	0.010	mg/Kg wet	0.0200		71.3	40-160				†
2-Butanone (MEK)	0.151	0.040	mg/Kg wet	0.200		75.3	40-160				†
n-Butylbenzene	0.0199	0.0020	mg/Kg wet	0.0200		99.6	70-130				
sec-Butylbenzene	0.0193	0.0020	mg/Kg wet	0.0200		96.5	70-130				
tert-Butylbenzene	0.0192	0.0020	mg/Kg wet	0.0200		96.0	70-130				
tert-Butyl Ethyl Ether (TBEE)	0.0182	0.0010	mg/Kg wet	0.0200		91.1	70-130				
Carbon Disulfide	0.0228	0.0060	mg/Kg wet	0.0200		114	70-130				
Carbon Tetrachloride	0.0176	0.0020	mg/Kg wet	0.0200		87.9	70-130				
Chlorobenzene	0.0194	0.0020	mg/Kg wet	0.0200		97.1	70-130				
Chlorodibromomethane	0.0175	0.0010	mg/Kg wet	0.0200		87.3	70-130			V-05	
Chloroethane	0.0155	0.010	mg/Kg wet	0.0200		77.3	70-130				
Chloroform	0.0198	0.0040	mg/Kg wet	0.0200		99.1	70-130				
Chloromethane	0.0138	0.010	mg/Kg wet	0.0200		69.2	40-160			L-14	†
2-Chlorotoluene	0.0199	0.0020	mg/Kg wet	0.0200		99.3	70-130				
4-Chlorotoluene	0.0196	0.0020	mg/Kg wet	0.0200		98.2	70-130				
1,2-Dibromo-3-chloropropane (DBCP)	0.0157	0.0020	mg/Kg wet	0.0200		78.5	70-130				
1,2-Dibromoethane (EDB)	0.0195	0.0010	mg/Kg wet	0.0200		97.4	70-130				
Dibromomethane	0.0199	0.0020	mg/Kg wet	0.0200		99.5	70-130				
1,2-Dichlorobenzene	0.0193	0.0020	mg/Kg wet	0.0200		96.7	70-130				
1,3-Dichlorobenzene	0.0201	0.0020	mg/Kg wet	0.0200		100	70-130				
1,4-Dichlorobenzene	0.0185	0.0020	mg/Kg wet	0.0200		92.7	70-130				
Dichlorodifluoromethane (Freon 12)	0.0141	0.010	mg/Kg wet	0.0200		70.3	40-160				†
1,1-Dichloroethane	0.0207	0.0020	mg/Kg wet	0.0200		104	70-130				
1,2-Dichloroethane	0.0199	0.0020	mg/Kg wet	0.0200		99.7	70-130				
1,1-Dichloroethylene	0.0193	0.0040	mg/Kg wet	0.0200		96.6	70-130				
cis-1,2-Dichloroethylene	0.0192	0.0020	mg/Kg wet	0.0200		96.0	70-130				
trans-1,2-Dichloroethylene	0.0194	0.0020	mg/Kg wet	0.0200		96.8	70-130				
1,2-Dichloropropane	0.0191	0.0020	mg/Kg wet	0.0200		95.3	70-130				
1,3-Dichloropropane	0.0192	0.0010	mg/Kg wet	0.0200		95.9	70-130				
2,2-Dichloropropane	0.0187	0.0020	mg/Kg wet	0.0200		93.3	70-130				
1,1-Dichloropropene	0.0195	0.0020	mg/Kg wet	0.0200		97.7	70-130				
cis-1,3-Dichloropropene	0.0175	0.0010	mg/Kg wet	0.0200		87.7	70-130				
trans-1,3-Dichloropropene	0.0177	0.0010	mg/Kg wet	0.0200		88.5	70-130				
Diethyl Ether	0.0174	0.010	mg/Kg wet	0.0200		87.1	70-130				
Diisopropyl Ether (DIPE)	0.0180	0.0010	mg/Kg wet	0.0200		89.9	70-130				
1,4-Dioxane	0.257	0.10	mg/Kg wet	0.200		129	40-160			R-05, V-16	†
Ethylbenzene	0.0197	0.0020	mg/Kg wet	0.0200		98.7	70-130				
Hexachlorobutadiene	0.0212	0.0020	mg/Kg wet	0.0200		106	70-130				
2-Hexanone (MBK)	0.158	0.020	mg/Kg wet	0.200		78.8	40-160				†
Isopropylbenzene (Cumene)	0.0214	0.0020	mg/Kg wet	0.0200		107	70-130				
p-Isopropyltoluene (p-Cymene)	0.0196	0.0020	mg/Kg wet	0.0200		97.9	70-130				
Methyl tert-Butyl Ether (MTBE)	0.0178	0.0040	mg/Kg wet	0.0200		89.1	70-130				
Methylene Chloride	0.0188	0.010	mg/Kg wet	0.0200		94.1	70-130				
4-Methyl-2-pentanone (MIBK)	0.175	0.020	mg/Kg wet	0.200		87.7	40-160				†
Naphthalene	0.0184	0.0040	mg/Kg wet	0.0200		92.1	70-130				

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QUALITY CONTROL

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes	
Batch B173635 - SW-846 5035											
LCS (B173635-BS1)				Prepared & Analyzed: 04/03/17							
n-Propylbenzene	0.0202	0.0020	mg/Kg wet	0.0200		101	70-130				
Styrene	0.0196	0.0020	mg/Kg wet	0.0200		98.2	70-130				
1,1,1,2-Tetrachloroethane	0.0165	0.0020	mg/Kg wet	0.0200		82.4	70-130			V-05	
1,1,2,2-Tetrachloroethane	0.0198	0.0010	mg/Kg wet	0.0200		99.2	70-130				
Tetrachloroethylene	0.0210	0.0020	mg/Kg wet	0.0200		105	70-130				
Tetrahydrofuran	0.0171	0.010	mg/Kg wet	0.0200		85.6	70-130				
Toluene	0.0185	0.0020	mg/Kg wet	0.0200		92.4	70-130				
1,2,3-Trichlorobenzene	0.0193	0.0020	mg/Kg wet	0.0200		96.6	70-130				
1,2,4-Trichlorobenzene	0.0185	0.0020	mg/Kg wet	0.0200		92.6	70-130				
1,1,1-Trichloroethane	0.0197	0.0020	mg/Kg wet	0.0200		98.5	70-130				
1,1,2-Trichloroethane	0.0189	0.0020	mg/Kg wet	0.0200		94.6	70-130				
Trichloroethylene	0.0188	0.0020	mg/Kg wet	0.0200		93.8	70-130				
Trichlorofluoromethane (Freon 11)	0.0178	0.010	mg/Kg wet	0.0200		89.2	70-130				
1,2,3-Trichloropropane	0.0188	0.0020	mg/Kg wet	0.0200		93.8	70-130				
1,2,4-Trimethylbenzene	0.0183	0.0020	mg/Kg wet	0.0200		91.6	70-130				
1,3,5-Trimethylbenzene	0.0201	0.0020	mg/Kg wet	0.0200		100	70-130				
Vinyl Chloride	0.0156	0.010	mg/Kg wet	0.0200		77.8	70-130				
m+p Xylene	0.0384	0.0040	mg/Kg wet	0.0400		96.1	70-130				
o-Xylene	0.0193	0.0020	mg/Kg wet	0.0200		96.3	70-130				
Surrogate: 1,2-Dichloroethane-d4	*0.0521*		mg/Kg wet	0.0500		104	70-130				
Surrogate: Toluene-d8	*0.0502*		mg/Kg wet	0.0500		100	70-130				
Surrogate: 4-Bromofluorobenzene	*0.0518*		mg/Kg wet	0.0500		104	70-130				
LCS Dup (B173635-BSD1)				Prepared & Analyzed: 04/03/17							
Acetone	0.133	0.10	mg/Kg wet	0.200		66.6	40-160	5.34	20	L-14	†
tert-Amyl Methyl Ether (TAME)	0.0178	0.0010	mg/Kg wet	0.0200		89.0	70-130	1.34	20		
Benzene	0.0185	0.0020	mg/Kg wet	0.0200		92.7	70-130	0.538	20		
Bromobenzene	0.0208	0.0020	mg/Kg wet	0.0200		104	70-130	4.13	20		
Bromochloromethane	0.0206	0.0020	mg/Kg wet	0.0200		103	70-130	0.195	20		
Bromodichloromethane	0.0195	0.0020	mg/Kg wet	0.0200		97.3	70-130	5.38	20		
Bromoform	0.0164	0.0020	mg/Kg wet	0.0200		82.2	70-130	0.610	20	V-05	
Bromomethane	0.0150	0.010	mg/Kg wet	0.0200		74.8	40-160	4.79	20		†
2-Butanone (MEK)	0.150	0.040	mg/Kg wet	0.200		75.2	40-160	0.213	20		†
n-Butylbenzene	0.0205	0.0020	mg/Kg wet	0.0200		103	70-130	3.06	20		
sec-Butylbenzene	0.0205	0.0020	mg/Kg wet	0.0200		102	70-130	5.84	20		
tert-Butylbenzene	0.0200	0.0020	mg/Kg wet	0.0200		99.9	70-130	3.98	20		
tert-Butyl Ethyl Ether (TBEE)	0.0183	0.0010	mg/Kg wet	0.0200		91.3	70-130	0.219	20		
Carbon Disulfide	0.0224	0.0060	mg/Kg wet	0.0200		112	70-130	1.86	20		
Carbon Tetrachloride	0.0172	0.0020	mg/Kg wet	0.0200		85.9	70-130	2.30	20		
Chlorobenzene	0.0203	0.0020	mg/Kg wet	0.0200		102	70-130	4.43	20		
Chlorodibromomethane	0.0180	0.0010	mg/Kg wet	0.0200		90.2	70-130	3.27	20	V-05	
Chloroethane	0.0162	0.010	mg/Kg wet	0.0200		81.0	70-130	4.67	20		
Chloroform	0.0195	0.0040	mg/Kg wet	0.0200		97.3	70-130	1.83	20		
Chloromethane	0.0140	0.010	mg/Kg wet	0.0200		69.9	40-160	1.01	20	L-14	†
2-Chlorotoluene	0.0200	0.0020	mg/Kg wet	0.0200		100	70-130	0.902	20		
4-Chlorotoluene	0.0208	0.0020	mg/Kg wet	0.0200		104	70-130	5.74	20		
1,2-Dibromo-3-chloropropane (DBCP)	0.0156	0.0020	mg/Kg wet	0.0200		78.2	70-130	0.383	20		
1,2-Dibromoethane (EDB)	0.0195	0.0010	mg/Kg wet	0.0200		97.3	70-130	0.103	20		
Dibromomethane	0.0197	0.0020	mg/Kg wet	0.0200		98.5	70-130	1.01	20		
1,2-Dichlorobenzene	0.0198	0.0020	mg/Kg wet	0.0200		99.2	70-130	2.55	20		
1,3-Dichlorobenzene	0.0206	0.0020	mg/Kg wet	0.0200		103	70-130	2.65	20		
1,4-Dichlorobenzene	0.0193	0.0020	mg/Kg wet	0.0200		96.7	70-130	4.22	20		

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QUALITY CONTROL

Volatile Organic Compounds by GC/MS - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD		RPD Limit	Notes	
Batch B173635 - SW-846 5035												
LCS Dup (B173635-BSD1)				Prepared & Analyzed: 04/03/17								
Dichlorodifluoromethane (Freon 12)	0.0142	0.010	mg/Kg wet	0.0200		71.0	40-160	0.991		20		†
1,1-Dichloroethane	0.0208	0.0020	mg/Kg wet	0.0200		104	70-130	0.193		20		
1,2-Dichloroethane	0.0204	0.0020	mg/Kg wet	0.0200		102	70-130	2.48		20		
1,1-Dichloroethylene	0.0191	0.0040	mg/Kg wet	0.0200		95.5	70-130	1.15		20		
cis-1,2-Dichloroethylene	0.0196	0.0020	mg/Kg wet	0.0200		98.2	70-130	2.27		20		
trans-1,2-Dichloroethylene	0.0187	0.0020	mg/Kg wet	0.0200		93.4	70-130	3.58		20		
1,2-Dichloropropane	0.0188	0.0020	mg/Kg wet	0.0200		93.9	70-130	1.48		20		
1,3-Dichloropropane	0.0192	0.0010	mg/Kg wet	0.0200		96.1	70-130	0.208		20		
2,2-Dichloropropane	0.0180	0.0020	mg/Kg wet	0.0200		89.8	70-130	3.82		20		
1,1-Dichloropropene	0.0196	0.0020	mg/Kg wet	0.0200		98.2	70-130	0.510		20		
cis-1,3-Dichloropropene	0.0170	0.0010	mg/Kg wet	0.0200		85.2	70-130	2.89		20		
trans-1,3-Dichloropropene	0.0179	0.0010	mg/Kg wet	0.0200		89.3	70-130	0.900		20		
Diethyl Ether	0.0170	0.010	mg/Kg wet	0.0200		85.2	70-130	2.21		20		
Diisopropyl Ether (DIPE)	0.0178	0.0010	mg/Kg wet	0.0200		89.0	70-130	1.01		20		
1,4-Dioxane	0.206	0.10	mg/Kg wet	0.200		103	40-160	**22.1**	*	20	R-05, V-16	†
Ethylbenzene	0.0203	0.0020	mg/Kg wet	0.0200		101	70-130	2.60		20		
Hexachlorobutadiene	0.0222	0.0020	mg/Kg wet	0.0200		111	70-130	4.42		20		
2-Hexanone (MBK)	0.159	0.020	mg/Kg wet	0.200		79.5	40-160	0.897		20		†
Isopropylbenzene (Cumene)	0.0225	0.0020	mg/Kg wet	0.0200		112	70-130	4.74		20		
p-Isopropyltoluene (p-Cymene)	0.0201	0.0020	mg/Kg wet	0.0200		100	70-130	2.42		20		
Methyl tert-Butyl Ether (MTBE)	0.0179	0.0040	mg/Kg wet	0.0200		89.5	70-130	0.448		20		
Methylene Chloride	0.0191	0.010	mg/Kg wet	0.0200		95.6	70-130	1.58		20		
4-Methyl-2-pentanone (MIBK)	0.179	0.020	mg/Kg wet	0.200		89.7	40-160	2.21		20		†
Naphthalene	0.0182	0.0040	mg/Kg wet	0.0200		90.8	70-130	1.42		20		
n-Propylbenzene	0.0208	0.0020	mg/Kg wet	0.0200		104	70-130	3.03		20		
Styrene	0.0206	0.0020	mg/Kg wet	0.0200		103	70-130	4.97		20		
1,1,1,2-Tetrachloroethane	0.0180	0.0020	mg/Kg wet	0.0200		90.2	70-130	9.04		20	V-05	
1,1,2,2-Tetrachloroethane	0.0209	0.0010	mg/Kg wet	0.0200		105	70-130	5.39		20		
Tetrachloroethylene	0.0213	0.0020	mg/Kg wet	0.0200		106	70-130	1.61		20		
Tetrahydrofuran	0.0171	0.010	mg/Kg wet	0.0200		85.3	70-130	0.351		20		
Toluene	0.0192	0.0020	mg/Kg wet	0.0200		95.9	70-130	3.72		20		
1,2,3-Trichlorobenzene	0.0185	0.0020	mg/Kg wet	0.0200		92.6	70-130	4.23		20		
1,2,4-Trichlorobenzene	0.0176	0.0020	mg/Kg wet	0.0200		88.2	70-130	4.87		20		
1,1,1-Trichloroethane	0.0189	0.0020	mg/Kg wet	0.0200		94.4	70-130	4.25		20		
1,1,2-Trichloroethane	0.0193	0.0020	mg/Kg wet	0.0200		96.7	70-130	2.20		20		
Trichloroethylene	0.0203	0.0020	mg/Kg wet	0.0200		101	70-130	7.79		20		
Trichlorofluoromethane (Freon 11)	0.0177	0.010	mg/Kg wet	0.0200		88.4	70-130	0.901		20		
1,2,3-Trichloropropane	0.0204	0.0020	mg/Kg wet	0.0200		102	70-130	8.18		20		
1,2,4-Trimethylbenzene	0.0189	0.0020	mg/Kg wet	0.0200		94.7	70-130	3.33		20		
1,3,5-Trimethylbenzene	0.0210	0.0020	mg/Kg wet	0.0200		105	70-130	4.19		20		
Vinyl Chloride	0.0155	0.010	mg/Kg wet	0.0200		77.6	70-130	0.257		20		
m+p Xylene	0.0399	0.0040	mg/Kg wet	0.0400		99.7	70-130	3.68		20		
o-Xylene	0.0203	0.0020	mg/Kg wet	0.0200		101	70-130	5.06		20		
Surrogate: 1,2-Dichloroethane-d4	*0.0494*		mg/Kg wet	0.0500		98.8	70-130					
Surrogate: Toluene-d8	*0.0489*		mg/Kg wet	0.0500		97.7	70-130					
Surrogate: 4-Bromofluorobenzene	*0.0516*		mg/Kg wet	0.0500		103	70-130					

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QUALITY CONTROL

Petroleum Hydrocarbons Analyses - EPH - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B173507 - SW-846 3546										
Blank (B173507-BLK1)				Prepared: 03/31/17 Analyzed: 04/03/17						
C9-C18 Aliphatics	ND	10	mg/Kg wet							
C19-C36 Aliphatics	ND	10	mg/Kg wet							
Unadjusted C11-C22 Aromatics	ND	10	mg/Kg wet							
C11-C22 Aromatics	ND	10	mg/Kg wet							
Acenaphthene	ND	0.10	mg/Kg wet							
Acenaphthylene	ND	0.10	mg/Kg wet							
Anthracene	ND	0.10	mg/Kg wet							
Benzo(a)anthracene	ND	0.10	mg/Kg wet							
Benzo(a)pyrene	ND	0.10	mg/Kg wet							
Benzo(b)fluoranthene	ND	0.10	mg/Kg wet							
Benzo(g,h,i)perylene	ND	0.10	mg/Kg wet							
Benzo(k)fluoranthene	ND	0.10	mg/Kg wet							
Chrysene	ND	0.10	mg/Kg wet							
Dibenz(a,h)anthracene	ND	0.10	mg/Kg wet							
Fluoranthene	ND	0.10	mg/Kg wet							
Fluorene	ND	0.10	mg/Kg wet							
Indeno(1,2,3-cd)pyrene	ND	0.10	mg/Kg wet							
2-Methylnaphthalene	ND	0.10	mg/Kg wet							
Naphthalene	ND	0.10	mg/Kg wet							
Phenanthrene	ND	0.10	mg/Kg wet							
Pyrene	ND	0.10	mg/Kg wet							
n-Decane	ND	0.10	mg/Kg wet							
n-Docosane	ND	0.10	mg/Kg wet							
n-Dodecane	ND	0.10	mg/Kg wet							
n-Eicosane	ND	0.10	mg/Kg wet							
n-Hexacosane	ND	0.10	mg/Kg wet							
n-Hexadecane	ND	0.10	mg/Kg wet							
n-Hexatriacontane	ND	0.10	mg/Kg wet							
n-Nonadecane	ND	0.10	mg/Kg wet							
n-Nonane	ND	0.10	mg/Kg wet							
n-Octacosane	ND	0.10	mg/Kg wet							
n-Octadecane	ND	0.10	mg/Kg wet							
n-Tetracosane	ND	0.10	mg/Kg wet							
n-Tetradecane	ND	0.10	mg/Kg wet							
n-Triacontane	ND	0.10	mg/Kg wet							
Naphthalene-aliphatic fraction	ND	0.10	mg/Kg wet							
2-Methylnaphthalene-aliphatic fraction	ND	0.10	mg/Kg wet							
Surrogate: Chlorooctadecane (COD)	*3.41*		mg/Kg wet	5.00		68.1	40-140			
Surrogate: o-Terphenyl (OTP)	*3.82*		mg/Kg wet	5.00		76.5	40-140			
Surrogate: 2-Bromonaphthalene	*3.76*		mg/Kg wet	5.00		75.2	40-140			
Surrogate: 2-Fluorobiphenyl	*4.11*		mg/Kg wet	5.00		82.2	40-140			
LCS (B173507-BS1)				Prepared: 03/31/17 Analyzed: 04/03/17						
C9-C18 Aliphatics	25.3	10	mg/Kg wet	30.0		84.3	40-140			
C19-C36 Aliphatics	38.7	10	mg/Kg wet	40.0		96.7	40-140			
Acenaphthene	3.73	0.10	mg/Kg wet	5.00		74.6	40-140			
Acenaphthylene	3.54	0.10	mg/Kg wet	5.00		70.9	40-140			
Anthracene	4.01	0.10	mg/Kg wet	5.00		80.3	40-140			
Benzo(a)anthracene	3.97	0.10	mg/Kg wet	5.00		79.3	40-140			
Benzo(a)pyrene	3.87	0.10	mg/Kg wet	5.00		77.4	40-140			
Benzo(b)fluoranthene	3.93	0.10	mg/Kg wet	5.00		78.6	40-140			
Benzo(g,h,i)perylene	3.69	0.10	mg/Kg wet	5.00		73.8	40-140			

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QUALITY CONTROL

Petroleum Hydrocarbons Analyses - EPH - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B173507 - SW-846 3546										
LCS (B173507-BS1)				Prepared: 03/31/17 Analyzed: 04/03/17						
Benzo(k)fluoranthene	3.87	0.10	mg/Kg wet	5.00		77.3	40-140			
Chrysene	3.97	0.10	mg/Kg wet	5.00		79.3	40-140			
Dibenz(a,h)anthracene	3.97	0.10	mg/Kg wet	5.00		79.4	40-140			
Fluoranthene	3.95	0.10	mg/Kg wet	5.00		79.0	40-140			
Fluorene	3.79	0.10	mg/Kg wet	5.00		75.8	40-140			
Indeno(1,2,3-cd)pyrene	3.80	0.10	mg/Kg wet	5.00		76.0	40-140			
2-Methylnaphthalene	3.34	0.10	mg/Kg wet	5.00		66.8	40-140			
Naphthalene	3.14	0.10	mg/Kg wet	5.00		62.8	40-140			
Phenanthrene	3.89	0.10	mg/Kg wet	5.00		77.8	40-140			
Pyrene	3.96	0.10	mg/Kg wet	5.00		79.2	40-140			
n-Decane	2.53	0.10	mg/Kg wet	5.00		50.6	40-140			
n-Docosane	3.93	0.10	mg/Kg wet	5.00		78.5	40-140			
n-Dodecane	3.10	0.10	mg/Kg wet	5.00		62.0	40-140			
n-Eicosane	3.92	0.10	mg/Kg wet	5.00		78.4	40-140			
n-Hexacosane	3.83	0.10	mg/Kg wet	5.00		76.6	40-140			
n-Hexadecane	4.03	0.10	mg/Kg wet	5.00		80.5	40-140			
n-Hexatriacontane	4.22	0.10	mg/Kg wet	5.00		84.4	40-140			
n-Nonadecane	3.94	0.10	mg/Kg wet	5.00		78.9	40-140			
n-Nonane	1.90	0.10	mg/Kg wet	5.00		38.1	30-140			
n-Octacosane	3.74	0.10	mg/Kg wet	5.00		74.7	40-140			
n-Octadecane	4.17	0.10	mg/Kg wet	5.00		83.3	40-140			
n-Tetracosane	3.95	0.10	mg/Kg wet	5.00		79.0	40-140			
n-Tetradecane	3.68	0.10	mg/Kg wet	5.00		73.6	40-140			
n-Triacontane	3.79	0.10	mg/Kg wet	5.00		75.8	40-140			
Naphthalene-aliphatic fraction	ND	0.10	mg/Kg wet	5.00			0-5			
2-Methylnaphthalene-aliphatic fraction	ND	0.10	mg/Kg wet	5.00			0-5			
Surrogate: Chlorooctadecane (COD)	*3.35*		mg/Kg wet	5.00		66.9	40-140			
Surrogate: o-Terphenyl (OTP)	*3.80*		mg/Kg wet	5.00		75.9	40-140			
Surrogate: 2-Bromonaphthalene	*4.11*		mg/Kg wet	5.00		82.2	40-140			
Surrogate: 2-Fluorobiphenyl	*3.90*		mg/Kg wet	5.00		78.1	40-140			
LCS Dup (B173507-BSD1)				Prepared: 03/31/17 Analyzed: 04/03/17						
C9-C18 Aliphatics	24.7	10	mg/Kg wet	30.0		82.4	40-140	2.36	25	
C19-C36 Aliphatics	38.3	10	mg/Kg wet	40.0		95.7	40-140	1.08	25	
Acenaphthene	3.82	0.10	mg/Kg wet	5.00		76.5	40-140	2.40	25	
Acenaphthylene	3.62	0.10	mg/Kg wet	5.00		72.5	40-140	2.22	25	
Anthracene	4.09	0.10	mg/Kg wet	5.00		81.8	40-140	1.82	25	
Benzo(a)anthracene	4.04	0.10	mg/Kg wet	5.00		80.8	40-140	1.88	25	
Benzo(a)pyrene	3.94	0.10	mg/Kg wet	5.00		78.8	40-140	1.71	25	
Benzo(b)fluoranthene	3.98	0.10	mg/Kg wet	5.00		79.6	40-140	1.27	25	
Benzo(g,h,i)perylene	3.81	0.10	mg/Kg wet	5.00		76.3	40-140	3.30	25	
Benzo(k)fluoranthene	3.94	0.10	mg/Kg wet	5.00		78.9	40-140	2.02	25	
Chrysene	4.05	0.10	mg/Kg wet	5.00		81.0	40-140	2.08	25	
Dibenz(a,h)anthracene	4.06	0.10	mg/Kg wet	5.00		81.3	40-140	2.29	25	
Fluoranthene	4.03	0.10	mg/Kg wet	5.00		80.5	40-140	1.87	25	
Fluorene	3.88	0.10	mg/Kg wet	5.00		77.7	40-140	2.42	25	
Indeno(1,2,3-cd)pyrene	3.87	0.10	mg/Kg wet	5.00		77.3	40-140	1.70	25	
2-Methylnaphthalene	3.41	0.10	mg/Kg wet	5.00		68.1	40-140	1.96	25	
Naphthalene	3.21	0.10	mg/Kg wet	5.00		64.1	40-140	2.05	25	
Phenanthrene	3.96	0.10	mg/Kg wet	5.00		79.3	40-140	1.94	25	
Pyrene	4.03	0.10	mg/Kg wet	5.00		80.7	40-140	1.85	25	
n-Decane	2.55	0.10	mg/Kg wet	5.00		51.0	40-140	0.822	25	

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QUALITY CONTROL

Petroleum Hydrocarbons Analyses - EPH - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B173507 - SW-846 3546										
LCS Dup (B173507-BSD1)				Prepared: 03/31/17 Analyzed: 04/03/17						
n-Docosane	3.91	0.10	mg/Kg wet	5.00		78.1	40-140	0.490	25	
n-Dodecane	3.08	0.10	mg/Kg wet	5.00		61.6	40-140	0.625	25	
n-Eicosane	3.90	0.10	mg/Kg wet	5.00		78.0	40-140	0.547	25	
n-Hexacosane	3.82	0.10	mg/Kg wet	5.00		76.5	40-140	0.183	25	
n-Hexadecane	4.00	0.10	mg/Kg wet	5.00		79.9	40-140	0.763	25	
n-Hexatriacontane	4.20	0.10	mg/Kg wet	5.00		84.0	40-140	0.482	25	
n-Nonadecane	3.91	0.10	mg/Kg wet	5.00		78.3	40-140	0.787	25	
n-Nonane	2.00	0.10	mg/Kg wet	5.00		39.9	30-140	4.78	25	
n-Octacosane	3.73	0.10	mg/Kg wet	5.00		74.7	40-140	0.0214	25	
n-Octadecane	4.15	0.10	mg/Kg wet	5.00		83.0	40-140	0.378	25	
n-Tetracosane	3.94	0.10	mg/Kg wet	5.00		78.8	40-140	0.362	25	
n-Tetradecane	3.68	0.10	mg/Kg wet	5.00		73.6	40-140	0.0679	25	
n-Triacontane	3.80	0.10	mg/Kg wet	5.00		76.1	40-140	0.337	25	
Naphthalene-aliphatic fraction	ND	0.10	mg/Kg wet	5.00			0-5			
2-Methylnaphthalene-aliphatic fraction	ND	0.10	mg/Kg wet	5.00			0-5			
Surrogate: Chlorooctadecane (COD)	*3.25*		mg/Kg wet	5.00		65.1	40-140			
Surrogate: o-Terphenyl (OTP)	*3.83*		mg/Kg wet	5.00		76.6	40-140			
Surrogate: 2-Bromonaphthalene	*4.11*		mg/Kg wet	5.00		82.2	40-140			
Surrogate: 2-Fluorobiphenyl	*3.94*		mg/Kg wet	5.00		78.8	40-140			
Matrix Spike (B173507-MS1)	**Source: 17C1191-01**			Prepared: 03/31/17 Analyzed: 04/06/17						
C9-C18 Aliphatics	31.0	11	mg/Kg dry	33.4	8.91	66.3	40-140			
C19-C36 Aliphatics	66.3	11	mg/Kg dry	44.5	27.7	86.7	40-140			
Unadjusted C11-C22 Aromatics	102	11	mg/Kg dry	94.5	30.6	75.4	40-140			
Acenaphthene	4.40	0.11	mg/Kg dry	5.56	ND	79.1	40-140			
Acenaphthylene	4.22	0.11	mg/Kg dry	5.56	ND	75.8	40-140			
Anthracene	4.32	0.11	mg/Kg dry	5.56	0.0768	76.3	40-140			
Benzo(a)anthracene	4.43	0.11	mg/Kg dry	5.56	0.236	75.4	40-140			
Benzo(a)pyrene	4.35	0.11	mg/Kg dry	5.56	0.345	72.0	40-140			
Benzo(b)fluoranthene	4.41	0.11	mg/Kg dry	5.56	0.350	72.9	40-140			
Benzo(g,h,i)perylene	4.15	0.11	mg/Kg dry	5.56	0.253	70.0	40-140			
Benzo(k)fluoranthene	4.20	0.11	mg/Kg dry	5.56	0.122	73.3	40-140			
Chrysene	4.47	0.11	mg/Kg dry	5.56	0.298	75.1	40-140			
Dibenz(a,h)anthracene	4.20	0.11	mg/Kg dry	5.56	ND	75.5	40-140			
Fluoranthene	4.70	0.11	mg/Kg dry	5.56	0.566	74.4	40-140			
Fluorene	4.33	0.11	mg/Kg dry	5.56	ND	77.8	40-140			
Indeno(1,2,3-cd)pyrene	4.09	0.11	mg/Kg dry	5.56	0.162	70.7	40-140			
2-Methylnaphthalene	4.04	0.11	mg/Kg dry	5.56	ND	72.7	40-140			
Naphthalene	3.73	0.11	mg/Kg dry	5.56	ND	67.1	40-140			
Phenanthrene	4.50	0.11	mg/Kg dry	5.56	0.374	74.2	40-140			
Pyrene	4.69	0.11	mg/Kg dry	5.56	0.582	73.9	40-140			
n-Nonane	2.11	0.11	mg/Kg dry	5.56	ND	37.9	30-140			
Surrogate: Chlorooctadecane (COD)	*3.53*		mg/Kg dry	5.56		63.4	40-140			
Surrogate: o-Terphenyl (OTP)	*4.11*		mg/Kg dry	5.56		73.9	40-140			
Surrogate: 2-Bromonaphthalene	*4.54*		mg/Kg dry	5.56		81.7	40-140			
Surrogate: 2-Fluorobiphenyl	*5.00*		mg/Kg dry	5.56		90.0	40-140			

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QUALITY CONTROL

Petroleum Hydrocarbons Analyses - EPH - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B173507 - SW-846 3546										
Matrix Spike Dup (B173507-MSD1)	**Source: 17C1191-01**		Prepared: 03/31/17 Analyzed: 04/06/17							
C9-C18 Aliphatics	29.7	11	mg/Kg dry	33.4	8.91	62.2	40-140	4.51	50	
C19-C36 Aliphatics	59.4	11	mg/Kg dry	44.5	27.7	71.2	40-140	11.0	50	
Unadjusted C11-C22 Aromatics	108	11	mg/Kg dry	94.5	30.6	81.4	40-140	5.43	50	
Acenaphthene	4.07	0.11	mg/Kg dry	5.56	ND	73.2	40-140	7.69	50	
Acenaphthylene	3.93	0.11	mg/Kg dry	5.56	ND	70.7	40-140	6.92	50	
Anthracene	4.06	0.11	mg/Kg dry	5.56	0.0768	71.6	40-140	6.16	50	
Benzo(a)anthracene	4.30	0.11	mg/Kg dry	5.56	0.236	73.0	40-140	3.10	50	
Benzo(a)pyrene	4.16	0.11	mg/Kg dry	5.56	0.345	68.6	40-140	4.36	50	
Benzo(b)fluoranthene	4.24	0.11	mg/Kg dry	5.56	0.350	69.9	40-140	3.88	50	
Benzo(g,h,i)perylene	3.92	0.11	mg/Kg dry	5.56	0.253	65.9	40-140	5.70	50	
Benzo(k)fluoranthene	3.95	0.11	mg/Kg dry	5.56	0.122	68.9	40-140	5.92	50	
Chrysene	4.36	0.11	mg/Kg dry	5.56	0.298	73.0	40-140	2.62	50	
Dibenz(a,h)anthracene	3.88	0.11	mg/Kg dry	5.56	ND	69.7	40-140	7.97	50	
Fluoranthene	4.73	0.11	mg/Kg dry	5.56	0.566	75.0	40-140	0.693	50	
Fluorene	4.06	0.11	mg/Kg dry	5.56	ND	73.0	40-140	6.31	50	
Indeno(1,2,3-cd)pyrene	3.85	0.11	mg/Kg dry	5.56	0.162	66.3	40-140	6.20	50	
2-Methylnaphthalene	3.67	0.11	mg/Kg dry	5.56	ND	66.0	40-140	9.69	50	
Naphthalene	3.38	0.11	mg/Kg dry	5.56	ND	60.8	40-140	9.80	50	
Phenanthrene	4.61	0.11	mg/Kg dry	5.56	0.374	76.2	40-140	2.37	50	
Pyrene	4.82	0.11	mg/Kg dry	5.56	0.582	76.1	40-140	2.55	50	
n-Nonane	2.13	0.11	mg/Kg dry	5.56	ND	38.3	30-140	0.982	50	
Surrogate: Chlorooctadecane (COD)	*3.20*		mg/Kg dry	5.56		57.5	40-140			
Surrogate: o-Terphenyl (OTP)	*3.85*		mg/Kg dry	5.56		69.3	40-140			
Surrogate: 2-Bromonaphthalene	*4.69*		mg/Kg dry	5.56		84.3	40-140			
Surrogate: 2-Fluorobiphenyl	*5.02*		mg/Kg dry	5.56		90.3	40-140			

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QUALITY CONTROL

Petroleum Hydrocarbons Analyses - VPH - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B173753 - MA VPH										
Blank (B173753-BLK1)				Prepared & Analyzed: 04/04/17						
Unadjusted C5-C8 Aliphatics	ND	10	mg/Kg wet							
C5-C8 Aliphatics	ND	10	mg/Kg wet							
Unadjusted C9-C12 Aliphatics	ND	10	mg/Kg wet							
C9-C12 Aliphatics	ND	10	mg/Kg wet							
C9-C10 Aromatics	ND	10	mg/Kg wet							
Benzene	ND	0.050	mg/Kg wet							
Butylcyclohexane	ND	0.050	mg/Kg wet							
Decane	ND	0.050	mg/Kg wet							
Ethylbenzene	ND	0.050	mg/Kg wet							
Methyl tert-Butyl Ether (MTBE)	ND	0.050	mg/Kg wet							
2-Methylpentane	ND	0.050	mg/Kg wet							
Naphthalene	ND	0.50	mg/Kg wet							
Nonane	ND	0.050	mg/Kg wet							
Pentane	ND	0.050	mg/Kg wet							
Toluene	ND	0.050	mg/Kg wet							
1,2,4-Trimethylbenzene	ND	0.050	mg/Kg wet							
2,2,4-Trimethylpentane	ND	0.050	mg/Kg wet							
m+p Xylene	ND	0.10	mg/Kg wet							
o-Xylene	ND	0.050	mg/Kg wet							
Surrogate: 2,5-Dibromotoluene (FID)	*2.94*		mg/Kg wet	3.33		88.3	70-130			
Surrogate: 2,5-Dibromotoluene (PID)	*2.72*		mg/Kg wet	3.33		81.5	70-130			
LCS (B173753-BS1)				Prepared & Analyzed: 04/04/17						
Benzene	0.100	0.0010	mg/Kg wet	0.100		100	70-130			
Butylcyclohexane	0.0829	0.0010	mg/Kg wet	0.100		82.9	70-130			
Decane	0.0856	0.0010	mg/Kg wet	0.100		85.6	70-130			
Ethylbenzene	0.0985	0.0010	mg/Kg wet	0.100		98.5	70-130			
Methyl tert-Butyl Ether (MTBE)	0.0955	0.0010	mg/Kg wet	0.100		95.5	70-130			
2-Methylpentane	0.110	0.0010	mg/Kg wet	0.100		110	70-130			
Naphthalene	0.100	0.010	mg/Kg wet	0.100		100	70-130			
Nonane	0.0813	0.0010	mg/Kg wet	0.100		81.3	30-130			
Pentane	0.121	0.0010	mg/Kg wet	0.100		121	70-130			
Toluene	0.0995	0.0010	mg/Kg wet	0.100		99.5	70-130			
1,2,4-Trimethylbenzene	0.0950	0.0010	mg/Kg wet	0.100		95.0	70-130			
2,2,4-Trimethylpentane	0.0882	0.0010	mg/Kg wet	0.100		88.2	70-130			
m+p Xylene	0.196	0.0020	mg/Kg wet	0.200		97.9	70-130			
o-Xylene	0.0977	0.0010	mg/Kg wet	0.100		97.7	70-130			
Surrogate: 2,5-Dibromotoluene (FID)	*0.0428*		mg/Kg wet	0.0400		107	70-130			
Surrogate: 2,5-Dibromotoluene (PID)	*0.0429*		mg/Kg wet	0.0400		107	70-130			
LCS Dup (B173753-BSD1)				Prepared & Analyzed: 04/04/17						
Benzene	0.100	0.0010	mg/Kg wet	0.100		100	70-130	0.212	25	
Butylcyclohexane	0.0825	0.0010	mg/Kg wet	0.100		82.5	70-130	0.452	25	
Decane	0.0872	0.0010	mg/Kg wet	0.100		87.2	70-130	1.89	25	
Ethylbenzene	0.0983	0.0010	mg/Kg wet	0.100		98.3	70-130	0.149	25	
Methyl tert-Butyl Ether (MTBE)	0.0955	0.0010	mg/Kg wet	0.100		95.5	70-130	0.0251	25	
2-Methylpentane	0.107	0.0010	mg/Kg wet	0.100		107	70-130	2.91	25	
Naphthalene	0.0989	0.010	mg/Kg wet	0.100		98.9	70-130	1.28	25	
Nonane	0.0819	0.0010	mg/Kg wet	0.100		81.9	30-130	0.712	25	
Pentane	0.117	0.0010	mg/Kg wet	0.100		117	70-130	3.45	25	
Toluene	0.0997	0.0010	mg/Kg wet	0.100		99.7	70-130	0.258	25	
1,2,4-Trimethylbenzene	0.0949	0.0010	mg/Kg wet	0.100		94.9	70-130	0.101	25	

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QUALITY CONTROL

Petroleum Hydrocarbons Analyses - VPH - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B173753 - MA VPH										
LCS Dup (B173753-BSD1)				Prepared & Analyzed: 04/04/17						
2,2,4-Trimethylpentane	0.0858	0.0010	mg/Kg wet	0.100		85.8	70-130	2.67	25	
m+p Xylene	0.196	0.0020	mg/Kg wet	0.200		97.8	70-130	0.0496	25	
o-Xylene	0.0980	0.0010	mg/Kg wet	0.100		98.0	70-130	0.255	25	
Surrogate: 2,5-Dibromotoluene (FID)	*0.0450*		mg/Kg wet	0.0400		113	70-130			
Surrogate: 2,5-Dibromotoluene (PID)	*0.0456*		mg/Kg wet	0.0400		114	70-130			
Batch B173829 - MA VPH										
Blank (B173829-BLK1)				Prepared & Analyzed: 04/05/17						
Unadjusted C5-C8 Aliphatics	ND	10	mg/Kg wet							
C5-C8 Aliphatics	ND	10	mg/Kg wet							
Unadjusted C9-C12 Aliphatics	ND	10	mg/Kg wet							
C9-C12 Aliphatics	ND	10	mg/Kg wet							
C9-C10 Aromatics	ND	10	mg/Kg wet							
Benzene	ND	0.050	mg/Kg wet							
Butylcyclohexane	ND	0.050	mg/Kg wet							
Decane	ND	0.050	mg/Kg wet							
Ethylbenzene	ND	0.050	mg/Kg wet							
Methyl tert-Butyl Ether (MTBE)	ND	0.050	mg/Kg wet							
2-Methylpentane	ND	0.050	mg/Kg wet							
Naphthalene	ND	0.50	mg/Kg wet							
Nonane	ND	0.050	mg/Kg wet							
Pentane	ND	0.050	mg/Kg wet							
Toluene	ND	0.050	mg/Kg wet							
1,2,4-Trimethylbenzene	ND	0.050	mg/Kg wet							
2,2,4-Trimethylpentane	ND	0.050	mg/Kg wet							
m+p Xylene	ND	0.10	mg/Kg wet							
o-Xylene	ND	0.050	mg/Kg wet							
Surrogate: 2,5-Dibromotoluene (FID)	*2.99*		mg/Kg wet	3.33		89.6	70-130			
Surrogate: 2,5-Dibromotoluene (PID)	*2.72*		mg/Kg wet	3.33		81.5	70-130			
LCS (B173829-BS1)				Prepared & Analyzed: 04/05/17						
Benzene	0.0866	0.0010	mg/Kg wet	0.100		86.6	70-130			
Butylcyclohexane	0.0738	0.0010	mg/Kg wet	0.100		73.8	70-130			
Decane	0.0776	0.0010	mg/Kg wet	0.100		77.6	70-130			
Ethylbenzene	0.0846	0.0010	mg/Kg wet	0.100		84.6	70-130			
Methyl tert-Butyl Ether (MTBE)	0.0863	0.0010	mg/Kg wet	0.100		86.3	70-130			
2-Methylpentane	0.0906	0.0010	mg/Kg wet	0.100		90.6	70-130			
Naphthalene	0.0878	0.010	mg/Kg wet	0.100		87.8	70-130			
Nonane	0.0729	0.0010	mg/Kg wet	0.100		72.9	30-130			
Pentane	0.0960	0.0010	mg/Kg wet	0.100		96.0	70-130			
Toluene	0.0861	0.0010	mg/Kg wet	0.100		86.1	70-130			
1,2,4-Trimethylbenzene	0.0824	0.0010	mg/Kg wet	0.100		82.4	70-130			
2,2,4-Trimethylpentane	0.0723	0.0010	mg/Kg wet	0.100		72.3	70-130			
m+p Xylene	0.169	0.0020	mg/Kg wet	0.200		84.5	70-130			
o-Xylene	0.0850	0.0010	mg/Kg wet	0.100		85.0	70-130			
Surrogate: 2,5-Dibromotoluene (FID)	*0.0412*		mg/Kg wet	0.0400		103	70-130			
Surrogate: 2,5-Dibromotoluene (PID)	*0.0418*		mg/Kg wet	0.0400		104	70-130			

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QUALITY CONTROL

Petroleum Hydrocarbons Analyses - VPH - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B173829 - MA VPH										
LCS Dup (B173829-BSD1)				Prepared & Analyzed: 04/05/17						
Benzene	0.0900	0.0010	mg/Kg wet	0.100		90.0	70-130	3.76	25	
Butylcyclohexane	0.0757	0.0010	mg/Kg wet	0.100		75.7	70-130	2.42	25	
Decane	0.0810	0.0010	mg/Kg wet	0.100		81.0	70-130	4.32	25	
Ethylbenzene	0.0878	0.0010	mg/Kg wet	0.100		87.8	70-130	3.75	25	
Methyl tert-Butyl Ether (MTBE)	0.0892	0.0010	mg/Kg wet	0.100		89.2	70-130	3.21	25	
2-Methylpentane	0.0916	0.0010	mg/Kg wet	0.100		91.6	70-130	1.09	25	
Naphthalene	0.0916	0.010	mg/Kg wet	0.100		91.6	70-130	4.17	25	
Nonane	0.0747	0.0010	mg/Kg wet	0.100		74.7	30-130	2.43	25	
Pentane	0.100	0.0010	mg/Kg wet	0.100		100	70-130	4.24	25	
Toluene	0.0892	0.0010	mg/Kg wet	0.100		89.2	70-130	3.60	25	
1,2,4-Trimethylbenzene	0.0851	0.0010	mg/Kg wet	0.100		85.1	70-130	3.24	25	
2,2,4-Trimethylpentane	0.0743	0.0010	mg/Kg wet	0.100		74.3	70-130	2.83	25	
m+p Xylene	0.175	0.0020	mg/Kg wet	0.200		87.5	70-130	3.49	25	
o-Xylene	0.0879	0.0010	mg/Kg wet	0.100		87.9	70-130	3.37	25	
Surrogate: 2,5-Dibromotoluene (FID)	*0.0421*		mg/Kg wet	0.0400		105	70-130			
Surrogate: 2,5-Dibromotoluene (PID)	*0.0428*		mg/Kg wet	0.0400		107	70-130			

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QUALITY CONTROL

Metals Analyses (Total) - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B173743 - SW-846 3051										
Blank (B173743-BLK1)				Prepared: 04/04/17 Analyzed: 04/05/17						
Antimony	ND	2.5	mg/Kg wet							
Arsenic	ND	2.5	mg/Kg wet							
Barium	ND	2.5	mg/Kg wet							
Beryllium	ND	0.25	mg/Kg wet							
Cadmium	ND	0.25	mg/Kg wet							
Chromium	ND	0.50	mg/Kg wet							
Lead	ND	0.75	mg/Kg wet							
Nickel	ND	0.50	mg/Kg wet							
Selenium	ND	5.0	mg/Kg wet							
Silver	ND	0.50	mg/Kg wet							
Thallium	ND	2.5	mg/Kg wet							
Vanadium	ND	1.0	mg/Kg wet							
Zinc	ND	1.0	mg/Kg wet							
LCS (B173743-BS1)				Prepared: 04/04/17 Analyzed: 04/05/17						
Antimony	152	5.0	mg/Kg wet	88.2		172	0-210.3			
Arsenic	57.9	5.0	mg/Kg wet	57.0		102	77.8-122.1			
Barium	102	5.0	mg/Kg wet	110		93.1	82-117.4			
Beryllium	72.9	0.50	mg/Kg wet	67.5		108	82.3-117.7			
Cadmium	73.0	0.50	mg/Kg wet	77.8		93.9	81.9-118.2			
Chromium	62.6	1.0	mg/Kg wet	65.0		96.3	78.7-120.6			
Lead	79.3	1.5	mg/Kg wet	85.6		92.7	82.4-117.8			
Nickel	58.6	1.0	mg/Kg wet	61.3		95.7	82.2-117.8			
Selenium	75.5	10	mg/Kg wet	78.9		95.7	77.1-122.3			
Silver	52.1	1.0	mg/Kg wet	54.2		96.1	74.3-125.4			
Thallium	167	5.0	mg/Kg wet	178		93.6	78.2-121.6			
Vanadium	54.7	2.0	mg/Kg wet	56.3		97.2	64.8-135.2			
Zinc	199	2.0	mg/Kg wet	198		100	79.7-120.8			
LCS Dup (B173743-BSD1)				Prepared: 04/04/17 Analyzed: 04/05/17						
Antimony	150	5.0	mg/Kg wet	88.2		170	0-210.3	0.748	30	
Arsenic	56.5	5.0	mg/Kg wet	57.0		99.2	77.8-122.1	2.31	30	
Barium	97.4	5.0	mg/Kg wet	110		88.6	82-117.4	4.98	30	
Beryllium	71.4	0.50	mg/Kg wet	67.5		106	82.3-117.7	2.11	30	
Cadmium	73.8	0.50	mg/Kg wet	77.8		94.9	81.9-118.2	1.09	30	
Chromium	62.2	1.0	mg/Kg wet	65.0		95.7	78.7-120.6	0.645	30	
Lead	76.8	1.5	mg/Kg wet	85.6		89.8	82.4-117.8	3.18	30	
Nickel	58.5	1.0	mg/Kg wet	61.3		95.5	82.2-117.8	0.218	30	
Selenium	73.1	10	mg/Kg wet	78.9		92.7	77.1-122.3	3.15	30	
Silver	51.2	1.0	mg/Kg wet	54.2		94.5	74.3-125.4	1.59	30	
Thallium	168	5.0	mg/Kg wet	178		94.1	78.2-121.6	0.609	30	
Vanadium	55.5	2.0	mg/Kg wet	56.3		98.6	64.8-135.2	1.46	30	
Zinc	188	2.0	mg/Kg wet	198		94.8	79.7-120.8	5.71	30	

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QUALITY CONTROL

Metals Analyses (Total) - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC		%REC Limits	RPD	RPD Limit	Notes
Batch B173743 - SW-846 3051											
Duplicate (B173743-DUP1)	**Source: 17C1191-06**			Prepared: 04/04/17 Analyzed: 04/05/17							
Antimony	5.07	2.7	mg/Kg dry		ND				NC	35	
Arsenic	21.6	2.7	mg/Kg dry		19.2				12.2	35	
Barium	98.8	2.7	mg/Kg dry		131				28.2	35	
Beryllium	0.500	0.27	mg/Kg dry		0.477				4.88	35	
Cadmium	0.891	0.27	mg/Kg dry		0.805				10.2	35	
Chromium	32.0	0.54	mg/Kg dry		30.8				3.80	35	
Lead	785	0.82	mg/Kg dry		779				0.886	35	
Nickel	19.1	0.54	mg/Kg dry		17.1				11.0	35	
Selenium	ND	5.4	mg/Kg dry		ND				NC	35	
Silver	ND	0.54	mg/Kg dry		ND				NC	35	
Thallium	ND	2.7	mg/Kg dry		ND				NC	35	
Vanadium	27.3	1.1	mg/Kg dry		26.5				2.90	35	
Zinc	109	1.1	mg/Kg dry		101				7.01	35	
MRL Check (B173743-MRL1)				Prepared: 04/04/17 Analyzed: 04/05/17							
Lead	0.838	0.73	mg/Kg wet	0.727		115		80-120			
Matrix Spike (B173743-MS1)	**Source: 17C1191-06**			Prepared: 04/04/17 Analyzed: 04/05/17							
Antimony	28.3	2.6	mg/Kg dry	26.0	ND	109		75-125			
Arsenic	47.6	2.6	mg/Kg dry	26.0	19.2	109		75-125			
Barium	117	2.6	mg/Kg dry	26.0	131	**-55.6**	*	75-125			MS-19
Beryllium	27.5	0.26	mg/Kg dry	26.0	0.477	104		75-125			
Cadmium	25.4	0.26	mg/Kg dry	26.0	0.805	94.3		75-125			
Chromium	54.4	0.52	mg/Kg dry	26.0	30.8	90.5		75-125			
Lead	756	0.78	mg/Kg dry	26.0	779	**-86.6**	*	75-125			MS-19
Nickel	41.3	0.52	mg/Kg dry	26.0	17.1	92.9		75-125			
Selenium	24.6	5.2	mg/Kg dry	26.0	1.38	89.0		75-125			
Silver	23.4	0.52	mg/Kg dry	26.0	ND	89.9		75-125			
Thallium	26.0	2.6	mg/Kg dry	26.0	ND	99.9		75-125			
Vanadium	50.4	1.0	mg/Kg dry	26.0	26.5	91.8		75-125			
Zinc	133	1.0	mg/Kg dry	26.0	101	121		75-125			
Batch B173810 - SW-846 7471											
Blank (B173810-BLK1)				Prepared: 04/06/17 Analyzed: 04/07/17							
Mercury	ND	0.025	mg/Kg wet								
LCS (B173810-BS1)				Prepared: 04/06/17 Analyzed: 04/07/17							
Mercury	8.42	1.9	mg/Kg wet	9.36		90.0		73.7-126.3			
LCS Dup (B173810-BSD1)				Prepared: 04/06/17 Analyzed: 04/07/17							
Mercury	9.13	1.9	mg/Kg wet	9.36		97.5		73.7-126.3	8.09	30	

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QUALITY CONTROL

Metals Analyses (Total) - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD		RPD Limit	Notes
Batch B173810 - SW-846 7471											
Duplicate (B173810-DUP1)	**Source: 17C1191-09**			Prepared: 04/06/17 Analyzed: 04/07/17							
Mercury	0.433	0.029	mg/Kg dry		0.258			**50.8**	*	35	R-02
Matrix Spike (B173810-MS1)	**Source: 17C1191-09**			Prepared: 04/06/17 Analyzed: 04/07/17							
Mercury	0.474	0.029	mg/Kg dry	0.193	0.258	112	75-125				

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QUALITY CONTROL

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total) - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B173503 - % Solids										
Duplicate (B173503-DUP9)	**Source: 17C1191-01**		Prepared: 03/31/17 Analyzed: 04/03/17							
% Solids	90.6		% Wt		89.9			0.776	20	

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FLAG/QUALIFIER SUMMARY

*	QC result is outside of established limits.
†	Wide recovery limits established for difficult compound.
‡	Wide RPD limits established for difficult compound.
#	Data exceeded client recommended or regulatory level
ND	Not Detected
RL	Reporting Limit
DL	Method Detection Limit
MCL	Maximum Contaminant Level
	Percent recoveries and relative percent differences (RPDs) are determined by the software using values in the calculation which have not been rounded.
	No results have been blank subtracted unless specified in the case narrative section.
L-07	Either laboratory fortified blank/laboratory control sample or duplicate recovery is outside of control limits, but the other is within limits. RPD between the two LFB/LCS results is within method specified criteria.
L-14	Compound classified by MA CAM as difficult with acceptable recoveries of 40-160%. Recovery does not meet 70-130% criteria but does meet difficult compound criteria.
MS-19	Sample to spike ratio is greater than or equal to 4:1. Spiked amount is not representative of the native amount in the sample. Appropriate or meaningful recoveries cannot be calculated.
O-01	Soil/methanol ratio does not meet method specifications. Excess amount of soil. Sample was completely covered with methanol, but with less than the method-specified amount.
R-02	Duplicate RPD is outside of control limits. Outlier can be attributed to sample non-homogeneity encountered during sample prep.
R-05	Laboratory fortified blank duplicate RPD is outside of control limits. Reduced precision is anticipated for any reported value for this compound.
RL-07	Elevated reporting limit based on lowest point in calibration. MA CAM reporting limit not met.
V-05	Continuing calibration did not meet method specifications and was biased on the low side for this compound. Increased uncertainty is associated with the reported value which is likely to be biased on the low side.
V-16	Response factor is less than method specified minimum acceptable value. Reduced precision and accuracy may be associated with reported result.
V-20	Continuing calibration did not meet method specifications and was biased on the high side. Data validation is not affected since sample result was "not detected" for this compound.

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CERTIFICATIONS

Certified Analyses included in this Report

Analyte	Certifications
MADEP-EPH-04-1.1 in Soil	
C9-C18 Aliphatics	CT,NC,ME,NH-P
C19-C36 Aliphatics	CT,NC,ME,NH-P
Unadjusted C11-C22 Aromatics	CT,NC,ME,NH-P
C11-C22 Aromatics	CT,NC,ME,NH-P
Acenaphthene	CT,NC,ME,NH-P
Acenaphthylene	CT,NC,ME,NH-P
Anthracene	CT,NC,ME,NH-P
Benzo(a)anthracene	CT,NC,ME,NH-P
Benzo(a)pyrene	CT,NC,ME,NH-P
Benzo(b)fluoranthene	CT,NC,ME,NH-P
Benzo(g,h,i)perylene	CT,NC,ME,NH-P
Benzo(k)fluoranthene	CT,NC,ME,NH-P
Chrysene	CT,NC,ME,NH-P
Dibenz(a,h)anthracene	CT,NC,ME,NH-P
Fluoranthene	CT,NC,ME,NH-P
Fluorene	CT,NC,ME
Indeno(1,2,3-cd)pyrene	CT,NC,ME,NH-P
2-Methylnaphthalene	CT,NC,ME
Naphthalene	CT,NC,ME,NH-P
Phenanthrene	CT,NC,ME,NH-P
Pyrene	CT,NC,ME,NH-P
MADEP-VPH-04-1.1 in Soil	
Unadjusted C5-C8 Aliphatics	CT,NC,ME,NH-P
C5-C8 Aliphatics	CT,NC,ME,NH-P
Unadjusted C9-C12 Aliphatics	CT,NC,ME,NH-P
C9-C12 Aliphatics	CT,NC,ME,NH-P
C9-C10 Aromatics	CT,NC,ME,NH-P
Benzene	CT,NC,ME,NH-P
Ethylbenzene	CT,NC,ME,NH-P
Methyl tert-Butyl Ether (MTBE)	CT,NC,ME,NH-P
Naphthalene	CT,NC,ME,NH-P
Toluene	CT,NC,ME,NH-P
m+p Xylene	CT,NC,ME,NH-P
o-Xylene	CT,NC,ME,NH-P
SW-846 6010C-D in Soil	
Antimony	CT,NH,NY,ME,VA,NC
Arsenic	CT,NH,NY,ME,VA,NC
Barium	CT,NH,NY,ME,VA,NC
Beryllium	CT,NH,NY,ME,VA,NC
Cadmium	CT,NH,NY,ME,VA,NC
Chromium	CT,NH,NY,ME,VA,NC
Lead	CT,NH,NY,AIHA,ME,VA,NC
Nickel	CT,NH,NY,ME,VA,NC
Selenium	CT,NH,NY,ME,VA,NC
Silver	CT,NH,NY,ME,VA,NC
Thallium	CT,NH,NY,ME,VA,NC

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CERTIFICATIONS

Certified Analyses included in this Report

Analyte	Certifications
SW-846 6010C-D in Soil	
Vanadium	CT,NH,NY,ME,VA,NC
Zinc	CT,NH,NY,ME,VA,NC
SW-846 7471B in Soil	
Mercury	CT,NH,NY,NC,ME,VA
SW-846 8260C in Soil	
Acetone	CT,NH,NY,ME
Acetone	CT,NH,NY,ME
Benzene	CT,NH,NY,ME
Benzene	CT,NH,NY,ME
Bromobenzene	NH,NY,ME
Bromobenzene	NH,NY,ME
Bromochloromethane	NH,NY,ME
Bromochloromethane	NH,NY,ME
Bromodichloromethane	CT,NH,NY,ME
Bromodichloromethane	CT,NH,NY,ME
Bromoform	CT,NH,NY,ME
Bromoform	CT,NH,NY,ME
Bromomethane	CT,NH,NY,ME
Bromomethane	CT,NH,NY,ME
2-Butanone (MEK)	CT,NH,NY,ME
2-Butanone (MEK)	CT,NH,NY,ME
n-Butylbenzene	CT,NH,NY,ME
n-Butylbenzene	CT,NH,NY,ME
sec-Butylbenzene	CT,NH,NY,ME
sec-Butylbenzene	CT,NH,NY,ME
tert-Butylbenzene	CT,NH,NY,ME
tert-Butylbenzene	CT,NH,NY,ME
Carbon Disulfide	CT,NH,NY,ME
Carbon Disulfide	CT,NH,NY,ME
Carbon Tetrachloride	CT,NH,NY,ME
Carbon Tetrachloride	CT,NH,NY,ME
Chlorobenzene	CT,NH,NY,ME
Chlorobenzene	CT,NH,NY,ME
Chlorodibromomethane	CT,NH,NY,ME
Chlorodibromomethane	CT,NH,NY,ME
Chloroethane	CT,NH,NY,ME
Chloroethane	CT,NH,NY,ME
Chloroform	CT,NH,NY,ME
Chloroform	CT,NH,NY,ME
Chloromethane	CT,NH,NY,ME
Chloromethane	CT,NH,NY,ME
2-Chlorotoluene	CT,NH,NY,ME
2-Chlorotoluene	CT,NH,NY,ME
4-Chlorotoluene	CT,NH,NY,ME
4-Chlorotoluene	CT,NH,NY,ME
Dibromomethane	NH,NY,ME

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CERTIFICATIONS

Certified Analyses included in this Report

Analyte	Certifications
SW-846 8260C in Soil	
Dibromomethane	NH,NY,ME
1,2-Dichlorobenzene	CT,NH,NY,ME
1,2-Dichlorobenzene	CT,NH,NY,ME
1,3-Dichlorobenzene	CT,NH,NY,ME
1,3-Dichlorobenzene	CT,NH,NY,ME
1,4-Dichlorobenzene	CT,NH,NY,ME
1,4-Dichlorobenzene	CT,NH,NY,ME
Dichlorodifluoromethane (Freon 12)	NY,ME
Dichlorodifluoromethane (Freon 12)	NY,ME
1,1-Dichloroethane	CT,NH,NY,ME
1,1-Dichloroethane	CT,NH,NY,ME
1,2-Dichloroethane	CT,NH,NY,ME
1,2-Dichloroethane	CT,NH,NY,ME
1,1-Dichloroethylene	CT,NH,NY,ME
1,1-Dichloroethylene	CT,NH,NY,ME
cis-1,2-Dichloroethylene	CT,NH,NY,ME
cis-1,2-Dichloroethylene	CT,NH,NY,ME
trans-1,2-Dichloroethylene	CT,NH,NY,ME
trans-1,2-Dichloroethylene	CT,NH,NY,ME
1,2-Dichloropropane	CT,NH,NY,ME
1,2-Dichloropropane	CT,NH,NY,ME
1,3-Dichloropropane	NH,NY,ME
1,3-Dichloropropane	NH,NY,ME
2,2-Dichloropropane	NH,NY,ME
2,2-Dichloropropane	NH,NY,ME
1,1-Dichloropropene	NH,NY,ME
1,1-Dichloropropene	NH,NY,ME
cis-1,3-Dichloropropene	CT,NH,NY,ME
cis-1,3-Dichloropropene	CT,NH,NY,ME
trans-1,3-Dichloropropene	CT,NH,NY,ME
trans-1,3-Dichloropropene	CT,NH,NY,ME
1,4-Dioxane	NY
Ethylbenzene	CT,NH,NY,ME
Ethylbenzene	CT,NH,NY,ME
Hexachlorobutadiene	NH,NY,ME
Hexachlorobutadiene	NH,NY,ME
2-Hexanone (MBK)	CT,NH,NY,ME
2-Hexanone (MBK)	CT,NH,NY,ME
Isopropylbenzene (Cumene)	CT,NH,NY,ME
Isopropylbenzene (Cumene)	CT,NH,NY,ME
p-Isopropyltoluene (p-Cymene)	NH,NY
p-Isopropyltoluene (p-Cymene)	NH,NY
Methyl tert-Butyl Ether (MTBE)	NH,NY
Methyl tert-Butyl Ether (MTBE)	NY
Methylene Chloride	CT,NH,NY,ME
Methylene Chloride	CT,NH,NY,ME
4-Methyl-2-pentanone (MIBK)	CT,NH,NY

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CERTIFICATIONS

Certified Analyses included in this Report

Analyte	Certifications
SW-846 8260C in Soil	
4-Methyl-2-pentanone (MIBK)	CT,NH,NY
Naphthalene	NH,NY,ME
Naphthalene	NH,NY,ME
n-Propylbenzene	NH,NY
n-Propylbenzene	NH,NY
Styrene	CT,NH,NY,ME
Styrene	CT,NH,NY,ME
1,1,1,2-Tetrachloroethane	CT,NH,NY,ME
1,1,1,2-Tetrachloroethane	CT,NH,NY,ME
1,1,2,2-Tetrachloroethane	CT,NH,NY,ME
1,1,2,2-Tetrachloroethane	CT,NH,NY,ME
Tetrachloroethylene	CT,NH,NY,ME
Tetrachloroethylene	CT,NH,NY,ME
Toluene	CT,NH,NY,ME
Toluene	CT,NH,NY,ME
1,2,3-Trichlorobenzene	ME
1,2,3-Trichlorobenzene	NY
1,2,4-Trichlorobenzene	NH,NY,ME
1,2,4-Trichlorobenzene	NH,NY,ME
1,1,1-Trichloroethane	CT,NH,NY,ME
1,1,1-Trichloroethane	CT,NH,NY,ME
1,1,2-Trichloroethane	CT,NH,NY,ME
1,1,2-Trichloroethane	CT,NH,NY,ME
Trichloroethylene	CT,NH,NY,ME
Trichloroethylene	CT,NH,NY,ME
Trichlorofluoromethane (Freon 11)	CT,NH,NY,ME
Trichlorofluoromethane (Freon 11)	CT,NH,NY,ME
1,2,3-Trichloropropane	NH,NY,ME
1,2,3-Trichloropropane	NH,NY,ME
1,2,4-Trimethylbenzene	CT,NH,NY,ME
1,2,4-Trimethylbenzene	CT,NH,NY,ME
1,3,5-Trimethylbenzene	CT,NH,NY,ME
1,3,5-Trimethylbenzene	CT,NH,NY,ME
Vinyl Chloride	CT,NH,NY,ME
Vinyl Chloride	CT,NH,NY,ME
m+p Xylene	CT,NH,NY,ME
m+p Xylene	CT,NH,NY,ME
o-Xylene	CT,NH,NY,ME
o-Xylene	CT,NH,NY,ME

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The CON-TEST Environmental Laboratory operates under the following certifications and accreditations:

Code	Description	Number	Expires
AIHA	AIHA-LAP, LLC - ISO17025:2005	100033	02/1/2018
MA	Massachusetts DEP	M-MA100	06/30/2017
CT	Connecticut Department of Publilc Health	PH-0567	09/30/2017
NY	New York State Department of Health	10899 NELAP	04/1/2018
NH-S	New Hampshire Environmental Lab	2516 NELAP	02/5/2018
RI	Rhode Island Department of Health	LAO00112	12/30/2017
NC	North Carolina Div. of Water Quality	652	12/31/2017
NJ	New Jersey DEP	MA007 NELAP	06/30/2017
FL	Florida Department of Health	E871027 NELAP	06/30/2017
VT	Vermont Department of Health Lead Laboratory	LL015036	07/30/2017
ME	State of Maine	2011028	06/9/2017
VA	Commonwealth of Virginia	460217	12/14/2017
NH-P	New Hampshire Environmental Lab	2557 NELAP	09/6/2017

con-test ANALYTICAL LABORATORY
Phone: 413-525-2332
Fax: 413-525-6405
Email: info@contestlabs.com
www.contestlabs.com

CHAIN OF CUSTODY RECORD

17C1191

Rev 04.05.12

39 Spruce Street
East longmeadow, MA 01028

Company Name: NOBIS ENGINEERING
Address: 585 MIDDLESEX ST.
LOWELL, MA 01851
Attention: E. JOHNSON / S. VETERE
Project Location: LOWELL, MA
Sampled By: E. JOHNSON

Telephone: 978-683-0891
Project #: 91830.01
Client PO#:

DATA DELIVERY (check all that apply)
○ FAX ☒ EMAIL ○ WEBSITE
Fax #:
Email: ejohnson@nobiseng.com
Format: ☒ PDF ☒ EXCEL ○ GIS
○ OTHER
○ "Enhanced Data Package"

Project Proposal Provided? (for billing purposes)
○ yes _____ proposal date

									3	1	1	"							# of Containers
									M/B	M	1	"							** Preservation
									V	V	A	"							***Container Code

ANALYSIS REQUESTED

Con-Test Lab ID (laboratory use only)	Client Sample ID / Description	Collection Beginning Date/Time	Collection Ending Date/Time	Composite	Grab	*Matrix Code	Conc Code	VOCs	VPH	EPH	METALS
1	NOB-101 0-2	3/29/17	1215		X	SO	U	X	X	X	X
2	NOB-101 6-8		1200		X						
3	NOB-102 0-2		1035		X						
4	NOB-102 7-8		1055		X						
5	NOB-104 0-2		945		X						
6	NOB-104 5-5.5'		955		X						
7	NOB-105 0-2		840		X						
8	NOB-105 11-12		830		X						
9	NOB-106 0-2		910		X						
10	NOB-106 4-5		920		X						

Dissolved Metals
○ Field Filtered
○ Lab to Filter

***Cont. Code:
A=amber glass
G=glass
P=plastic
ST=sterile
V= vial
S=summa can
T=tedlar bag
O=Other

**Preservation
I = Iced
H = HCL
M = Methanol
N = Nitric Acid
S = Sulfuric Acid
B = Sodium bisulfate
X = Na hydroxide
T = Na thiosulfate
O = Other

*Matrix Code:
GW= groundwater
WW= wastewater
DW= drinking water
A = air
S = soil/solid
SL = sludge
O = other

Comments:
MCP metals & VPH ranges only per client - MEK 3/31/2017

Please use the following codes to let Con-Test know if a specific sample may be high in concentration in Matrix/Conc. Code Box:
H - High; M - Medium; L - Low; C - Clean; U - Unknown

Relinquished by: (signature)	Date/Time:
[signature] (NOBIS)	1007
Received by: (signature) [signature] 3/30/17	1007
Relinquished by: (signature) [signature] "	4:15
Received by: (signature) [signature] 3/30/17	1615

Turnaround ††
☒ 7-Day
☐ 10-Day
☐ Other
RUSH †
☐ †24-Hr ☐ †48-Hr
☐ †72-Hr ☐ †4-Day
† Require lab approval

Detection Limit Requirements
Massachusetts: S-2
Connecticut:
Other:

Is your project MCP or RCP ?
☒ MCP Form Required
○ RCP Form Required
○ MA State DW Form Required PWSID #

NELAC & AIHA-LAP, LLC Accredited
WBE/DBE Certifie

TURNAROUND TIME STARTS AT 9:00 A.M. THE DAY AFTER SAMPLE RECEIPT UNLESS THERE ARE QUESTIONS ON YOUR CHAIN. IF THIS FORM IS NOT FILLED OUT COMPLETELY OR IS INCORRECT, TURNAROUND TIME WILL NOT START UNTIL ALL QUESTIONS ARE ANSWERED BY OUR CLIENT.

PLEASE BE CAREFUL NOT TO CONTAMINATE THIS DOCUMENT

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39 Spruce Street
East longmeadow, MA 01028

CHAIN OF CUSTODY RECORD

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Format: ☒ PDF ☒ EXCEL ○ GIS
○ OTHER
○ "Enhanced Data Package"

Project Proposal Provided? (for billing purposes)
○ yes _____ proposal date

Con-Test Lab ID (laboratory use only)	Client Sample ID / Description	Collection Beginning Date/Time	Collection Ending Date/Time	Composite	Grab	*Matrix Code	Conc Code	VOCs	VPH	EPH	METALS	# of Containers	** Preservation	***Container Code
								3	1	1	"			
								M/B	M	1	"			
								V	V	A	"			
11	FD-01	3/29/17	1500		X	SO	U	X	X	X	X			
12	TB-01	3/29/17	0700		X	BLANK	U	X						

ANALYSIS REQUESTED

Dissolved Metals
○ Field Filtered
○ Lab to Filter

***Cont. Code:**
A=amber glass
G=glass
P=plastic
ST=sterile
V= vial
S=summa can
T=tedlar bag
O=Other

****Preservation**
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N = Nitric Acid
S = Sulfuric Acid
B = Sodium bisulfate
X = Na hydroxide
T = Na thiosulfate
O = Other

*Matrix Code:
GW= groundwater
WW= wastewater
DW= drinking water
A = air
S = soil/solid
SL= sludge
O = other

Comments:

Please use the following codes to let Con-Test know if a specific sample may be high in concentration in Matrix/Conc. Code Box:
H - High; M - Medium; L - Low; C - Clean; U - Unknown

Relinquished by: (signature) Eric Johnson (NOBIS)	Date/Time: 1007	
Received by: (signature)	Date/Time: 1007	
Relinquished by: (signature)	Date/Time: 4:15	
Received by: (signature)	Date/Time: 1615	

Turnaround ††
☒ 7-Day
☐ 10-Day
☐ Other
RUSH †
☐ †24-Hr ☐ †48-Hr
☐ †72-Hr ☐ †4-Day
† Require lab approval

Detection Limit Requirements
Massachusetts: S-2
Connecticut:
Other:

Is your project MCP or RCP ?
☒ MCP Form Required
○ RCP Form Required
○ MA State DW Form Required PWSID # _____

NELAC & AIHA-LAP, LLC Accredited
WBE/DBE Certified

TURNAROUND TIME STARTS AT 9:00 A.M. THE DAY AFTER SAMPLE RECEIPT UNLESS THERE ARE QUESTIONS ON YOUR CHAIN. IF THIS FORM IS NOT FILLED OUT COMPLETELY OR INCORRECT, TURNAROUND TIME WILL NOT START UNTIL ALL QUESTIONS ARE ANSWERED BY OUR CLIENT.

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Table of Contents

39 Spruce St.
East Longmeadow, MA 01028
P: 413-525-2332
F: 413-525-6405
www.contestlabs.com

con-test® ANALYTICAL LABORATORY

Sample Receipt Checklist

CLIENT NAME: Nobis Eng. **RECEIVED BY:** JM **DATE:** 3/30/17

1) **Was the chain(s) of custody relinquished and signed?** **Yes** ✓ **No** ____ **No COC Incl.**

2) **Does the chain agree with the samples?** **Yes** ✓ **No** ____
If not, explain:

3) **Are all the samples in good condition?** **Yes** ✓ **No** ____
If not, explain:

4) **How were the samples received:**
On Ice ✓ Direct from Sampling ____ Ambient ____ In Cooler(s) ✓

Were the samples received in Temperature Compliance of (2-6°C)? **Yes** ✓ **No** ____ **N/A** ____

Temperature °C by Temp blank ____ # ____ Temperature °C by Temp gun 2.4 # 2

5) **Are there Dissolved samples for the lab to filter?** **Yes** ____ **No** ✓
Who was notified ____ Date ____ Time ____

6) **Are there any RUSH or SHORT HOLDING TIME samples?** **Yes** ____ **No** ✓
Who was notified ____ Date ____ Time ____

7) **Location where samples are stored:** Login

Permission to subcontract samples? Yes No
(Walk-in clients only) if not already approved
Client Signature: ____

8) **Do all samples have the proper Acid pH:** **Yes** ____ **No** ____ **N/A** ✓

9) **Do all samples have the proper Base pH:** **Yes** ____ **No** ____ **N/A** ✓

10) **Was the PC notified of any discrepancies with the CoC vs the samples:** **Yes** ____ **N/A** ✓

Containers received at Con-Test

	# of containers		# of containers
1 Liter Amber		16 oz amber	
500 mL Amber		8 oz amber/clear jar	11
250 mL Amber (8oz amber)		4 oz amber/clear jar	
1 Liter Plastic		2 oz amber/clear jar	
500 mL Plastic		Plastic Bag / Ziploc	
250 mL plastic		SOC Kit	
40 mL Vial - type listed below	47	Perchlorate Kit	
Colisure / bacteria bottle		Flashpoint bottle	
Dissolved Oxygen bottle		Other glass jar	
Encore		Other	

(JM)

40 mL vials: # HCl ____ # Methanol ~~18~~ 23 **Time and Date Frozen:**
Bisulfate 24 # DI Water ____
Thiosulfate ____ Unpreserved ____

Login Sample Receipt Checklist

(Rejection Criteria Listing - Using Sample Acceptance Policy)

Any False statement will be brought to the attention of Client

Question	Answer (True/False) T/F/NA	Comment
1) The cooler's custody seal, if present, is intact.	N/A	
2) The cooler or samples do not appear to have been compromised or tampered with.	T	
3) Samples were received on ice.	T	
4) Cooler Temperature is acceptable.	T	
5) Cooler Temperature is recorded.	T	
6) COC is filled out in ink and legible.	T	
7) COC is filled out with all pertinent information.	T	
8) Field Sampler's name present on COC.	T	
9) There are no discrepancies between the sample IDs on the container and the COC.	T	
10) Samples are received within Holding Time.	T	
11) Sample containers have legible labels.	T	
12) Containers are not broken or leaking.	T	
13) Air Cassettes are not broken/open.	N/A	
14) Sample collection date/times are provided.	T	
15) Appropriate sample containers are used.	T	
16) Proper collection media used.	T	
17) No headspace sample bottles are completely filled.	N/A	
18) There is sufficient volume for all requsted analyses, including any requested MS/MSDs.	T	
19) Trip blanks provided if applicable.	T	
20) VOA sample vials do not have head space or bubble is <6mm (1/4") in diameter.	N/A	
21) Samples do not require splitting or compositing.	T	

Who notified of False statements? **Date/Time:**

Doc #277 Rev. 4 August 2013 **Log-In Technician Initials:** JM **Date/Time:** 3/30/17 1615

MADEP MCP Analytical Method Report Certification Form

Laboratory Name: Con-Test Analytical Laboratory	Project #: 17C1191
Project Location: Lowell, MA	RTN:

This Form provides certifications for the following data set: [list Laboratory Sample ID Number(s)]

17C1191-01 thru 17C1191-12

Matrices: Soil

CAM Protocol (check all that below)

8260 VOC CAM II A (X)	7470/7471 Hg CAM IIIB (X)	MassDEP VPH CAM IV A (X)	8081 Pesticides CAM V B ( )	7196 Hex Cr CAM VI B ( )	MassDEP APH CAM IX A ( )
8270 SVOC CAM II B ( )	7010 Metals CAM III C ( )	MassDEP EPH CAM IV A (X)	8151 Herbicides CAM V C ( )	8330 Explosives CAM VIII A ( )	TO-15 VOC CAM IX B ( )
6010 Metals CAM III A (X)	6020 Metals CAM III D ( )	8082 PCB CAM V A ( )	9014 Total Cyanide/PAC CAM VI A ( )	6860 Perchlorate CAM VIII B ( )	

Affirmative response to Questions A throughF is required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	☑ Yes	☐ No[1]
B	Were the analytical method(s) and all associated QC requirements specificed in the selected CAM protocol(s) followed?	☑ Yes	☐ No[1]
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	☑ Yes	☐ No[1]
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, Quality Assurance and Quality Control Guidlines for the Acquisition and Reporting of Analytical Data?	☑ Yes	☐ No[1]
E a	VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	☑ Yes	☐ No[1]
E b	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	☐ Yes	☐ No[1]
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all No responses to Qestions A through E)?	☑ Yes	☐ No[1]

A response to questions G, H and I below is required for "Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	☐ Yes	☑ No[1]

<u>Data User Note:</u> Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.

H	Were all QC perfomance standards specified in the CAM protocol(s) achieved?	☐ Yes	☑ No[1]
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	☐ Yes	☑ No[1]

[1] *All Negative responses must be addressed in an attached Environmental Laboratory case narrative.*

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature:  Position: Project Manager

Printed Name: Lisa A. Worthington Date: 04/10/17

con-test® ANALYTICAL LABORATORY
39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

April 12, 2017

Eric Johnson
Nobis Engineering
585 Middlesex Street
Lowell, MA 01851

Project Location: Lowell, MA
Client Job Number:
Project Number: 91830.01
Laboratory Work Order Number: 17D0402

Enclosed are results of analyses for samples received by the laboratory on April 11, 2017. If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Meghan E. Kelley
Project Manager

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Nobis Engineering
585 Middlesex Street
Lowell, MA 01851
ATTN: Eric Johnson

REPORT DATE: 4/12/2017

PURCHASE ORDER NUMBER: MO 16-008

PROJECT NUMBER: 91830.01

ANALYTICAL SUMMARY

WORK ORDER NUMBER: 17D0402

The results of analyses performed on the following samples submitted to the CON-TEST Analytical Laboratory are found in this report.

PROJECT LOCATION: Lowell, MA

FIELD SAMPLE #	LAB ID:	MATRIX	SAMPLE DESCRIPTION	TEST	SUB LAB
NOB-106N 0-1	17D0402-01	Soil		SM 2540G SW-846 6010C-D	
NOB-106S 0-1	17D0402-02	Soil		SM 2540G SW-846 6010C-D	

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CASE NARRATIVE SUMMARY

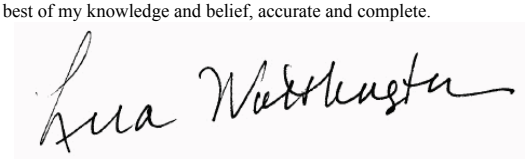
All reported results are within defined laboratory quality control objectives unless listed below or otherwise qualified in this report.

For method 6010, only As was requested and reported.

SW-846 6010C/D SW-846 6020A/B

For NC, Metals methods SW-846 6010D and SW-846 6020B are followed, and for all other states methods SW-846 6010C and SW-846 6020A are followed.

The results of analyses reported only relate to samples submitted to the Con-Test Analytical Laboratory for testing.
I certify that the analyses listed above, unless specifically listed as subcontracted, if any, were performed under my direction according to the approved methodologies listed in this document, and that based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.



Lisa A. Worthington
Project Manager

con-test® ANALYTICAL LABORATORY
39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA
Sample Description:
Work Order: 17D0402

Date Received: 4/11/2017

Field Sample #: NOB-106N 0-1
Sampled: 4/11/2017 10:20

Sample ID: 17D0402-01

Sample Matrix: Soil

Metals Analyses (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Arsenic	180	2.7	mg/Kg dry	1		SW-846 6010C-D	4/12/17	4/12/17 12:25	SHN

con-test® ANALYTICAL LABORATORY
39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17D0402

Date Received: 4/11/2017

Field Sample #: NOB-106N 0-1 | Sampled: 4/11/2017 10:20

Sample ID: 17D0402-01

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	90.7		% Wt	1		SM 2540G	4/11/17	4/12/17 7:47	MRL

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Project Location: Lowell, MA | Sample Description: | Work Order: 17D0402

Date Received: 4/11/2017

Field Sample #: NOB-106S 0-1 | Sampled: 4/11/2017 10:30

Sample ID: 17D0402-02

Sample Matrix: Soil

Metals Analyses (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
Arsenic	140	2.8	mg/Kg dry	1		SW-846 6010C-D	4/12/17	4/12/17 12:29	SHN

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Lowell, MA | Sample Description: | Work Order: 17D0402

Date Received: 4/11/2017

Field Sample #: NOB-106S 0-1 | Sampled: 4/11/2017 10:30

Sample ID: 17D0402-02

Sample Matrix: Soil

Conventional Chemistry Parameters by EPA/APHA/SW-846 Methods (Total)

Analyte	Results	RL	Units	Dilution	Flag/Qual	Method	Date Prepared	Date/Time Analyzed	Analyst
% Solids	89.3		% Wt	1		SM 2540G	4/11/17	4/12/17 7:47	MRL

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Sample Extraction Data

Prep Method: % Solids-SM 2540G

Lab Number [Field ID]	Batch	Date
17D0402-01 [NOB-106N 0-1]	B174298	04/11/17
17D0402-02 [NOB-106S 0-1]	B174298	04/11/17

Prep Method: SW-846 3050B-SW-846 6010C-D

Lab Number [Field ID]	Batch	Initial [g]	Final [mL]	Date
17D0402-01 [NOB-106N 0-1]	B174280	1.04	50.0	04/12/17
17D0402-02 [NOB-106S 0-1]	B174280	1.01	50.0	04/12/17

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

QUALITY CONTROL

Metals Analyses (Total) - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B174280 - SW-846 3050B										
Blank (B174280-BLK1)				Prepared & Analyzed: 04/12/17						
Arsenic	ND	2.5	mg/Kg wet							
LCS (B174280-BS1)				Prepared & Analyzed: 04/12/17						
Arsenic	54.3	4.9	mg/Kg wet	57.0		95.2	77.8-122.1			
LCS Dup (B174280-BSD1)				Prepared & Analyzed: 04/12/17						
Arsenic	55.7	5.0	mg/Kg wet	57.0		97.8	77.8-122.1	2.65	30	

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

FLAG/QUALIFIER SUMMARY

*	QC result is outside of established limits.
†	Wide recovery limits established for difficult compound.
‡	Wide RPD limits established for difficult compound.
#	Data exceeded client recommended or regulatory level
ND	Not Detected
RL	Reporting Limit
DL	Method Detection Limit
MCL	Maximum Contaminant Level

Percent recoveries and relative percent differences (RPDs) are determined by the software using values in the calculation which have not been rounded.

No results have been blank subtracted unless specified in the case narrative section.

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

CERTIFICATIONS

Certified Analyses included in this Report

Analyte	Certifications
SW-846 6010C-D in Soil	
Arsenic	CT,NH,NY,ME,VA,NC

The CON-TEST Environmental Laboratory operates under the following certifications and accreditations:

Code	Description	Number	Expires
AIHA	AIHA-LAP, LLC - ISO17025:2005	100033	02/1/2018
MA	Massachusetts DEP	M-MA100	06/30/2017
CT	Connecticut Department of Publilc Health	PH-0567	09/30/2017
NY	New York State Department of Health	10899 NELAP	04/1/2018
NH-S	New Hampshire Environmental Lab	2516 NELAP	02/5/2018
RI	Rhode Island Department of Health	LAO00112	12/30/2017
NC	North Carolina Div. of Water Quality	652	12/31/2017
NJ	New Jersey DEP	MA007 NELAP	06/30/2017
FL	Florida Department of Health	E871027 NELAP	06/30/2017
VT	Vermont Department of Health Lead Laboratory	LL015036	07/30/2017
ME	State of Maine	2011028	06/9/2017
VA	Commonwealth of Virginia	460217	12/14/2017
NH-P	New Hampshire Environmental Lab	2557 NELAP	09/6/2017

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17D0402

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Con-Test Lab ID (laboratory use only)	Client Sample ID / Description	Collection Beginning Date/Time	Collection Ending Date/Time	Composite	Grab	*Matrix Code	Conc Code	# of Containers	** Preservation	***Container Code	ANALYSIS REQUESTED: ARSENIC
1	NOB-106N 0-1	4/11/17	1020		X	SO	J	1	1	A	X
2	NOB-106S 0-1	4/11/17	1030		X	SO	J	1	1	A	X

Dissolved Metals
○ Field Filtered
○ Lab to Filter

***Cont. Code:**
A=amber glass
G=glass
P=plastic
ST=sterile
V=vial
S=summa can
T=tedlar bag
O=Other

****Preservation**
I = Iced
H = HCL
M = Methanol
N = Nitric Acid
S = Sulfuric Acid
B = Sodium bisulfate
X = Na hydroxide
T = Na thiosulfate
O = Other

*Matrix Code:
GW= groundwater
WW= wastewater
DW= drinking water
A = air
S = soil/solid
SL = sludge
O = other

Comments:

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H - High; M - Medium; L - Low; C - Clean; U - Unknown

Relinquished by: (signature)	Date/Time:
	4/11/17 1430
Received by: (signature)	Date/Time:
	4/11/17 1930
Relinquished by: (signature)	Date/Time:
	4/11/17 1940
Received by: (signature)	Date/Time:
	4/11/17 1940

Turnaround ††
☐ 7-Day
☐ 10-Day
☐ Other
RUSH †
☒ †24-Hr ☐ †48-Hr
☐ †72-Hr ☐ †4-Day
† Require lab approval

Detection Limit Requirements
Massachusetts: RCS1, RCS-2
Connecticut:
Other:

Is your project MCP or RCP ?
☒ MCP Form Required
○ RCP Form Required
○ MA State DW Form Required PWSID # _____

NELAC & AIHA-LAP, LLC Accredited
WBE/DBE Certifie

TURNAROUND TIME STARTS AT 9:00 A.M. THE DAY AFTER SAMPLE RECEIPT UNLESS THERE ARE QUESTIONS ON YOUR CHAIN. IF THIS FORM IS NOT FILLED OUT COMPLETELY OR INCORRECT, TURNAROUND TIME WILL NOT START UNTIL ALL QUESTIONS ARE ANSWERED BY OUR CLIENT.

PLEASE BE CAREFUL NOT TO CONTAMINATE THIS DOCUMENT

Table of Contents

39 Spruce St.
East Longmeadow, MA. 01028
P: 413-525-2332
F: 413-525-6405
www.contestlabs.com

CON-TEST ANALYTICAL LABORATORY

Sample Receipt Checklist

CLIENT NAME: Nobis Engineering **RECEIVED BY:** JM **DATE:** 4/11/12

1) **Was the chain(s) of custody relinquished and signed?** Yes ✓ No ____ No COC Incl.

2) **Does the chain agree with the samples?** Yes ✓ No ____
If not, explain:

3) **Are all the samples in good condition?** Yes ✓ No ____
If not, explain:

4) **How were the samples received:**
On Ice ✓ Direct from Sampling ____ Ambient ____ In Cooler(s) ✓

Were the samples received in Temperature Compliance of (2-6°C)? Yes ✓ No ____ N/A ____

Temperature °C by Temp blank ____ # ____ Temperature °C by Temp gun 3.2 # 2

5) **Are there Dissolved samples for the lab to filter?** Yes ____ No ✓
Who was notified ____ Date ____ Time ____

6) **Are there any RUSH or SHORT HOLDING TIME samples?** Yes ✓ No ____
Who was notified N/A Date 4/11/12 Time 1940

7) **Location where samples are stored:** Cog. 7

Permission to subcontract samples? Yes No
(Walk-in clients only) if not already approved
Client Signature: ____

8) **Do all samples have the proper Acid pH:** Yes ____ No ____ N/A ✓

9) **Do all samples have the proper Base pH:** Yes ____ No ____ N/A ✓

10) **Was the PC notified of any discrepancies with the CoC vs the samples:** Yes ____ N/A ✓

Containers received at Con-Test

	# of containers		# of containers
1 Liter Amber		16 oz amber	
500 mL Amber		8 oz amber/clear jar	
250 mL Amber (8oz amber)		4 oz amber/clear jar	2
1 Liter Plastic		2 oz amber/clear jar	
500 mL Plastic		Plastic Bag / Ziploc	
250 mL plastic		SOC Kit	
40 mL Vial - type listed below		Perchlorate Kit	
Colisure / bacteria bottle		Flashpoint bottle	
Dissolved Oxygen bottle		Other glass jar	
Encore		Other	

40 mL vials: # HCl ____ # Methanol ____ Time and Date Frozen:
Bisulfate ____ # DI Water ____
Thiosulfate ____ Unpreserved ____

Login Sample Receipt Checklist

(Rejection Criteria Listing - Using Sample Acceptance Policy)

Any False statement will be brought to the attention of Client

Question	Answer (True/False) T/F/NA	Comment
1) The cooler's custody seal, if present, is intact.	N/A	
2) The cooler or samples do not appear to have been compromised or tampered with.	T	
3) Samples were received on ice.	T	
4) Cooler Temperature is acceptable.	T	
5) Cooler Temperature is recorded.	T	
6) COC is filled out in ink and legible.	T	
7) COC is filled out with all pertinent information.	T	
8) Field Sampler's name present on COC.	T	
9) There are no discrepancies between the sample IDs on the container and the COC.	T	
10) Samples are received within Holding Time.	T	
11) Sample containers have legible labels.	T	
12) Containers are not broken or leaking.	T	
13) Air Cassettes are not broken/open.	N/A	
14) Sample collection date/times are provided.	T	
15) Appropriate sample containers are used.	T	
16) Proper collection media used.	T	
17) No headspace sample bottles are completely filled.	N/A	
18) There is sufficient volume for all requsted analyses, including any requested MS/MSDs.	T	
19) Trip blanks provided if applicable.	N/A	
20) VOA sample vials do not have head space or bubble is <6mm (1/4") in diameter.	N/A	
21) Samples do not require splitting or compositing.	T	

Who notified of False statements? **Date/Time:**

Doc #277 Rev. 4 August 2013 **Log-In Technician Initials:** JM **Date/Time:** 4/11/17 1940

MADEP MCP Analytical Method Report Certification Form

Laboratory Name: Con-Test Analytical Laboratory	Project #: 17D0402
Project Location: Lowell, MA	RTN:

This Form provides certifications for the following data set: [list Laboratory Sample ID Number(s)]

17D0402-01 thru 17D0402-02

Matrices: Soil

CAM Protocol (check all that below)

8260 VOC CAM II A ( )	7470/7471 Hg CAM IIIB ( )	MassDEP VPH CAM IV A ( )	8081 Pesticides CAM V B ( )	7196 Hex Cr CAM VI B ( )	MassDEP APH CAM IX A ( )
8270 SVOC CAM II B ( )	7010 Metals CAM III C ( )	MassDEP EPH CAM IV A ( )	8151 Herbicides CAM V C ( )	8330 Explosives CAM VIII A ( )	TO-15 VOC CAM IX B ( )
6010 Metals CAM III A (X)	6020 Metals CAM III D ( )	8082 PCB CAM V A ( )	9014 Total Cyanide/PAC CAM VI A ( )	6860 Perchlorate CAM VIII B ( )	

Affirmative response to Questions A throughF is required for "Presumptive Certainty" status

A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	☑ Yes	☐ No[1]
B	Were the analytical method(s) and all associated QC requirements specificed in the selected CAM protocol(s) followed?	☑ Yes	☐ No[1]
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	☑ Yes	☐ No[1]
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, Quality Assurance and Quality Control Guidlines for the Acquisition and Reporting of Analytical Data?	☑ Yes	☐ No[1]
E a	VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	☐ Yes	☐ No[1]
E b	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	☐ Yes	☐ No[1]
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all No responses to Qestions A through E)?	☑ Yes	☐ No[1]

A response to questions G, H and I below is required for "Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	☑ Yes	☐ No[1]

***Data User Note:* Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.**

H	Were all QC perfomance standards specified in the CAM protocol(s) achieved?	☑ Yes	☐ No[1]
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	☐ Yes	☑ No[1]

[1] *All Negative responses must be addressed in an attached Environmental Laboratory case narrative.*

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature:  Position: Project Manager

Printed Name: Lisa A. Worthington Date: 04/12/17

APPENDIX D

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

RELEASE LOG FORM

BWSC 101

Release Tracking Number
3 - 34180

A. THIS FORM IS BEING USED TO: (check one)

1. Log Date: 4/12/2017 (mm/dd/yyyy) Log Time: 02:21 (hh:mm) ☐ AM ☑ PM

☑ 2. Assign a Release Tracking Number (RTN) to a Release or TOR Report.
☑ a. **Reportable Release or TOR.** ☐ b. **Release that is Less Than the Reporting Thresholds.**

☐ 3. Amend a Previously Recorded Release or TOR Report (RTN Assigned) .
☐ a. The Release is a **Reportable Release or TOR.** ☐ b. The Release is a **Release that is Less Than the Reporting Thresholds.**
☐ c. The Release or TOR is **Retracted.** (BWSC103 must be submitted, as well) ☐ d. The Release or TOR is **not a Release under M.G.L. c. 21E.**

B. REPORTING PERSON:

1. Name of Organization: NOBIS ENGINEERING
2. First Name: STEPHEN 3. Last Name: VETERE
4. Telephone: 9787036029 5. Ext.:
6. Relationship of Person to Release: ☐ PRP ☑ Other c. Type, if known (e.g. Current Owner): Licensed Site Professional

C. RELEASE OR THREAT OF RELEASE (TOR) /SITE LOCATION:

1. Location Aid/Site Name: LOWELL HIGH SCHOOL
2. Street Address: 50 FATHER MORISSETTE BLVD. 3. 2nd Address Line:
4. City/Town: LOWELL, LOWELL 5. Zip Code (if known): 018520000
6. Type of Location: (check all that apply) ☑ a. School ☐ b. Water Body ☐ c. Right of Way ☐ d. Utility Easement
☐ e. Roadway ☐ f. Municipal ☐ g. State ☐ h. Residential ☐ i. Open Space ☐ j. Private Property
☐ k. Industrial ☐ l. Commercial ☐ m. Federal ☑ n. Other Describe: LOWELL HIGH SCHOOL

D. RELEASE OR TOR INFORMATION:

1. Date and Time of **Notification**: 4/12/2017 (mm/dd/yyyy) Time: 02:21 (hh:mm) ☐ AM ☑ PM
2. Date and Time Reporting Person obtained **Knowledge of Release or TOR**: 4/12/2017 (mm/dd/yyyy) Time: 01:30 (hh:mm) ☐ AM ☑ PM
3. Date and Time **Release or TOR occurred**, if known: (mm/dd/yyyy) Time: (hh:mm) ☐ AM ☐ PM
4. **Sources of the Release or TOR**: (check all that apply) ☐ a. Transformer ☐ b. Fuel Tank ☐ c. Pipe
☐ d. OHM Delivery ☐ e. AST ☐ f. Drums ☐ g. Tanker Truck ☐ h. Hose ☐ i. Line
☐ j. UST Describe ☐ k. Vehicle ☐ l. Boat/Vessel
☐ m. Unknown ☑ n. Other: HISTORICAL FILL MATERIAL
5. **Federal LUST Eligible**: ☐ Yes ☑ No ☐ Unknown

Check all Notification Thresholds that apply to the Release or TOR:

6. 2 Hour Reporting Conditions:

- ☐ a. Sudden Release
- ☐ b. Threat of Sudden Release
- ☐ c. Oil Sheen on Surface Water
- ☐ d. Poses Imminent Hazard
- ☑ e. Could Pose Imminent Hazard
- ☐ f. Release Detected in Private Well
- ☐ g. Release to Storm Drain
- ☐ h. Sanitary Sewer Release (Imminent Hazard Only)

7. 72 Hour Reporting Conditions:

- ☐ a. Subsurface Non-Aqueous Phase Liquid (NAPL) Equal to or Greater than 1/2 Inch
- ☐ b. Underground Storage Tank (UST) Release
- ☐ c. Threat of UST Release
- ☐ d. Release to Groundwater near Water Supply
- ☐ e. Release to Groundwater near School or Residence
- ☐ f. Substantial Release Migration

8. 120 Day Reporting Conditions:

- ☐ a. Release of Hazardous Material(s) to Soil or Groundwater Exceeding Reportable Concentration(s)
- ☐ b. Release of Oil to Soil Exceeding Reportable Concentration(s) and Affecting More than 2 Cubic Yards
- ☐ c. Release of Oil to Groundwater Exceeding Reportable Concentration(s)
- ☐ d. Subsurface Non-Aqueous Phase Liquid(NAPL) Equal to or Greater than 1/8 Inch and Less than 1/2 Inch

9. Type of Release or TOR: (check all that apply) ☐ a. Dumping ☐ b. Fire ☐ c. AST Removal ☐ d. Overfill ☐ e. rupture ☐ f. Vehicle Accident ☐ g. Leak ☐ h. Spill ☐ i. Test Failure ☐ j. TOR Only ☐ k. UST Removal Describe ☐ l. Unknown ☑ m. Other: HISTORICAL

10. Media Impacted and Receptors Affected: (check all that apply) ☐ a. Paved Surface ☐ b. Basement ☐ c. School ☐ d. Public Water Supply ☐ e. Surface Water ☐ f. Zone 2 ☐ g. Private Well ☐ h. Residence ☑ i. Soil ☐ j. Ground Water ☐ k. Sediments ☐ l. Wetland ☐ m. Storm Drain ☐ n. Indoor Air ☐ o. Air ☐ p. Soil Gas ☐ q. Sub-Slab Soil Gas ☐ r. Critical Exposure Pathway ☐ s. NAPL ☐ t. Unknown ☐ u. Others Specify:

11. List below the Oils (O) or Hazardous Materials (HM) that exceed their Reportable Concentration (RC) or Reportable Quantity (RQ) by the greatest amount.

☐ Check here if an amount or concentration is unknown or less than detectable.

O or HM Released	CAS Number, if known	O or HM	Amount or Concentration	Units	RCs Exceeded, if Applicable
ARSENIC		HM	180	MG/KG	N/A
					N/A
					N/A

12. Description of Release or Threat of Release (if additional space is needed, attach additional information in H17)

LSP STEPHEN VETERE (THE CALLER) REPORTS A SOIL CONDITION THAT "COULD POSE AN IMMINENT HAZARD" (CPIH) AS EVIDENCED BY THE MEASUREMENT OF 180 MG/KG OF ARSENIC IN ONE SOIL SAMPLE COLLECTED FROM THE 0"-12" SOIL HORIZON DURING SITE CHARACTERIZATION WORK IN PREPARATION FOR POTENTIAL FUTURE SITE CONSTRUCTION ACTIVITIES. THE CALLER REPORTS A SIX-FOOT HIGH CHAIN LINK FENCE WILL BE INSTALLED TO RESTRICT ACCESS TO THE CPIH LOCATION INCLUDING SIGNAGE. THE CALLER REPORTS ADDITIONAL SITE ASSESSMENT WILL BE CONDUCTED TO FURTHER DEFINE THE ARSENIC IN SOIL CONTAMINATION PROFILE. THE CALLER INFORMED THE WRITER A TOTAL OF TWO SURFICIAL SOIL SAMPLES WERE COLLECTED ALONG THE VEGETATED LANSCAPED AREA BETWEEN THE HIGH SCHOOL AND THE ACTIVE RAILROAD TRACKS (USED FOR TROLLEY USE FOR HISTORICAL TOURS AT THAT LOCATION). THE CALLER REPORTS THE FENCE WILL BE INSTALLED BY FRIDAY APRIL 21, 2017 AND INFORMED THE WRITER THAT THE SAMPLE LOCATION EXHIBITING THE CPIH WILL BE IMMEDIATELY TREATED WITH SNOW-FENCE UNTIL THE CHAIN-LINK FENCE IS INSTALLED. THE CALLER STATED THAT THE CHAIN LINK FENCE WILL BE INSTALLED ALONG THE ENTIRE LINEAR DISTANCE OF THE VEGETATED LANSCAPED AREA SO AS TO RESTRICT AND PREVENT DIRECT ACCESS TO ALL THE VEGETATED LANSCAPED AREAS.

E. INVOLVED PARTIES SUMMARY :

1. PRP Status (check one): ☐ a. PRP Unknown ☐ b. PRP unwilling, unable or has not committed to Perform Response Actions
☑ c. PRP Performing Response Actions ☐ d. Release is Adequated Regulated by the US Coast Guard

2. If PRP is not Performing Response Actions, who is?

☐ a. MassDEP State Contractor ☐ b. Other Person

3. Contractor:	a. Name of Organization:		b. Telephone:	
	c. Contact First Name:		d. Last Name:	
4. LSP:	a. Name:	VETERE STEPHEN A	b. LSP #:	3507
	c. Telephone:	9787036029		

F. PRP OR PERSON PERFORMING RESPONSE ACTIONS:

1. Name of Organization: CITY OF LOWELL
2. Contact First Name: MICHAEL 3. Last Name: MCGOVERN
4. Street: 375 MERRIMACK STREET - #43 5. Title: CITY MANAGER
6. City/Town: LOWELL 7. State: MA 8. ZIP Code: 018520000
9. Telephone: 9789704000 10. Ext: 11. Email:
12. Relationship of Person to Release: ☑ PRP ☐ Other c. Type (e.g. Current Owner): Non-specified PRP

☐ 13. Check here if this PRP received a field NOR ☑ 14. Check here if an RNF was requested from this PRP

☑ 15. Check here if Provisions of 21E were explained to this PRP.

G. RECORD ORAL RESPONSE ACTIVITIES:

☐ 1. IRA Completed Pre-notification
☐ 2. No IRA Approved at Notification
☐ 3. IRA Assessment Only.
☑ 4. IRA Oral Plan Approved
☐ 5. IRA Oral Modified Plan Approved
☐ 6. IRA Oral Plan Denied and/or Request for Written Plan
☐ 7. Notice of Intent to Conduct a URAM
☐ 8 IRA-D Oral Plan Approved
☐ 9. IRA-D Oversight Work Started

10. Date of Action:

11. Soil Previously Excavated: ☐ a. Excavated prior to notification. ☐ b. Excavated as part of an UST closure.

c. Quantity of contaminated soil previously excavated and destination, if applicable:

12. Specify any Regional Specific Code (Regional Use):

H. ORAL RESPONSE ACTION PLAN: (check all that apply)

☐ 1. Assessment and/or Monitoring Only
☐ 2. Temporary Covers or Caps
☐ 3. Deployment of Absorbent or Containment Materials
☐ 4. Temporary Water Supplies
☐ 5. Structure Venting System
☐ 6. Temporary Evacuation or Relocation of Residents
☐ 7. Product or NAPL Recovery
☑ 8. Fencing and Sign Posting
☐ 9. Groundwater Treatment Systems
☐ 10. Soil Vapor Extraction
☐ 11. Bioremediation
☐ 12. Air Sparging
☐ 13. Excavation of Contaminated Soils
- ☐ a. Re-use, Recycling or Treatment ☐ i. On Site ☐ ii. Off Site Authorized volume in cubic yards:
- ☐ b. Store ☐ i. On Site ☐ ii. Off Site Authorized volume in cubic yards:
- ☐ c. Landfill ☐ i. Cover ☐ ii. Disposal Authorized volume in cubic yards:

☐ 14. Removal of Drums, Tanks or Containers:

Describe Quantity and Amount: _____

☐ 15. Removal of Other Contaminated Media:

Specify Type and Volume: _____

☑ 16 Other Response Actions and Additional Comments (describe):

THE WRITER PROVIDED A BRIEF EXPLANATION OF THE PROVISIONS OF M.G.L. C. 21E AND THE MCP TO LSP STEPHEN VETERE DURING THE ABOVE REFERENCED CPIH NOTIFICATION, AND HE STATED THAT HE UNDERSTOOD THE IMMEDIATE NEED TO RESTRICT ACCESS TO THE SUBJECT SURFICIAL SOILS BY INSTALLING A CHAIN-LINK FENCE WITH SIGNAGE. LSP VETERE STATED THAT SOIL REMOVAL IS NOT BEING PROPOSED AT THIS TIME.

☐ 17. Check here if Additional Information is Provided in an Attachment

I. DEP STAFF AND FORM PREPARER:

1. DEP Staff: a. Name: FONKEM VICTOR ☐ b. Check here, if Unassigned (or staff name not applicable).

2 . Preparer : a. Name: ROSS STEVEN

b. Signature: STEVEN ROSS c. Date: 4/14/2017

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Geotechnical Partnership, Inc.



Since 1987

Geotechnical Engineering Services for New England

Lisa R. Casselli,PE Principal - A WBE Firm

Subsurface Exploration ***Laboratory Soil Testing*** ***Geothermal Testing***
Foundation Specialty Systems ***Ground Improvement*** ***Earthwork Testing***

28 March 2018
GPI File No. 1628-01
PEADPC No. 67150.01

Perkins Eastman
50 Franklin Street – Suite 203
Boston, MA 02110

Attention: Joseph Drown, AIA - Principal

Subject: Lowell High School, Lowell MA
PSR Pricing Narrative - Geotechnical

Dear Sir:

This geotechnical data summary report outlines our site background data review, subsurface explorations, field soil and groundwater testing, engineering data summaries, analyses and calculations for potential new construction at the Lowell High School downtown campus in Lowell, Massachusetts (*Figure 1A*).

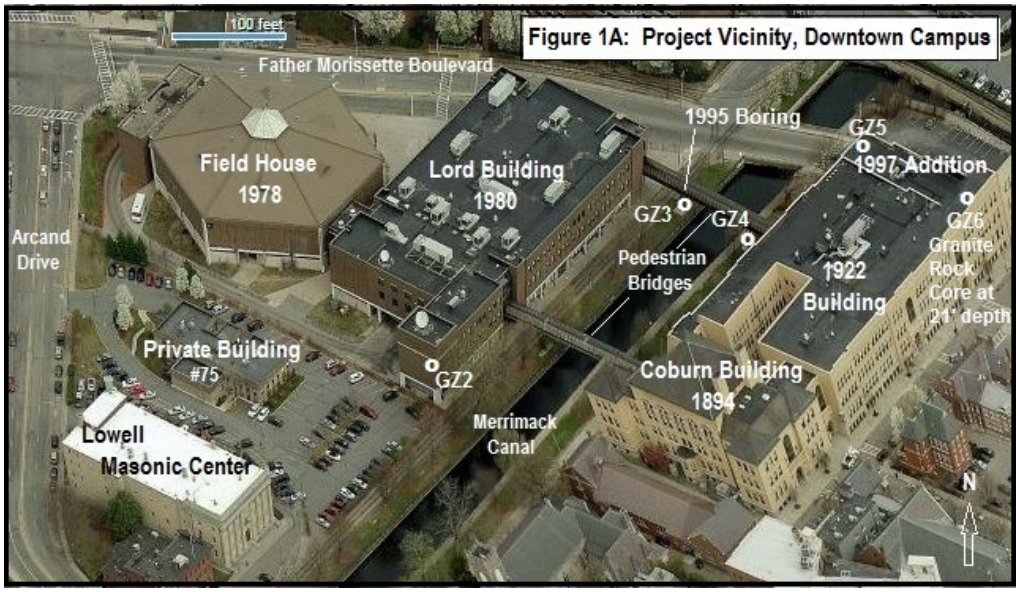


Figure 1A: Project Vicinity, Downtown Campus

45 New Ocean Street – Suite A
Swampscott, MA 01907
Tel. 781/646-6982

805 Main Street
Sanford, ME 04073
Tel. 207/459-7800

I. Lowell High School Downtown Campus - New Construction:

Existing Conditions:

- Plan reference:
  - *Existing Conditions (X01); Additions and Alterations to the Lowell High School Lowell, Massachusetts;* prepared by Lev Zetlin Associates; dated 26 September 1978.
  - *Record Foundations (X03); Additions and Alterations to the Lowell High School Lowell, Massachusetts;* prepared by Lev Zetlin Associates; dated 26 September 1978.
  - *Foundation Plan (*Lord Building*) (S1); Additions and Alterations to the Lowell High School Lowell, Massachusetts;* prepared by Lev Zetlin Associates; dated 26 September 1978.
  - *Foundation Plan (*Lord Building*) (S2); Additions and Alterations to the Lowell High School Lowell, Massachusetts;* prepared by Lev Zetlin Associates; dated 26 September 1978.
  - *Foundation Plan (*Field House*) (S3); Additions and Alterations to the Lowell High School Lowell, Massachusetts;* prepared by Lev Zetlin Associates; dated 26 September 1978.
  - *Details (S26); Additions and Alterations to the Lowell High School Lowell, Massachusetts;* prepared by Lev Zetlin Associates; dated 26 September 1978.
  - *Structural General Notes (S001) Lowell High School Renovations – Task I Lowell, Massachusetts*; prepared by Sverdrup Facilities, Inc. 11 December 1995.
  - *Structural 1922 Building Classroom Addition Foundation Plan (S201) Lowell High School Renovations – Task I Lowell, Massachusetts*; prepared by Sverdrup Facilities, Inc. 11 December 1995.
  - *Structural 1980 Building Partial Foundation Plan (S209) Lowell High School Renovations – Task I Lowell, Massachusetts*; prepared by Sverdrup Facilities, Inc. 11 December 1995.
  - *Structural Bridge Landing Foundations & Framing Plans, Sections & Details (S221) Lowell High School Renovations – Task 2 Lowell, Massachusetts*; prepared by Sverdrup Facilities, Inc. 11 December 1995.
  - *Structural Bridge Landing Foundations & 1st Floor Framing Plans & Details (S222) Lowell High School Renovations – Task 2 Lowell, Massachusetts*; prepared by Sverdrup Facilities, Inc. 11 December 1995.

- Direction, Datum and Coordinates:
  - Direction:
    - Plan north: refer to *Figure 1A*
    - Called north: Father Morissette Boulevard
  - Elevation datum: Lowell City Base (LCB)
  - Site Coordinates:
    - Latitude: 42.6476° N
    - Longitude: -71.3120° W

- Existing Site Conditions:
  - Preliminary historic site use review of this property was performed as part of this work.

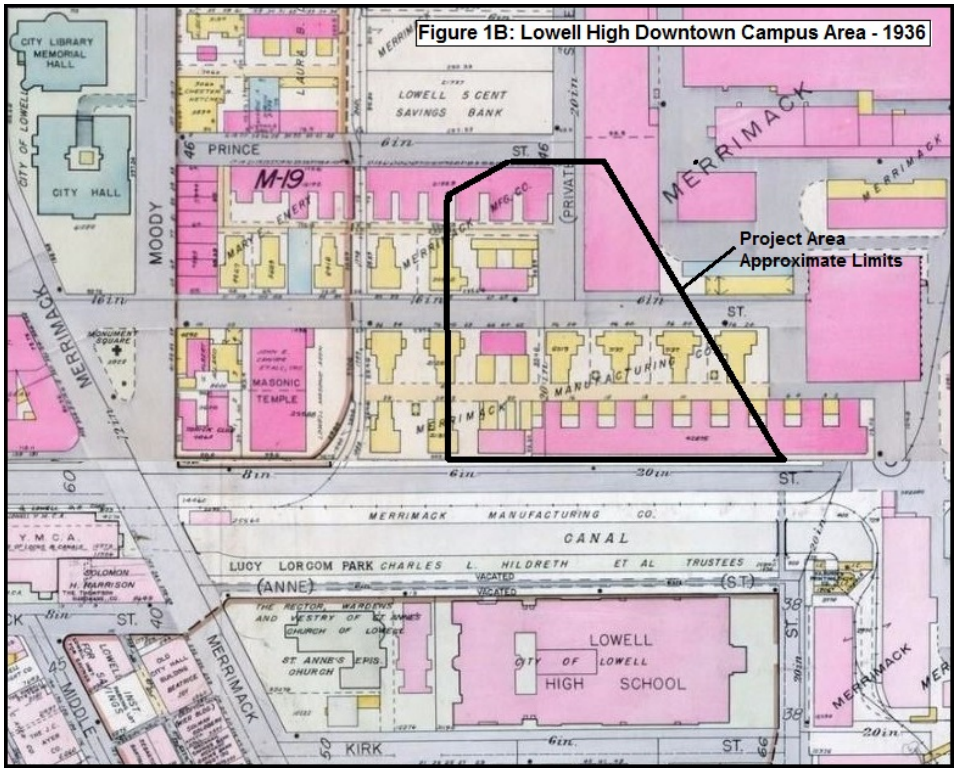


Figure 1B: Lowell High Downtown Campus Area - 1936

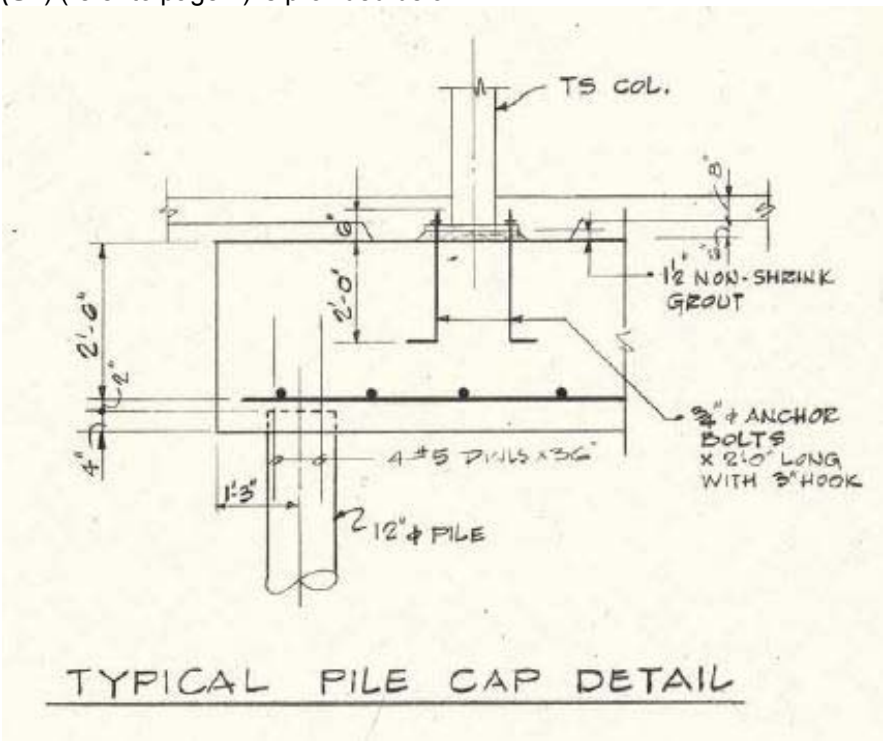
        - Detailed site use history is typically presented in an initial environmental site assessment.
        - It is known that structures since razed existed on this land prior to school construction. The associated street pattern differed from that found today *(Figure 1B: Lowell High Downtown Campus Area – 1936).*
    - Remnant foundations from older site structures were found in some of the borings drilled for this review near both the Field House and the Lord Building (*Appendix A*).
        - As can be seen in *Figure 1B* the westerly part of the current high school campus was densely developed with buildings occupied by the Merrimack Manufacturing Company (Merrimack Mills).
        - The company was a major textile manufacturer operating in Lowell from about 1823 to about 1958. It was situated at the Merrimack Canal (excavated in 1820 to provide hydraulic power) to make use of a 32 ft. hydraulic drop to power its mill.
        - Buildings erected by Merrimack Manufacturing in this area included a mill, machine shop, dye house and boarding houses for employees (*Figure 1B*).
        - The plant buildings were demolished around 1960, while the boarding houses were razed a few years later. This land is in part currently occupied by the Lowell High School buildings: Field House, Lord Building, and associated new streets, paved walkways and landscaping (*Figure 1A, Figure 1B*).
    - Two pedestrian bridges connect the site area under review with the older portion of the campus found east adjacent to the Merrimack Canal (*Figure 1A, Figure 1B*).
    - The immediate site area appears relatively level to slightly sloping.
    - Active underground site utilities: electric, cable, natural gas, water, sewer, and drains.

- Existing Building and Pedestrian Bridge Foundations (*Figure 1A*):
    - Data collected from existing drawings and reports is summarized below in *Table I: Existing Site Structures' Foundations Summary*:

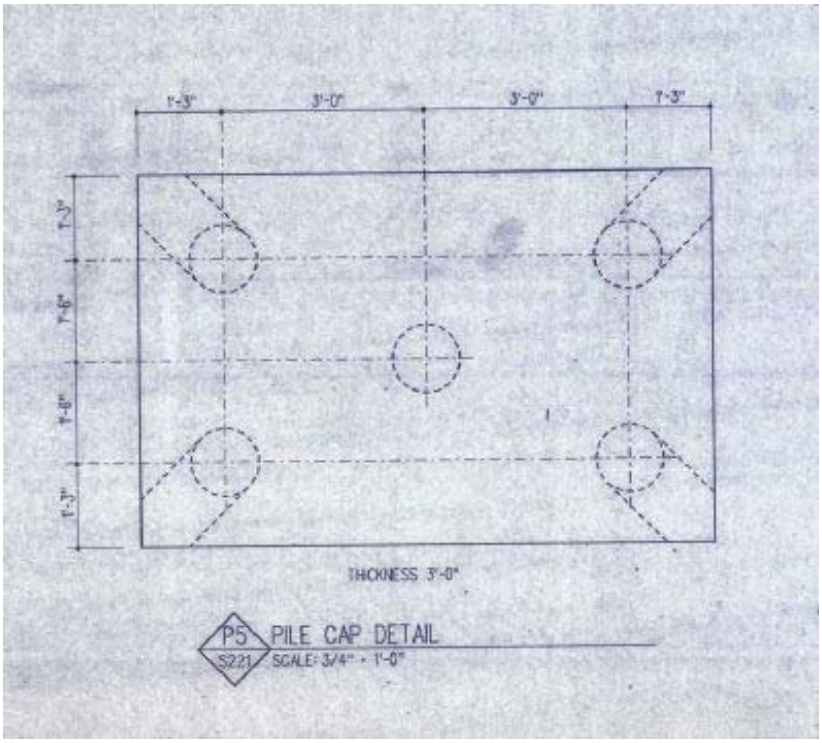
Table I: Existing Site Structures' Foundations Summary

Building Location	Approx. Date	Foundation System	Foundation Type	Allowable Capacity	Approx. Installed Depth below Pile Cap or Footing
Field House	1978	Pile	12.25" dia. concrete Shell Pile	120 K	20 ft.
Field House pool area	1978	Shallow	Footing	Up to 10 KSF	Normal depth
South Bridge	1978	Pile	12" concrete pile	NA	
1922 Building Addition-north	1997	Shallow	Footing	8 KSF	Normal depth
Lord Building Addition	1997	Pile	10.75" dia. steel pipe Pile (concrete filled)	100 K	25 ft. – 35 ft.
North Bridge-west	1997	Pile	10.75" dia. steel pipe pile (concrete filled); 15" dia. batter piles	100 K	25 ft. – 35 ft.
North Bridge-east	1997	Shallow	Footing	8 KSF	

- A typical building pile cap detail from 1978 LZA structural drawing *Foundation Sections (S4*) (refer to page 2) is provided below:



- A pile cap for the 1997 pedestrian bridge (one central vertical end bearing pile and four batter piles to provide lateral capacity) from the Sverdrup plan *Structural Bridge Foundations & Framing Plans Sections & Details (S221)*; 1995 (see page 2) is given below:



Potential New Construction:

- Plan Reference:
  - *Lowell High School Existing Site Boring Locations;* prepared by Perkins Eastman/DPC of Boston, Massachusetts (base plan by Nitsch Engineering).

- Potential New Construction Structural Information:
  - Three (3) potential building renovation and construction schemes provided by Perkins Eastman/DPC include:
    - New Option A: demolition of the 1980 buildings (*Figure 1A*) including the gym and pedestrian bridges and construction of a new high school
    - Addition/Renovation Option 2a of the Existing High School Site
    - Addition/Renovation Option 3a of the Existing High School Site with a potential expansion south onto the 75 Arcand Drive property (not owned by the City of Lowell).
  - Potential new construction:
    - Building levels:
      - Five (5) above grade
      - One (1) below grade level (New Option A only, limited area)
    - Existing building finish floor elevations:
      - Field House area:
        - 1st floor: El. 34 ft. (new structure assumed similar to existing)
        - Lower level: El. 34 ft. – 12 ft. (assumed) = El. 22 ft.
        - Elevator pit base: El. 22 ft. – 4 ft. = El. 18 ft.
      - Lord (1980) Building area:
        - 1st floor: El. 36 ft. (new structure assumed similar to existing)
        - Lower level: El. 36 ft. – 12 ft. (assumed) = El. 24 ft.
        - Elevator pit base: El. 20 ft.

    - Structural unit maximum applied foundation base loads (assumed; to be determined by the Project Structural Engineer):
      - Walls: 12 KLF
      - Columns: 350 K
    - Structural unit base elevation: TBD
  - New pedestrian bridges adjacent to the Lord (1980) Building spanning the Merrimack Canal and connecting east to the 1922 Building (*Figure 1*) :
    - A new bridge centrally located on the Lord (1980) Building
    - A new bridge at the south end of the Lord (1980) Building

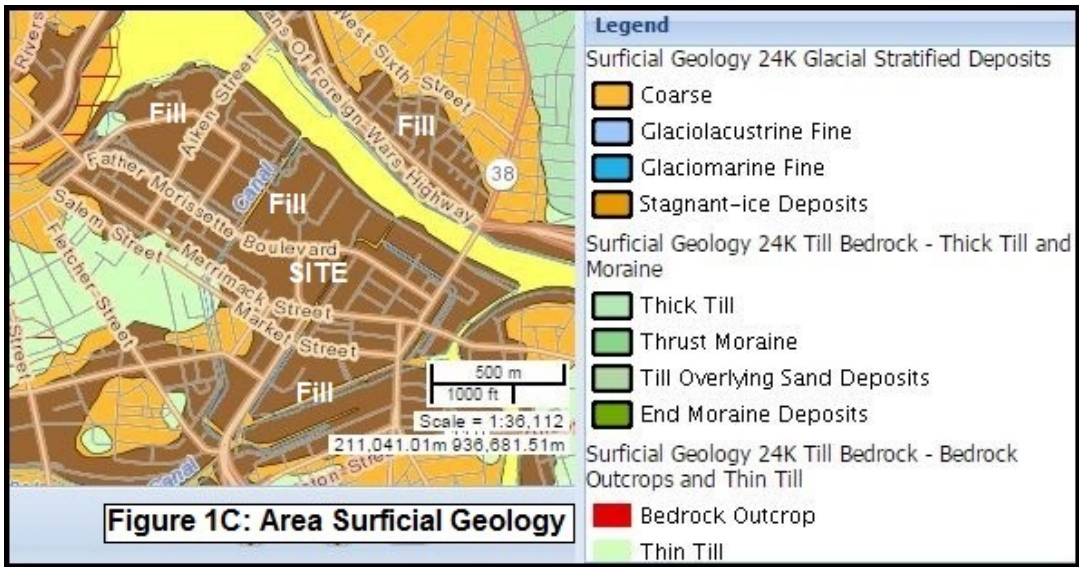


Figure 1C: Area Surficial Geology

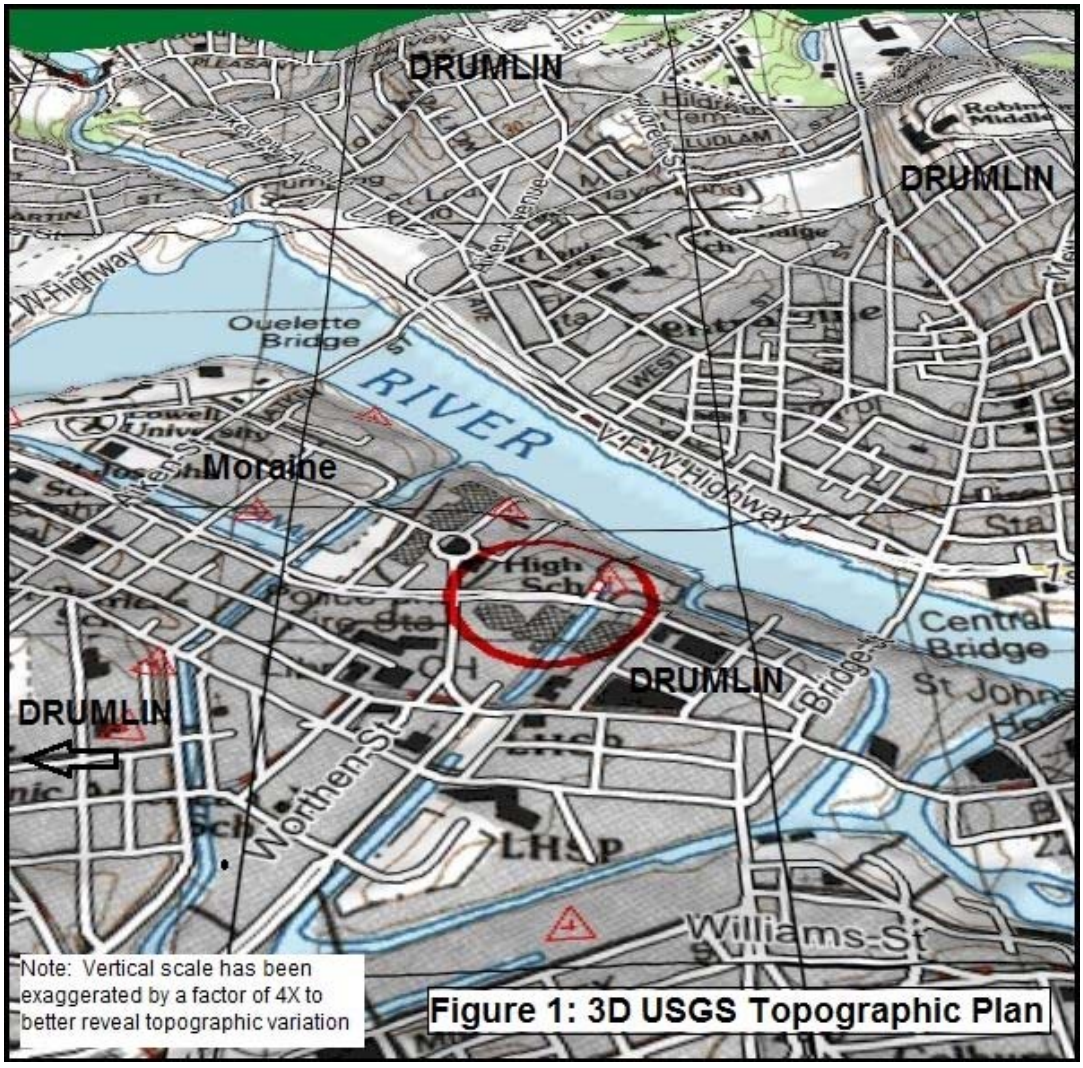


Figure 1: 3D USGS Topographic Plan

II. Subsurface Conditions:

Topographic Data:

- Elevation Range: The general site area is relatively level to sloping (see *Figure 1: 3D USGS Area Topographic Plan*)

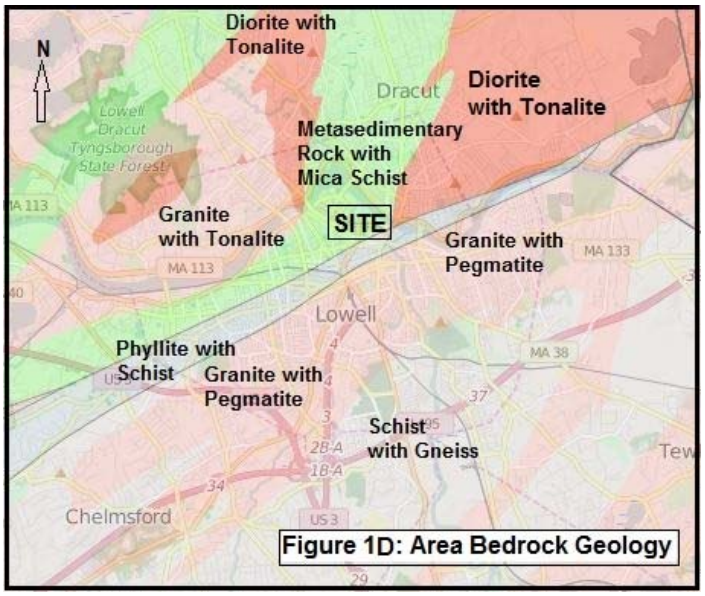
- Area Surficial Geology:
  - Area surficial geology is the result of a complex interaction of glacial advance and retreat.
  - *Figure 1* shows an alluvial plain area dotted with glacial moraine and glacial drumlin formations left behind by glacial scour and melt. The vertical scale in *Figure 1* has been exaggerated by a factor of 4X to better reveal subtle topographic variation.
    - An alluvial plain is formed by deposition of silt, sand and gravel during periodic river flooding (note the Merrimack River, *Figure 1).* Glacial outwash (glacial melt stream deposition) is also a component of the plain's subgrade (also granular material).
    - Glacial moraines are an accumulation of glacial drift (silt, sand and gravel) within a glaciated region by deposition and thrust of glacial ice (bulldozed material)
    - Glacial drumlins are oval hills of clay, silt, sand and gravel compacted under pressure at the base of hundreds of vertical feet of glacial ice (compacted material). A drumlin's axis indicates the direction of ice movement (northwest to southeast).

- According to area surficial geologic mapping [*Massachusetts GIS, Surficial Geology;* Commonwealth of Massachusetts Office of Geographic Information; September 2012] the site was predicted to be located upon:
  - Man placed fill; *Figure 1C: Area Surficial Geology*); and
  - Alluvium: alluvial or glacial fluvial silts, sands and gravel placed during Merrimack River flooding.
- The "thick till" area in *Figure 1C* just southwest of the site at Merrimack Street represents:
  - The glacial drumlin mapped on *Figure 1*
  - Older soil material expected on-site below the alluvium is glacial till.

- Area Water Bodies: the Lowell High School downtown campus is a potentially water rich area of Lowell (*Figure 1*)
  - Rivers:
    - The Merrimack River is located 770 ft. northeast
    - The Concord River is found 1470 ft. west
  - Canals:
    - Merrimack Canal is situated on-site
    - Northern Canal is located 930 ft. west
    - Pawtucket Canal is found 1160 ft. west and 1260 ft. southwest
  - No other significant project area water bodies (ponds, lakes, rivers, streams) are mapped on *Figure 1A*.
  - No wetlands are shown within the site area mapped on *Figure 1,* although marsh deposits may exist buried localized below the fill on-site.

- Geologically Predicted Site Substrata: Based upon the collected geologic and topographic data, anticipated site subsoils were considered to potentially include a mix of both drumlin/moraine and lowland soils:
  - Man-placed fill.
  - Organic soils (peat, organic silt found within buried marsh land)
  - Alluvial soils (alluvial silts, sands and gravels; buried streams)
  - Glacial fluvial soils (glacial outwash; silts, sands and gravels; buried low density outwash channels)
  - Glacial till (ablation till; hardpan or basal till)

- Area Bedrock Geology: [US Department of the Interior; US Geological Survey, *Massachusetts State Geologic Map*; 1998; see *Figure 1D*]
  - Common area rock: metasedimentary rock
    - Hardness: a medium hard partly metamorphosed rock;
    - Structure: aphanatic structure: extremely fine grained
    - Mineralogy: likely quartz dominant
  - Secondary rock: mica schist
    - Hardness: a medium hard rock
    - Structure: foliated or schistose
    - Mineralogy: mica, quartz, with or without feldspar
  - Near boundary rock alternatives (*Figure 1D*):
    - Common: diorite, granite or phyllite
    - Secondary: tonalite, pegmatite or schist
  - Depth to bedrock data was not available from MA GIS (2012 database).



Previous Test Borings:

- Borings and Groundwater Monitoring Wells:
  - Existing campus site borings and wells:
    - Thirty seven test borings were drilled in March 1977 at the site of the Field House and Lord (1980) buildings by Carr-Dee of Medford, Massachusetts.
    - Six test borings (see *Figure 1A*) were drilled in August 1995 for GZA in support of the design of the improvements and additions to the Lord (1980), Coburn and 1922 buildings. Of these boring GZ1 was germane to this review (*Figure 2*).
    - Nearby Boring: a boring drilled on Merrimack Street at the Merrimack Canal during July 2016 encountered bedrock at 16 ft. depth.
    - Wells: no remnant groundwater well roadway boxes were found on-site which would have indicated other prior subsurface site review.



Figure 2: Site Exploration Location Plan

Test Borings Undertaken for this Review:

- Dig Safe:
  - Dig Safe site underground utility clearance was provided by Soil Exploration Corporation of Leominster, Massachusetts: relevant Dig Safe ticket numbers are held by them.
  - Utilities contacted: utilities list is held by Soil Exploration
  - Water & sewer is not covered by Dig Safe and the City of Lowell engineer's office and the Lowell DPW were visited separately by Soil Exploration for Dig Safe site review.
  - During this process the City of Lowell engineering and water department offices requested pre-clearance of most campus site drilling locations by soil vacuuming to about 7 ft. depth.
    - These requests were made due to uncertainty with respect to the locations of existing site utilities.
    - Soil vacuuming of boring locations in advance of test boring drilling was performed as noted on the boring logs in *Appendix A*.

- Test borings:
  - Drilling by Soil Exploration Corp. of Leominster, MA:
    - Nine (9) structural borings were drilled on the existing campus during 22-24 March 2017. The borings were designated B101 through B109.
    - Approximate as-drilled boring locations are shown on *Figure 2*.
  - An ATV mounted drill-rig equipped with an auto-hammer drilled and sampled soils below grade in all borings (*Photo 1*). Soil samples were taken in 2-foot increments.
    - HSA auger borings were drilled to up to 47 ft. depth with:
      - Semi-continuous 2-foot interval sampling and testing to 17 ft. depth and
      - Standard 5-foot interval sampling and testing thereafter.

Photo 1: Drill rig at Boring B107



- Digital Boring Logs:
  - Recovered test boring soil samples were digitally logged by the geotechnical engineer in accordance with *ASTM D-5434-97: Standard Guide for Logging of Subsurface Explorations of Soil and Rock*.
  - Boring logs prepared by the engineer are presented in soil boring log sheets in *Appendix A.* Logs detail soil type, boundary elevation or depth, density, consistency, thickness, coloration, moisture and composition.

III. Geotechnical Testing:

Field Testing Performed:

- Standard Penetration Tests (SPT) (N_{70} in blows/foot)
- Field Unconfined Compressive Strength Tests ($q_{u\text{-field}}$ in TSF)
- Field Gradation Tests

Standard Penetration Testing (SPT):

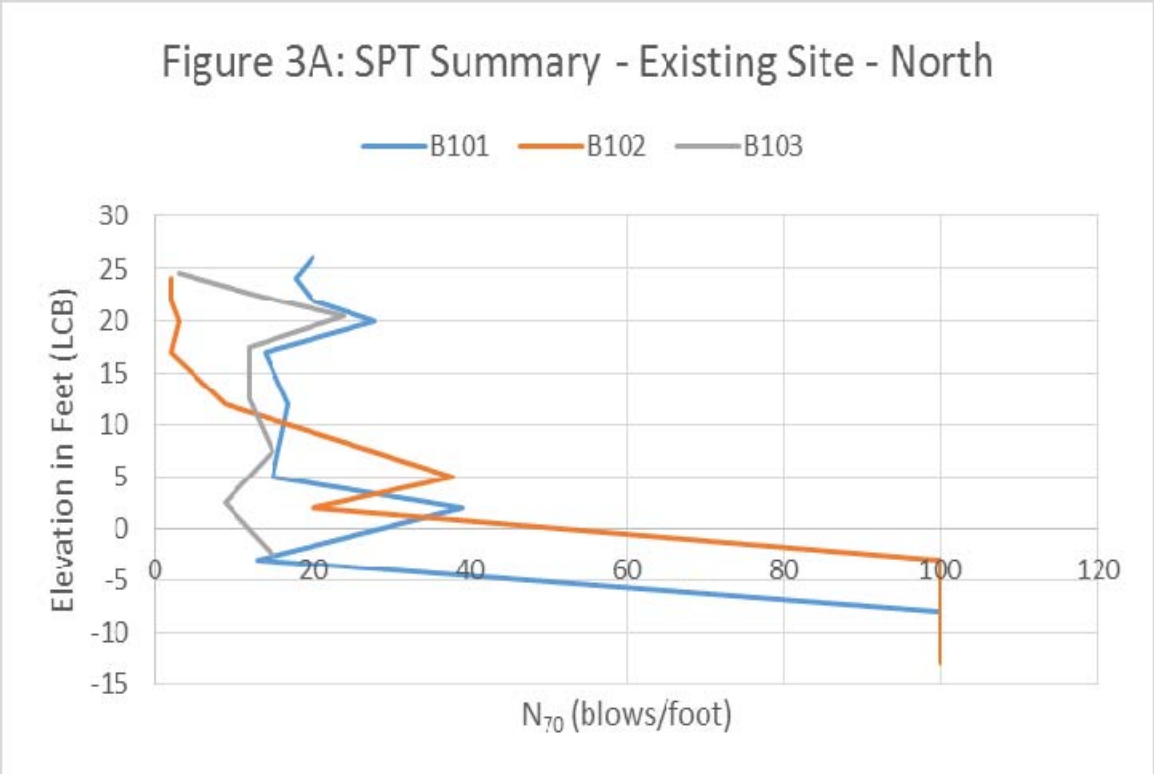
- SPT Presentation and Definition:
  - A standard penetration test is defined as the number of blows of a 140 lb. hammer falling 30 inches to drive a standard soil split spoon sampler 12 vertical inches. The number of blows is designated as "N"
  - Standard penetration tests (SPT) N are summarized for the borings with depth on the boring logs in *Appendix A* and in *Figure 5A* through *Figure 5D.*
  - Field SPT N (blows/foot) is taken from blow count graphs provided on the boring logs.
  - Standard penetration test N are plotted for the borings with depth in *Figure 3A* through *Figure 3D.*

- SPT Type:
  - The borings drilled for this study (see *Appendix A*) used an auto-hammer sampler drive system which delivers replicable, consistent energy for each blow.
  - This is considered an improvement over older style drill rigs which utilized a rope and cathead system and can have operator error or bias particularly when drilling in dense soils (e.g. "short stroke" as driller tired, yielding artificially high N values).

- SPT N Data Review:
  - Note that the plot of N with depth in *Figure 3A* through *Figure 3D*:
    - Most borings showed a fairly low, variable range of in N values to about 10 ft. to 12 ft. depth. The exception was found at B102 where the low N continued to about 20 ft. depth within a possible former sandy glacial outwash channel. This condition should be expected elsewhere on-site.
    - The borings recovered to a reliably low medium dense condition below 12 ft. depth+/- reflecting the variability of soil deposition within variable overburden alluvial soils.
    - At greater depth within the naturally cemented glacial till deposit soil density increased into the high medium dense to dense range.
  - See also the N pattern variation with respect to soil type in *Figure 5A* through *Figure 5D* as well as in the blow count graphs on individual boring logs in *Appendix A.*

- SPT N Engineering Uses: SPT data can be useful in determination of values of soil bearing capacity, Young's Modulus for footing settlement evaluation, as well as input to footing base soil friction angle, seismic site class and slab subgrade modulus determination.

- Corrected SPT N:
  - Correction of raw field N_{70} values is performed based upon:
    - Factors of soil overburden pressure, drill rig sampler hammer type, drill rod length, sampler liner, etc. are employed to calibrate the field N values reported.
    - Auto hammer field N values can require initial correction by a factor of about 1.15 when using other hammer systems as a basis for calculations.
  - Final N energy adjustment to N_{55} is required for performance of granular soil foundation settlement calculations [refer to Joseph E. Bowles; *Foundation Analysis and Design*; *5th Edition*; 1997].



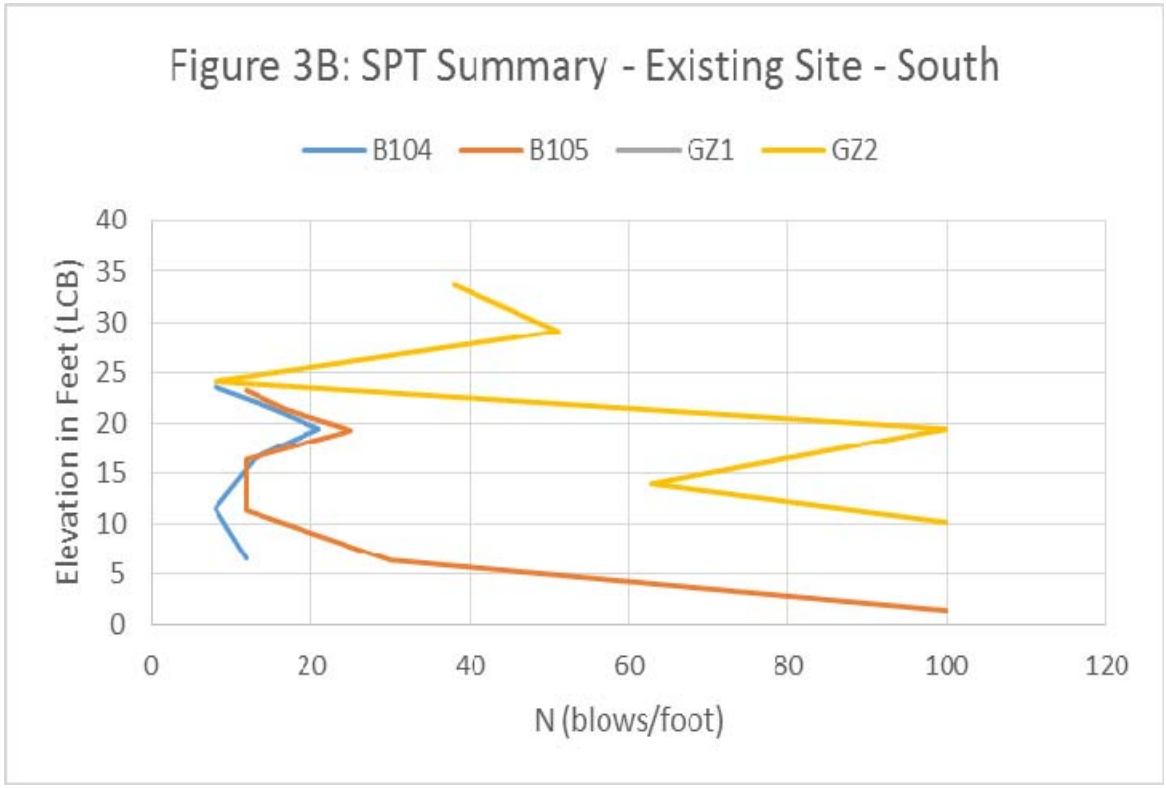


Figure 3B: SPT Summary - Existing Site - South
B104
B105
GZ1
GZ2
Elevation in Feet (LCB)
40
35
30
25
20
15
10
5
0
0
20
40
60
80
100
120
N (blows/foot)

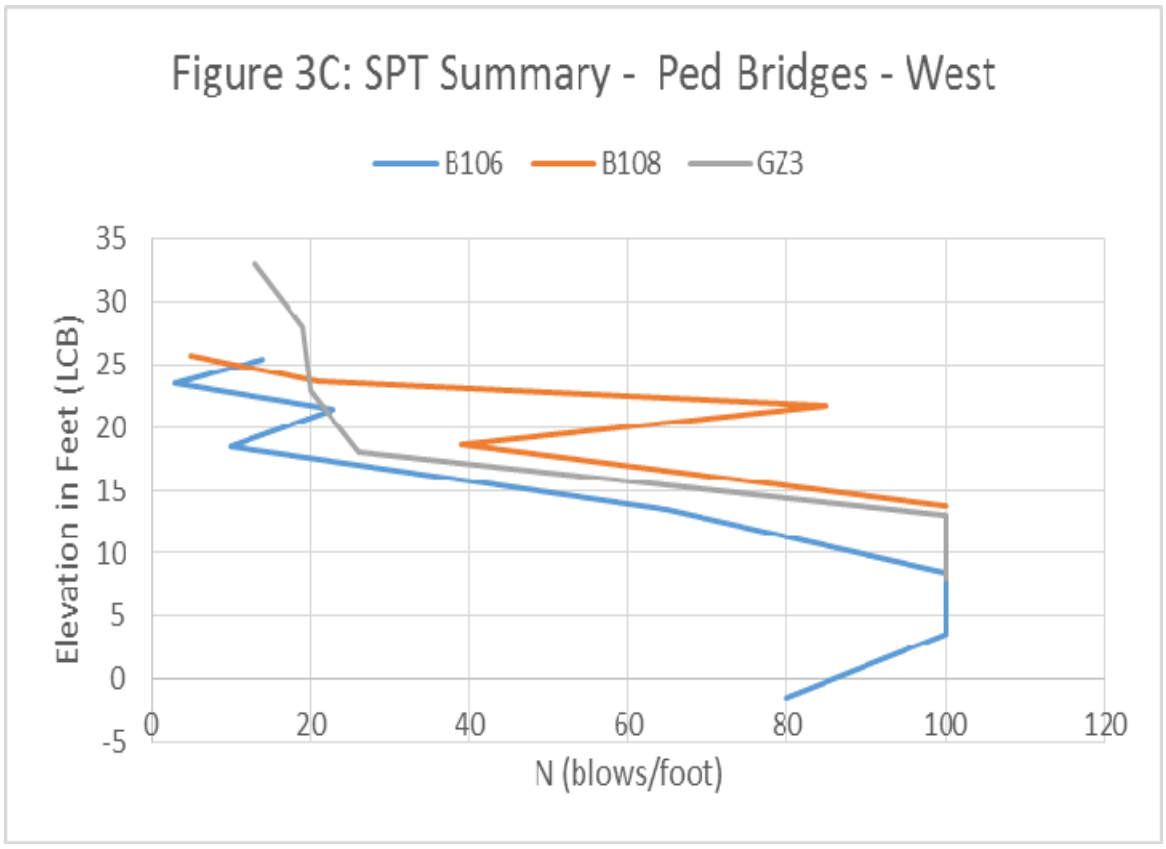
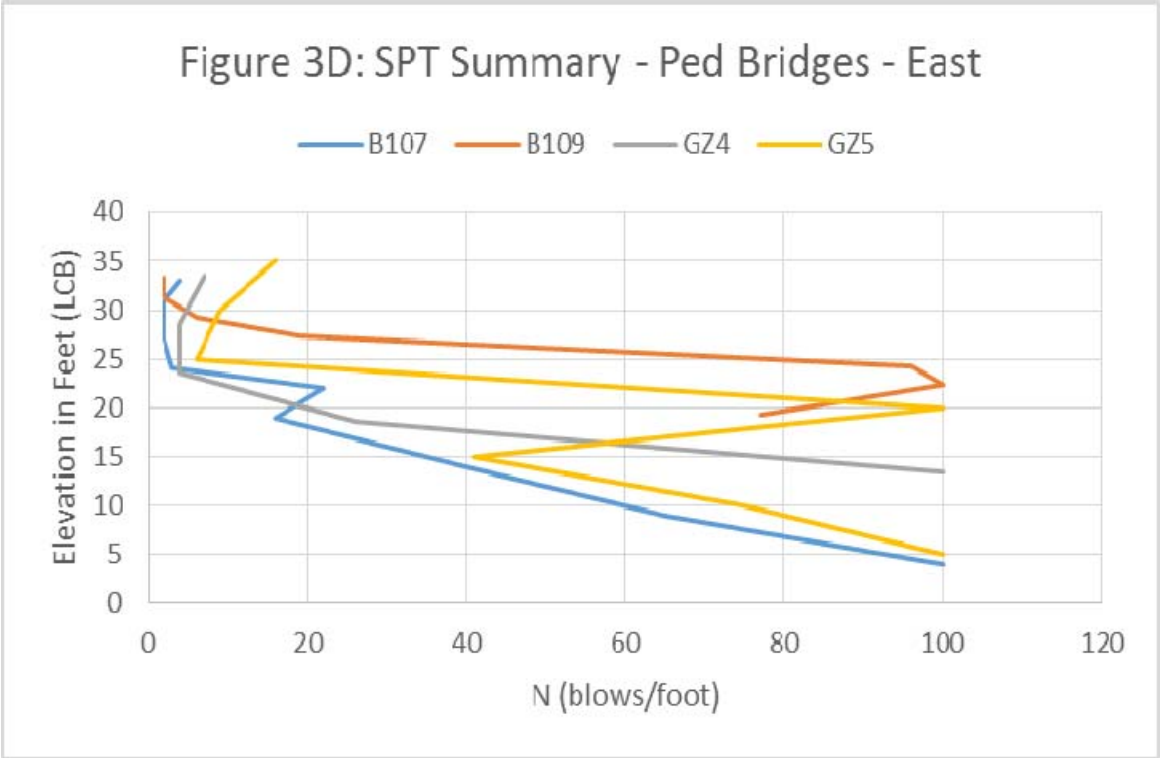


Figure 3C: SPT Summary - Ped Bridges - West
B106
B108
GZ3
Elevation in Feet (LCB)
35
30
25
20
15
10
5
0
-5
0
20
40
60
80
100
120
N (blows/foot)



Field Compressive Strength Tests ($q_{u-field}$, in TSF):

- Test Use:
  - Field compressive strength tests are a good indicator of plastic (cohesive) soil field compressive strength variation ($q_{u-field}$, in TSF) in organic soil with depth.
  - The test also gives preliminary level input for derivation of soil undrained shear strength.

- Presentation:
  - Only a single $q_{u-field}$ test was performed within the organic deposit.
  - No marine sediment was found to the depths drilled.
  - The $q_{u-field}$ test result is given on the boring log (B107; *Appendix A).*

Field Gradation Tests:

- Test Use:
  - Limited field gradation tests were performed to better determine the relative percents of coarse gravel, fine gravel, coarse sand, and medium sand and fines (silt and fine sand) in recovered granular soil samples.
  - Field use was limited to recovered samples of granular fill and clean alluvial sand.

- Limitations:
  - Field tests are limited to recovered dry or field air dried soil samples.
  - 4-sieve method does not allow for separation of silt from fine sand.

Laboratory Soil Testing: No laboratory soil particle gradation testing was undertaken for this phase of review.

IV. Soil Strata:

Data Summaries:

- Subsoil Profile Data Summary: A general summary of substrata found in the subsurface explorations is provided in *Table IA*.

- Subsoil Profile Drawings:
  - Refer to the subsoil profiles sketched in *Figure 5A through Figure 5D* to gain an overview of site subsurface conditions encountered within the campus areas of interest (*Figure 2*):
    - Existing west campus, north: *Figure 5A*
    - Existing west campus, south: *Figure 5B*
    - Pedestrian bridges' areas, west: *Figure 5C*
    - Pedestrian bridges' areas, east: *Figure 5D*
  - Subsoil profile directional orientations are as indicated on the drawings.

- Soil Field Descriptions: Detailed field soil descriptions are given in the logs of the borings presented in *Appendix A*.

Table IA: Exploration Summary

Test Boring No.	***Ground Surface El. (ft.)***	***Depth Drilled (ft.)***	***All Fill (ft.)***	***OH Organics (ft.)***	***All SM and/or ML Glacial Fluvial (ft.)***	***SP Glacial Fluvial (ft.)***	***Glacial Till (ft.)***
B101	33.0+/-	42	6.0	---	9.0	14.0	>13
B102	33.0+/-	47	12.0	---	4.5	9.0	>21.5
B103	33.5+/-	39R	8.0	---	18.5	7.5	5.0R
B104	32.5+/-	30*	8.5	---	3.0	>18.5*	
B105	32.3+/-	32	8.0	---	2.5	13.5	>8
GZ1	32.0+/-	36.3	8.5	---	---	5.0	>22.8
Bridges							
B106	34.5+/-	38R	12.0	---	1.5	7.0	17.5R
B107	35.0+/-	30.3R	9.5	1.5	2.5	7.0	9.8R
B108	34.7+/-	21.4R	9.0	---	---	2.0	10.4R
B109	35.3+/-	18.0R	7.0	---	2.5	---	8.5R^

R – Likely top of bedrock encountered as per field drilling procedures summarized in Appendix A
Note: SP, SM and ML layers can be in any sequence below ground (see Appendix A for details)
** - Running sand condition encountered in this boring only; abandoned boring at 30 ft. depth*
^ - Includes 2.5' thickness of weathered rock at the base of the glacial till deposit (see Appendix A)

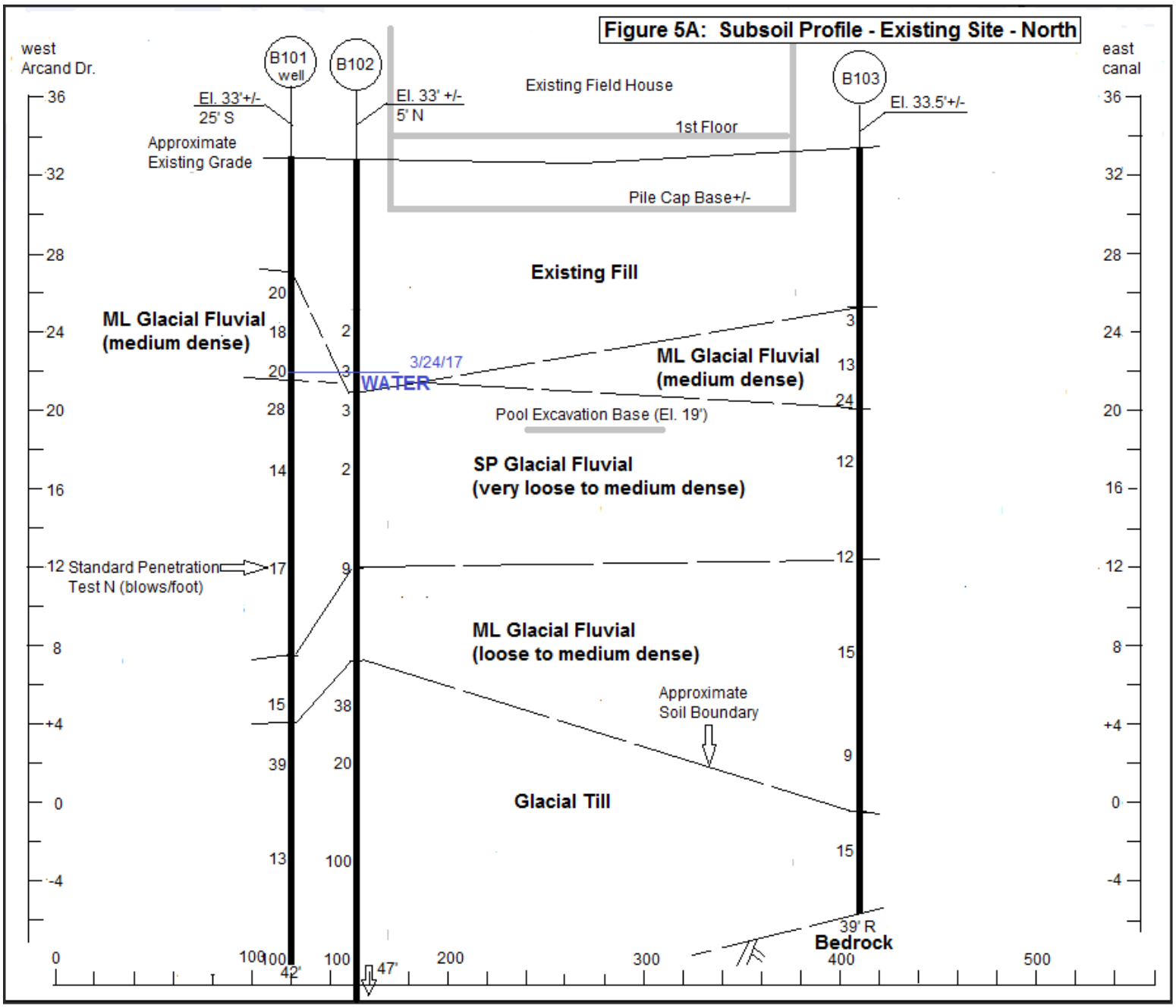


Figure 5A: Subsoil Profile - Existing Site - North
west
Arcand Dr.
east
canal
B101
well
B102
B103
El. 33'+/-
25' S
El. 33' +/-
5' N
El. 33.5'+/-
Existing Field House
1st Floor
Approximate
Existing Grade
Pile Cap Base+/-
Existing Fill
ML Glacial Fluvial
(medium dense)
3/24/17
WATER
ML Glacial Fluvial
(medium dense)
Pool Excavation Base (El. 19')
SP Glacial Fluvial
(very loose to medium dense)
Standard Penetration
Test N (blows/foot)
ML Glacial Fluvial
(loose to medium dense)
Approximate
Soil Boundary
Glacial Till
39' R
Bedrock
42'
47'
36
32
28
24
20
16
12
8
+4
0
-4
0
100
200
300
400
500

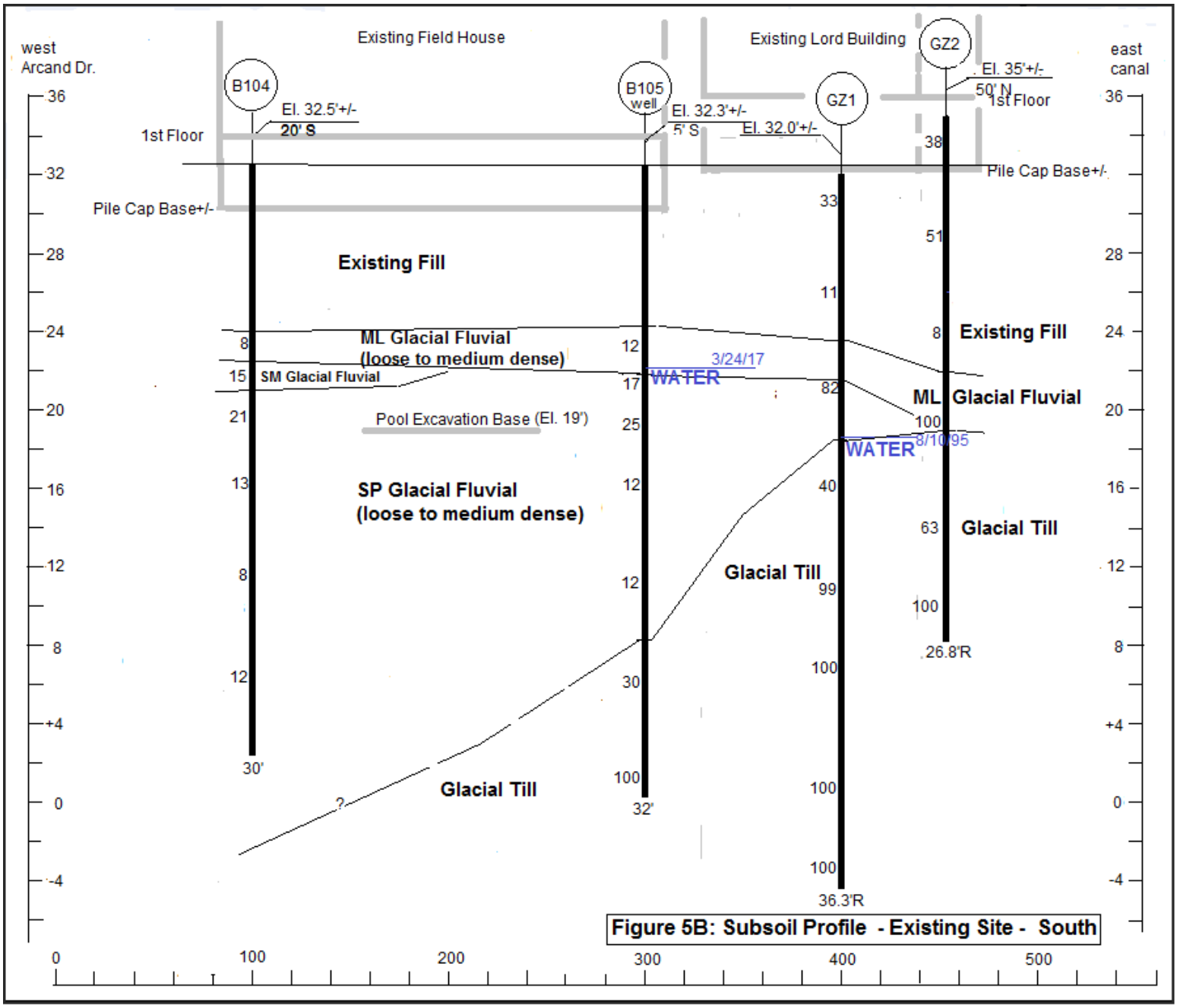
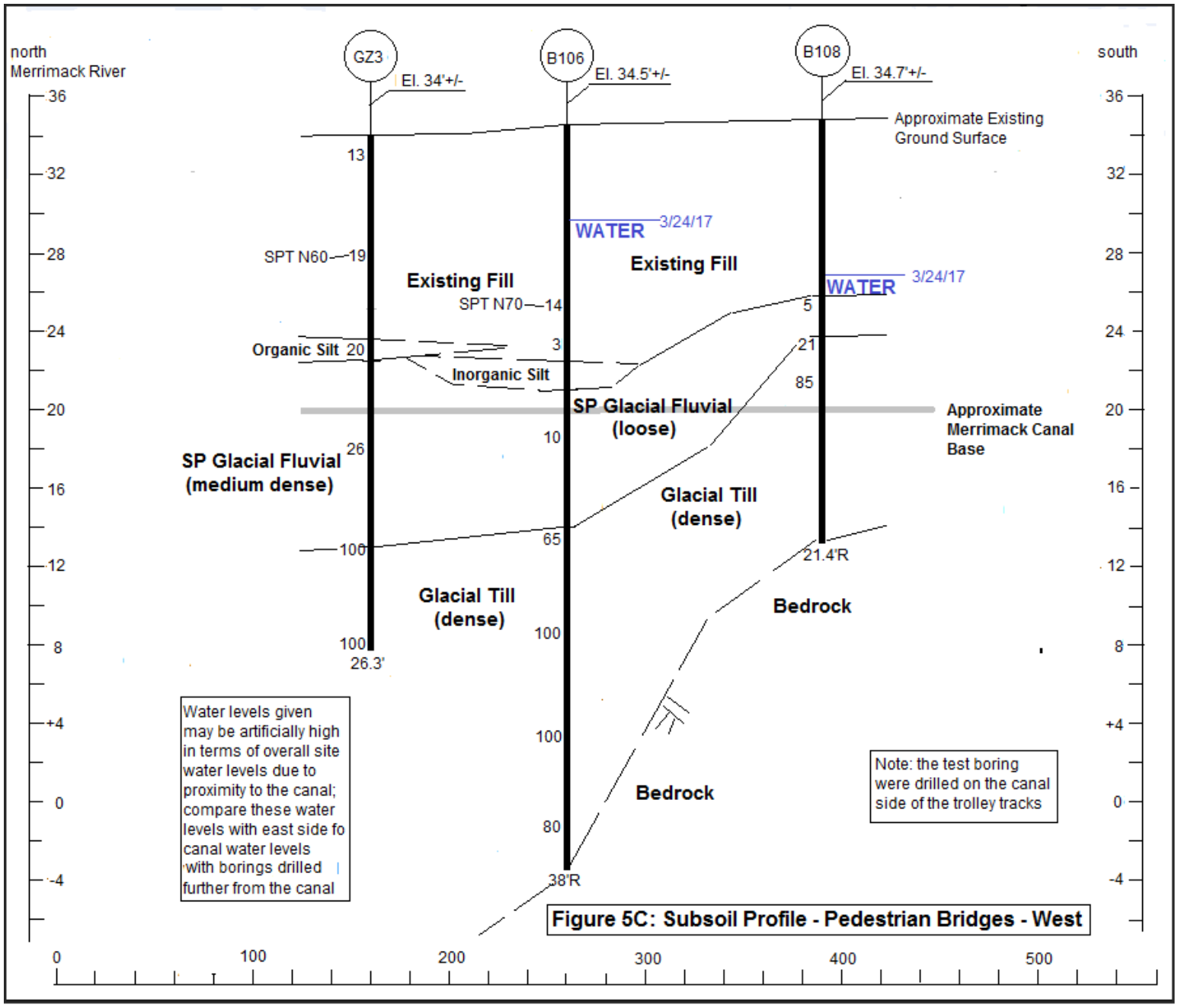


Figure 5B: Subsoil Profile - Existing Site - South


north
Merrimack River
south
GZ3
El. 34'+/-
B106
El. 34.5'+/-
B108
El. 34.7'+/-
Approximate Existing Ground Surface
WATER 3/24/17
WATER 3/24/17
SPT N60
SPT N70
Existing Fill
Existing Fill
Organic Silt
Inorganic Silt
SP Glacial Fluvial (loose)
Approximate Merrimack Canal Base
SP Glacial Fluvial (medium dense)
Glacial Till (dense)
Glacial Till (dense)
Bedrock
Bedrock
21.4'R
26.3'
38'R
Water levels given may be artificially high in terms of overall site water levels due to proximity to the canal; compare these water levels with east side fo canal water levels with borings drilled further from the canal
Note: the test boring were drilled on the canal side of the trolley tracks
Figure 5C: Subsoil Profile - Pedestrian Bridges - West

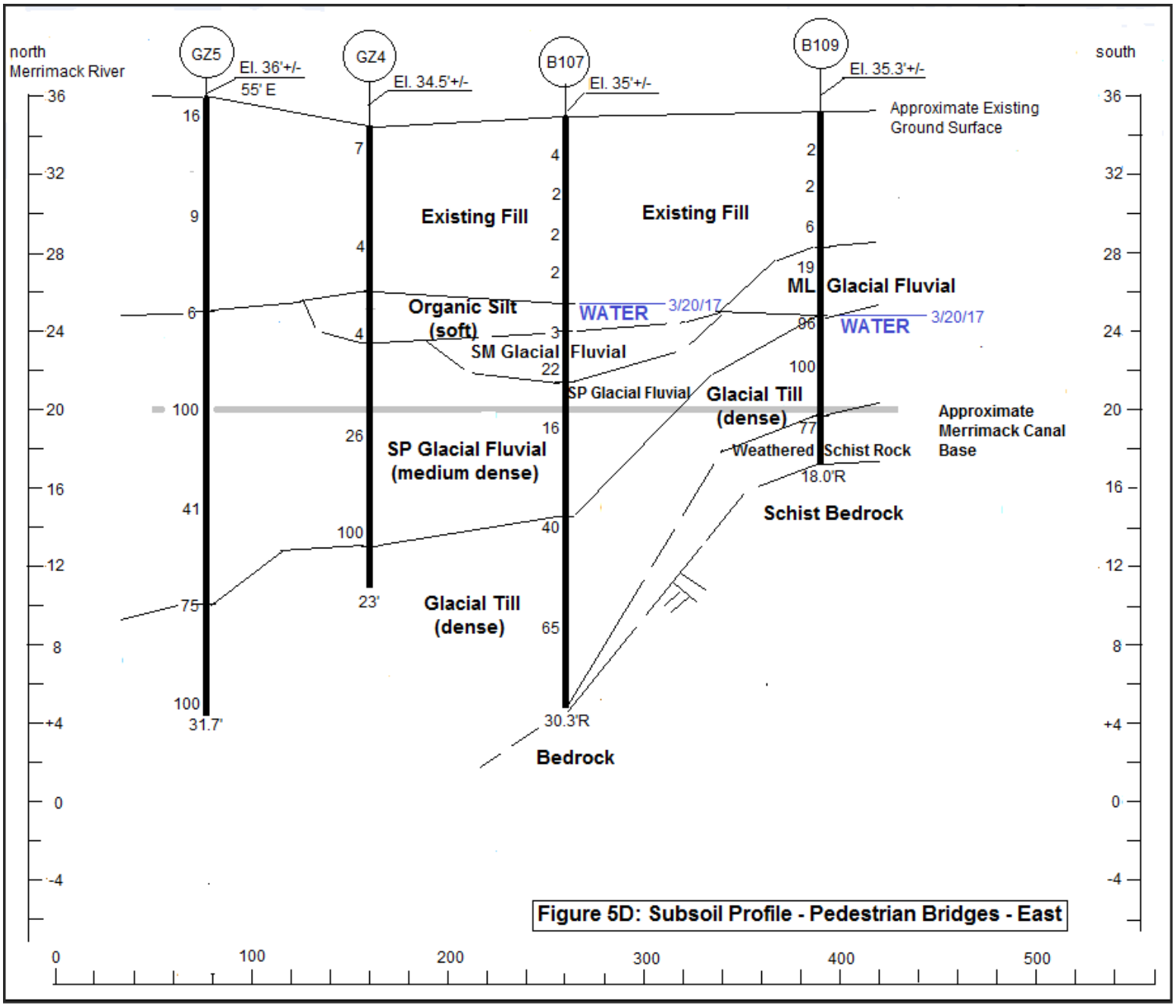


Figure 5D: Subsoil Profile - Pedestrian Bridges - East

Soil Classification System Used for this Site Investigation: ***both sites***

- Soil Classification System: Project soils have been classified in accordance with the Unified Soil Classification System (USCS; MIT System). This is reflected in the test boring logs in *Appendix A*.

- Soil Descriptions: Soils are described in terms of color, grain size, moisture content, density (coarse grained soils), consistency (fine grained soils), plasticity and cementation, as appropriate.

Grain	Size Boundaries (dia.)	Common Size Example
Boulder	>12 in.	>Basketball
Cobble	3-in. to 12-in.	Grapefruit size
Coarse Gravel	¾-in. to 3-in.	Lemon size
Fine Gravel	#4 Sieve (4.75mm) to ¾-in.	Pea to grape size
Coarse Sand	#10 Sieve (2 mm) to #4 Sieve	Peppercorn size
Medium Sand	# 40 Sieve (.425 mm) to #10 Sieve	Sugar to table salt size
Fine Sand	#200 Sieve (.075 mm) to #40 Sieve	Powdered sugar size
Silt/Clay	<#200 Sieve (.075 mm)	Flour particle or finer

- Soil Moisture Content:
  - Dry: no moisture noted
  - Moist: some moisture observed
  - Very moist: very moist, but not saturated (possible vadose zone)
  - Wet: saturated above the liquid limit (likely groundwater zone)

- Soil Density and Consistency:
  - Density of coarse grained soils (non-plastic silts, sands, gravels): defined in terms of standard penetration test blowcount N values (refer to the summary table at the bottom of any boring log)
  - Consistency (plastic silts, clay, and organics): defined secondarily in terms of blowcount N values and primarily with respect to field unconfined compressive strength in TSF (refer to the summary table at the bottom of any boring log).

- Soil Particle Percentage Field Designation: Relative soil particle size percentages (trace, few, little, some, mostly [capitalized soil unit]): refer to summary table at bottom of any boring log. These are more accurately tallied by laboratory soil particle gradation tests.

- Subsoil Classes on this Site: USCS soil type designations utilized in this report:
  - AR = man placed fill; artificial soil stratum
  - OH = organic soil; organic silt
  - SP = glacial fluvial sand; poorly graded
  - SM = glacial fluvial sand with elevated silt content
  - ML = glacial fluvial silt with absent to minor sand content
  - GT = glacial till
  - GR = granitic rock association
  - ME = metamorphic or meta-sedimentary rock association

Site Subsoil Descriptions:

- Existing Fill: soil samples were recovered of existing fill yielding the following information.
  - Type: common fill was found in the samples recovered in the borings:
    - Sand with elevated silt content (SM fill; silty sand fill material); absent to minor gravel
    - Non-plastic silt (ML fill) with absent to minor sand (*Photo 2*)
    - Fill material frequently contained solid waste seen as buried building material and foundation remnants of former on-site buildings (*Photo 3, Photo 4*).
  - Thickness: 6 ft. ≤ fill ≤12 ft. at the drilled locations.
  - Density: fill ranged from very loose to medium dense in found in-situ density
  - Quality: due to elevated silt content this fill would best be limited to re-use as common fill.

Photo 2: Existing ML Fill at B107 – common fill



Photo 3: Solid waste recovered by soil vacuuming



Photo 4: Buried foundation wall



Photo 4: Organic silt; found in B107



- Organics:
  - Definition and Source:
    - Semi carbonized plant material
    - This area of Lowell likely contains some former marsh land subsequently filled.

- Description:
  - Material rich in humus and acidic in found state.
  - Organic silt has no typically distinguishing organic characteristics (roots, fibers, etc.; *Photo 4*).
  - Organic silt on this site is desiccated (has undergone internal drying)
- Thickness: Layer thickness where present is < 2 ft.
- Coloration: dark brown.
- Distribution:
  - Organic silt was found directly below the existing fill.
  - It is discontinuous on-site and was only encountered in boring B107.
- Competency: problematic
  - Organic soils are infinitely compressible
  - Organic silt on this site was medium stiff in consistency where tested in boring B107
  - Organic silt left in place below structural units generates building subsidence.

Photo 5: SP Glacial Fluvial Sand



Photo 6: Glacial Till



- Glacial Fluvial Soils: alluvial and glacial outwash soil materials
  - Definition and Source:
    - Refer to the "Area Surficial Geology" report section (page 6).
    - Glacial fluvial material is composed of soil particles derived from river flooding (alluvium) and from meltwater glacial outwash streams formed during glacial melt.
  - Description:
    - Glacial fluvial soil types found in the borings: cohesionless
      - SM: silty poorly-graded medium to fine sand or silty fine sand to sandy non-plastic silt.
      - SP: clean uniform (poorly graded) medium to fine sand with scant silt content and absent coarse sand and gravel content (*Photo 6*); may also grade to well graded (SW); would require soil particle gradation tests to better distinguish.
      - ML: non-plastic silt with absent to minor fine sand component; distinguishable from fine sand by its velvety feel and flour size particles.
    - Water bearing (wet, saturated)
  - Coloration: typically tan or gray
  - Thickness:
    - SM and/or ML: 0 ft. < SM/ML < 15 ft.
    - SP: 0 ft. < SP < 20 ft.
  - Competency: unreliable due to variability in overburden thickness and flood/flow patterns
    - Variable: ranges from very loose to medium dense soil density in-situ
    - SP may be difficult to compact if allowed to dry; requires addition of water.

- Marine Sediment: this soil was not encountered to the depths drilled in any site boring

- Glacial Till:
  - Description:
    - Varies in soil particle distribution; initial characterizations include:
      - Tendencies to GM/SM (*Photo 6*; silty sand and gravel) or GP/SP (poorly graded sand and gravel) or GW/SW (well graded sand and gravel).
      - Particle variation reflects the depositional randomness within the glacial till formation.
      - Glacial till on this site can be water bearing
  - Coloration: tan to gray; approaches whitish gray when desiccated
  - Thickness: ranged from 5 ft. to > 22 ft. thickness at the drilled boring locations.
  - Density:
    - Expected to be medium dense to dense in-situ;
    - Typically increases in density with depth due both to increase in desiccation and particle cementation.
    - A false higher N can occur due to the presence of cobbles and boulders (*Appendix A*).
  - Competence:
    - Glacial till on this site in natural undisturbed state is an excellent bearing material.
    - It is unlikely glacial till would be encountered in normal depth site earthwork excavations.

Photo 7: Retrieved Schist rock sample



Photo 8: ML Glacial fluvial soil with rust lines



- Bedrock:
  - Occurrence: No rock outcropping was noted either on-site or on nearby properties. Area topographic mapping did not suggest a rock controlled ground surface (*Figure 1*).
  - Determination of top of bedrock:
    - Boulders are readily drilled through by the auger drill rig.
    - Determination of top of bedrock was taken as the depth at which a rock surface was encountered which elicited unyielding behavior when the auger drilled at maximum drill rig crowd pressure sustained for a period of time.
    - No diamond core rock drilling was included in this phase of site review.
  - Samples: Rock samples recovered by hammered auger plug at depths believed to represent top of bedrock.
    - Rock sample recovered in boring B109 (*Figure 2*) revealed schist bedrock as predicted in *Figure 1D* (*Photo 7*) and drill rig auger behavior.
    - Refer also to the "Area Bedrock Geology" section on page 7.

- Depth to bedrock at the test borings drilled, where encountered:
  - Ranged from 18 ft. to 39 ft. below existing ground surface (*Table I*).
  - Found top of bedrock elevation range is shown on subsoil profiles in *Figure 5A, Figure 5C* and *Figure 5D*.
  - Bedrock elevation summary at the borings drilled for this review:

Boring No. - Location	Depth to Bedrock	Top of Rock Elevation
B103 – Field House NE	39 ft.	El. -5.5 ft.
B106 – Pedestrian Bridge	38 ft.	El. -3.5 ft.
B107 – Pedestrian Bridge	30.3 ft.	El. +4.7 ft.
B108 – Pedestrian Bridge	21.4 ft.	El. +13.3 ft.
B109 – Pedestrian Bridge	18 ft.	El. +17.3 ft.

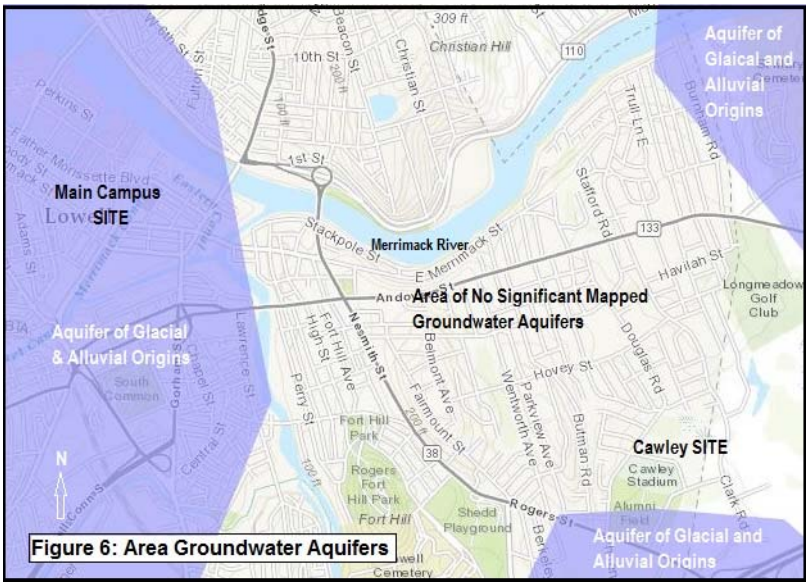


Figure 6: Area Groundwater Aquifers



Photo 9: Merrimack Canal (frozen), looking south

V. Groundwater Behavior

- Free Water:
  - Wet (saturated) granular soil zones were encountered in all nine borings drilled during 22 to 24 March 2017 (*Appendix A*; *Table II*).
  - The campus groundwater is considered unconfined,
  - The site lies within a mapped significant groundwater aquifer (*Figure 6*).
  - No existing groundwater monitoring wells were found. Two wells were installed as part of this review in on-site borings B101 and B105 (refer to *Figure 2*).
  - Water levels were reasonably consistent across campus.
  - However, water levels found in canal adjacent borings (*Figure 2*) particularly those drilled within a few feet of the Merrimack Canal (*Photo 9;* those confined by the presence of active trolley tracks; B106, B108) were inconsistent with other existing campus drilled locations (*Table II*).
    - Water levels were likely elevated due to canal sidewall water seepage (*Photo 9*).
    - The closer a boring was drilled to the canal the higher the water level that was observed.
    - The Merrimack Canal base is reported to be 14 feet depth adjacent to the site.

- *Table II* summarizes the site groundwater data collected on-campus.

Table II: Groundwater Observations

Loc. No.	Elevation	Date	Observation	Groundwater Depth	Groundwater El.
B101-well	33'+/-	03/24/17	48 hr. well reading	11.1'	21.9'+/-
B102	33'+/-	03/23/17	Wet fill sample	11.0'	22.0'+/-
B103	33.5'+/-	03/24/17	Wet ML sample	12.0'	21.5'+/-
B104	32.5'+/-	03/23/17	Wet SM sample	10.0'	22.5'+/-
B105-well	32.3'+/-	03/24/17	24 hr. well reading	10.0'	22.3'+/-
Bridges:					
B106-west	34.5'+/-	03/24/17	Wet fill sample	5.0'	29.5'+/-
B107-east	35'+/-	03/22/17	Very moist OH sample	9.5'	25.5'+/-
B108-west	34.7'+/-	03/24/17	Wet fill sample	8.0'	26.7'+/-
B109-east	35.3'+/-	03/22/17	Wet glacial till sample	9.5'	25.8'+/-



Photo 10: Wet/saturated soil sample in B109



Photo 11: Groundwater monitoring well in B105

- Groundwater Level Variation:
  - Clear soil rust staining (*Photo 8*) and/or soil mottling was noted in some of the soil borings.
    - Rust staining and mottling found above water table can indicate the presence of a seasonal high groundwater level.
    - Rust staining and mottling are not found in fill soil, only in native soil.

Location	Indicator	Indicator Depth	Indicator Elevation	Water Elevation
B103	Rust lines	10'	23.5'	21.5'
B104	Mottling	8'	24.5'	22.5'
B105	Rust lines	8'	24.3'	22.3'

  - Based upon the data collected a reasonable preliminary value of seasonal high water level for the west campus west beyond the pedestrian bridge and canal area is El. 24.5 ft.

- Localized temporary and long term changes to groundwater level can be natural or man-made. These changes source from activities such as:
  - The 2016 extreme drought condition and the relatively dry summer of 2017, although ended may still be of some influence.
  - Winter and drier season water levels.
  - Heavy rainstorms or lengthy precipitation periods
  - Leaky underground structures (pipes, tunnels)
  - Underground flow retarders (buried structures, walls)
  - Percent of land surface covered by pavement and buildings without ability to recharge.
  - Nearby construction dewatering.
  - Changes to the existing surface drainage pattern due to new site topography, trenches, infiltrators, bio-retention basins and subgrade structures.
- Groundwater impact:
  - Past site excavation at the Field House to El. 19 ft. was performed to install the pool according to construction drawings. It is not known what level of pool uplift resistance and waterproofing was undertaken in pool design.
  - The preliminary value of seasonal high water (El. 24.5 ft.) would impact any new basement level foundations and lowest level slab and associated excavations (*Table II*) if installed below about El. 25.5 ft. Additional groundwater well readings should be taken following storm and extended precipitation events to better ascertain seasonal high water level on this site.
  - Underground utilities on some sites are designed to be installed deeper than foundations, however such data has not been provided us to-date for this project.

Hydraulic Conductivity (K in GPD/ft.^{2}):

- Scope: Laboratory soil gradation testing was not undertaken for this study and associated calculations and estimations of soil hydraulic conductivity (K) were not undertaken for any site subsoil unit.

- K Determination: Many input factors go into determination of K. K is a function of particle grain sizes, soil density, soil particle uniformity, soil cementation and soil layering.

VI. Preliminary Foundation Recommendations:

Foundation System:

- Preliminary Recommendations: three alternatives are provided for this project
  - o Driven pile foundation alternative:
    - The presence of the following subsoils eliminates use of conventional shallow foundations and slabs-on-grade to support new construction (see *Figure 5A* and *Figure 5B*):
      - Non-engineered fill, primarily common fill
      - Buried organic silt; and
      - Inconsistent strength glacial fluvial (alluvial) soils (SM, ML, SP).
    - If a driven pile foundation system is selected, piles would need to be driven to bear in dense glacial till, weathered rock or bedrock.
    - Pile lengths as estimated from existing ground surface can be expected to range from about:
      - 20 ft. to 40 ft. at the pedestrian bridges, including batter piles (*Figure 5C, Figure 5D*) and
      - 30 ft. to 50 ft. at the buildings (*Figure 5A, Figure 5B*).
    - Driven piles:
      - Due to the presence of left-in-place foundations and debris from the Merrimack Manufacturing Company building complex (*Figure 1B*), significant solid waste present below ground (*Appendix A*) precludes use of any driven pile other than a heavy section conical point pipe pile. We have found conical point heavy section steel pipe piles have been able to successfully be installed on sites like this one.
      - Other driven pile types would be subject to collapse while driving and would require pre-drilling or pre-excavating to about 7 ft. depth at all pile locations.
      - Driven pile types, sections and capacities include:

Pile Type	Description	Preliminary Allowable Capacity
Pre-cast Pre-stressed Concrete	12” x 12”	200 K
	14” x 14”	270 K
Steel H-Pile	HP12 x 74	140 K
	HP14 x 89	200 K
Steel Pipe Pile	10-¾”; 0.375” wall	190 K
	12-¾”; 0.375” wall	250 K

  - o Drilled concrete micropile (DMP) alternative:
    - Drilled concrete micro piles (DMP) nominal pile diameter: 5 in. to 12 in. dia. (max)
    - Flush joint permanent drill casing diameter is assumed:
      - Assume 9-⅝ in. casing shoe with carbide teeth;
      - Casing wall thickness: 0.472 in.
      - Nominal DMP pile diameter = 10 in.
      - Core bar selection: No. 10, Grade 75
      - Grout strength: min. 4500 PSI (28 days, neat cement)
      - Assumed rock socket diameter: 7 in.
      - Rock socket within intact bedrock, assume 10 KSF grout-to-rock bond strength
      - Bond length (rock socket in intact bedrock), minimum is 5 ft.; actual for this project is dependent on required DMP capacity
      - Factor of safety = 2.5 if no DMP compression load test is performed
    - Due to the presence of left-in-place foundations and debris from the Merrimack Manufacturing Company building complex (*Figure 1B*), significant solid waste present

below ground (*Appendix A)* the drilling duration through buried obstructions can impact pile production schedule.
    - Drilling duration would have to be defined as part of the DMP contract. Hayward Baker for example assumes a 45 minute limit for drilling through obstructions at a given pile location before expecting additional compensation for pile installation.
    - Language to this effect would need to be in the pile contract if DMPs are selected.
- Ground improvement foundation alternative:
    - A grid of aggregate piers (20 in. to 30 in. nominal diameter columns of compacted aggregate) can be designed to be installed on-site to provide ground improvement for structural support below new footings and floor slabs:
        - Most of the existing fill can remain in-place below structural units.
        - Foundations and debris from the Merrimack Manufacturing Company building complex (*Figure 1B*), yield significant solid waste present below ground (*Appendix A*) and require trench excavation (pre-trenching) at aggregate pier locations to about 7 ft. depth prior to pier installation. Conventional aggregate pier installation equipment cannot penetrate buried solid waste.
        - Piers would typically be designed to take-up within the medium dense to dense glacial till bearing soil zone shown in *Figure 5A* through *Figure 5D (Appendix A)*.
        - An acceptable site ground improvement design can provide:
            - A minimum 6 KSF net allowable soil bearing pressure for structural support with less than 1 in. total settlement and less than 0.5 in. differential settlement; and
            - The ability to use conventional shallow foundations (wall footings and column footings) and slabs-on-grade for new construction on this site. Use of pile caps, grade beams and structural slabs are unnecessary with ground improvement.
    - Trade descriptors of aggregate pier ground improvement systems installed locally include:
        - Geopiers or rammed aggregate piers (Helical Drilling, Inc.; since 2005); or
        - Vibro-piers (Hayward Baker, Inc.; since the 1990s); or
        - Vibro stone columns (Subsurface Constructors; since 2012)
        - Aggregate piers (HB Fleming, Inc.; since 2008).
    - Use of an augered (non-displacement) type of aggregate pier avoids vibration issues on-site and in the neighborhood associated with soil displacement types such as rammed aggregate piers (RAP). However RAPs can be at least partially pre-drilled.
    - Aggregate piers below footings and slabs will not need be grouted on this site.
    - Some installer's ground improvement systems may require use of load transfer platforms following aggregate pier installation:
        - These are installed at the base of footings above the piers.
        - They consist of single or alternating layers of specified crushed stone and geotextile below footings.
    - Aggregate pier Installers potentially available for ground improvement review of this site:
        - Geopiers: Helical Drilling, Inc.; Colin Dahlen: 781/535-5832
        - Vibro-Piers: Hayward Baker, Inc.; Kevin Dawson: 617/306-5910
        - Vibro Stone Columns: Subsurface Constructors: Kurt Amidon 978/850-4193
        - Aggregate Piers: HB Fleming, Inc.: Scotty Linscott 207/799-8514
    - Ground improvement systems may not be able to provide adequate lateral capacity for the pedestrian bridge foundations. Lateral capacity development may require use of larger bridge footings. In any case:
        - Aggregate piers cannot do so unless grouted and provided with interior reinforcing bar. Rigid inclusions likely would require reinforcement as well.
        - Ground improvement systems likely cannot be installed at a batter.

Seismic Recommendations:

- Seismic Site Hazard Review:
  - Probabilistic Site Hard Analysis [*PSHA Interactive Deagregation*; Geologic Hazards Science Center, US Geologic Survey; 2008 v.2]
    - Decimal site latitude and longitude utilized in this review: (42.65° N, -71.31° W)
    - Probability of magnitude 5 (M5.0) or greater earthquake occurrence within 50 km (80 miles) of the subject site within a 50-year building design life is considered relatively low (2.5%+/-, see *Figure 7*).
  - Area earthquake history:
    - Typical measured earthquakes within the past 40 years have had magnitude ≤ 3
    - Far older significant earthquakes with area impact recreated from the geologic record:

Year	Magnitude	Location	Intensity in Boston
1638	6.5	Central New Hampshire	MMI: V-VII
1663	7.0	Charlevoix, Quebec	MMI: V-VI
1727	5.6	Newbury, MA	MMI: V-VI
1755	5.9	Scituate, MA	MMI: IX

MMI: Modified Mercalli Scale (subjective; observed damage and effects)

- Seismic Site Class: The collected site subsoil data has been applied to the Massachusetts adopted *International Building Code (2015)*. According to the *Building Code*
  - The upper 100 feet of soil and bedrock are subject to analysis.
    - Soil and rock data on-site has been collected on site to 47 ft. depth.
    - Previous site area soil and rock data has been collected on site to similar depth.
  - Top of bedrock:
    - Bedrock is schist, a moderately hard metamorphic rock (see "Existing Campus Area Bedrock Geology" report section).
    - Bedrock was found in borings from depths ranging from 18 ft. to > 47 ft.
    - These 'depths to bedrock' does not allow classification of this site as Site Class A or Site Class B (depth to rock as measured from BOF < 10 ft.).
  - Very soft or very thick soft or liquefiable subsoil site based upon an average site organic soil thickness:
    - Site Class F soils have been ruled out.
    - In addition, subsoils were generally found to be not liquefiable (see "Liquefaction" section).
  - Derivation of site class has been summarized below after conversion of field testing data (N values, $q_{u\text{-field}}$) to shear velocities [*Seismic Loads-Guide to the Seismic Load Provisions of ASCE 7-05*; Table G3-1; ASCE Press; 2010]. Fill thickness was modified to account for pile cap depth. Soil thicknesses are considered site averages:

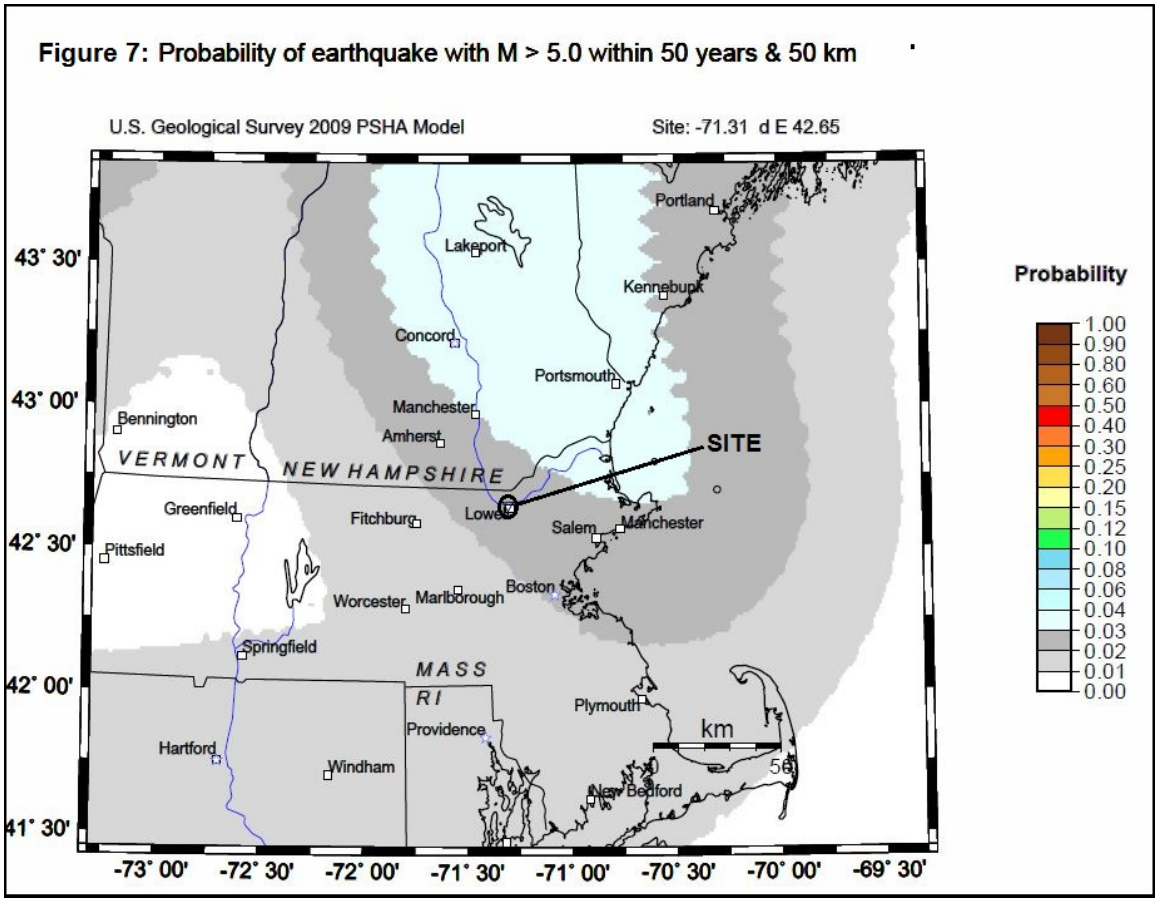
T*able III: Derivation of Seismic Site Class*

Unit	Thickness (ft.) (di)	Shear Velocity (ft./sec.) (Vsi)	di / Vsi (sec.)
Existing Fill	4	400	0.0100
Desiccated Organics	2	300	0.0067
Med Dense Glac Fluv	8	600	0.0133
Loose Glacial Fluvial	8	150	0.0533
Dense Glacial Till	13	1000	0.0130
Schist-med. hard	65	5000	0.0130

- *Table III* provides the basis to derive the site average shear velocity:

  $V_{s\text{-}ave}$ = Σ di / Σ (di / Vsi) = 100 ft. / 0.1093 sec. = 915 ft./sec. → Site Class D

- Seismic Design Factors: Preliminary estimated Earthquake Design Factors for Lowell, Massachusetts (*Massachusetts Amendments to the International Building Code (2017; 9th Edition)* and *IBC (2015)*):
  - S_s = 0.235g (short interval)
  - S_1 = 0.074g (1-second interval)
  - F_a = 1.6 (site coefficient, classification as Site Class D)
  - F_v = 2.4 (site coefficient, classification as Site Class D)



Liquefaction:

- Liquefaction Factors:
  - Earthquake magnitude
  - Earthquake amplitude (duration)
  - Subsoil types and condition

- Earthquake Magnitude:
  - *Figure 7* indicates that the probability of occurrence of an earthquake of magnitude 5 or higher is low probable during a 50 year building design life.
  - However, with a time period measured in centuries instead of decades, earthquakes of magnitude 5 or greater can be expected to occur as the earthquakes listed on page 27 indicate.

- Earthquake Duration: This topic is beyond the scope of this review.

- Subsoil Data Input: Review of the site subsoil profile was necessary for soil liquefaction determination below structural units:
  - Relevant test boring information:
    - In general varying limited thicknesses of loose to very loose saturated silty to clean sands and non-plastic silts (SM, SP, SW, ML) glacial fluvial soil layers were found below structural units to the depth drilled (*Figure 5A* through *Figure 5D*).
    - An apparent outwash flow channel at B102 was taken as a limited anomaly and was neglected.
  - Drill rig, site groundwater level and measured soil strength data with depth:
    - Drill rig hammer type: auto-hammer
    - Groundwater level: 10 ft. depth
    - Plotted field N_{70}-values from the borings with depth (*Figure 3A* through *Figure 3D*).

- Existing Site Liquefaction Determination:
  - Review of field auto hammer N_{70} from the borings with depth with respect to *Figure 1806.4c* of the *Massachusetts Amendments (2017; 9th Edition)* for preliminary liquefaction exclusion review compared to an assumed (seasonal high) groundwater level.
  - Result: liquefaction settlement is not of concern for this site were a 5M or greater earthquake to occur here (see also *Figure 7).*

Foundation Wall Design (Restrained Walls):

- Lateral Earth Pressure and Hydrostatic Pressure:
  - New foundation walls should be designed to resist *lateral pressures* calculated on the basis of an equivalent fluid weight of:
    - 60 PCF (not designed to resist hydrostatic pressure: drains provided)
    - 90 PCF (designed to resist hydrostatic pressure: no drains provided)
  - The recommendations assume an at-rest earth pressure coefficient (K_o) as follows [Knappett & Craig, *Craig's Soil Mechanics*; 2012; Figure 11.11]:
    - $K_o = 0.54$ ($\Phi'=28°$)
    - Where the calculated earth pressure behind walls is < 250 PSF, it should be increased to 250 PSF to account for stresses caused by compaction within 5 lateral feet from the wall face.

- Surcharge Loads:
  - Surcharge loads are generated by adjacent loads of construction equipment, materials, stockpiles and traffic loads
  - Surcharge loads can be determined on the basis of a uniform lateral pressure equal to K_o multiplied by the vertical surcharge load applied over the full height of the wall.

- Seismically Induced Loads:
  - Seismically-induced earth pressures (*earthquake force*, F_w) should be distributed as an inverted triangle over the height of the wall (*Massachusetts Amendments (2017)*).
  - $F_w = 0.1 (S_s)(F_a)(Y_t)(H)^2$
    - $S_s = 0.235g$ (see "Seismic Recommendations" report section)
    - F_a = Site Coefficient = 1.6 (classification as Site Class D)
    - Y_t = Total Soil Unit Weight = use 125 PCF
    - H = height of foundation wall

- Total Lateral Stress: The two static lateral pressures and the seismic pressure when added yield the total lateral stress for structural design of the walls.

Structural Unit Frost Protection Depth:

- Definition:
  - Frost depth, freezing depth or frost line is the depth to which moisture in subsoil is expected to freeze.
  - Frost line varies in position (elevation) during seasonal freeze and thaw.

- *Massachusetts State Building Code* Mandated Frost Protection Depth Changes:
  - 7th Edition: "All foundations for buildings and structures shall extend to a minimum of 4 ft. below (exterior) finished grades…"
  - 8th Edition: Foundations and permanent building supports should be protected by "extending below the frost line of the locality…" This suggests a 4 ft. frost depth is too deep for coastal and southern areas and too shallow for northern or topographically elevated locales.

- Site Structural Unit Frost Protection Depth:
  - Frost line:
    - Average area frost line value: 0.9 m = 35.5 in. [J.E. *Bowles; Foundation Analysis and Design 5th Ed.*; 1997; Figure 7-1].
    - Extreme frost line based upon state average: 58 in. [NAVFAC DM-7.1; *Soil Mechanics Design Manual 7.1*; Figure 7; 1982].
    - Based upon the data collected to-date: recommended minimum site structural unit frost protection depth for this near coastal property as measured from final adjacent exterior grade: = 48 in. (4 ft.)

- Cold Weather Work Soil Protection:
  - During construction earthwork the contractor must be prepared to provide protection and/or thawing of foundation bearing soils against freezing.
    - Footings: insulation blankets and/or ground heating hoses should be utilized if footing subgrade is exposed to freezing during cold weather periods.
    - Lowest Level Slabs:
      - Typically slab subgrade areas are thawed once basic framing is up by providing heaters after enclosing the lowest level in plastic sheeting.
      - Then any remaining required grade raise fill, treatment and placement of the slab base pad can be properly performed.

Excavation and Bracing:

- Excavation Depth ≤ 4 ft.+/-:
  - Common practice is to maintain a 1H:1V temporary side slope for shallow excavation (≤ 4 ft.+/-) during construction. Benched steps can also be executed.
  - Note that the sidewall stability will be undermined by:
    - Minor sloughing when sidewall bleeding occurs either from release of trapped groundwater in soil or drainage following storm events; and
    - Surficial exposed granular sidewall soil drying.

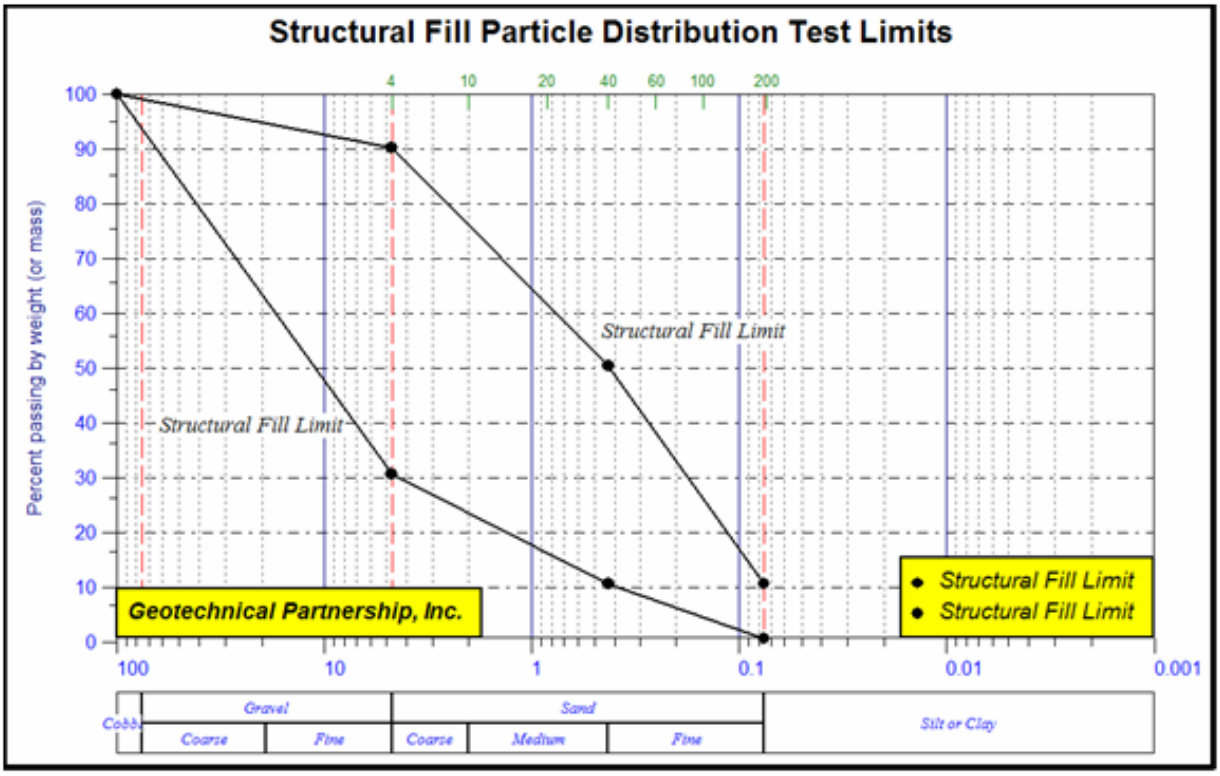
- Excavation > 4 ft.:
  - A braced excavation is required where adequate lateral space does not exist for a temporary 1H:1V sloped excavation.
  - Type of bracing that is practicable (soldier pile and lagging, sheet piling) is dependent upon the actual embedment depth of the New Option A basement level.

Drainage and Waterproofing:

- General Comments/Good Practice:
  - Exterior grading at the building should be designed to carry surface water runoff away from the structure.
  - Planted areas or pavements should enhance the exterior grading performed to insure surface water runoff beyond building limits.
  - Roof downspout water or other water should not be allowed to pool near the building.

- Building Foundation Walls: TBD

- Lowest Level Floor Slab: TBD



Engineered Fills and their Uses:

- Crushed stone: ¾ in. clean, hard, durable crushed stone; uses:
  - As a construction working pad
  - As a surface protection below footings
  - As drainage media in wall and under slab drainage systems.

- Gravel: sandy gravel, bank run gravel; max. 3-in. gravel; limit No. 200 sieve content to about 6%; uses:
  - As base in a pavement section

- Structural fill: hard, durable sand and gravel;
  - Common gradation limits for structural fill are given in the plot on page 31.
  - Gradation adjustments: gradations often specify
    - Minimum of 2% passing No. 200 to aid compaction
    - Maximum of 15% passing No. 200 with the assumption that work may not proceed during wet conditions using this material (Dense Grade can be substituted)
  - Structural Fill Uses (in lieu of crushed stone):
    - To form a protective base directly below footings
    - As a slab base pad
    - As a replacement fill below structural units (over-excavated soft areas)
    - As sub base in a pavement section

- Dense Grade Structural Fill/2-in. Crushed Stone: Structural fill/crushed stone meeting the following minimum requirements

Sieve Size	Percent Finer by Weight
2 in.	100
1.5 in.	70 – 100
¾ in.	50 – 85
No. 4	30 – 55
No. 50	8 – 24
No. 200	3 – 10

  - Dense grade structural fill uses:
    - As a readily workable replacement for conventional or recycled concrete type structural fill when work must proceed during cold and/or wet conditions.
    - As a base pad for lowest level floor slabs and footings

- Granular Fill: absent to minor gravel; primarily medium to fine sand and silt meeting the following minimum requirements

Sieve Size	Percent Finer by Weight
4 in.	100
No. 10	30 – 95
No. 40	10 – 70
No. 200	0 – 15*

** May be as high as 20% if field compaction can be verified*

  - Granular Fill Uses:
    - As under slab fill below 2 ft. depth as measured from the slab base.
    - As densified trench backfill

Re-use of Existing Site Subsoils as Engineered Fill:

- Existing Common Fill and Excavated Silty Glacial Soils:
  - Re-use of these soils is limited to use as common fill (below planted areas).
  - Refer to the high silt contents found in SM and ML alluvial soils.

- Existing Granular Fill:
  - The existing clean granular fill can be re-used as engineered fill if it can be:
    - Readily separated and stockpiled.
    - Confirmed for fill quality and use by construction phase soil particle gradation testing.
    - Shown to be free of contaminants

Final Comment:

If the selected building design includes 75 Arcand Drive, additional test borings will need to be drilled on the property at the outset of Schematic Design to provide necessary supplemental foundation design information.

Thank you for inviting us to perform this review. Please contact us with any questions.

Sincerely yours,
Geotechnical Partnership, Inc.

Lisa R. Casselli, PE
Principal

Attachments: *Appendix A*: *Logs of Test Boring B101 through B109*

APPENDIX A: Logs of Structural Test Borings B101 to B109

Lowell High School
Lowell, Massachusetts

Geotechnical Partnership, Inc.
Swampscott, MA
File No. 1628-01

Geotechnical Partnership, Inc.
Swampscott, Massachusetts
Sanford, Maine

PROJECT: Potential New Construction
Lowell High School
Lowell, Massachusetts

CLIENT: Perkins Eastman DPC Boston, MA

File No. 1628

Date Drilled	: 20-24 March 2017
Boring Location	: Refer to Report Figure 2
Drilling Contractor	: Soil Exploration Corp.
	: Leominster, MA
Driller	: P. Goodale
Rock Core	: ---
GPI Field Engineer	: LR Casselli, PE, MASCE CSI
Elevation and Datum	: El. 33'+/- (LCB)
Drilling Mud Utilized	: Not necessary
Constant Water Head	: Water added as needed

Test Boring No. B101-well

(1 of 2)

Drill Rig Type	: ATV Mounted
Hammer Type	: Auto
Cat-Head or Winch	: NA
Soil Casing Type	: 8 in. OD HSA
Sampler Type	: SS - 1.375 in. I.D.; unlined
Sampler Hammer Fall	: 140 lbs. / 30 in.

Depth in Feet	Elev. in Feet	DESCRIPTIONS	USCS	Sample No.	Blow Count	Blow Count Graph (10 50)	Average qu-Field	Average qu-Field (TSF) (0 1 2 3 4)	REMARKS
0	33	Soil vacuuming to 6 ft. depth: Material vacuumed included: Miscellaneous Fill and solid waste: Cobbles Rubble masonry Bricks		1					Groundwater=10' 24 hours=11.2' 48 hours=11.1' Well Set: yes; 20'
3	30	Tan, medium to fine SAND, little silt, trace coarse sand and fine gravel (dry)	AR	2					Area of reported former row house buildings. Remnant buried construction debris and foundation elements found
5	28	Foundation wall exposed at 6 ft. depth. Began drilling adjacent to wall at 6 ft.							
6	27	6.0 ft. --Urban Fill/Common Fill--							
6	27	Tan to tan-yellow, SILT (non-plastic), few fine sand (medium dense; moist)		3	14 9 11 7				SS-3: 6' - 8' R=15 N=20
8	25	8'-10': no recovery, pushed 3 in. dia. rock stuck in tip of split spoon sampler	ML	4	7 8 10 14				SS-4: 8' - 10' R=0 N=18 N unreliable, pushed rock
10	23	Tan to tan-yellow, SILT (non-plastic), few fine sand and tan-orange, fine SAND, few silt and medium sand (medium dense; moist to wet)		5	8 9 11 14				SS-5: 10' - 12' R=19 N=20
11	22	11.5 ft. --Glacial Fluvial--							
12	21	Brown, medium to fine SAND, few silt (medium dense to dense; wet)		6	13 13 15 20				SS-6: 12' - 14' R=23 N=28
15	18	Brown to tan-brown, medium to fine SAND, few silt, trace coarse sand (medium dense; wet) with lenses, tan, fine SAND, few silt (wet)	SP	7	7 7 7 10				SS-7: 15' - 17' R=22 N=14
20	13	Brown, medium to fine SAND, few silt, trace coarse sand (medium dense, wet)		8	7 8 9 12				SS-8: 20' - 22' R=20 N=17
22		--Glacial Fluvial--							

COHESIONLESS SOILS: (DENSITY) L: Sands; R: Gravels
0-6 Very Loose
6-10 Loose
11-30 Med-Dense
>30 Dense
0-8
8-15
16-40
41-50
Very Dense >50

COHESIVE SOILS: (CONSISTENCY)
0-2 Very Soft (<0.25 TSF)
2-4 Soft (0.25-0.5 TSF)
4-8 Med. Stiff (0.5-1.0 TSF)
9-20 Stiff (1.0-4.0 TSF)
>20 Hard (>4.0 TSF)

Test Boring No. B101-well

(1 of 2)

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Geotechnical Partnership, Inc.
Swampscott, Massachusetts
Sanford, Maine

PROJECT: Potential New Construction
Lowell High School
Lowell, Massachusetts

CLIENT: Perkins Eastman DPC Boston, MA

File No. 1628

Date Drilled	: 20-24 March 2017
Boring Location	: Refer to Report Figure 2
Drilling Contractor	: Soil Exploration Corp.
	: Leominster, MA
Driller	: P. Goodale
Rock Core	: ---
GPI Field Engineer	: LR Casselli, PE, MASCE CSI
Elevation and Datum	: El. 33'+/- (LCB)
Drilling Mud Utilized	: Not necessary
Constant Water Head	: Water added as needed

Test Boring No. B101-well

(2 of 2)

Drill Rig Type	: ATV Mounted
Hammer Type	: Auto
Cat-Head or Winch	: NA
Soil Casing Type	: 8 in. OD HSA
Sampler Type	: SS - 1.375 in. I.D.; unlined
Sampler Hammer Fall	: 140 lbs. / 30 in.

Depth in Feet	Elev. in Feet (33)	DESCRIPTIONS	USCS	Sample No.	Blow Count	REMARKS
22	11	Brown, medium to fine SAND, few silt, trace coarse sand (medium dense, wet)	SP			
23	10					
24	9	Brown, medium to fine SAND, few silt (medium dense, wet)				
25	8	--Glacial Fluvial--		9	5 6 9 11	SS-9: 25' - 27' R=24 N=15
		25.5 ft.				
26	7	Tan to tan-brown , SILT (non-plastic) (medium dense; moist)	ML			
27	6	--Glacial Fluvial--				
28	5					Auger grinding on gravel at 29 ft. depth
		29.0 ft.				
29	4	Tan, medium to fine sandy SILT (non-plastic) to silty medium to fine SAND, little to some coarse to fine gravel (sub-angular to angular), few coarse sand (dense; wet)	GT	10	18 22 17 16	SS-10: 30' - 32' R=16 N=35
30	3					
31	2					
32	1					
33	0					
34	-1					
35	-2	Tan, medium to fine sandy SILT (non-plastic) to silty medium to fine SAND, few coarse sand and coarse to fine gravel (sub-angular to angular) (medium dense; wet)		11	6 6 7 9	SS-11: 35' - 37' R=21 N=13
36	-3					
37	-4					
38	-5					
39	-6					
40	-7	Tan, medium to fine sandy SILT (non-plastic) to silty medium to fine SAND, little to some coarse to fine gravel (sub-angular to angular), few coarse sand (desiccated; moderate cementation; dense; dry to moist)		12	30 48 61 52	SS-12: 40' - 42' R=19 N=109
41	-8					
42	-9	--Glacial Till--				P=Penetrometer
		Bottom of Exploration at 42 feet Depth				
43	-10	Particle Size: trace: <5%; few: 5-10%; little: 15-20%; some 30-45%; mostly: 50-100%				
44						

Blow Count Graph: 10 50

Average qu-Field

Average qu-Field (TSF): 0 1 2 3 4

COHESIONLESS SOILS: (DENSITY) L: Sands; R: Gravels
0-6 Very Loose
6-10 Loose
11-30 Med-Dense
>30 Dense
Very Dense

0-8
8-15
16-40
41-50
>50

COHESIVE SOILS: (CONSISTENCY)
0-2 Very Soft (<0.25 TSF)
2-4 Soft (0.25-0.5 TSF)
4-8 Med. Stiff (0.5-1.0 TSF)
9-20 Stiff (1.0-4.0 TSF)
>20 Hard (>4.0 TSF)

Test Boring No. B101-well

(2 of 2)

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Geotechnical Partnership, Inc.
Swampscott, Massachusetts
Sanford, Maine

PROJECT: Potential New Construction
Lowell High School
Lowell, Massachusetts

CLIENT: Perkins Eastman DPC Boston, MA

File No. 1628

Date Drilled	: 20-24 March 2017
Boring Location	: Refer to Report Figure 2
Drilling Contractor	: Soil Exploration Corp.
	: Leominster, MA
Driller	: P. Goodale
Rock Core	: ---
GPI Field Engineer	: LR Casselli, PE, MASCE CSI
Elevation and Datum	: El. 33 ft.+/- (LCB)
Drilling Mud Utilized	: Not necessary
Constant Water Head	: Water added as needed

Test Boring No. B102

(1 of 3)

Drill Rig Type	: ATV Mounted
Hammer Type	: Auto
Cat-Head or Winch	: NA
Soil Casing Type	: 8 in. OD HSA
Sampler Type	: SS - 1.375 in. I.D.; unlined
Sampler Hammer Fall	: 140 lbs. / 30 in.

Depth in Feet	Elev. in Feet	DESCRIPTIONS	USCS	Sample No.	Blow Count	Blow Count Graph (10 50)	Average qu-Field	Average qu-Field (TSF) (0 1 2 3 4)	REMARKS
0	33	Pavement (t= 2.5 in.)							Groundwater=11'
1	32	Soil vacuuming to 7 ft. depth		1					Well Set: no
2	31								SS-1: 1' - 3' R= N=
3	30			2					SS-2: 3' - 5' R= N=
4	29		AR						
5	28	Miscellaneous Common Fill encountered		3					SS-3: 5' - 7' R= N=
6	27								
7	26								
8	25	Brown, medium to fine SAND, few to little silt, few coarse to fine gravel, trace coarse sand (very loose; moist)		4	1 1 1 1				SS-4: 8' - 10' R=9 N=2
9	24								
10	23		AR						SS-5: 10' - 12' R=20 N=2
11	22	Brown, medium to fine SAND, few to little silt, trace to few coarse to fine gravel, trace coarse sand (very loose; moist to wet)		5	2 1 1 1				
12	21	12.0 ft. --Granular Fill--							SS-6: 12' - 14' R=7 N=3
13	20	Tan, medium to fine SAND, trace silt (very loose; wet)		6	1 1 2 2				
14	19								
15	18			7	1 1 1 1				SS-7: 15' - 17' R=15 N=2
16	17	Tan, medium to fine SAND, trace silt (very loose; wet)	SP						
17	16								
18	15								
19	14								
20	13	Tan, medium to fine SAND, trace silt and coarse sand (very loose; wet) 21.0 ft. --Glacial Fluvial--		8	4 4 5 5				SS-8: 20' - 22' R=15 N=9
21	12	Tan to tan-brown, SILT (non-plastic) (loose; moist) --Glacial Fluvial--	ML						
22									

COHESIONLESS SOILS: 0-6 Very Loose 0-8
(DENSITY) 6-10 Loose 8-15
L: Sands; R: Gravels 11-30 Med-Dense 16-40
>30 Dense 41-50
Very Dense >50

COHESIVE SOILS: 0-2 Very Soft (<0.25 TSF)
(CONSISTENCY) 2-4 Soft (0.25-0.5 TSF)
4-8 Med. Stiff (0.5-1.0 TSF)
9-20 Stiff (1.0-4.0 TSF)
>20 Hard (>4.0 TSF)

Test Boring No. B102

(1 of 3)

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Geotechnical Partnership, Inc.
Swampscott, Massachusetts
Sanford, Maine

PROJECT: Potential New Construction
Lowell High School
Lowell, Massachusetts

CLIENT: Perkins Eastman DPC Boston, MA

File No. 1628

Date Drilled	: 20-24 March 2017
Boring Location	: Refer to Report Figure 2
Drilling Contractor	: Soil Exploration Corp.
	: Leominster, MA
Driller	: P. Goodale
Rock Core	: ---
GPI Field Engineer	: LR Casselli, PE, MASCE CSI
Elevation and Datum	: El. 33 ft.+/- (LCB)
Drilling Mud Utilized	: Not necessary
Constant Water Head	: Water added as needed

Test Boring No. B102

(2 of 3)

Drill Rig Type	: ATV Mounted
Hammer Type	: Auto
Cat-Head or Winch	: NA
Soil Casing Type	: 8 in. OD HSA
Sampler Type	: SS - 1.375 in. I.D.; unlined
Sampler Hammer Fall	: 140 lbs. / 30 in.

Depth in Feet	Elev. in Feet (33)	DESCRIPTIONS	USCS	Sample No.	Blow Count	Blow Count Graph (10 50)	Average qu-Field	Average qu-Field (TSF) (0 1 2 3 4)	REMARKS
22	11	Tan to tan-brown, SILT (non-plastic) (loose; moist)	ML						
23	10								
24	9								
25	8	Tan to tan-brown, SILT (non-plastic) (dense; moist) --Glacial Fluvial-- 25.5 ft.		9	16 18 20 21				SS-9: 25' - 27' R=19 N=38
26	7	Tan, silty medium to fine SAND, little to some coarse to fine gravel (sub-angular), few coarse sand (moderate cementation; dense; moist)							
27	6								
28	5								
29	4								
30	3	Tan-gray, medium to fine SAND, little silt and coarse to fine gravel (sub-angular), trace coarse sand (medium dense; wet) with lenses tan, medium to fine sandy SILT (non-plastic) (very moist)		10	7 13 7 9				SS-10: 30' - 32' R=20 N=20
31	2								
32	1								
33	0								
34	-1								
35	-2	Tan-gray, medium to fine SAND, little silt and coarse to fine gravel (angular), trace coarse sand (strong cementation; dense; wet); cobble or boulder	GT	11	28 53 67 100/1"				SS-11: 35' - 37' R=22 N=120 cobble or boulder; augered through
36	-3								
37	-4								
38	-5								
39	-6								
40	-7	Tan-gray, medium to fine SAND, little to some coarse to fine gravel (angular), little silt, trace coarse sand (strong cementation; dense; wet); cobble		12	37 45 100/1"				SS-12: 40' - 42' R=13 N>100 cobble; uugered through
41	-8								
42	-9	--Glacial Till--							
43	-10								
44									

COHESIONLESS SOILS: (DENSITY) L: Sands; R: Gravels
0-6 Very Loose; 6-10 Loose; 11-30 Med-Dense; >30 Dense; Very Dense >50
0-8; 8-15; 16-40; 41-50

COHESIVE SOILS: (CONSISTENCY)
0-2 Very Soft (<0.25 TSF); 2-4 Soft (0.25-0.5 TSF); 4-8 Med. Stiff (0.5-1.0 TSF); 9-20 Stiff (1.0-4.0 TSF); >20 Hard (>4.0 TSF)

Test Boring No. B102

(2 of 3)

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Geotechnical Partnership, Inc.
Swampscott, Massachusetts
Sanford, Maine

PROJECT: Potential New Construction
Lowell High School
Lowell, Massachusetts

CLIENT: Perkins Eastman DPC Boston, MA

File No. 1628

Date Drilled	: 20-24 March 2017
Boring Location	: Refer to Report Figure 2
Drilling Contractor	: Soil Exploration Corp.
	: Leominster, MA
Driller	: P. Goodale
Rock Core	: ---
GPI Field Engineer	: LR Casselli, PE, MASCE CSI
Elevation and Datum	: El. 33 ft.+/- (LCB)
Drilling Mud Utilized	: Not necessary
Constant Water Head	: Water added as needed

Test Boring No. B102

(3 of 3)

Drill Rig Type	: ATV Mounted
Hammer Type	: Auto
Cat-Head or Winch	: NA
Soil Casing Type	: 8 in. OD HSA
Sampler Type	: SS - 1.375 in. I.D.; unlined
Sampler Hammer Fall	: 140 lbs. / 30 in.

Depth in Feet	Elev. in Feet (33)	DESCRIPTIONS	USCS	GRAPHIC	Water Level	Sample No.	Blow Count	Blow Count Graph (10 50)	Average qu-Field	Average qu-Field (TSF) (0 1 2 3 4)	REMARKS
44	-11										
45	-12	Tan-gray, medium to fine SAND, little to some coarse to fine gravel (angular), little silt, trace coarse sand (strong cementation; dense; wet); cobble	GT			13	67				SS-13: 45' - 47' R=10 N>100 cobble, not bedrock; end of boring at 47 ft. P=Penetrometer
46	-13	--Glacial Till--					100/4"				
47	-14	Bottom of Exploration at 47 feet Depth									
48	-15	Particle Size: trace: <5%; few: 5-10%; little: 15-20%; some 30-45%; mostly: 50-100%									
49	-16										
50	-17										
51	-18										
52	-19										
53	-20										
54	-21										
55	-22										
56	-23										
57	-24										
58	-25										
59	-26										
60	-27										
61	-28										
62	-29										
63	-30										
64	-31										
65	-32										
66											

COHESIONLESS SOILS: (DENSITY) L: Sands; R: Gravels
0-6 Very Loose; 6-10 Loose; 11-30 Med-Dense; >30 Dense; Very Dense >50
0-8; 8-15; 16-40; 41-50

COHESIVE SOILS: (CONSISTENCY)
0-2 Very Soft (<0.25 TSF); 2-4 Soft (0.25-0.5 TSF); 4-8 Med. Stiff (0.5-1.0 TSF); 9-20 Stiff (1.0-4.0 TSF); >20 Hard (>4.0 TSF)

Test Boring No. B102

(3 of 3)

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Geotechnical Partnership, Inc.
Swampscott, Massachusetts
Sanford, Maine

PROJECT: Potential New Construction
Lowell High School
Lowell, Massachusetts

CLIENT: Perkins Eastman DPC Boston, MA

File No. 1628

Date Drilled	: 20-24 March 2017
Boring Location	: Refer to Report Figure 2
Drilling Contractor	: Soil Exploration Corp.
	: Leominster, MA
Driller	: P. Goodale
Rock Core	: ---
GPI Field Engineer	: LR Casselli, PE, MASCE CSI
Elevation and Datum	: El. 33.5' (LCB)
Drilling Mud Utilized	: Not necessary
Constant Water Head	: Water added as needed

Test Boring No. B103

(1 of 2)

Drill Rig Type	: ATV Mounted
Hammer Type	: Auto
Cat-Head or Winch	: NA
Soil Casing Type	: 8 in. OD HSA
Sampler Type	: SS - 1.375 in. I.D.; unlined
Sampler Hammer Fall	: 140 lbs. / 30 in.

Depth in Feet	Elev. in Feet (33.5)	DESCRIPTIONS	USCS	Sample No.	Blow Count	Blow Count Graph (10 50)	Average qu-Field	Average qu-Field (TSF) (0 1 2 3 4)	REMARKS
0	33	Concrete (t=3 in.)							Groundwater=12'
									Well Set: no
1	32			1					SS-1: 1' - 3'
		Soil vacuuming to 7 ft. depth							R= N=
2	31								
		Miscellaneous fill							SS-2: 3' - 5'
3	30			2					R= N=
		Cobbles	AR						
4	29								
				3					SS-3: 5' - 7'
5	28								R= N=
6	27	Brown to tan-brown, medium to fine SAND, few to little silt, trace coarse sand (moist)							
7		--Granular Fill--							
	26	8.0 ft.							
8	25	Tan, SiLT (non-plastic), few fine sand (very loose; moist)		4	1 1 2 3				SS-4: 8' - 10' R=7 N=3
9	24								
10	23	Tan to tan-yellow, SILT (non-plastic), little fine sand (medium dense; moist) with lenses tan-yellow, silty fine SAND (moist)	ML	5	3 5 8 9				SS-5: 10' - 12' R=17 N=13 Rust stains at 10'
11	22								
12	21	Tan to tan-yellow, SILT (non-plastic), little fine sand (medium dense; wet) with seams and lenses tan-yellow, silty fine SAND (wet)		6	11 11 13 16				SS-6: 12' - 14' R=22 N=24
13	20	13.5 ft. --Glacial Fluvial--							
14	19	Tan, medium to fine SAND, trace silt and coarse sand (medium dense; wet)							
15	18			7	5 6 6 9				SS-7: 15' - 17' R=13 N=12
16	17	Tan, medium to fine SAND, trace silt and none to trace coarse sand (medium dense; wet)	SP						
17	16								
18	15								
19	14								
20	13	Tan, medium to fine SAND, trace silt and coarse sand (medium dense; wet) 21.0 ft. --Glacial Fluvial--		8	3 5 7 8				SS-8: 20' - 22' R=17 N=12
21	12	Tan, SILT (non-plastic), few fine sand (medium dense; moist) --Glacial Fluvial--	ML						
22									

COHESIONLESS SOILS: (DENSITY) L: Sands; R: Gravels
0-6 Very Loose; 6-10 Loose; 11-30 Med-Dense; >30 Dense; Very Dense
0-8; 8-15; 16-40; 41-50; >50

COHESIVE SOILS: (CONSISTENCY)
0-2 Very Soft (<0.25 TSF); 2-4 Soft (0.25-0.5 TSF); 4-8 Med. Stiff (0.5-1.0 TSF); 9-20 Stiff (1.0-4.0 TSF); >20 Hard (>4.0 TSF)

Test Boring No. B103

(1 of 2)

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Geotechnical Partnership, Inc.
Swampscott, Massachusetts
Sanford, Maine

PROJECT: Potential New Construction
Lowell High School
Lowell, Massachusetts

CLIENT: Perkins Eastman DPC Boston, MA

File No. 1628

Date Drilled	: 20-24 March 2017
Boring Location	: Refer to Report Figure 2
Drilling Contractor	: Soil Exploration Corp.
	: Leominster, MA
Driller	: P. Goodale
Rock Core	: ---
GPI Field Engineer	: LR Casselli, PE, MASCE CSI
Elevation and Datum	: El. 33.5' (LCB)
Drilling Mud Utilized	: Not necessary
Constant Water Head	: Water added as needed

Test Boring No. B103

(2 of 2)

Drill Rig Type	: ATV Mounted
Hammer Type	: Auto
Cat-Head or Winch	: NA
Soil Casing Type	: 8 in. OD HSA
Sampler Type	: SS - 1.375 in. I.D.; unlined
Sampler Hammer Fall	: 140 lbs. / 30 in.

Depth in Feet	Elev. in Feet (33.5)	DESCRIPTIONS	USCS	Sample No.	Blow Count	Blow Count Graph (10 50)	Average qu-Field	Average qu-Field (TSF) (0 1 2 3 4)	REMARKS
22–23	11–10	Tan, SILT (non-plastic), few fine sand (medium dense; moist)							
24–25	9–8				6				
25–26	8–7	Tan, SILT (non-plastic) (medium dense; moist to very moist)	ML	9	6				SS-9: 25' - 27' R=18 N=15
26–27	7–6				9				
27–28	6–5				10				
28–29	5–4								
29–30	4–3	Tan, SILT (non-plastic) (medium dense; moist to very moist) --Glacial Fluvial--			6				SS-10: 30' - 32' R=23 N=9
30–31	3–2	31.0 ft.		10	5				
31–32	2–1	Gray, SILT (non-plastic) (loose; moist to very moist) --Glacial Fluvial--	ML		4				
32–33	1–0				5				Auger grinding on gravel at 34 ft.
33–34	0–-1	34.0 ft.							
34–35	-1–-2				44				SS-11: 35' - 37' R=14 N=15
35–36	-2–-3	Gray, sitly medium to fine SAND, little coarse to fine gravel (sub-angular to angular), trace coarse sand (medium dense; very moist) --Glacial Till--	GT	11	8				
36–37	-3–-4				7				
37–38	-4–-5				20				
38–39	-5–-6	39.0 ft.							Bedrock
39–40	-6–-7	Auger refusal at 39 feet Depth Maximum drill rig crowd pressure applied to auger tip. No advance Auger plug hammered sample: no recovery; hard rock Bedrock	ME						P=Penetrometer
41–42	-8–-9								
42–43	-9–-10								
43–44	-10	Particle Size: trace: <5%; few: 5-10%; little: 15-20%; some 30-45%; mostly: 50-100%							

COHESIONLESS SOILS: (DENSITY) L: Sands; R: Gravels
0-6 Very Loose; 6-10 Loose; 11-30 Med-Dense; >30 Dense; Very Dense
0-8; 8-15; 16-40; 41-50; >50

COHESIVE SOILS: (CONSISTENCY)
0-2 Very Soft (<0.25 TSF); 2-4 Soft (0.25-0.5 TSF); 4-8 Med. Stiff (0.5-1.0 TSF); 9-20 Stiff (1.0-4.0 TSF); >20 Hard (>4.0 TSF)

Test Boring No. B103

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Geotechnical Partnership, Inc.
Swampscott, Massachusetts
Sanford, Maine

PROJECT: Potential New Construction
Lowell High School
Lowell, Massachusetts

CLIENT: Perkins Eastman DPC Boston, MA

File No. 1628

Date Drilled	: 20-24 March 2017
Boring Location	: Refer to Report Figure 2
Drilling Contractor	: Soil Exploration Corp.
	: Leominster, MA
Driller	: P. Goodale
Rock Core	: ---
GPI Field Engineer	: LR Casselli, PE, MASCE CSI
Elevation and Datum	: El. 32.5 ft.+/- (LCB)
Drilling Mud Utilized	: Not necessary
Constant Water Head	: Water added as needed

Test Boring No. B104

(1 of 2)

Drill Rig Type	: ATV Mounted
Hammer Type	: Auto
Cat-Head or Winch	: NA
Soil Casing Type	: 8 in. OD HSA
Sampler Type	: SS - 1.375 in. I.D.; unlined
Sampler Hammer Fall	: 140 lbs. / 30 in.

Depth in Feet	Elev. in Feet	DESCRIPTIONS	USCS	Sample No.	Blow Count	Blow Count Graph (10 – 50)	Average qu-Field	Average qu-Field (TSF) (0 1 2 3 4)	REMARKS
0	32.5	Pavement (t=3 in.)							Groundwater=10'
									Well Set: no
1	31	Air vacuuming to top of exposed foundation wall.		1					SS-1: 1' - 3'
									R= N=
2	30	Masonry wall at 4 ft.		2					SS-2: 3' - 5'
3	29	Augered through to 8 ft.							R= N=
4	28		AR						
5	27			3					SS-3: 5' - 7'
6	26								R= N=
7	25	Tan-brown to brown, silty medium to fine SAND, few coarse to fine gravel (very loose; moist) --Common Fill--							
8	24	8.5 ft.		4	2 3 5 5				SS-4: 8' - 10'
									R=14 N=8
9	23	Tan-yellow, SILT (non-plastic), few to little fine sand (loose; moist) --Glacial Fluvial--	ML						Mottling at 8 ft.
10		10.0 ft.							
	22	Tan, silty fine SAND to fine sandy SILT (non-plastic) (medium dense; wet) --Glacial Fluvial--	SM	5	6 7 8 11				SS-5: 10' - 12'
11	21								R=20 N=15
12		11.5 ft							
	20	Tan to tan-orange, medium to fine SAND, few silt (medium dense; wet)		6	8 10 11 12				SS-6: 12' - 14'
13	19	Tan to tan-orange, medium to fine SAND, few silt (medium dense; wet)							R=24 N=21
14	18								
15	17			7	7 6 7 8				SS-7: 15' - 17'
16	16	Tan and tan-orange, medium to fine SAND, few silt (medium dense; wet)	SP						R=22 N=13
17	15								
18	14								
19	13								
20	12			8	3 4 4 5				SS-8: 20' - 22'
21	11	Tan, medium to fine SAND, trace silt (loose; wet) --Glacial Fluvial--							R=12 N=8
22									

COHESIONLESS SOILS: (DENSITY) L: Sands; R: Gravels
0-6 Very Loose; 6-10 Loose; 11-30 Med-Dense; >30 Dense; Very Dense >50
0-8; 8-15; 16-40; 41-50; >50

COHESIVE SOILS: (CONSISTENCY)
0-2 Very Soft (<0.25 TSF); 2-4 Soft (0.25-0.5 TSF); 4-8 Med. Stiff (0.5-1.0 TSF); 9-20 Stiff (1.0-4.0 TSF); >20 Hard (>4.0 TSF)

Test Boring No. B104

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Geotechnical Partnership, Inc.
Swampscott, Massachusetts
Sanford, Maine

PROJECT: Potential New Construction
Lowell High School
Lowell, Massachusetts

CLIENT: Perkins Eastman DPC Boston, MA

File No. 1628

Date Drilled	: 20-24 March 2017
Boring Location	: Refer to Report Figure 2
Drilling Contractor	: Soil Exploration Corp.
	: Leominster, MA
Driller	: P. Goodale
Rock Core	: ---
GPI Field Engineer	: LR Casselli, PE, MASCE CSI
Elevation and Datum	: El. 32.5 ft.+/- (LCB)
Drilling Mud Utilized	: Not necessary
Constant Water Head	: Water added as needed

Test Boring No. B104

(2 of 2)

Drill Rig Type	: ATV Mounted
Hammer Type	: Auto
Cat-Head or Winch	: NA
Soil Casing Type	: 8 in. OD HSA
Sampler Type	: SS - 1.375 in. I.D.; unlined
Sampler Hammer Fall	: 140 lbs. / 30 in.

Depth in Feet	Elev. in Feet (32.5)	DESCRIPTIONS	USCS	GRAPHIC	Water Level	Sample No.	Blow Count	Blow Count Graph (10 50)	Average qu-Field	Average qu-Field (TSF) (0 1 2 3 4)	REMARKS
22	10	Tan, medium to fine SAND, trace silt (loose; wet)									
23	9										
24	8										
25	7						5				SS-9: 25' - 27'
26	6	Tan, medium to fine SAND, trace silt and coarse sand (medium dense; wet)	SP			9	6				R=15 N=12
27	5						6				
28	4						8				
29	3	Tan, medium to fine SAND, trace silt and coarse sand (wet)									Running sand at 30 ft. depth; unable to continue auger boring.
30	2	--Glacial Fluvial--									
31	1	Bottom of Exploration at 30 feet Depth									P=Penetrometer
32	0										
33	-1										
34	-2										
35	-3										
36	-4										
37	-5										
38	-6										
39	-7										
40	-8										
41	-9										
42	-10										
43	-11										
44											

Particle Size: trace: <5%; few: 5-10%; little: 15-20%; some 30-45%; mostly: 50-100%

COHESIONLESS SOILS: (DENSITY) L: Sands; R: Gravels
0-6 Very Loose; 6-10 Loose; 11-30 Med-Dense; >30 Dense; Very Dense >50
0-8; 8-15; 16-40; 41-50

COHESIVE SOILS: (CONSISTENCY)
0-2 Very Soft (<0.25 TSF); 2-4 Soft (0.25-0.5 TSF); 4-8 Med. Stiff (0.5-1.0 TSF); 9-20 Stiff (1.0-4.0 TSF); >20 Hard (>4.0 TSF)

Test Boring No. B104

(2 of 2)

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Geotechnical Partnership, Inc.
Swampscott, Massachusetts
Sanford, Maine

PROJECT: Potential New Construction
Lowell High School
Lowell, Massachusetts

CLIENT: Perkins Eastman DPC Boston, MA

File No. 1628

Date Drilled	: 20-24 March 2017
Boring Location	: Refer to Report Figure 2
Drilling Contractor	: Soil Exploration Corp.
	: Leominster, MA
Driller	: P. Goodale
Rock Core	: ---
GPI Field Engineer	: LR Casselli, PE, MASCE CSI
Elevation and Datum	: El. 32.3'
Drilling Mud Utilized	: Not necessary
Constant Water Head	: Water added as needed

Test Boring No. B105-well

(1 of 2)

Drill Rig Type	: ATV Mounted
Hammer Type	: Auto
Cat-Head or Winch	: NA
Soil Casing Type	: 8 in. OD HSA
Sampler Type	: SS - 1.375 in. I.D.; unlined
Sampler Hammer Fall	: 140 lbs. / 30 in.

Depth in Feet	Elev. in Feet (32.3)	DESCRIPTIONS	USCS	Sample No.	Blow Count	Blow Count Graph (10 50)	Average qu-Field	Average qu-Field (TSF) (0 1 2 3 4)	REMARKS
0	32	Pavement (t=3 in.)							Groundwater=10.5' 24 hours=10.0 ft. Well Set: yes; 20 ft.
1	31	Air vacuuming to 4 ft. depth to top of foundation wall. Same result in moving over to two other locations here.		1					SS-1: 1' - 3' R= N=
2	30								SS-2: 3' - 5' R= N=
3	29	Auger drilled through foundation wall to 8 ft. depth	AR	2					
4	28								
5	27	Miscellaneous Fill		3					SS-3: 5' - 7' R= N=
6	26								
7	25								SS-4: 8' - 10' R=15 N=12
8	24	8.0 ft. Tan, SILT (non-plastic), few to little fine sand (medium dense; moist)	ML	4	5 6 6 6				Rust lines at 8 ft.
9	23								
10	22	Tan, SILT (non-plastic), little fine sand (medium dense; moist to wet)		5	7 7 10 15				SS-5: 10' - 12' R=22 N=17
11	21	10.5 ft. --Glacial Fluvial-- Tan, medium to fine SAND, trace silt (medium dense; wet)							
12	20			6	11 12 13 15				SS-6: 12' - 14' R=24 N=25
13	19	Tan, medium to fine SAND, trace silt (medium dense; wet)							
14	18								
15	17		SP	7	4 5 7 6				SS-7: 15' - 17' R=24 N=12
16	16	Tan, medium to fine SAND, trace silt and coarse sand (medium dense; wet)							
17	15								
18	14								
19	13	Tan, medium to fine SAND, trace silt (medium dense; wet) --Glacial Fluvial--							
20	12	20.5 ft.		8	5 5 7 9				SS-8: 20' - 22' R=13 N=12
21	11	Gray, medium to fine SAND, trace silt and coarse sand (medium dense; wet) --Glacial Fluvial--	SP						
22									

COHESIONLESS SOILS: (DENSITY) L: Sands; R: Gravels
0-6 Very Loose; 6-10 Loose; 11-30 Med-Dense; >30 Dense; Very Dense
0-8; 8-15; 16-40; 41-50; >50

COHESIVE SOILS: (CONSISTENCY)
0-2 Very Soft (<0.25 TSF); 2-4 Soft (0.25-0.5 TSF); 4-8 Med. Stiff (0.5-1.0 TSF); 9-20 Stiff (1.0-4.0 TSF); >20 Hard (>4.0 TSF)

Test Boring No. B105-well

(1 of 2)

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Geotechnical Partnership, Inc.
Swampscott, Massachusetts
Sanford, Maine

PROJECT: Potential New Construction
Lowell High School
Lowell, Massachusetts

CLIENT: Perkins Eastman DPC Boston, MA

File No. 1628

Date Drilled	: 20-24 March 2017
Boring Location	: Refer to Report Figure 2
Drilling Contractor	: Soil Exploration Corp.
	: Leominster, MA
Driller	: P. Goodale
Rock Core	: ---
GPI Field Engineer	: LR Casselli, PE, MASCE CSI
Elevation and Datum	: El. 32.3'
Drilling Mud Utilized	: Not necessary
Constant Water Head	: Water added as needed

Test Boring No. B105-well

(2 of 2)

Drill Rig Type	: ATV Mounted
Hammer Type	: Auto
Cat-Head or Winch	: NA
Soil Casing Type	: 8 in. OD HSA
Sampler Type	: SS - 1.375 in. I.D.; unlined
Sampler Hammer Fall	: 140 lbs. / 30 in.

Depth in Feet	Elev. in Feet (32.3)	DESCRIPTIONS	USCS	GRAPHIC	Water Level	Sample No.	Blow Count	Blow Count Graph (10 50)	Average qu-Field	Average qu-Field (TSF) (0 1 2 3 4)	REMARKS
22	10	Gray, medium to fine SAND, trace silt and coarse sand (medium dense; wet) --Glacial Fluvial--	SP								
23	9										
24	8	24.0 ft.									Auger grinding on gravel
25	7	Tan-gray, medium to fine sandy SILT (non-plastic), little coarse to fine gravel (angular), trace coarse sand (dense; very moist)	GT			9	11 14 16 21				SS-9: 25' - 27' R=14 N=30
26	6										
27	5										
28	4										
29	3										
30	2	Gray, medium to fine sandy SILT (non-plastic), little coarse to fine gravel (angular), few coarse sand (desiccated; strong cementation; dense; dry to moist); cobble				10	37 42 58 100/1"				SS-10: 30' - 32' R=13 N=100 Cobble, not bedrock
31	1										
32	0	--Glacial Till-- Bottom of Exploration at 32 feet Depth									P=Penetrometer
33	-1										
34	-2										
35	-3										
36	-4										
37	-5										
38	-6										
39	-7										
40	-8										
41	-9										
42	-10										
43	-11	Particle Size: trace: <5%; few: 5-10%; little: 15-20%; some 30-45%; mostly: 50-100%									
44											

COHESIONLESS SOILS: (DENSITY) L: Sands; R: Gravels
0-6 Very Loose; 6-10 Loose; 11-30 Med-Dense; >30 Dense; Very Dense >50
0-8; 8-15; 16-40; 41-50

COHESIVE SOILS: (CONSISTENCY)
0-2 Very Soft (<0.25 TSF); 2-4 Soft (0.25-0.5 TSF); 4-8 Med. Stiff (0.5-1.0 TSF); 9-20 Stiff (1.0-4.0 TSF); >20 Hard (>4.0 TSF)

Test Boring No. B105-well

(2 of 2)

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Geotechnical Partnership, Inc.
Swampscott, Massachusetts
Sanford, Maine

PROJECT: Potential New Construction
Lowell High School
Lowell, Massachusetts

CLIENT: Perkins Eastman DPC Boston, MA

File No. 1628

Date Drilled	: 20-24 March 2017
Boring Location	: Refer to Report Figure 2
Drilling Contractor	: Soil Exploration Corp.
	: Leominster, MA
Driller	: P. Goodale
Rock Core	: ---
GPI Field Engineer	: LR Casselli, PE, MASCE CSI
Elevation and Datum	: El. 34.5 ft.+/- (LCB)
Drilling Mud Utilized	: Not necessary
Constant Water Head	: Water added as needed

Test Boring No. B106

(1 of 2)

Drill Rig Type	: ATV Mounted
Hammer Type	: Auto
Cat-Head or Winch	: NA
Soil Casing Type	: 8 in. OD HSA
Sampler Type	: SS - 1.375 in. I.D.; unlined
Sampler Hammer Fall	: 140 lbs. / 30 in.

Depth in Feet	Elev. in Feet	DESCRIPTIONS	USCS	Sample No.	Blow Count	Blow Count Graph (10 50)	Average qu-Field	Average qu-Field (TSF) (0 1 2 3 4)	REMARKS
0	34.5								Groundwater=5' Well Set: no
0 – 2	34 – 32	Soil vacuuming to 7 ft. depth		1					SS-1: 1' - 3' R= N=
2 – 5	32 – 29	Miscellaneous fill	AR	2					SS-2: 3' - 5' R= N=
				3					SS-3: 5' - 7' R= N=
8	26	Tan, SILT (non-plastic), little fine sand (medium dense; moist) --Common Fill--	AR	4	5 6 8 10				SS-4: 8' - 10' R=13 N=14
9 – 10	25	Gray, medium to fine sandy SILT (non-plastic), little coarse sand and fine gravel (medium dense; very moist) --Common Fill--	AR						
10 – 12	24 – 23	Tan, silty fine SAND (very loose; wet) and dark-brown, SILT LOAM (buried topsoil) (moist) 12.0 ft. --Common Fill--	AR	5	1 1 2 3				SS-5: 10' - 12' R=15 N=3
12 – 13.5	22 – 21	Tan, SILT (non-plastic), little fine sand (medium dense; moist) with lenses tan, fine sandy SILT (non-plastic) (very moist) 13.5 ft. --Glacial Fluvial--	ML	6	7 10 13 19				SS-6: 12' - 14' R=24 N=23
14 – 15	20 – 19	Tan, medium to fine SAND,trace silt (dense; wet)							
15 – 17	19 – 17	Tan to tan-gray, medium to fine SAND, few silt, trace coarse sand (loose to medium dense; wet)	SP	7	5 5 5 7				SS-7: 15' - 17' R=16 N=10
19 – 20.5	15 – 14	Tan-gray, medium to fine SAND, trace silt and coarse sand (dense; wet) --Glacial Fluvial-- 20.5 ft.							
20 – 22	14 – 13	Tan, medium to fine SAND, little to some coarse to fine gravel (sub-angular to angular), trace coarse sand (dense; very moist) --Glacial Till--	GT	8	18 22 43 47				SS-8: 20' - 22' R=20 N=65

COHESIONLESS SOILS: (DENSITY) L: Sands; R: Gravels
0-6 Very Loose
6-10 Loose
11-30 Med-Dense
>30 Dense
0-8
8-15
16-40
41-50
Very Dense >50

COHESIVE SOILS: (CONSISTENCY)
0-2 Very Soft (<0.25 TSF)
2-4 Soft (0.25-0.5 TSF)
4-8 Med. Stiff (0.5-1.0 TSF)
9-20 Stiff (1.0-4.0 TSF)
>20 Hard (>4.0 TSF)

Test Boring No. B106

(1 of 2)

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Geotechnical Partnership, Inc.
Swampscott, Massachusetts
Sanford, Maine

PROJECT: Potential New Construction
Lowell High School
Lowell, Massachusetts

CLIENT: Perkins Eastman DPC Boston, MA

File No. 1628

Date Drilled	: 20-24 March 2017
Boring Location	: Refer to Report Figure 2
Drilling Contractor	: Soil Exploration Corp.
	: Leominster, MA
Driller	: P. Goodale
Rock Core	: ---
GPI Field Engineer	: LR Casselli, PE, MASCE CSI
Elevation and Datum	: El. 34.5 ft.+/- (LCB)
Drilling Mud Utilized	: Not necessary
Constant Water Head	: Water added as needed

Test Boring No. B106

(2 of 2)

Drill Rig Type	: ATV Mounted
Hammer Type	: Auto
Cat-Head or Winch	: NA
Soil Casing Type	: 8 in. OD HSA
Sampler Type	: SS - 1.375 in. I.D.; unlined
Sampler Hammer Fall	: 140 lbs. / 30 in.

Depth in Feet	Elev. in Feet (34.5)	DESCRIPTIONS	USCS	Sample No.	Blow Count	Blow Count Graph (10 50)	Average qu-Field	Average qu-Field (TSF) (0 1 2 3 4)	REMARKS
22–25	12–9	Tan, medium to fine SAND, little to some coarse to fine gravel (sub-angular to angular), trace coarse sand (dense; very moist) --Glacial Till--	GT	9	25 47 61 70				SS-9: 25' - 27' R=23 N=108
26	8	26.0 ft. Gray, silty medium to fine SAND, little to some coarse to fine gravel (sub-angular to angular), few coarse sand (desiccated; strong cementation; dense; dry to moist)							
27–30	7–4								
30–32	4–2	Gray, silty medium to fine SAND, little coarse to fine gravel (angular), few coarse sand (desiccated; strong cementation; dense; dry to moist)	GT	10	43 55 53 67				SS-10: 30' - 32' R=19 N=108
33–35	1–(-1)								
35–37	-1–(-3)	Gray, silty medium to fine SAND, few coarse to fine gravel (angular), trace coarse sand (desiccated; strong cementation; dense; dry to moist) --Glacial Till-- 38.0 ft.		11	27 33 47 41				SS-11: 35' - 37' R=17 N=80
38–44	-4–-9	Auger refusal at 32 feet Depth Full crowd pressure of the drill rig applied to auger tip, no advance. Auger plug hammered sample attempted: no recovery, hard rock Bedrock	ME						Bedrock P=Penetrometer

Particle Size: trace: <5%; few: 5-10%; little: 15-20%; some 30-45%; mostly: 50-100%

COHESIONLESS SOILS: (DENSITY) L: Sands; R: Gravels
0-6 Very Loose; 6-10 Loose; 11-30 Med-Dense; >30 Dense; Very Dense >50
0-8; 8-15; 16-40; 41-50

COHESIVE SOILS: (CONSISTENCY)
0-2 Very Soft (<0.25 TSF); 2-4 Soft (0.25-0.5 TSF); 4-8 Med. Stiff (0.5-1.0 TSF); 9-20 Stiff (1.0-4.0 TSF); >20 Hard (>4.0 TSF)

Test Boring No. B106

(2 of 2)

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Geotechnical Partnership, Inc.
Swampscott, Massachusetts
Sanford, Maine

PROJECT: Potential New Construction
Lowell High School
Lowell, Massachusetts

CLIENT: Perkins Eastman DPC Boston, MA

File No. 1628

Date Drilled	: 20-24 March 2017
Boring Location	: Refer to Report Figure 2
Drilling Contractor	: Soil Exploration Corp.
	: Leominster, MA
Driller	: P. Goodale
Rock Core	: ---
GPI Field Engineer	: LR Casselli, PE, MASCE CSI
Elevation and Datum	: El. 35'+/- (LCB)
Drilling Mud Utilized	: Not necessary
Constant Water Head	: Water added as needed

Test Boring No. B107

(1 of 2)

Drill Rig Type	: ATV Mounted
Hammer Type	: Auto
Cat-Head or Winch	: NA
Soil Casing Type	: 8 in. OD HSA
Sampler Type	: SS - 1.375 in. I.D.; unlined
Sampler Hammer Fall	: 140 lbs. / 30 in.

Depth in Feet	Elev. in Feet	DESCRIPTIONS	USCS	Sample No.	Blow Count	Average qu-Field	REMARKS
0	35	Topsoil (t=6")					Groundwater=9.5'
							Well Set: no
							Canal base=14'+/-
1	34			1	1 2 2 2		SS-1: 1' - 3' R=14 N=4
2	33	Tan, SILT (non-plastic), little fine sand (very loose; dry)					
3	32			2	2 1 1 2		SS-2: 3' - 5' R=16 N=2
4	31	Tan and dark-brown, SILT (non-plastic), little fine sand, trace coarse sand and fine gravel (very loose; dry)	AR				
5	30			3	1 1 1 2		SS-3: 5' - 7' R=19 N=2
6	29	Tan, SILT (non-plastic), little fine sand (very loose; moist)					
7	28			4	2 1 1 2		SS-4: 7' - 9' R=15 N=2
8	27	Tan-gray, SILT (non-plastic), little fine sand (very loose; moist)					
		--Common Fill--					
9	26	9.5 ft.					
10	25	Dark-brown to brown, ORGANIC SILT (soft to medium stiff; moist)	OH	5	woh 1 2 8	0.7	SS-5: 10' - 12' R=20 N=3 **P=0.7 TSF@10.5**
		--Organics--					
11	24	11.0 ft.					
12	23	Tan, silty fine SAND (medium dense; wet) with lenses tan, SILT (non-plastic), little to some fine sand (wet)	SM	6	10 10 12 18		SS-6: 12' - 14' R=24 N=22
		--Glacial Fluvial--					
13	22	13.5 ft.					
14	21	Tan, medium to fine SAND, trace silt and coarse sand (medium dense; wet)					
15	20			7	7 7 9 13		SS-7: 15' - 17' R=15 N=16
16	19	Tan, medium to fine SAND, trace to few coarse sand, trace silt (medium dense; wet)					
17	18		SP				
18	17						
19	16						
20	15	Tan to tan-brown, medium to fine SAND, trace silt and coarse sand (medium dense; wet)					SS-8: 20' - 22' R= 21 N=40
		20.5 ft. --Glacial Fluvial--		8	11 20 20 18		
21	14	Tan to tan-orange, SILT (non-plastic) and silty medium to fine SAND, some coarse to fine gravel (sub-angular to angular), few coarse sand (dense; wet)	GT				
22		--Glacial Till--					

Blow Count Graph: 10 50

Average qu-Field (TSF): 0 1 2 3 4

COHESIONLESS SOILS: 0-6 Very Loose 0-8
(DENSITY) 6-10 Loose 8-15
L: Sands; R: Gravels 11-30 Med-Dense 16-40
>30 Dense 41-50
Very Dense >50

COHESIVE SOILS: 0-2 Very Soft (<0.25 TSF)
(CONSISTENCY) 2-4 Soft (0.25-0.5 TSF)
4-8 Med. Stiff (0.5-1.0 TSF)
9-20 Stiff (1.0-4.0 TSF)
>20 Hard (>4.0 TSF)

Test Boring No. B107

(1 of 2)

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Geotechnical Partnership, Inc.
Swampscott, Massachusetts
Sanford, Maine

PROJECT: Potential New Construction
Lowell High School
Lowell, Massachusetts

CLIENT: Perkins Eastman DPC Boston, MA

File No. 1628

Date Drilled	: 20-24 March 2017
Boring Location	: Refer to Report Figure 2
Drilling Contractor	: Soil Exploration Corp.
	: Leominster, MA
Driller	: P. Goodale
Rock Core	: ---
GPI Field Engineer	: LR Casselli, PE, MASCE CSI
Elevation and Datum	: El. 35'+/- (LCB)
Drilling Mud Utilized	: Not necessary
Constant Water Head	: Water added as needed

Test Boring No. B107
(2 of 2)

Drill Rig Type	: ATV Mounted
Hammer Type	: Auto
Cat-Head or Winch	: NA
Soil Casing Type	: 8 in. OD HSA
Sampler Type	: SS - 1.375 in. I.D.; unlined
Sampler Hammer Fall	: 140 lbs. / 30 in.

Depth in Feet	Elev. in Feet	DESCRIPTIONS	USCS	Sample No.	Blow Count	Blow Count Graph (10 50)	Average qu-Field	Average qu-Field (TSF) (0 1 2 3 4)	REMARKS
22	13	Tan to tan-orange, SILT (non-plastic) and silty medium to fine SAND, some coarse to fine gravel (sub-angular to angular), few coarse sand (dense; wet)							
23	12								
24	11								
25	10	Tan, medium to fine sandy SILT (non-plastic), some coarse to fine gravel (sub-angular to angular), few coarse sand (strong cementation; dense; wet)	GT	9	13 34 31 28				SS-9: 25' - 27' R=16 N=65
26	9	--Glacial Till--							
27	8								
28	7								
29	6								
30	5	30.3 ft.							
31	4	Auger and split spoon refusal at 30.3 ft.. Maximum crowd pressure of drill rig applied on auger; hammered auger plug rock sample attempted: no rock recovery, hard rock Likely top of bedrock at 30.3 ft.		10	100/3"				SS-10: 30' - 32' R=0 N>100 Likely bedrock P=Penetrometer
32	3								
33	2								
34	1								
35	0								
36	-1		ME						
37	-2								
38	-3								
39	-4								
40	-5								
41	-6								
42	-7								
43	-8								
44									

Particle Size: trace: <5%; few: 5-10%; little: 15-20%; some 30-45%; mostly: 50-100%

COHESIONLESS SOILS: (DENSITY) L: Sands; R: Gravels
0-6 Very Loose
6-10 Loose
11-30 Med-Dense
>30 Dense
0-8
8-15
16-40
41-50
Very Dense >50

COHESIVE SOILS: (CONSISTENCY)
0-2 Very Soft (<0.25 TSF)
2-4 Soft (0.25-0.5 TSF)
4-8 Med. Stiff (0.5-1.0 TSF)
9-20 Stiff (1.0-4.0 TSF)
>20 Hard (>4.0 TSF)

Test Boring No. B107
(2 of 2)

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Geotechnical Partnership, Inc.
Swampscott, Massachusetts
Sanford, Maine

PROJECT: Potential New Construction
Lowell High School
Lowell, Massachusetts

CLIENT: Perkins Eastman DPC Boston, MA

File No. 1628

Date Drilled	: 20-24 March 2017
Boring Location	: Refer to Report Figure 2
Drilling Contractor	: Soil Exploration Corp.
	: Leominster, MA
Driller	: P. Goodale
Rock Core	: ---
GPI Field Engineer	: LR Casselli, PE, MASCE CSI
Elevation and Datum	: El. 34.7 ft. (LCB)
Drilling Mud Utilized	: Not necessary
Constant Water Head	: Water added as needed

Test Boring No. B108

(1 of 1)

Drill Rig Type	: ATV Mounted
Hammer Type	: Auto
Cat-Head or Winch	: NA
Soil Casing Type	: 8 in. OD HSA
Sampler Type	: SS - 1.375 in. I.D.; unlined
Sampler Hammer Fall	: 140 lbs. / 30 in.

Depth in Feet	Elev. in Feet	DESCRIPTIONS	USCS	Sample No.	Blow Count	Blow Count Graph (10 50)	Average qu-Field	Average qu-Field (TSF) (0 1 2 3 4)	REMARKS
0	34.7								Groundwater=8' Well Set: no
0	34	Soil vacuuming to 7 ft. depth:		1					SS-1: 1' - 3' R= N=
2	33								
3	32								SS-2: 3' - 5' R= N=
4	31		AR	2					
5	30	Miscellaneous Fill							SS-3: 5' - 7' R= N=
6	29			3					
7	28								SS-4: 8' - 10' R=15 N=5
8	27								
9	26	Tan, SILT (non-plastic), few to little fine sand (very loose; very moist) --Common Fill-- 9.0 ft.	AR	4	1 2 3 3				
10	25	Tan to tan-brown, medium to fine SAND, few silt (loose; wet)	SP	5	5 8 13 47				SS-5: 10' - 12' R=19 N=21
11	24	Tan to tan-brown, medium to fine SAND, few silt, coarse sand and fine gravel (medium dense; wet) --Glacial Fluvial-- 11.0 ft.							
12	23			6	52 48 37 22				SS-6: 12' - 14' R=15 N=85
13	22								
14	21	Tan, silty medium to fine SAND, little coarse to fine gravel (angular), trace coarse sand (dense; very moist)							
15	20			7	17 18 21 15				SS-7: 15' - 17' R=20 N=39
16	19		GT						
17	18	Tan, medium to fine SAND, little to some coarse to fine gravel (angular), little silt, few coarse sand (dense; very moist)							
18	17								
19	16								
20	15	Tan, medium to fine SAND, few to little coarse to fine gravel (sub-angular to angular), little silt, trace coarse sand (dense; very moist) 21.4 ft. --Glacial Till--		8	18 21 100/5"				SS-8: 20' - 22' R=17 N>100
21	14								
22	13	Auger refusal at full drill rig crowd pressure. Auger plug hammered sample: no recovery hard rock; Bedrock	ME						Bedrock
23	12								P=Penetrometer
24	11	Particle Size: trace: <5%; few: 5-10%; little: 15-20%; some 30-45%; mostly: 50-100%							

COHESIONLESS SOILS: (DENSITY) L: Sands; R: Gravels
0-6 Very Loose; 6-10 Loose; 11-30 Med-Dense; >30 Dense; Very Dense >50
0-8; 8-15; 16-40; 41-50; >50

COHESIVE SOILS: (CONSISTENCY)
0-2 Very Soft (<0.25 TSF); 2-4 Soft (0.25-0.5 TSF); 4-8 Med. Stiff (0.5-1.0 TSF); 9-20 Stiff (1.0-4.0 TSF); >20 Hard (>4.0 TSF)

Test Boring No. B108

(1 of 1)

03-25-2017 C:\Documents and Settings\Owner\My Documents\M-Tech\samples\1628 B108-42.bor

Geotechnical Partnership, Inc.
Swampscott, Massachusetts
Sanford, Maine

PROJECT: Potential New Construction
Lowell High School
Lowell, Massachusetts

CLIENT: Perkins Eastman DPC Boston, MA

File No. 1628

Date Drilled	: 20-24 March 2017
Boring Location	: Refer to Report Figure 2
Drilling Contractor	: Soil Exploration Corp.
	: Leominster, MA
Driller	: P. Goodale
Rock Core	: ---
GPI Field Engineer	: LR Casselli, PE, MASCE CSI
Elevation and Datum	: El. 35'.3+/- (LCB)
Drilling Mud Utilized	: Not necessary
Constant Water Head	: Water added as needed

Test Boring No. B109

(1 of 1)

Drill Rig Type	: ATV Mounted
Hammer Type	: Auto
Cat-Head or Winch	: NA
Soil Casing Type	: 8 in. OD HSA
Sampler Type	: SS - 1.375 in. I.D.; unlined
Sampler Hammer Fall	: 140 lbs. / 30 in.

Depth in Feet	Elev. in Feet (35.3)	DESCRIPTIONS	USCS	Sample No.	Blow Count	Blow Count Graph (10 50)	Average qu-Field	Average qu-Field (TSF) (0 1 2 3 4)	REMARKS
0	35	Tan, SILT (non-plastic), little fine sand (very loose; dry) with lenses tan, silty fine SAND (dry)	AR	1	1 1 1 1				Groundwater=9.5' Well Set: no Canal base=14'+/- SS-1: 1' - 3' R=18 N=2
1	34								
2	33								
3	32	Tan, SILT (non-plastic), little fine sand (very loose; dry)		2	1 1 1 1				SS-2: 3' - 5' R=16 N=2
4	31								
5	30	Tan, SILT (non-plastic), little fine sand, few coarse to fine gravel, trace coarse sand (loose; moist) --Common Fill--		3	2 2 4 4				SS-3: 5' - 7' R=15 N=6
6	29								
7	28	7.0 ft.							
8	27	Tan, SILT (non-plastic), little medium to fine sand, none to few coarse to fine gravel, trace coarse sand (medium dense; moist to very moist) --Glacial Fluvial--	ML	4	4 6 13 13				SS-4: 7' - 9' R=17 N=19
9	26	9.5 ft.							
10	25	Tan, coarse to fine GRAVEL (angular), some to mostly medium to fine sandy SILT (non-plastic), few coarse sand (dense; wet)	GT	5	12 21 75 56				SS-5: 10' - 12' R=22 N=96
11	24								
12	23	Tan to tan-gray, SILT (non-plastic) and medium to fine sandy SILT (non-plastic), some coarse to fine gravel (angular), few coarse sand (desiccated; strong cementation; dense; dry) --Glacial Till--		6	30 57 74 63				SS-6: 12' - 14' R=19 N=131
13	22								
14	21								
15	20	15.5 ft.		7	24 29 48 40				SS-7: 15' - 17' R=23 N=77
16	19	Dark-gray, highly WEATHERED ROCK (dense; moist); recognizable degraded schist rock alternating with completely weathered rock --Weathered Rock--	ME						P=Penetrometer
17	18	18.0 ft.							
18	17	Auger refusal at maximum drill rig crowd pressure							
19	16	Hammered auger plug intact rock sample (4"x4"x3") retrieved at 18 ft. depth: Dark-gray, hard, SCHIST	ME						
20	15	End of sampling at 18.3 ft. depth							
21	14								
22		Particle Size: trace: <5%; few: 5-10%; little: 15-20%; some 30-45%; mostly: 50-100%							

COHESIONLESS SOILS: (DENSITY) L: Sands; R: Gravels	0-6 Very Loose 6-10 Loose 11-30 Med-Dense >30 Dense Very Dense	0-8 8-15 16-40 41-50 >50
COHESIVE SOILS: (CONSISTENCY)	0-2 Very Soft (<0.25 TSF) 2-4 Soft (0.25-0.5 TSF) 4-8 Med. Stiff (0.5-1.0 TSF) 9-20 Stiff (1.0-4.0 TSF) >20 Hard (>4.0 TSF)	

Test Boring No. B109

(1 of 1)

03-25-2017 C:\Documents and Settings\Owner\My Documents\M-Tech\samples\1628 B109-42.bor

FINAL REPORT
FOR
LOWELL HIGH SCHOOL
PSR PRICING NARRATIVE
HAZARDOUS MATERIALS IDENTIFICATION STUDY
PERKINS EASTMAN PROJECT # 67150.01

PROJECT NO: 218 115.00

Survey Dates:
September 19 – October 12, 2016
March-April 2017

Revised for Pricing
March 28, 2018

CONDUCTED BY:

UNIVERSAL ENVIRONMENTAL CONSULTANTS
12 Brewster Road
Framingham, MA 01702

UEC universal environmental consultants

March 28, 2018

Ms. Alicia Caritano, Senior Associate
Perkins Eastman
20 Ashburton Place, Floor 8
Boston, MA 02108

Reference: Report for Hazardous Materials Identification Study
Lowell High School, Lowell, MA - PE# 67150.01
PSR Pricing Narrative

Dear Ms. Caritano:

Thank you for the opportunity for Universal Environmental Consultants (UEC) to provide professional services.

Enclosed please find the report for the hazardous materials identification study at the Lowell High School, Lowell, MA.

Please do not hesitate to call should you have any questions.

Very truly yours,

Universal Environmental Consultants

_____
Ammar M. Dieb
President

UEC:\217 109.00\Report.DOC

Enclosure

1.0 INTRODUCTION:

Universal Environmental Consultants (UEC) has been providing comprehensive asbestos services since 2001 and has completed projects throughout New England. We have completed projects for a variety of clients including commercial, industrial, municipal, and public and private schools. We maintain appropriate asbestos licenses and staff with a minimum of twenty-nine years of experience.

UEC was contracted by Perkins Eastman to conduct the following services at the Lowell High School, Lowell, MA:

- Asbestos Containing Materials (ACM) determination inspection and sampling;
- Polychlorinated Biphenyls (PCB's)-Electrical Equipment and Light Fixtures inspection;
- PCB's Caulking Inspection;
- Lead Based Paint (LBP) inspection;
- Mercury in Rubber Flooring inspection and sampling;
- Airborne Mold inspection and sampling;
- Radon sampling;

The following buildings/wings were included in the study as follows:

- 1922 Building Compromised of 1892 Original Building, 1922 addition and 1997 addition;
- 1980 Building Compromised of Lord Building /Field House;

The scope of work included the inspection of accessible ACM, collection of bulk samples from materials suspected to contain asbestos, determination and quantities of types of ACM found and cost estimates for remediation. A comprehensive survey per the Environmental Protection Agency (EPA) NESHAP regulation would be required prior to any renovation or demolition activities.

Selective destructive investigation was performed on the interior and exterior of the school. Interior and exterior investigation was performed at the 1922 Building.

Bulk samples analyses for asbestos were performed using the standard Polarized Light Microscopy (PLM) Method in accordance with EPA standard. Bulk samples were collected by Massachusetts licensed asbestos inspectors Mr. Leonard J. Busa (AI-030673) and Mr. Jason Becotte (AI-034963) and analyzed by Massachusetts licensed laboratories Asbestos Identification Laboratory and EMSL, Woburn, MA.

Mercury in rubber flooring sample was analyzed by an EPA approved laboratory EMSL, Cinnaminson, NJ.

Airborne mold samples were analyzed by an EPA approved laboratory EMSL, Woburn, MA.

Radon samples were analyzed by an EPA licensed laboratory AccuStar, Medway, MA.

Samples results are attached.

2.0 FINDINGS:

Asbestos Containing Materials (ACM):
The regulations for asbestos inspection are based on representative sampling. It would be impractical and costly to sample all materials in all areas. Therefore, representative samples of each homogenous area were collected and analyzed or assumed.

All suspect materials were grouped into homogenous areas. By definition, a homogenous area is one in which the materials are evenly mixed and similar in appearance and texture throughout. A homogeneous area shall be determined to contain asbestos based on findings that the results of at least one sample collected from that area

shows that asbestos is present in an amount greater than 1 percent in accordance with EPA regulations. Per the Department of Environmental Protection (DEP) any amount of asbestos found must be disposed as asbestos. No additional suspect and accessible ACM were found during this survey. However, hidden ACM may be found during the renovation and demolition activities.

Number of Samples Collected:
1922 Building:

September 19 – October 12, 2016

Ninety-eight (98) bulk samples were collected from materials suspected of containing asbestos, including:

Type and Location of Suspect Material

1. Bedding/adhesive for ceramic floor at basement custodian room
2. Cementitious painted floor at basement main corridor
3. Lab table at classroom 314
4. Adhesive for tectum wall panel at basement heating room 23
5. Adhesive for tectum wall panel at basement heating room 23
6. White fire block above ceiling at basement heating room 23
7. Grey duct sealant at teacher's center attic
8. Lime/grey duct sealant at attic
9. Insulation inside wood fire door type I at basement stairwell
10. Insulation inside wood fire door type II at second floor auditorium lobby
11. White brick mortar at teacher's center attic
12. Fireproofing at auditorium lobby
13. Fireproofing at auditorium lobby
14. Hard tan glazing caulking for vision lite in wood door at classroom 133
15. Soft black glazing caulking for borrowed lite at second floor
16. Hard grey glazing caulking for borrowed lite at second floor
17. Hard grey glazing caulking for borrowed lite at second floor
18. Soft black glazing caulking for borrowed lite at first floor
19. 2' x 2' Suspended acoustical ceiling tile at band storage room
20. 2' x 2' Suspended acoustical ceiling tile at auditorium lobby
21. 2' x 2' Suspended acoustical ceiling tile at teacher's center
22. Blue/dark grey spot linoleum floor covering at classroom 017
23. Grey spot linoleum floor covering at bridge I
24. Light grey spot linoleum floor covering at bridge II (new bridge)
25. Adhesive for grey spot linoleum floor covering at bridge I
26. Joint compound at classroom 12
27. Joint compound at heating room 23
28. Ceiling joint compound at basement custodian area
29. Joint compound at first floor by room 139
30. Joint compound at basement small mechanical room
31. Joint compound at teacher's center hall
32. Joint compound at hallway outside lockers by room 136
33. Joint compound at custodian closet by room 223
34. Joint compound behind ceramic wall tile at second floor elevator
35. Grey/brown grey/white vinyl floor tile at upper level above teacher's center
36. Adhesive for grey/brown grey/white vinyl floor tile at upper level above teacher's center
37. Grey/brown grey/white vinyl floor tile at upper level above teacher's center
38. Adhesive for grey/brown grey/white vinyl floor tile at upper level above teacher's center
39. Dark blue vinyl floor tile at classroom 105 closet
40. Adhesive for dark blue vinyl floor tile at classroom 105 closet
41. Dark blue vinyl floor tile at teacher's center kitchen

42. Adhesive for dark blue vinyl floor tile at teacher's center kitchen
43. Dark blue vinyl floor tile at classroom 28
44. Light blue vinyl floor tile at ROTC storage room
45. Caramel vinyl floor tile at third floor plant room top of stairwell I
46. Adhesive for caramel vinyl floor tile at third floor plant room top of stairwell I
47. White/black grey vinyl floor tile at end of bridge
48. White/blue spots vinyl floor tile at hallway outside teacher's center
49. Mastic for white/blue spots vinyl floor tile at hallway outside teacher's center
50. Sea green vinyl floor tile at hallway outside teacher's center
51. Mastic for sea green vinyl floor tile at hallway outside teacher's center
52. White/blue spots vinyl floor tile at classroom 314
53. White/blue spots vinyl floor tile at basement ROTC hall
54. Mastic for white/blue spots vinyl floor tile at basement ROTC hall
55. Mastic for white/blue spots vinyl floor tile at basement ROTC hall
56. Light grey/white vinyl floor tile at basement stairwell
57. Mastic for light grey/white vinyl floor tile at basement stairwell
58. Vinyl floor tile under plywood/carpet at classroom 117
59. Mastic for vinyl floor tile under plywood/carpet at classroom 117
60. Vinyl floor tile under plywood/carpet at storage room 126-A
61. Mastic for vinyl floor tile under plywood/carpet at storage room 126-A
62. Ceiling plaster at third floor custodian closet
63. Ceiling plaster at basement band room
64. Glue daub for ceiling plaster at basement band room
65. Wall plaster at teacher's center
66. Wall plaster at auditorium
67. Wall plaster at third floor stairwell
68. Wall plaster at classroom 105
69. Wall plaster at classroom 110
70. Wall plaster at classroom 223
71. Wall plaster at main corridor by classroom 220
72. Wall plaster at main corridor by classroom 321
73. Fireproofing at hallway by classroom 352
74. Hard tan glazing caulking for vision lite in wood door at classroom 323
75. Joint compound behind ceramic wall tile at boy's room by room 203
76. Hard black lab table at classroom 304
77. Slate chalkboard at classroom 329
78. White residue on slate chalkboard at classroom 329
79. Wall plaster at classroom 304
80. Concrete slab under hardwood floor at rear hallway of room 220-C
81. Hard tan glazing caulking for vision lite in wood door at classroom 131
82. Hard grey glazing caulking for vision lite in metal door at first floor stairwell
83. Hard grey glazing caulking for vision lite in metal door at second floor stairwell
84. Hard grey glazing caulking for vision lite in metal door at rear hallway
85. Exterior window framing caulking
86. Exterior window framing caulking
87. Exterior window framing caulking
88. Exterior window framing caulking
89. Exterior window framing caulking
90. Exterior window framing caulking
91. Exterior door framing caulking
92. Exterior residue door framing caulking on brick
93. Exterior door framing caulking
94. Exterior horizontal white caulking in sill
95. Exterior horizontal white caulking in sill
96. Blue/dark grey spot linoleum floor covering at Coburn basement stairwell

97. Adhesive for blue/dark grey spot linoleum floor covering at Coburn basement stairwell
98. Grey spot linoleum floor covering at bridge I

Sample Results:

Type and Location of Suspect Material	Sample Result
1. Bedding/adhesive for ceramic floor at basement custodian room	No Asbestos Detected
2. Cementitious painted floor at basement main corridor	No Asbestos Detected
3. Lab table at classroom 314	20% Asbestos
4. Adhesive for tectum wall panel at basement heating room 23	No Asbestos Detected
5. Adhesive for tectum wall panel at basement heating room 23	No Asbestos Detected
6. White fire block above ceiling at basement heating room 23	No Asbestos Detected
7. Grey duct sealant at teacher's center attic	No Asbestos Detected
8. Lime/grey duct sealant at attic	No Asbestos Detected
9. Insulation inside wood fire door type I at basement stairwell	No Asbestos Detected
10. Insulation inside wood fire door type II at second floor auditorium lobby	No Asbestos Detected
11. White brick mortar at teacher's center attic	No Asbestos Detected
12. Fireproofing at auditorium lobby	No Asbestos Detected
13. Fireproofing at auditorium lobby	No Asbestos Detected
14. Hard tan glazing caulking for vision lite in wood door at classroom 133	No Asbestos Detected
15. Soft black glazing caulking for borrowed lite at second floor	3% Asbestos
16. Hard grey glazing caulking for borrowed lite at second floor	2% Asbestos
17. Hard grey glazing caulking for borrowed lite at second floor	No Asbestos Detected
18. Soft black glazing caulking for borrowed lite at first floor	No Asbestos Detected
19. 2' x 2' Suspended acoustical ceiling tile at band storage room	No Asbestos Detected
20. 2' x 2' Suspended acoustical ceiling tile at auditorium lobby	No Asbestos Detected
21. 2' x 2' Suspended acoustical ceiling tile at teacher's center	No Asbestos Detected
22. Blue/dark grey spot linoleum floor covering at classroom 017	No Asbestos Detected
23. Grey spot linoleum floor covering at bridge I	No Asbestos Detected
24. Light grey spot linoleum floor covering at bridge II (new bridge)	No Asbestos Detected
25. Adhesive for grey spot linoleum floor covering at bridge I	No Asbestos Detected
26. Joint compound at classroom 12	No Asbestos Detected
27. Joint compound at heating room 23	No Asbestos Detected
28. Ceiling joint compound at basement custodian area	No Asbestos Detected
29. Joint compound at first floor by room 139	No Asbestos Detected
30. Joint compound at basement small mechanical room	No Asbestos Detected
31. Joint compound at teacher's center hall	No Asbestos Detected
32. Joint compound at hallway outside lockers by room 136	No Asbestos Detected
33. Joint compound at custodian closet by room 223	No Asbestos Detected
34. Joint compound behind ceramic wall tile at second floor elevator	No Asbestos Detected
35. Grey/brown grey/white vinyl floor tile at upper level above teacher's center	No Asbestos Detected
36. Adhesive for grey/brown grey/white vinyl floor tile at upper level above teacher's center	No Asbestos Detected
37. Grey/brown grey/white vinyl floor tile at upper level above teacher's center	No Asbestos Detected
38. Adhesive for grey/brown grey/white vinyl floor tile at upper level above teacher's center	No Asbestos Detected
39. Dark blue vinyl floor tile at classroom 105 closet	No Asbestos Detected
40. Adhesive for dark blue vinyl floor tile at classroom 105 closet	No Asbestos Detected
41. Dark blue vinyl floor tile at teacher's center kitchen	No Asbestos Detected
42. Adhesive for dark blue vinyl floor tile at teacher's center kitchen	No Asbestos Detected
43. Dark blue vinyl floor tile at classroom 28	No Asbestos Detected
44. Light blue vinyl floor tile at ROTC storage room	No Asbestos Detected
45. Caramel vinyl floor tile at third floor plant room top of stairwell I	No Asbestos Detected
46. Adhesive for caramel vinyl floor tile at third floor plant room top of stairwell I	No Asbestos Detected
47. White/black grey vinyl floor tile at end of bridge	No Asbestos Detected
48. White/blue spots vinyl floor tile at hallway outside teacher's center	No Asbestos Detected

49. Mastic for white/blue spots vinyl floor tile at hallway outside teacher's center	No Asbestos Detected
50. Sea green vinyl floor tile at hallway outside teacher's center	No Asbestos Detected
51. Mastic for sea green vinyl floor tile at hallway outside teacher's center	No Asbestos Detected
52. White/blue spots vinyl floor tile at classroom 314	No Asbestos Detected
53. White/blue spots vinyl floor tile at basement ROTC hall	No Asbestos Detected
54. Mastic for white/blue spots vinyl floor tile at basement ROTC hall	No Asbestos Detected
55. Mastic for white/blue spots vinyl floor tile at basement ROTC hall	No Asbestos Detected
56. Light grey/white vinyl floor tile at basement stairwell	2% Asbestos
57. Mastic for light grey/white vinyl floor tile at basement stairwell	No Asbestos Detected
58. Vinyl floor tile under plywood/carpet at classroom 117	No Asbestos Detected
59. Mastic for vinyl floor tile under plywood/carpet at classroom 117	5% Asbestos
60. Vinyl floor tile under plywood/carpet at storage room 126-A	No Asbestos Detected
61. Mastic for vinyl floor tile under plywood/carpet at storage room 126-A	3% Asbestos
62. Ceiling plaster at third floor custodian closet	No Asbestos Detected
63. Ceiling plaster at basement band room	No Asbestos Detected
64. Glue daub for ceiling plaster at basement band room	3% Asbestos
65. Wall plaster at teacher's center	No Asbestos Detected
66. Wall plaster at auditorium	No Asbestos Detected
67. Wall plaster at third floor stairwell	No Asbestos Detected
68. Wall plaster at classroom 105	No Asbestos Detected
69. Wall plaster at classroom 110	No Asbestos Detected
70. Wall plaster at classroom 223	No Asbestos Detected
71. Wall plaster at main corridor by classroom 220	No Asbestos Detected
72. Wall plaster at main corridor by classroom 321	No Asbestos Detected
73. Fireproofing at hallway by classroom 352	No Asbestos Detected
74. Hard tan glazing caulking for vision lite in wood door at classroom 323	No Asbestos Detected
75. Joint compound behind ceramic wall tile at boy's room by room 203	No Asbestos Detected
76. Hard black lab table at classroom 304	No Asbestos Detected
77. Slate chalkboard at classroom 329	No Asbestos Detected
78. White residue on slate chalkboard at classroom 329	No Asbestos Detected
79. Wall plaster at classroom 304	No Asbestos Detected
80. Concrete slab under hardwood floor at rear hallway of room 220-C	No Asbestos Detected
81. Hard tan glazing caulking for vision lite in wood door at classroom 131	No Asbestos Detected
82. Hard grey glazing caulking for vision lite in metal door at first floor stairwell	2% Asbestos
83. Hard grey glazing caulking for vision lite in metal door at second floor stairwell	No Asbestos Detected
84. Hard grey glazing caulking for vision lite in metal door at rear hallway	2% Asbestos
85. Exterior window framing caulking	No Asbestos Detected
86. Exterior window framing caulking	No Asbestos Detected
87. Exterior window framing caulking	No Asbestos Detected
88. Exterior window framing caulking	No Asbestos Detected
89. Exterior window framing caulking	No Asbestos Detected
90. Exterior window framing caulking	No Asbestos Detected
91. Exterior door framing caulking	2% Asbestos
92. Exterior residue door framing caulking on brick	2% Asbestos
93. Exterior door framing caulking	2% Asbestos
94. Exterior horizontal white caulking in sill	No Asbestos Detected
95. Exterior horizontal white caulking in sill	No Asbestos Detected
96. Blue/dark grey spot linoleum floor covering at Coburn basement stairwell	No Asbestos Detected
97. Adhesive for blue/dark grey spot linoleum floor covering at Coburn basement stairwell	No Asbestos Detected
98. Grey spot linoleum floor covering at bridge I	No Asbestos Detected

April 8, 2017
Two (2) bulk samples were collected from materials suspected of containing asbestos, including:

Type and Location of Suspect Material

1. Damproofing on foundation at new addition
2. Damproofing on foundation at new addition

Sample Results:

Type and Location of Suspect Material	Sample Result
1. Damproofing on foundation at new addition	No Asbestos Detected
2. Damproofing on foundation at new addition	No Asbestos Detected

Observations and Conclusions:
The condition of ACM is very important. ACM in good condition does not present a health issue unless it is disturbed. Therefore, it is not necessary to remediate ACM in good condition unless it will be disturbed through renovation, demolition or other activity.

Refer to the AHERA Management Plan for condition of ACM.

1. Lab table was found to contain asbestos.
2. Soft black glazing caulking for borrowed lite was found to contain asbestos.
3. Hard grey glazing caulking for borrowed lite was found to contain asbestos.
4. Light grey/white vinyl floor tile was found to contain asbestos.
5. Mastic for vinyl floor tile under plywood/carpet was found to contain asbestos.
6. Glue daub for ceiling plaster was found to contain asbestos.
7. Hard grey glazing caulking for vision lite in metal door was found to contain asbestos.
8. Exterior door framing caulking was found to contain asbestos.
9. Exterior residue door framing caulking on brick was found to contain asbestos.
10. Glue holding blackboard was assumed to contain asbestos.
11. Pipe insulation was assumed to contain asbestos.
12. Stage fire curtain was assumed to contain asbestos.
13. Transite panels were assumed to contain asbestos and assumed to exist under windows on both bridges.
14. Underground sewer pipes were assumed to contain asbestos.
15. Damproofing on exterior walls was assumed to contain asbestos. The demolition contractor will have to segregate the ACM from non-ACM building surfaces for proper disposal in an EPA approved landfill that does not recycle. A non-traditional abatement plan would have to be prepared and submitted to the DEP for approval.
16. Damproofing on exterior foundation walls was found not to contain asbestos. The damproofing was only found at the addition.
17. Testing was not performed of the roof to avoid damage. Therefore, roofing was assumed to contain asbestos. However, roofing does not have to be removed by a licensed asbestos abatement contractor. Roofing material does not have to be removed by a licensed asbestos contractor. However, the General Contractor must comply with OSHA regulation during demolition and with state regulations for proper disposal. A non-traditional abatement plan would have to be prepared and submitted to the DEP for approval.
18. All other suspect materials were found not to contain asbestos. Hidden ACM may be found during renovation and demolition activities.
19. No additional ACM was found during interior investigations.

1980 Building:
Sixty (60) bulk samples were collected from materials suspected of containing asbestos, including:

Type and Location of Suspect Material

1. Grey sink damproofing at teacher's room
2. Soft black glazing caulking for borrowed lite at main lobby
3. Vertical white caulking in CMU wall at administrative conference room
4. Dark blue vinyl floor tile at cafeteria
5. Mastic for dark blue vinyl floor tile at cafeteria

6. White with light blue vinyl floor tile at cafeteria
7. Mastic for white with light blue vinyl floor tile at cafeteria
8. White with black/grey vinyl floor tile at exit hall by administrative conference room
9. Mastic for white with black/grey vinyl floor tile at exit hall by administrative conference room
10. White with black/grey vinyl floor tile at exit hall by kitchen
11. Mastic for white with black/grey vinyl floor tile at exit hall by kitchen
12. Exterior window framing caulking at receiving
13. Exterior window soft brown glazing caulking at receiving
14. Exterior window framing caulking at kitchen
15. Exterior window soft brown glazing caulking at kitchen
16. Exterior window framing caulking for transite panel by main entrance II
17. Exterior transite panel by main entrance II
18. Exterior transite panel covering vertical steel column
19. Exterior transite panel covering vertical steel column
20. Exterior transite panel covering vertical steel column
21. Exterior window glazing caulking for transite panel by main entrance II
22. Exterior black damproofing behind brick at foundation by kitchen
23. Exterior black damproofing behind brick at foundation by kitchen
24. Joint compound at column hall by room 620
25. Joint compound at hall outside library
26. Joint compound at column by gymnasium
27. 2’ x 2’ Suspended acoustical ceiling tile at library computer lab
28. 2’ x 2’ Suspended acoustical ceiling tile at third floor copy room
29. 2’ x 2’ Suspended acoustical ceiling tile at library conference room
30. Fireproofing at library
31. Fireproofing at library
32. Fireproofing at library
33. Blown-in insulation in CMU wall at gymnasium
34. Older caramel vinyl floor tile at little theater storage room
35. Mastic for older caramel vinyl floor tile at little theater storage room
36. Older caramel vinyl floor tile at kitchen storage room
37. Mastic for older caramel vinyl floor tile at kitchen storage room
38. Soft black glazing caulking for vision lite in metal door at room 610
39. White with black/grey vinyl floor tile at hall outside room 610-B
40. Mastic for white with black/grey vinyl floor tile at hall outside room 610-B
41. White with black/grey vinyl floor tile at second floor hall by stairwell 6
42. Mastic for white with black/grey vinyl floor tile at second floor hall by stairwell 6
43. Adhesive for white with black/grey vinyl floor tile at hall outside library
44. Black sink damproofing at nurse
45. Exterior damproofing under brick on foundation at pool building
46. Exterior flashing protruding from brick at pool building
47. Exterior unit vent grille caulking at pool building
48. Exterior hidden caulking for transite panel encasing vertical steel column
49. Exterior hidden caulking for transite panel encasing vertical steel column
50. Transite panel encasing vertical steel column at pool building
51. Damproofing on CMU at flower bed at Trolley side
52. Exterior window framing caulking at Trolley side
53. Soft black glazing caulking for vision lite in metal door at first floor stairwell door
54. Joint compound on ceiling soffit at second floor gymnasium lobby
55. Finish on CMU wall at pool
56. Adhesive for ceramic baseboard at boy’s locker room
57. Adhesive for ceramic baseboard at pool
58. Glue tab for fiberglass insulated duct at sub-basement of pool
59. Glue tab for fiberglass insulated duct at sub-basement of pool
60. Grey sealant on metal duct at sub-basement of pool

Sample Results:

Type and Location of Suspect Material	Sample Result
1. Grey sink damproofing at teacher's room	No Asbestos Detected
2. Soft black glazing caulking for borrowed lite at main lobby	3% Asbestos
3. Vertical white caulking in CMU wall at administrative conference room	2% Asbestos
4. Dark blue vinyl floor tile at cafeteria	No Asbestos Detected
5. Mastic for dark blue vinyl floor tile at cafeteria	No Asbestos Detected
6. White with light blue vinyl floor tile at cafeteria	No Asbestos Detected
7. Mastic for white with light blue vinyl floor tile at cafeteria	No Asbestos Detected
8. White with black/grey vinyl floor tile at exit hall by administrative conference room	No Asbestos Detected
9. Mastic for white/black/grey vinyl floor tile at exit hall by administrative conference room	5% Asbestos
10. White with black/grey vinyl floor tile at exit hall by kitchen	No Asbestos Detected
11. Mastic for white/black/grey vinyl floor tile at exit hall by kitchen	5% Asbestos
12. Exterior window framing caulking at receiving	No Asbestos Detected
13. Exterior window soft brown glazing caulking at receiving	5% Asbestos
14. Exterior window framing caulking at kitchen	No Asbestos Detected
15. Exterior window soft brown glazing caulking at kitchen	2% Asbestos
16. Exterior window framing caulking for transite panel by main entrance II	No Asbestos Detected
17. Exterior transite panel by main entrance II	20% Asbestos
18. Exterior transite panel covering vertical steel column	20% Asbestos
19. Exterior transite panel covering vertical steel column	20% Asbestos
20. Exterior transite panel covering vertical steel column	20% Asbestos
21. Exterior window glazing caulking for transite panel by main entrance II	2% Asbestos
22. Exterior black damproofing behind brick at foundation by kitchen	10% Asbestos
23. Exterior black damproofing behind brick at foundation by kitchen	10% Asbestos
24. Joint compound at column hall by room 620	No Asbestos Detected
25. Joint compound at hall outside library	No Asbestos Detected
26. Joint compound at column by gymnasium	No Asbestos Detected
27. 2' x 2' Suspended acoustical ceiling tile at library computer lab	No Asbestos Detected
28. 2' x 2' Suspended acoustical ceiling tile at third floor copy room	No Asbestos Detected
29. 2' x 2' Suspended acoustical ceiling tile at library conference room	No Asbestos Detected
30. Fireproofing at library	No Asbestos Detected
31. Fireproofing at library	No Asbestos Detected
32. Fireproofing at library	No Asbestos Detected
33. Blown-in insulation in CMU wall at gymnasium	No Asbestos Detected
34. Older caramel vinyl floor tile at little theater storage room	No Asbestos Detected
35. Mastic for older caramel vinyl floor tile at little theater storage room	10% Asbestos
36. Older caramel vinyl floor tile at kitchen storage room	No Asbestos Detected
37. Mastic for older caramel vinyl floor tile at kitchen storage room	10% Asbestos
38. Soft black glazing caulking for vision lite in metal door at room 610	No Asbestos Detected
39. White with black/grey vinyl floor tile at hall outside room 610-B	No Asbestos Detected
40. Mastic for white with black/grey vinyl floor tile at hall outside room 610-B	5% Asbestos
41. White with black/grey vinyl floor tile at second floor hall by stairwell 6	No Asbestos Detected
42. Mastic for white with black/grey vinyl floor tile at second floor hall by stairwell 6	No Asbestos Detected
43. Adhesive for white with black/grey vinyl floor tile at hall outside library	5% Asbestos
44. Black sink damproofing at nurse	No Asbestos Detected
45. Exterior damproofing under brick on foundation at pool building	10% Asbestos
46. Exterior flashing protruding from brick at pool building	10% Asbestos
47. Exterior unit vent grille caulking at pool building	No Asbestos Detected
48. Exterior hidden caulking for transite panel encasing vertical steel column	2% Asbestos
49. Exterior hidden caulking for transite panel encasing vertical steel column	2% Asbestos
50. Transite panel encasing vertical steel column at pool building	20% Asbestos
51. Damproofing on CMU at flower bed at Trolley side	No Asbestos Detected

52. Exterior window framing caulking at Trolley side	No Asbestos Detected
53. Soft black glazing caulking for vision lite in metal door at first floor stairwell door	No Asbestos Detected
54. Joint compound on ceiling soffit at second floor gymnasium lobby	No Asbestos Detected
55. Finish on CMU wall at pool	No Asbestos Detected
56. Adhesive for ceramic baseboard at boy's locker room	No Asbestos Detected
57. Adhesive for ceramic baseboard at pool	No Asbestos Detected
58. Glue tab for fiberglass insulated duct at sub-basement of pool	No Asbestos Detected
59. Glue tab for fiberglass insulated duct at sub-basement of pool	No Asbestos Detected
60. Grey sealant on metal duct at sub-basement of pool	No Asbestos Detected

Observations and Conclusions:
The condition of ACM is very important. ACM in good condition does not present a health issue unless it is disturbed. Therefore, it is not necessary to remediate ACM in good condition unless it will be disturbed through renovation, demolition or other activity.

Refer to the AHERA Management Plan for condition of ACM.

1. Soft black glazing caulking for borrowed lite was found to contain asbestos.
2. Vertical white caulking in CMU wall was found to contain asbestos.
3. Mastic for white with black/grey vinyl floor tile was found to contain asbestos.
4. Mastic for older caramel vinyl floor tile was found to contain asbestos.
5. Exterior window soft brown glazing caulking was found to contain asbestos.
6. Exterior transite panel was found to contain asbestos.
7. Exterior transite panel covering vertical steel column was found to contain asbestos.
8. Exterior window glazing caulking for transite panel was found to contain asbestos.
9. Glue holding tectum deck at the pool building was assumed to contain asbestos.
10. Exterior black damproofing behind brick at foundation was found to contain asbestos. The demolition contractor should be segregate the ACM from non-ACM building surfaces for proper disposal in an EPA approved landfill that does not recycle. A non-traditional abatement plan would have to be prepared and submitted to the DEP for approval.
11. Exterior flashing protruding from brick was found to contain asbestos. The demolition contractor will have to segregate the ACM from non-ACM building surfaces for proper disposal in an EPA approved landfill that does not recycle. A non-traditional abatement plan would have to be prepared and submitted to the DEP for approval.
12. Exterior hidden caulking for transite panel encasing vertical steel column was found to contain asbestos.
13. Glue holding blackboard was assumed to contain asbestos.
14. Underground sewer pipes were assumed to contain asbestos.
15. Testing was not performed of the roof to avoid damage/warranty. Therefore, roofing was assumed to contain asbestos. Roofing material does not have to be removed by a licensed asbestos abatement contractor. However, the Contractor must comply with OSHA regulation during demolition and with state regulations for proper disposal. A non-traditional abatement plan would have to be prepared and submitted to the DEP for approval.
16. All other suspect materials were found not to contain asbestos. Hidden ACM may be found during renovation and demolition activities.

Polychlorinated Biphenyls (PCB's)-Electrical Equipment and Light Fixtures:
Observations and Conclusions:
Visual inspection of various equipments such as light fixtures, thermostats, exit signs and switches was performed for the presence of PCB's and mercury. Ballasts in light fixtures were assumed not to contain PCB's since there were labels indicating that "No PCB's" was found. Tubes in light fixtures, thermostats, signs and switches were assumed to contain mercury. It would be very costly to test those equipments and dismantling would be required to access. Therefore, the above mentioned equipments should be considered to contain PCB's and mercury and disposed in an EPA approved landfill as part of the demolition project.

PCB's in Caulking:
PCB's are manmade chemicals that were widely produced and distributed across the country from the 1950s to 1977 until the production of PCB's was banned by the US Environmental Protection Agency (EPA) law which became effective in 1978. PCB's are a class of chemicals made up of more than 200 different compounds. PCB's are non-flammable, stable, and good insulators so they were widely used in a variety of products including: electrical transformers and capacitors, cable and wire coverings, sealants and caulking, and household products such as television sets and fluorescent light fixtures. Because of their chemical properties, PCB's are not very soluble in water and they do not break down easily in the environment. PCB's also do not readily evaporate into air but tend to remain as solids or thick liquids. Even though PCB's have not been produced or used in the country for more than 30 years, they are still present in the environment in the air, soil, and water and in our food. EPA requires that all construction waste including caulking be disposed as PCB's if PCB's level exceed 50 mg/kg (ppm). An abatement plan might also be required.

Observations and Conclusions:
Building materials and caulking were assumed to contain PCB's.

Lead Based Paint (LBP):
Observations and Conclusions:
LBP was assumed to exist on painted surfaces in all areas constructed prior to 1978. A school is not considered a regulated facility. All LBP activities performed, including waste disposal, should be in accordance with applicable Federal, State, or local laws, ordinances, codes or regulations governing evaluation and hazard reduction. In the event of discrepancies, the most protective requirements prevail. These requirements can be found in OSHA 29 CFR 1926-Construction Industry Standards, 29 CFR 1926.62-Construction Industry Lead Standards, 29 CFR 1910.1200-Hazards Communication, 40 CFR 261-EPA Regulations. Per OSHA, any amount of LBP triggers compliance.

Mercury in Rubber Flooring:

1980 Building:
Number of Samples Collected:

Two (2) bulk samples were collected from the rubber flooring:

Type and Location of Suspect Material

1. Rubber floor at gymnasium
2. Rubber floor at gymnasium ramp down to pool

Sample Results:

Type and Location of Suspect Material	Sample Result
1. Rubber floor at gymnasium	90 mg/kg
2. Rubber floor at gymnasium ramp down to pool	60 mg/kg

Observations and Conclusions:
Samples results of the rubber flooring indicated the presence of high level of mercury. Mercury was assumed to have leached into the concrete slab. Sampling would be required to determine extent of contamination/leaching.

Airborne Mold:
Airborne mold testing was performed utilizing Zefon International Incorporated's Air-O-Cell® sampling device following all manufacturer supplied recommended sampling procedures. Air-O-Cell® is a direct read total particulate air sampling device. It works using the inertial impaction principle like other spore trap devices. It is designed for the rapid collection and analysis of airborne particulate including bioaerosols. The particulate includes fibers (e.g. asbestos, fiberglass, cellulose, clothing fibers) opaque particles (e.g. fly ash, combustion particles, copy toner, oil

droplets, paint), and bioaerosols (e.g. mold spores, pollen, insect parts, skin cell fragments).[1]

The method involves drawing a known quantity of air through a sterile sampling cassette. After sampling, the cassette is sealed and transferred to a microbiology laboratory under chain of custody protocol for microscopic analysis. This method counts both viable and nonviable mold spores.

There are currently no guidelines or standards promulgated by a government agency or widely recognized scientific organizations for the interpretation of airborne mold spore levels. The most commonly employed tool used to assess if mold growth is occurring and there is amplification in a structure is to evaluate the indoor levels and species as well as to compare levels and species of mold outdoors to indoors. Typically, if there were more molds indoors, and/or if species were present indoors which were not present outdoors, then growth and amplification is likely occurring and further evaluation and perhaps remediation is recommended.

1922 Building:

AIRBORNE MOLD and PARTICULATE

Lab ID #	Location	Total Mold Counts/M^3	Pollen	Insect Fragment	Hyphal Fragments
131604602-0001	Classroom 014	4,470	ND	ND	ND
131604602-0002	Custodian Room by Stairwell C	14,197	20	7	40
131604602-0003	Band Storage Room	4,671	20	ND	ND
131604602-0004	Classroom 029	8,520	10	ND	20
131604602-0005	Classroom 028	11,287	10	ND	20
131604602-0006	Classroom 012	11,387	10	ND	ND
131600829-0007	Outside of Building	17,807	70	ND	20

AIRBORNE MOLD and PARTICULATE
(Subjective Scales)

Lab ID #	Location	Skin Fragment Density (SFD)	Fibrous Particulates (FP)	Total Background Particulate (TBP)
131604602-0001	Classroom 014	2	1	1
131604602-0002	Custodian Room by Stairwell C	2	1	3
131604602-0003	Band Storage Room	2	1	2
131604602-0004	Classroom 029	2	1	3
131604602-0005	Classroom 028	2	1	2
131604602-0006	Classroom 012	2	1	2
131604602-0007	Outside of Building	1	1	3

Observations and Conclusions:
The indoor airborne mold spore concentrations were lower than the outside sample. Based on comparisons with historical data from projects of similar type, building utilization, geographic location and season, the indoor airborne

[1] Zefon International Inc. <www.zefon.com>

levels are considered high. Indoor mold spore counts in early fall are typically in the 4,500-6,500-spores/cubic meter range.

Breathing zone indoor samples indicated the presence of several common types of mold which are not considered to be hazardous and were also found outside. Levels inside are most likely being migrated from outside, which might indicate the higher levels of certain types of mold.

Pollen, insect fragments and Hyphal fragments were either not present or low in the samples. Hyphal fragment is a non-reproductive part of the mold.

Total background particulate on all samples was assessed as "1-3" on a scale of 1-5 where 1 is low and 5 is high. Skin fragment density on all samples was assessed as "1-2" on a scale of 1-4 where 1 is low and 4 is high. The total background levels are measured to determine airborne dust not related to airborne mold. Skin fragments are measured to determine proper housing cleaning.

1980 Building:

AIRBORNE MOLD and PARTICULATE

Lab ID #	Location	Total Mold Counts/M^3	Pollen	Insect Fragment	Hyphal Fragments
131604500-0001	Hallway by Room 432-A	1,797	ND	ND	ND
131604500-0002	Cafeteria	3,374	ND	ND	ND
131604500-0003	Hallway by Nurse	1,300	10	ND	ND
131604500-0004	Administrative Conference Room	3,361	ND	7	ND
131604500-0005	Hallway by Security	1,304	ND	ND	ND
131604500-0006	Hallway by Receiving	8,227	10	ND	ND
131604500-0007	Outside of Building	10,170	ND	ND	ND

AIRBORNE MOLD and PARTICULATE
(Subjective Scales)

Lab ID #	Location	Skin Fragment Density (SFD)	Fibrous Particulates (FP)	Total Background Particulate (TBP)
131604500-0001	Hallway by Room 432-A	2	1	2
131604500-0002	Cafeteria	3	1	3
131604500-0003	Hallway by Nurse	2	1	2
131604500-0004	Administrative Conference Room	2	1	1
131604500-0005	Hallway by Security	1	1	1
131604500-0006	Hallway by Receiving	3	1	2
131604500-0007	Outside of Building	1	1	1

Legend:
ND - Not Detected

Observations and Conclusions:
The indoor airborne mold spore concentrations were lower than the outside sample. Based on comparisons with historical data from projects of similar type, building utilization, geographic location and season, the indoor airborne levels are considered low. Indoor mold spore counts in late summer are typically in the 6,500-9,500-spores/cubic meter range.

Breathing zone indoor samples indicated the presence of several common types of mold which are not considered to be hazardous and were also found outside.

Pollen, insect fragments and Hyphal fragments were either not present or low in the samples. Hyphal fragment is a non-reproductive part of the mold.

Total background particulate on all samples was assessed as "1-2" on a scale of 1-5 where 1 is low and 5 is high. Skin fragment density on all samples was assessed as "1" on a scale of 1-4 where 1 is low and 4 is high. The total background levels are measured to determine airborne dust not related to airborne mold. Skin fragments are measured to determine proper housing cleaning.

Radon:

Number of Samples Collected

1922 Building:
Seven (7) air samples were collected at the following locations:

Location of Material

1. Basement room 014
2. Basement custodian stairwell
3. Basement band storage room
4. Basement room 029
5. Basement room 028
6. Basement fan room
7. Basement room 012

Sample Results:

Location of Material	**Sample Result**
1. Basement room 014	0.7 pCi/L
2. Basement custodian stairwell	<0.4 pCi/L
3. Basement band storage room	0.5 pCi/L
4. Basement room 029	0.5 pCi/L
5. Basement room 028	0.4 pCi/L
6. Basement fan room	0.5 pCi/L
7. Basement room 012	<0.4 pCi/L

Observations and Conclusions:
The measured radon concentrations of the samples were found to be lower than the EPA guideline of 4 picoCuris of radon per liter of air (pCi/L). No further action is required.

1980 Building:
Six (6) air samples were collected at the following locations:

Location of Material

1. First floor main office
2. First floor student postings storage room
3. First floor custodial room
4. First floor administrative conference room
5. First floor athletic director office
6. First floor teacher's room

Sample Results:

Location of Material	Sample Result
1. First floor main office	<0.4 pCi/L
2. First floor student postings storage room	<0.4 pCi/L
3. First floor custodial room	<0.4 pCi/L
4. First floor administrative conference room	<0.4 pCi/L
5. First floor athletic director office	<0.4 pCi/L
6. First floor teacher's room	<0.4 pCi/L

Observations and Conclusions:
The measured radon concentrations of the samples were found to be lower than the EPA guideline of 4 picoCuris of radon per liter of air (pCi/L). No further action is required.

3.0 COST ESTIMATES:

The cost includes removal and disposal of all accessible ACM, other hazardous material and an allowance for removal of inaccessible or hidden ACM that may be found during renovation or demolition project. No additional suspect and accessible ACM were found during this survey. Hidden ACM may be found during renovation or demolition activities. Quantities listed below were based on actual field measurement and should be within 5% +/-.

Location	Material	Approximate Quantity	Cost Estimate ($)
1922 Building:			
	Glue Daub on Ceiling Plaster	4,000 SF	20,000.00
	Borrowed lite	500 Total	50,000.00
	Vision Lite Windows in Doors	125 Total	25,000.00
	Flooring Materials and Mastic	43,000 SF	172,000.00
	Chalkboards	500 Total	75,000.00
	Miscellaneous Hazardous Materials and Hidden ACM	Unknown	25,000.00
	Light Fixtures Tubes	6,500 Total	65,000.00
Bridges	Transite Panels	1,600 SF	16,000.00
Stage	Fire Curtain	1 Total	7,500.00
Science Rooms	Transite Tables	25 Total	12,500.00
Basement Fan Room	Pipe Insulation	50 LF	2,500.00
Exterior	Doors	30 Total	6,000.00
	Roofing Materials	58,900 SF	176,700.00
	Transite Sewer Pipes	Unknown[1]	25,000.00
	Thru-Wall Flashing	Unknown[1]	25,000.00

Location	Material	Approximate Quantity	Cost Estimate ($)
	Damproofing on Exterior Walls	2,000 Tons[1]	250,000.00
PCB's Remediation[2]			50,000.00
Estimated costs for PCB's Testing and Abatement Plans Services[2]			10,000.00
Estimated costs for NESHAP Inspection and Testing Services			12,500.00
Estimated costs for Design, Construction Monitoring and Air Sampling Services			99,300.00
		TOTAL:	**$ 1,125,000.00**
1980 Building:			
	Borrowed lite	425 Total	63,750.00
	Interior Vertical Caulking in CMU	3,500 LF	35,000.00
	Various Types of Flooring Materials and Mastic	95,000 SF	380,000.00
	Tectum Deck and Glue	7,500 SF	35,000.00
	Chalkboards	125 Total	25,000.00
	Miscellaneous Hazardous Materials	Unknown	25,000.00
	Hidden ACM	Unknown	25,000.00
	Light Fixtures Tubes	6,500 Total	65,000.00
Gymnasium/Ramp	Rubber Flooring/Cement	25,000 SF	250,000.00
Exterior	Windows	550 Total	137,500.00
	Transite Panels	8,000 SF	80,000.00
	Caulking on Transite Panels	5,000 LF	25,000.00
	Roofing Materials	51,720 SF	155,160.00
	Transite Sewer Pipes	Unknown[1]	25,000.00
	Thru-Wall Flashing	1,250 LF[1]	25,000.00
	Damproofing on Exterior and Foundation Walls	4,500 Tons[1]	562,500.00
PCB's Remediation[2]			250,000.00
Estimated costs for PCB's Testing and Abatement Plans Services[2]			50,000.00
Estimated costs for NESHAP Inspection and Testing Services			12,500.00
Estimated costs for Design, Construction Monitoring and Air Sampling Services			198,590.00
		TOTAL:	**$ 2,425,000.00**
		GRAND TOTAL:	**$ 3,550,000.00**
Estimated HAZ MAT Cost for 75 Arcand Street			**$ 250,000.00**

[1]: Part of total demolition/Site Work.

[2]: Should results exceed EPA limit.

4.0 DESCRIPTION OF SURVEY METHODS AND LABORATORY ANALYSES:

Asbestos:

Asbestos samples were collected using a method that prevents fiber release. Homogeneous sample areas were determined by criteria outlined in EPA document 560/5-85-030a. Bulk material samples were analyzed using PLM and dispersion staining techniques with EPA method 600/M4-82-020 by EPA licensed laboratories Asbestos Identification Laboratory and EMSL, Woburn, MA.

Mercury in Rubber Flooring:
Bulk sample was analyzed in accordance with EPA method 7471B by an EPA approved laboratory EMSL, Cinnaminson, NJ.

Airborne Mold:
The samples were analyzed by an EPA approved laboratory EMSL, Woburn, MA.

Radon:
Radon samples were analyzed by an EPA licensed laboratory AccuStar, Medway, MA.

Inspected By:



Leonard J. Busa
Asbestos Inspector (AI-030673)

Inspected By:



Jason Becotte
Asbestos Inspector (AI-034963)

5.0 LIMITATIONS AND CONDITIONS:

This report has been completed based on visual and physical observations made and information available at the time of the site visits, as well as an interview with the Owner's representatives. This report is intended to be used as a summary of available information on existing conditions with conclusions based on a reasonable and knowledgeable review of evidence found in accordance with normally accepted industry standards, state and federal protocols, and within the scope and budget established by the client. Any additional data obtained by further review must be reviewed by UEC and the conclusions presented herein may be modified accordingly.

This report and attachments, prepared for the exclusive use of Owner for use in an environmental evaluation of the subject site, are an integral part of the inspections and opinions should not be formulated without reading the report in its entirety. No part of this report may be altered, used, copied or relied upon without prior written permission from UEC, except that this report may be conveyed in its entirety to parties associated with Owner for this subject study.

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Lowell High School Conceptual Design Options Civil/Environmental Permitting Report
Perkins Eastman Project #67150.01
PSR Pricing Narrative

January 6, 2017, Revised March 28, 2018 Revised April 10, 2018 Revised May 1, 2018

Nitsch Engineering has performed research of the existing site conditions and anticipated site permitting requirements for the Lowell High School located at 50 Father Morissette Boulevard in Lowell, Massachusetts. Nitsch Engineering's research included an initial site visit/walk and discussions with various facilities personnel. Information included in this report is also based on record plans and compiled documents from Perkins Eastman, survey from Nitsch Engineering and Lowell Regional Wastewater Utility. Nitsch Engineering reviewed the record plans and documents in preparing this document, and discussed the nature of the infrastructure with City representatives.

A summary of our observations and findings are listed below.

EXISTING SITE UTILITIES

Lowell High School currently consists of four (4) buildings: 1922 Building, 1980 Building, Freshman Academy and the Steam Plant. The buildings were constructed and have undergone renovations and additions from dates that range between 1892 and 1997. Based on record documents, site observations, and conversations with school officials, the summary descriptions below represent the site utility conditions/assumptions as we understand them at this time. Nitsch Engineering understands that the Freshman Academy and Steam Plant Buildings will not be a part of the proposed High School Project and will be turned over to the City. Accordingly, the Freshman Academy and Steam Plant are not included in this report under Proposed Utilities for the various options being considered..

STORM DRAINAGE

1922 Building

Based on information gathered on the site visits and existing design plans, there are several catch basins located on the westerly side of the building that connect to the existing 12-inch combined sewer line near the Merrimack Canal.



There is a 6-inch storm drain line that discharges from the approximate southerly center of the building at the alley that then discharges to an existing catch basin and then drains via an 8-inch storm drain line to the existing combined sewer system at a sewer manhole located in the sidewalk of Kirk Street.

An 8-inch storm drain line discharges from the northwest corner of the building and connects to an existing storm drain line located on the westerly side of the building near the Merrimack Canal.

There is a 4-inch foundation drain on the northerly side of the building that extends approximately 100 feet southerly on the easterly side (Kirk Street) and the westerly side (Merrimack Canal) that connects to the 12-inch combined sewer line. It appears that the current drainage system is not in compliance with the current Department of Environmental Protection (DEP) Stormwater Regulations (2008) with combined sanitary sewer and storm drain discharges from the building to combined sewer lines and should be separated out.

There are a total of four (4) downspouts that discharge on the southerly side of the building (2) and on the westerly side of the building (2). The downspouts discharge to the ground surface.

1980 Building

Based on information gathered on the site visits and existing design plans, the 1980 Building's roof run-off is routed internally into the building and eventually into the Father Morissette Boulevard storm drain system. There is a 15-inch reinforced concrete pipe (RCP) storm drain line that appears to drain roof water from the northerly side of the 1980 Building to an 18-inch RCP storm drain line located in Father Morissette Boulevard.

A 6-inch vitrified clay (VC) drain pipe appears to drain roof water from the of the Fieldhouse Building from the westerly side of the Building to combined sewer manhole located in the intersection of Father Morissette Boulevard. It appears that the current drainage system is not in compliance with the current Department of Environmental Protection (DEP) Stormwater Regulations (2008).

A third closed drainage system composed of catch basins, drain manholes and reinforced concrete pipe (RCP) collects surface stormwater from the driveway to the loading dock discharging to a manhole and then into a 12-inch storm drain line that discharges to a combined sewer system in Arnand Drive. It appears that the current drainage system is not in compliance with the current Department of Environmental Protection (DEP) Stormwater Regulations (2008).

WATER

Lowell High School and its current makeup of four (4) buildings (1922 Building, 1980 Building, Freshman Academy and Steam Plant) are connected to the Lowell Regional Water Utility (LRWU) water system.

1922 Building

There are two (2) existing 4-inch water services under the sidewalk on the easterly side of the building and connected to an existing 6-inch water main located in Kirk Street near Paige Street.

There is an existing 6-inch fire service with a post indicator valve (PIV) that connects to the southerly side of the building. The fire service connects to an existing 6-inch water main located between the 1922 Building and the Merrimack Canal. The fire service enters the building at a storage room near the intersection of the two wings.



There is a fire department siamese connection on the face of the building.



Currently, there are no indications from school personnel that there are issues with the domestic water and fire services for the site.

Two (2) fire hydrants were observed to be within 500 feet of the westerly side of the 1922 Building and the Merrimack Canal.



There is a hydrant located at the corner of Kirk and Lee Streets.



1980 Building

There is a single 8-inch cement-lined ductile iron water service that provides both domestic and fire service to the 1980 Building. The existing water service is installed under the sidewalk and connected to an existing 20-inch water main in French Street near its intersection with Arnand Street. The is a post indicator valve (PIV) on the existing 8-inch water service. Prior to entering the building, the 8-inch water service splits into a 6-inch fire service and a separate 6-inch domestic water service.

Currently, there are no indications from school personnel that there are issues with the domestic and fire water services for the site.

There is a fire department siamese connection observed on the face of the northwest corner of the Fieldhouse Building.

One fire hydrant was observed to be approximately 150 feet from the water services on French Street between the 1980 Building.



One fire hydrant was observed to be greater than 300 feet on John Street located between Paige Street and French Street.



One fire hydrant was observed to be within 100 feet of the building near the intersection of French Street and Kirk Street.

SEWER

Lowell High School and its current makeup of four [4] buildings (1922 Building, 1980 Building, Freshman Academy and Steam Plant) is serviced by the Lowell Regional Wastewater Utility (LRWWU) sewer system.

No exterior pumps were described or discovered during the site walk. There are internal grease traps located in the kitchen.

1922 Building

According to the existing site documents, one (1) 8-inch sewer service lateral and two 6-inch sewer service laterals that serve the school. The 8-inch sewer service lateral (near the northwest corner of the building) and a 6-inch sewer service lateral (near the southwest building corner) exits on the westerly side of the building and connects to the existing 12-inch combined sewer main near the Merrimack Canal. The second 6-inch sewer service lateral exits the school on the easterly side of the building and connects to an existing 12-inch combined sewer main near Lee Street.

1980 Building

According to the existing site documents, there are a total four (4) sewer service laterals that serve the buildings. The first sewer service is a 6-inch vitrified clay (VC) pipe that exits the westerly side of the Fieldhouse Building and connects to a sewer manhole located in the intersection of Arnand Street and French Street. The second sewer service is a 6-inch VC pipe that exits on the northeasterly side of the Fieldhouse Building and connects to a 15-inch sewer main at an existing sewer manhole located in French Street. The third sewer service is an 8-inch VC that exits on the northeasterly side of the 1980 Building, and the fourth sewer service is a 4-inch VC pipe that exits the 1980 Building approximately 10 feet from the third service. The 4-inch sewer service connects to an acid neutralization manhole that then connects to the 8-inch sewer service and connects to a 15-inch sewer main at a sewer manhole located in French Street.

SITE CONDITIONS AND OPERATIONS

SNOW REMOVAL

Snow is plowed and stored on site where applicable.

DUMPSTERS/RECYCLING

1922 Building

Dumpsters for trash and recycling were not observed at the 1922 Building.

1980 Building

Dumpsters for trash and recycling are located on the southerly side of the 1980 Building at the loading dock. There are no enclosures around the dumpsters. The dumpsters are situated on a concrete slab that makes up the entire loading dock area.



Dumpsters/Recycling at rear (loading dock) of 1980 Building

PROPOSED SITE UTILITIES

Addition / Renovation – Option 2A

STORM DRAINAGE

The proposed stormwater system will consist of updating the existing drainage system and installing a new closed drainage system incorporating deep-sump hooded catch basins and as many Low Impact Development (LID) Best Management Practices (BMPs) as possible, such as grassed swales, porous pavement, and biofiltration (if appropriate). A retention/detention storm drain system will be required to be included as part of the proposed stormwater design. This could be in the form of a subsurface infiltration system consisting of pipes/arch chambers. Water Quality will also need to be addressed as part of the stormwater design. Proprietary Units such as Stormceptor or Vortechnics can be used or more site integrated water quality options can be implemented as part of the stormwater design. Discharge points for stormwater will continue to be the existing drainage system in Father Morissette Boulevard and Arcand Drive, though if needed, the existing Merrimack Canal could also be a viable discharge point.

The existing site offers little to no water quantity or water quality mitigation. The proposed stormwater management system will be designed according to Massachusetts Department of Environmental Protection (MassDEP) Stormwater Standards, which require reductions in both stormwater discharge rates and volumes for the 2-year, 10-year, 25-year, and 100-year 24-hour rainfall events. As such, the proposed work is expected to improve drainage conditions for the high school site, which will result in better drainage and quality of stormwater eventually flowing to the Merrimack River.

WATER

An existing 20-inch water main in Father Morissette Boulevard and French Street, a 6-inch water main in Kirk Street and the former Anne Street and a 16-inch water main in Arcand Drive will provide water for the new school. (The existing 6-inch water mains may need to be replaced with an 8-inch water main). New cement-lined ductile iron water services will need to be provided as a part of the project to provide for both fire service water (indoor sprinkler systems and outdoor hydrants) as well as domestic water service. Such capacities will be confirmed by hydrant flow tests as design proceeds.

SEWER

Sanitary sewer service is provided by a 15-inch municipal sewer main in Arcand Drive, an 18-inch municipal sewer main in Father Morissette Boulevard, combined sewer lines in the former Anne Street, Dutton Street, Kirk Street and French Street. The new project will require construction of new PVC sanitary sewer mains (to replace the combined sewer lines in Kirk Street, the former Anne Street and the former Dutton Street) and sanitary services from the site to this main. An exterior grease trap (based on # of seats in cafeteria(s)) will be required for any sanitary sewer connections to kitchen waste lines. Acidic wastes from chemistry labs or other uses such as MEP systems will require neutralization prior to discharge into the main, and any interior floor drains will be directed to this system.

An increase in the number of staff and students over existing conditions and other options may require larger pipe sizing for the new sewer service and will likely result in larger sanitary loads to existing system in this area. Such requirements will be vetted during the design process, though infrastructure demands in the area are expected to remain the same under this option.

NATURAL GAS

Gas service is available and currently supplied from gas mains in Arcand Drive, Father Morissette Boulevard, Kirk Street, French Street, Paige Street and the former Anne Street and the former Dutton Street. A new gas service(s) will be required for the proposed building. National Grid Gas provides service for this area.

UNDERGROUND/ABOVE GROUND FUEL TANKS

No new underground storage tanks are anticipated.

ELECTRICAL, TELEPHONE, AND CABLE

Electrical, Telephone, and Cable service will be provided from underground lines in Arcand Drive, Father Morissette Boulevard, Kirk Street, French Street, Paige Street. A new transformer for electrical service will likely be required, and all services will be provided in underground ductbanks and/or conduit similar to existing conditions.

Addition/Renovation – Option 3A – Expanded Site

STORM DRAINAGE

The proposed stormwater system will consist of updating the existing drainage system and installing a new closed drainage system incorporating deep-sump hooded catch basins and as many Low Impact Development (LID) Best Management Practices (BMPs) as possible, such as grassed swales, porous pavement, and biofiltration (if appropriate). A retention/detention storm drain system will be required to be included as part of the proposed stormwater design. This could be in the form of a subsurface infiltration system consisting of pipes/arch chambers. Water Quality will also need to be addressed as part of the stormwater design. Proprietary Units such as Stormceptor or Vortechnics can be used or more site integrated water quality options can be implemented as part of the stormwater design. Discharge points for stormwater will continue to be the existing drainage system in Father Morissette Boulevard, though if needed, the existing Merrimack Canal could also be a viable discharge point.

The existing site offers little to no water quantity or water quality mitigation. The proposed stormwater management system will be designed according to Massachusetts Department of Environmental Protection (MassDEP) Stormwater Standards, which require reductions in both stormwater discharge rates and volumes for the 2-year, 10-year, 25-year, and 100-year 24-hour rainfall events. As such, the proposed work is expected to improve drainage conditions for the high school site, which will result in better drainage and quality of stormwater eventually flowing to the Merrimack River.

WATER

An existing 20-inch water main in Father Morissette Boulevard and French Street and a 6-inch water main in Kirk Street and the former Anne Street and a 16-inch water main in Arcand Drive will provide water for the new school. (The existing 6-inch water mains may need to be replaced with an 8-inch water main). New cement-lined ductile iron water services will be provided for both fire service water (indoor sprinkler systems and outdoor hydrants) as well as domestic water service. Such capacities will be confirmed by hydrant flow tests as design proceeds.

An increase in the number of staff and students over existing conditions and other options may require larger pipe sizing and/or pressure supplementation (such as fire pumps) based on the size of the building. Such requirements will be vetted during the design process; though domestic demands are expected to remain the same under this option.

SEWER

Sanitary sewer service is provided by an 18-inch municipal sewer main in Father Morissette Boulevard, combined sewer lines in the former Anne Street, Dutton Street, Kirk Street and French Street. The new project will require construction of new PVC sanitary sewer mains (to replace the combined sewer lines in Kirk Street, the former Anne Street and the former Dutton Street) and sanitary services from the site to this main. An exterior grease trap (based on # of seats in cafeteria(s)) will be required for any sanitary sewer connections to kitchen waste lines. Acidic wastes from chemistry labs or other uses such as MEP systems will require neutralization prior to discharge into the main, and any interior floor drains will be directed to this system.

Depending on the final building location (specifically the new Gymnasium Wing) on the abutting property (existing office building), there is an existing 15-inch sanitary sewer line from Moody Street that runs under

the Masonic Temple and then runs in a westerly direction to Arcand Drive (and south of the existing office building) that may need to be relocated as part of the project.

An increase in the number of staff and students over existing conditions and other options may require larger pipe sizing for the new sewer service and will likely result in larger sanitary loads to existing system in this area. Such requirements will be vetted during the design process, though infrastructure demands in the area are expected to remain the same under this option.

NATURAL GAS

Gas service is available and currently supplied from gas mains in Arcand Drive, Father Morissette Boulevard, Kirk Street, French Street, Paige Street and the former Anne Street and the former Dutton Street. A new gas service(s) will be required for the proposed addition/renovation. National Grid Gas provides service for this area.

UNDERGROUND/ABOVE GROUND FUEL TANKS

No new underground storage tanks are anticipated.

ELECTRICAL, TELEPHONE, AND CABLE

Electrical, Telephone, and Cable service will be provided from underground lines in Arcand Drive, Father Morissette Boulevard, Kirk Street, French Street, Paige Street. A new transformer for electrical service will likely be required, and all services will be provided in underground ductbanks and/or conduit similar to existing conditions.

New Option A – Expanded Site

STORM DRAINAGE

The proposed stormwater system will consist of updating the existing drainage system and installing a new closed drainage system incorporating deep-sump hooded catch basins and as many Low Impact Development (LID) Best Management Practices (BMPs) as possible, such as grassed swales, porous pavement, and biofiltration (if appropriate). A retention/detention storm drain system will be required to be included as part of the proposed stormwater design. This could be in the form of a subsurface infiltration system consisting of pipes/arch chambers. Water Quality will also need to be addressed as part of the stormwater design. Proprietary Units such as Stormceptor or Vortechnics can be used or more site integrated water quality options can be implemented as part of the stormwater design. Discharge points for stormwater will continue to be the existing drainage system in Father Morissette Boulevard, though if needed, the existing Merrimack Canal could also be a viable discharge point.

The existing site offers little to no water quantity or water quality mitigation. The proposed stormwater management system will be designed according to Massachusetts Department of Environmental Protection (MassDEP) Stormwater Standards, which require reductions in both stormwater discharge rates and volumes for the 2-year, 10-year, 25-year, and 100-year 24-hour rainfall events. As such, the proposed work is expected to improve drainage conditions for the high school site, which will result in better drainage and quality of stormwater eventually flowing to the Merrimack River.

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An increase in the number of staff and students over existing conditions and other options may require larger pipe sizing and/or pressure supplementation (such as fire pumps) based on the size of the building. Such requirements will be vetted during the design process; though domestic demands are expected to remain the same under this option.

SEWER

Sanitary sewer service is provided by an 18-inch municipal sewer main in Father Morissette Boulevard, combined sewer lines in the former Anne Street, Dutton Street, Kirk Street and French Street. The new project will require construction of new PVC sanitary sewer mains (to replace the combined sewer lines in Kirk Street, the former Anne Street and the former Dutton Street) and sanitary services from the site to this main. An exterior grease trap (based on # of seats in cafeteria(s)) will be required for any sanitary sewer connections to kitchen waste lines. Acidic wastes from chemistry labs or other uses such as MEP systems will require neutralization prior to discharge into the main, and any interior floor drains will be directed to this system.

Depending on the final building location (specifically the new Gymnasium Wing) on the abutting property (existing office building), there is an existing 15-inch sanitary sewer line from Moody Street that runs under the Masonic Temple and then runs in a westerly direction to Arcand Drive (and south of the existing office building) that may need to be relocated as part of the project.

An increase in the number of staff and students over existing conditions and other options may require larger pipe sizing for the new sewer service and will likely result in larger sanitary loads to existing system in this area. Such requirements will be vetted during the design process, though infrastructure demands in the area are expected to remain the same under this option.

NATURAL GAS

Gas service is available and currently supplied from gas mains in Arcand Drive, Father Morissette Boulevard, Kirk Street, French Street, Paige Street and the former Anne Street and the former Dutton Street. A new gas service(s) will be required for the proposed addition/renovation. National Grid Gas provides service for this area.

UNDERGROUND/ABOVE GROUND FUEL TANKS

No new underground storage tanks are anticipated.

ELECTRICAL, TELEPHONE, AND CABLE

Electrical, Telephone, and Cable service will be provided from underground lines in Arcand Drive, Father Morissette Boulevard, Kirk Street, French Street, Paige Street. A new transformer for electrical service will

likely be required, and all services will be provided in underground ductbanks and/or conduit similar to existing conditions.

PRELIMINARY PERMITTING CONSIDERATIONS – Existing Lowell High School Site

WETLANDS PROTECTION ACT (310 CMR 10.00)

The Wetlands Protection Act ensures the protection of Massachusetts' inland and coastal wetlands, tidelands, great ponds, rivers, and floodplains. It regulates activities in coastal and wetlands areas, and contributes to the protection of ground and surface water quality, the prevention of flooding and storm damage, and the protection of wildlife and aquatic habitat.

A review of the Massachusetts Department of Environmental Protection (DEP) wetland layers available on the Massachusetts Geographic Information System (MassGIS), dated April 2009 indicates a wetland resource area located along the Merrimack Canal, (and more specifically located between the 1922 Building and 1980 Building).

Work performed within resource areas or buffer zones will require a filing of a Notice of Intent (NOI) with the Lowell Conservation Commission and the Massachusetts Department of Environmental Protection.

It appears that any proposed work within the vicinity of the Merrimack Canal may require the filing of a Notice of Intent filing with the DEP and the Lowell Conservation Commission.

FLOOD PLAIN

Based on the Flood Insurance Rate Map (FIRM), Community Panel Numbers 25017C0139F and 25017C0143F and both dated July 7, 2014, the Merrimack Canal is in Zone A (No base flood elevations determined). The remainder of the school building sites are located in Zone X (Areas determined to be outside the 0.2% annual chance floodplain).

SURFACE WATER SUPPLY PROTECTION (310 CMR 22.20)

The Massachusetts Department of Environmental Protection (DEP) ensures the protection of surface waters used as sources of drinking water supply from contamination by regulating land use and activities within critical areas of surface water sources and tributaries and associated surface water bodies to these surface water sources.

The only water supply for the Lowell Regional Water Utility (LRWU) is the surface water from the Merrimack River, which has its source in the White Mountains of New Hampshire. The Intake Station is situated on the riverbank north of the city and water is pumped one half mile to the treatment plant. A review of the Massachusetts DEP resource layers available on the MassGIS indicates the High School is not located within a Water Supply Protection Zone, and appears to not require permitting under 310 CMR 22.20.

NATURAL HERITAGE & ENDANGERED SPECIES PROGRAM

A review of the 13th Edition of the Massachusetts Natural Heritage Atlas prepared by the Natural Heritage and Endangered Species Program (NHESP), dated October 1, 2008, indicates that the High School site is NOT located within a Priority Habitat of Rare Species or an Estimated Habitat of Rare Wildlife and that there are no vernal pools on or adjacent to the site.

In a letter dated April 4, 2017, The Natural Heritage & Endangered Species Program of the Massachusetts Division of Fisheries & Wildlife (the "Division") has determined that this project, as currently proposed, does not occur within Estimated Habitat of Rare Wildlife or Priority Habitat as indicated in the Massachusetts Natural Heritage Atlas (13th Edition). Therefore, the project is not required to be reviewed for compliance with the rare wildlife species section of the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.37, 10.59 & 10.58(4)(b)) or the MA Endangered Species Act Regulations (321 CMR 10.18). Any additional work beyond that shown on the site plans may require a filing with the Division.

SEWER CONNECTION PERMIT (314 CMR 7.00)

New connections to sanitary sewers, increases in flow to existing sanitary sewers, and discharges from businesses that are not considered to be "industrial wastewater" are NOT subject to state requirements based on their expected discharge volume.

BRPWP91 covers Special Sewer Connection Permit for Industrial Sewer User, other than BRP WP 92, as determined by MassDEP.

BRPWP92 covers specific industrial facilities with sewer connections for discharging greater than 25,000 gpd to Publicly Owned Treatment Works (POTW) (also known as sewage treatment plants) without Industrial Pretreatment Programs (IPP). IPPs are industrial sewer discharge permit programs operated by POTWs as required by their federally-issued National Pollution Discharge Elimination System (NPDES) permit.

These permits serve to protect the public health, welfare, and environment, as well as the safety of workers in the POTW. They also assure prevention of pollutants passing through or interfering in the operation of the treatment works, through the control of industrial discharges into the sewer systems. Lastly, these permits assure that sewers, pump stations, and POTWs already near or over capacity will not be further burdened.

Due to the existing sewer flows from the buildings to be maintained or to increase slightly, no permitting is expected to occur. Any new sewer services may require permitting (street opening, sewer connection fee) from the City of Lowell.

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION CHAPTER 40 §54A

The Massachusetts Department of Transportation, Rail and Transit Division, in accordance with Massachusetts General Law, Chapter 40 Permits for Construction on Railroad Rights-of-Way requires the following:

If a city or town or any other person purchases any lands formerly used as a railroad right-of-way or any property appurtenant thereto formerly used by any railroad company in the Commonwealth, no permit to build a structure of any kind on land so purchased shall be issued by any city or town in the Commonwealth without first obtaining, after a public hearing, the consent in writing to the issuance of such permit from the Secretary of the Massachusetts Department of Transportation (MassDOT).

MASSACHUSETTS DEPARTMENT OF CONSERVATION & RECREATION (DCR)

The Massachusetts Department of Conservation & Recreation Permits for Construction &/or associated access to DCR Park Lands and roadways and would require the filing of a "Permit Application for Construction &/Or Associated Access to DCR Park Lands & Roadways" and supporting documents for any work associated over the Merrimack Canal.

ENEL GREENPOWER NORTH AMERICA

The filing of a general license with Enel Greenpower North America may be required for any work associated within the walls of the Merrimack Canal.

PERMITTING TABLE TIMELINE

Permit	Permitting Authority	Anticipated Filing Date	Anticipated Approval Date
Notice of Intent (Order of Conditions)	MassDEP & City of Lowell Conservation Commission. The Canals would be considered in a Floodplain per the latest Flood Insurance Rate Map (FIRM) and as such, any work within and over the canal would be under the jurisdiction of the Lowell Conservation Commission and would require the filing of a Notice of Intent.	During DD	Approval in 2 to 3 months
Planning Board Site Plan Review (If Required)	City of Lowell Planning Board	From SD to DD	Up to 6 months+
General License w/ Enel	Ownership of the Merrimack Canal is by Enel GreenPower North America. Nitsch Engineering understands that any proposed work within Merrimack Canal walls would require the filing of a General License and supporting documents, including new storm drain outfalls into the canal. Enel will determine whether or not the proposed outfall will impact their use of the water. They generally prefer that you tie into existing outfalls, as opposed to creating new outfalls.	From SD to DD	Approval in 1 to 3 months
Section 106 of the National Historic Preservation Act of 1966 (NHPA)	Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires Federal agencies to take into account the effects of their undertakings on historic properties, and afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment. The historic preservation review process mandated by Section 106 is outlined in regulations issued by ACHP. Section 106 review made be needed for any proposed storm drain outfalls into the Merrimack Canal since LHS is located in a National Register Historic District. This may also traverse Federal land (trolley tracks) for the outfall that could trigger a full NEPA review of the project. Consulting with the National Park Service for clearer guidance on this is recommended. As with Enel, the National Park Service prefers that storm drain outfall tie into existing outfalls, as opposed to creating new outfalls.	From SD to DD	Up to 6 months+

Permit Application for Construction and/or Associated Access to DCR Park Lands & Roadways	The Department of Conservation & Recreation (DCR) owns the air rights over the Merrimack Canal and any proposed work (including the demolition and construction of the bridges) would require the filing of a Permit Application for Construction and/or Associated Access to DCR Park Lands & Roadways.	From SD to DD	Approval in 2 to 3 months
National Pollutant Discharge Elimination System (NPDES) with EPA Notice of Intent (NOI)	Environmental Protection Agency (EPA)	After 100% CD	Once Submitted; Close NOI at end of Construction
MGL Chapter 40 §54A	MassDOT and coordination with the Lowell Building Inspector	After 100% DD	Approximately 2-3 months

RECOMMENDATIONS

SUSTAINABLE SITE POSSIBILITIES

A new or reconstructed building provides opportunities to incorporate sustainable features which may help achieve LEED for Schools points for funding.

Bio-Swales are grassed channels that capture runoff from parking lot and walkway that remove sediment from stormwater. Bio-swales can be used throughout the site, primarily along parking lot edges and access roads.

Rain Gardens use soils, plants, and microbes to treat stormwater before it is infiltrated and or discharged. Rain gardens are shallow depressions filled with sandy soil topped with a thick layer of mulch and planted with dense vegetation. Rain gardens can be utilized in parking islands and within the site to treat pavement run-off.


Rain Garden


Porous Pavement and Porous Concrete



Subsurface Structures

Porous Pavement is a paved surface with a higher than normal percentage of air voids to allow water to pass through it and infiltrate in the subsoil. Porous pavement, like all drainage systems, requires maintenance at least twice per year.

Subsurface Structures are underground systems that capture run-off (usually rooftop) and gradually infiltrate it into the groundwater. This method of infiltrating stormwater saves space by placing the system under parking lots.

Based on the Natural Resources Conservation Service (NRCS) Web Soil Survey (2011) and record information, it appears that the site will have challenges providing a cost effective solution for stormwater infiltration into the ground.

Opportunities for rainwater reuse are possible at a renovated or expanded Lowell High School. However, the initial capital required for tanks, pumps and dual plumbing may be prohibitive in providing payback for water reuse.

SANITARY SEWER – EXTERIOR GREASE TRAP

Section 15.230 (1) of the State Environmental Code (310 CMR 15.000) [Title V] states, “Grease traps shall be provided for kitchen flows at restaurants, nursing homes, schools, hospitals and other facilities from which grease can be expected to be discharged.” Nitsch Engineering understands that there are only internal grease traps in the cafeterias at this time. Exterior grease traps conforming to 310 CMR 15.000 should be installed where there are cafeterias.

The existing combined sewer (sanitary sewer and storm drainage) lines that discharge from the sites that include catch basins and roof drains from the site and building should be separated into sanitary sewer and storm drain lines.

Appendix A – Maps

USGS Locus Map

DEP Wetlands

Flood Insurance Rate Maps

National Flood Hazard Layer Map

Natural Heritage and Endangered Species Program Map



Figure X: USGS Locus
Lowell High School
Lowell, Massachusetts

Data Source: MassGIS
Nitsch Project #11601

Nitsch Engineering

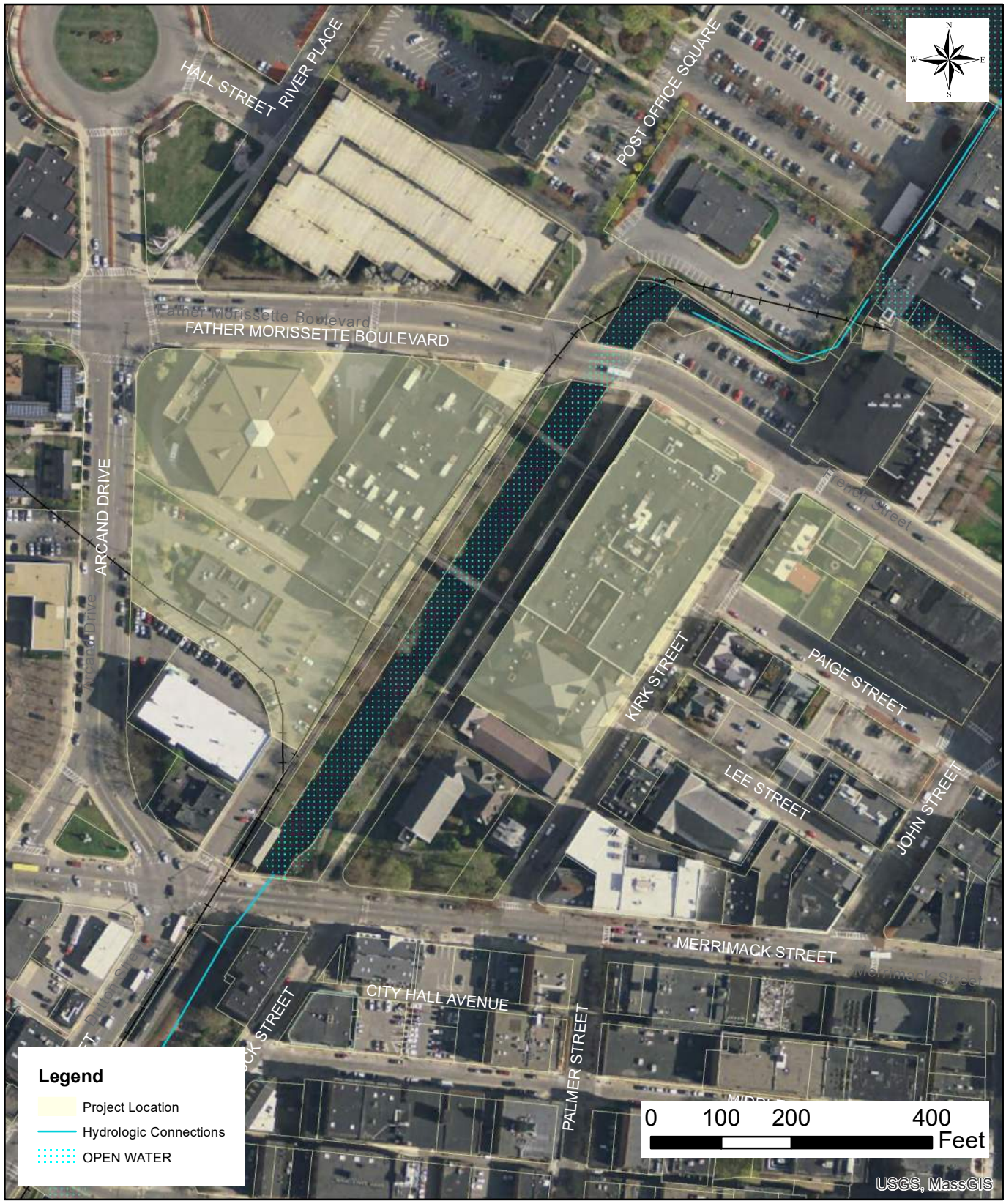


Figure X: DEP Wetlands

Lowell High School
Lowell, Massachusetts

Data Source: MassGIS
Nitsch Project #11601

Nitsch Engineering

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Massachusetts State Plane Mainland Zone (FIPS zone 2001). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from orthophotography provided by MassGIS at a scale of 1:500 from photography dated April 2008.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

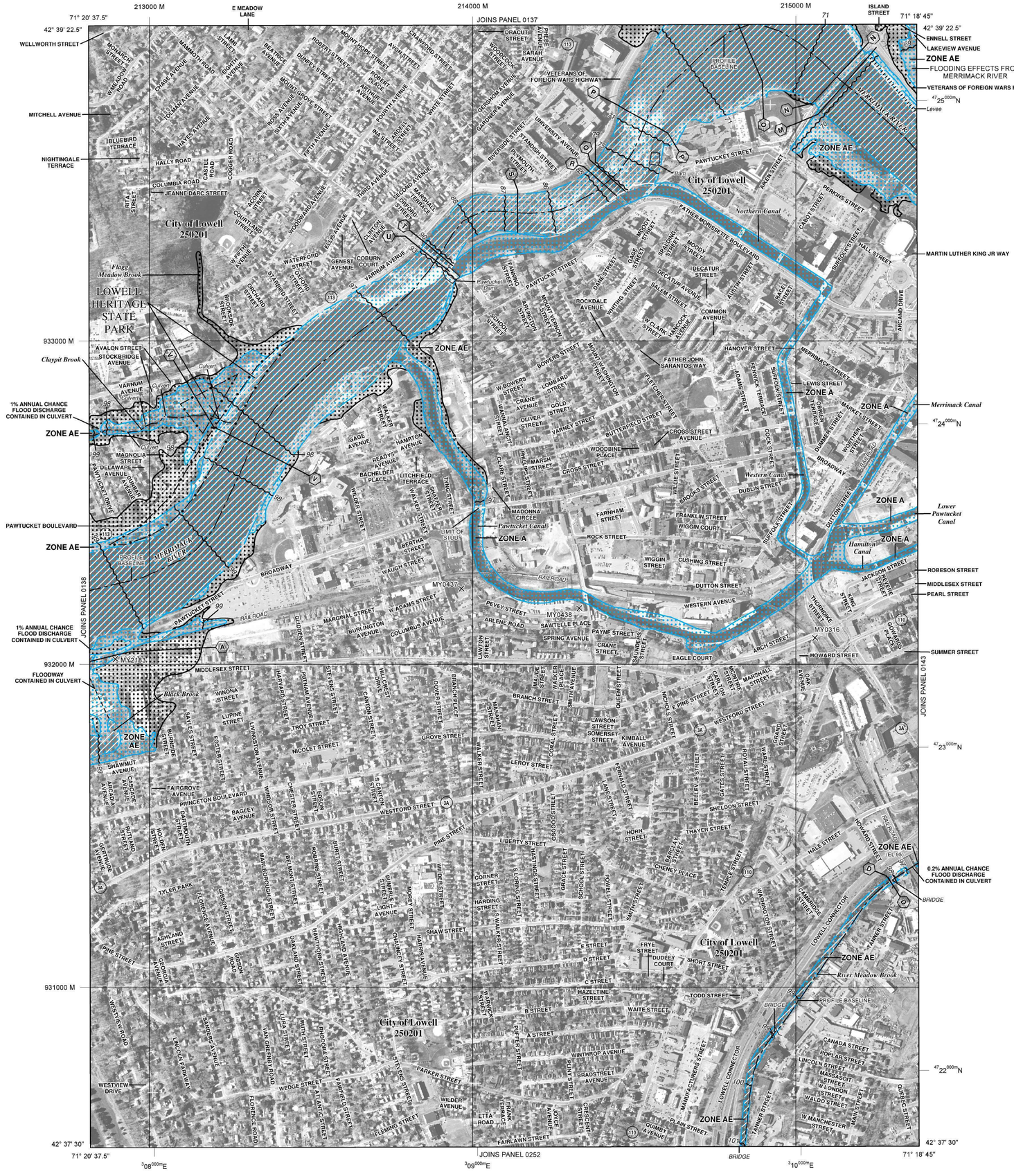
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% Annual Chance Floodplain Boundary
	0.2% Annual Chance Floodplain Boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

A A	Cross section line
23 23	Transect line
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
4989000 M	1000-meter ticks: Massachusetts State Plane Mainland Zone (FIPS Zone 2001), Lambert Conformal Conic projection
4 89 000m N	1000-meter Universal Transverse Mercator grid values, zone 19
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
June 4, 2010

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

July 7, 2014 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0139F

FIRM

FLOOD INSURANCE RATE MAP

MIDDLESEX COUNTY, MASSACHUSETTS
(ALL JURISDICTIONS)

PANEL 139 OF 656
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LOWELL, CITY OF	250201	0139	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
25017C0139F
MAP REVISED
JULY 7, 2014

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Massachusetts State Plane Mainland Zone (FIPS zone 2001). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from orthophotography provided by MassGIS at a scale of 1:500 from photography dated April 2008.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

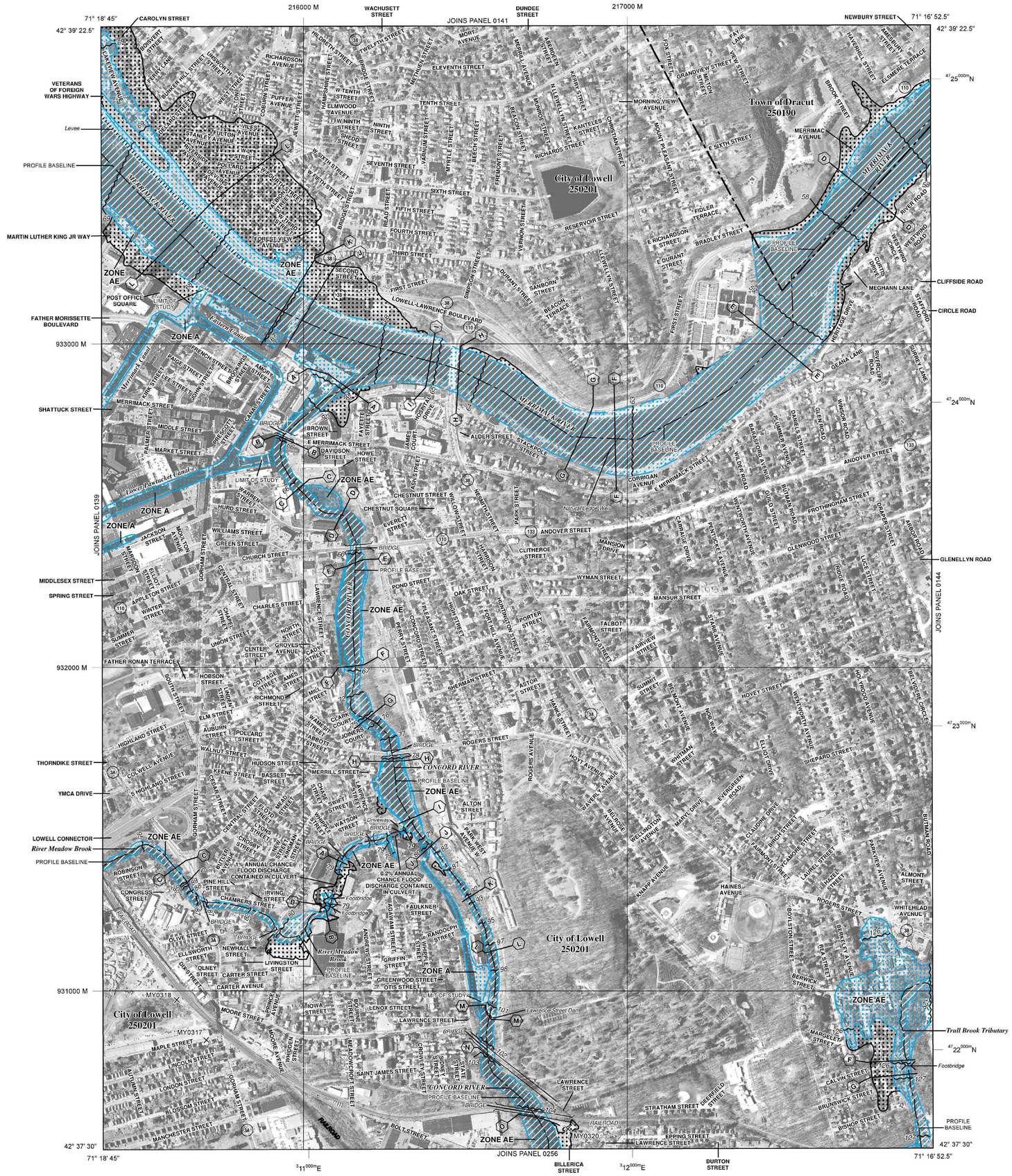
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% Annual Chance Floodplain Boundary
- 0.2% Annual Chance Floodplain Boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- 45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
- 4989000 M — 1000-meter ticks: Massachusetts State Plane Mainland Zone (FIPS Zone 2001), Lambert Conformal Conic projection
- 4689000 N — 1000-meter Universal Transverse Mercator grid values, zone 19
- DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
June 4, 2010

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

July 7, 2014 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0143F

FIRM

FLOOD INSURANCE RATE MAP

MIDDLESEX COUNTY, MASSACHUSETTS (ALL JURISDICTIONS)

PANEL 143 OF 656
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DRACUT, TOWN OF	250190	0143	F
LOWELL, CITY OF	250201	0143	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
25017C0143F
MAP REVISED
JULY 7, 2014

Federal Emergency Management Agency

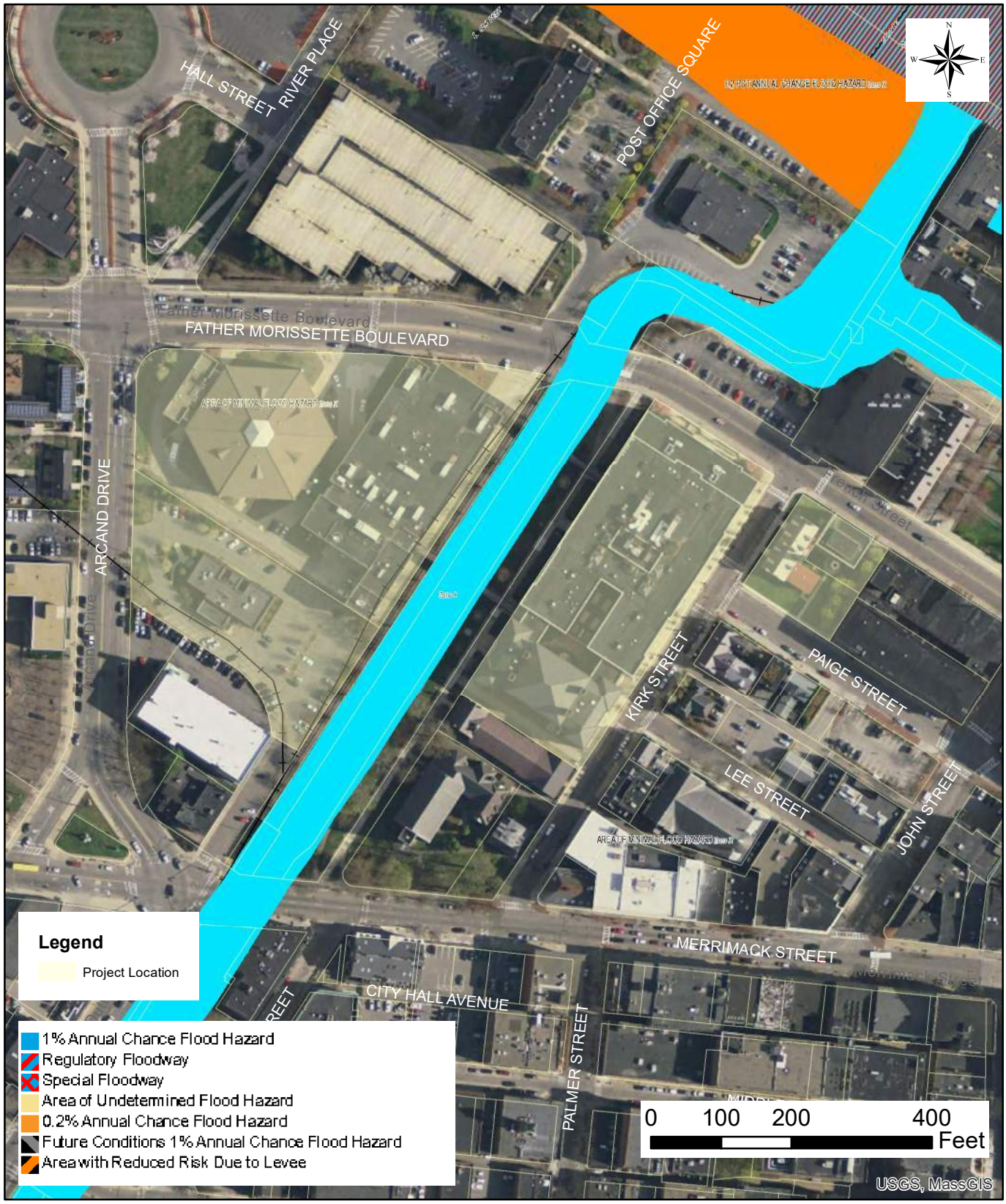


Figure X: National Flood Hazard Layer
Lowell High School
Lowell, Massachusetts

Data Source: MassGIS
Nitsch Project #11601

Nitsch Engineering



Natural Heritage and Endangered Species Program

Lowell, Massachusetts

Data Source: MassGIS
Nitsch Project #11601

Nitsch Engineering

HASTINGS CONSULTING

Building, Fire &Access Codes • Fire Protection Engineering

Lowell High School

Lowell, Massachusetts



Revised PSR Code Report

Prepared By: Kevin S. Hastings, P.E., LEED AP

Date: March 23, 2018

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Introduction

The existing Lowell High School is a campus-style high school consisting of multiple buildings. The Freshman Academy and Steam Plant are also part of the existing campus, however these buildings are not included in the scope of the design options being considered and are not included in this code report. This code summary is based on conceptual architectural plans for three potential redevelopment options for the school:

- **Add/Reno Option 2A –** renovation of the 1980 and 1922 buildings, new Gymnasium and Freshman wing additions, and new two-tier elevated pedestrian walkway.

- **Add/Reno Option 3A –** renovation of the 1980 and 1922 buildings, new Gymnasium and Freshman wing additions, and new two-tier elevated pedestrian walkway.

- **New Option A – Expanded Site** – entirely new building.

Following is a list of applicable codes:

Code Type	Applicable Code (Model Code Basis)
Building	780 CMR: Massachusetts State Building Code, 9th Edition • Amended 2015 International Building Code (IBC) • Amended 2015 International Existing Building Code (IEBC)
Fire Prevention	527 CMR: Massachusetts Fire Prevention Regulations
Accessibility	521 CMR: Massachusetts Architectural Access Board Regulations
Electrical	527 CMR 12.00: Massachusetts Electrical Code • Amended 2017 National Electrical Code
Elevators	524 CMR: Massachusetts Elevator Code • Amended 2004 ASME A17.1
Mechanical	2015 International Mechanical Code (IMC)
Plumbing	248 CMR: Massachusetts Plumbing Code
Energy Conservation	2015 International Energy Conservation Code & Stretch Energy Code

International Existing Building Code

The 2015 International Existing Building Code with Massachusetts amendments allows for 3 separate compliance methods, the Prescriptive Method, Work Area Method, and Performance Compliance Method. This report is based on the Work Area Method.

1. Work Area and Classification of Work:

It is expected that the proposed work will likely include renovations throughout the entire interior of the buildings, installation of new MEP systems throughout, as well as new additions. For the purposes of this report it has been assumed that the scope of work is likely to be classified as Level 3 (the highest level of renovation). This level includes the reconfiguration of spaces, the addition or elimination of doors and windows, the reconfiguration or extension of systems, and/or the installation of additional equipment in

more than 50% of the aggregate area of the building. The work must comply with the following IEBC Chapters based on the level of work in each building:

Level 2 Alteration: IEBC Chapters 7 & 8
Level 3 Alternation: IEBC Chapters 7, 8 & 9
Addition: IEBC Chapter 11

2. Occupancy Classifications:

1980 Building
Non-Separated Mixed Uses:
• E (Secondary Education)
• A-2 (Cafeteria)
• A-3 (Library and Assembly Areas)

1922 Building
Non-Separated Mixed Uses:
• E (Secondary Education)
• A-1 (Auditorium)
• A-3 (Library and Assembly Area)

New Gymnasium Wing Addition
Non-Separated Mixed Uses:
• A-3 (Exercise Areas and Locker Rooms)
• A-4 (Gymnasium with Spectator Seating)

New Freshman Wing Addition
• E (Secondary Education)

Entirely New Building
Non-Separated Mixed Uses:
• E (Secondary Education)
• A-1 (Auditorium)
• A-2 (Cafeteria)
• A-3 (Library and Assembly Areas)
• A-4 (Gymnasium with Spectator Seating)

No changes in occupancy classification of the existing buildings are anticipated for any of the options.

3. Construction Type:

1980 Building
Based on existing conditions observed, the 1980 Building appears to be constructed with CMU walls and unprotected structural steel members resulting in Type IIB construction (noncombustible, no fire-resistance rating).

1922 Building
The 1922 Building includes multiple sections constructed at separate times (south original 1892 building, central addition in 1922, and the north addition in 1997). It appears to be constructed with various construction materials including concrete, wood and steel structure and masonry exterior wall resulting in a minimum of Type IIIB construction (combustible interior- no fire-resistance rating; 2-hour noncombustible exterior wall). The addition at the front of the building had spray-on fireproofing on the structure, therefore the construction type could potentially be Type IIIA (combustible interior- 1-hour fire-resistance rating; 2-hour noncombustible exterior wall).

4. Height and Area Limitations

The construction of an addition requires that the building size not exceed the limitations for new construction (IEBC 1102). Therefore, all of the three potential design options will require compliance with the height and area limitations for new construction to some extent.

Add/Reno Options 2A & 3A
The 1980 Building and 1922 Building will be connected by new two-tier elevated pedestrian walkways which can comply with IBC Section 3104. This allows the two buildings to be considered as separate structures for the purposes of evaluating compliance with the height and area limitations for new construction. Since the proposed new construction in both Options 2A and 3A will only be connected to the 1980 Building, only the 1980 building is subject to compliance.

Based on an overall height of 5 stories above grade (max. height of 69'-0"), the 1980 Building, Freshman Wing, and Gymnasium Wing would all have to be of Type IB (2-hour, non-combustible) to comply with the height limitation if they are considered as a single building (IBC Table 504.4). However, since the Freshman Wing is the only section extending above 3 stories, that wing could be separated from the other two wings by a 3 hour structurally independent fire wall to create separate buildings. That would allow the 1980's Building and Gymnasium Wing to be of lower construction types. With fire walls separating the new Gymnasium Wing, it could be of Type IIB Construction, allowing exposed steel structure.

New Option 4
Since the proposed building would be 5 stories (69'-0") in height, it would have to be of Type IB construction (2-hour, non-combustible structure).

5. Fire Resistance Ratings:

The following table summarizes the required fire resistance ratings for the potential construction type options discussed above, based on IBC Table 601 and other applicable code provisions:

Structural Fire Ratings

Building Element	Type IB	Type IIB
	Fire Resistance Rating (Hrs)	
Primary Structural Frame	2	0[A]
Exterior Bearing Walls including columns along the exterior wall	2	0
Exterior Non-Bearing Walls	Based on Fire Separation Distance	
Interior Bearing Walls	2	0[A]
Floor Construction	2	0[A]
Roof Construction	1	0

A. Not less than the rating supported (IBC 707.5.1, 708.4. and 711.2.3).

Building Element	Fire Resistance Rating (Hrs)	Opening Protectives (Hrs)
Exit Access Corridors (IBC Table 1020.1)	0	0
Existing 3 stories or less Stair, Mechanical, and Elevator Shafts (IEBC 803.2.1 Exc. 6)	Maintain Existing Enclosure	
Existing 4 story Stair, Mechanical, and Elevator Shafts (IEBC 803.2.1)	1	1
New Shafts, connecting 4 stories or more (IBC 713.4)	2	1½
New Shafts, connecting less than 4 stories (IBC 713.4)	1	1
Pedestrian Walkway Separation (IBC 3104.5.2)	Smoke Resistant	Smoke Resitant

6. Vertical Openings:

All existing vertical openings in the work area connecting two or more floors must be enclosed with 1 hour rated construction and approved opening protectives unless the openings meet one of the exceptions in IEBC 803.2.1. New vertical openings are required to comply with IBC Sections 712 & 713.

Based on the plans reviewed and observations at the site, the majority of vertical openings appear to be enclosed with a shaft enclosure with the exception of the unenclosed vertical openings listed below. Where the building contains unprotected floor opening they must be brought into compliance with IEBC 703.2.1 if they are included in the work area. The floor openings would be considered part of the work area if the project includes reconfiguration of any of these spaces per the following definition:

> **WORK AREA.** That portion or portions of a building consisting of all reconfigured spaces as indicated on the construction documents. Work area excludes other

portions of the building where incidental work entailed by the intended work must be performed and portions of the building where work not initially intended by the owner is specifically required by this code.

Existing floor openings connecting 3 stories or less are permitted to remain within a fully sprinklered building (IEBC 703.2.1 Exc.6). The following vertical openings were observed:

- The library in the 1980 Building contains a 2-story space connecting the 2nd and 3rd levels. However the 3rd story appears to be separated from the library and the 2nd floor by fire-rated glass. The proposed alterations will eliminate this two story space however.

- The teacher's center is located on a mezzanine level on the 3rd level of the 1922 Building and contains a 2-story opening. For new construction mezzanines cannot exceed 1/3 of the area of the "room below", however in past building codes mezzanines were permitted to be up to 1/3 of the area of the story below. Although in this case the mezzanine may not be less than 1/3 the area of the room below, in the past typically building officials have allowed existing mezzanines to continue to be considered as a mezzanine under the prior area limitation based on the story below. All proposed options include demolition of this mezzanine level to create a high ceiling space in the Library that will eliminate this potential issue.

- Option 3A includes adding new light wells connecting Levels 1-3 in the 1980 Building. If these light wells are enclosed at the top they would create three story floor openings. In order to avoid classifying them as an atrium space (with a smoke exhaust system), the walls and windows on Levels 2 and 3 would require 1 hour fire-rated glazing. Sprinkler-protected glass or fire shutters could potentially be used as an alternative but would have to be approved by the building official. The building official may also accept separation only at Level 3 as an alternative approach, effectively creating the equivalent of a two story floor opening which is permitted.

  If the light wells are open to the exterior at the top they are not considered floor openings and would not require any additional fire protection measures.

7. Interior Finishes:

The existing interior finish of walls and ceilings in the work area and in all exits and corridors serving the work area must comply with the code requirements for new construction (IEBC 803.4). All newly installed wall and ceiling finishes, and interior trim materials must also comply with IBC Table 803.11 (IEBC 702.1, 702.2, 702.3). The requirements are summarized below:

Walls & Ceilings (IBC Table 803.11)

Use Group:	E	A
Exit Enclosures	Class B	Class B
Exit Access Corridors	Class C	Class B

Rooms & Enclosed Spaces	Class C	Class C

Note that where exit stairs and exit access corridors serve more than one use group, the most restrictive interior finish is required. The existing interior finishes appeared to comply for all buildings.

8. Means of Egress:

The means of egress including the number of exits and egress capacity must be sufficient for the number of occupants on all floors (IBC 102.6.4). The means of egress for the existing buildings and proposed new structures appears sufficient based on the number of exits shown on the conceptual plans. Once renovation plans have been developed, the means of egress can be further evaluated in more detail based on the calculated occupant load and available exits for the chosen design option.

General Egress Requirements

Since the buildings are a single-tenant occupancy, the means of egress provisions in the IEBC do not apply, however the existing buildings must maintain or improve their current level of egress (IEBC 704.1 & 805.1). As long as they are adequately maintained, existing means of egress stairs (including guardrails) and other elements can continue to serve as required egress regardless of their level of compliance with the code for new construction and regardless of the level of renovation (although see below for access code requirements for stair handrails and nosings).

The new additions or new building must be designed to comply with the following means of egress provisions. No significant deficiencies with these requirements were identified in the conceptual plans for each option.

a. Maximum exit access travel distance must be less than 250 feet (780 CMR Table 1017.2):

b. Maximum dead-end corridor length must be less than 20 ft or 2.5 times the least width of space (up to 50 ft is permitted in Use Group E spaces) (780 CMR 1020.4).

c. All rooms or spaces with an occupant load greater than 49 people or a common path of travel distance over 75 ft must be provided with two egress doors swinging in the direction of egress and illuminated exit signs at each exit (780 CMR Table 1006.2.1 & Sections 1010.1.2.1 & 1013.1). Boiler rooms require two means of egress if the room is greater than 500 sqft. and includes individual fuel-fired equipment greater than 400,000 Btuh input capacity. Also one of the two required exit access doorways is permitted to be a fixed ladder or alternating tread device (780 CMR Section 1006.2.2.1).

d. Doors serving assembly or educational rooms with more than 49 people and doors along the path of egress travel from such rooms must be provided with panic hardware (780 CMR 1010.1.10). Doors from main electrical rooms with equipment rated 1,200 amps and over 6 feet wide must swing in the direction of egress with panic hardware (780 CMR 1010.1.10).

e. All means of egress lighting and exit signs throughout the building must be provided with an emergency power supply to assure continued illumination for not less than 1.5 hours in case of primary power loss (780 CMR 1008.2 & 1008.3.4).

f. Remote means of egress must be separated by ⅓ of the diagonal dimension of the room or space they serve (780 CMR 1007.1.1). The distance between exits may be measured along 1-hour fire resistance rated corridors complying with 780 CMR 1018 but must otherwise be measured in a straight line between exit doors. Additionally high-rise buildings are required to have their interior exit stairways be separated by at least 30 feet or not less than one-fourth of the maximum overall diagonal dimension of the building floor (780 CMR 403.5.1).

g. A stair or alternating tread device must be provided to any main roof surface four or more stories above grade (780 CMR 1011.12). Roofs and penthouses containing elevator equipment that must be accessed for maintenance are required to be accessed by a stairway (780 CMR 1011.12.1). Permanent means of access to any roof containing mechanical equipment must be provided in accordance with the Mechanical Code. Permanent means of access to any roof containing mechanical equipment must be provided in accordance with the Mechanical Code. If the roof contains any gas-fired equipment access via a hatch and permanent or foldaway inside stairway or ladder is required in accordance with Section 9.4.3 of the National Fuel Gas Code (NFPA 54).

h. All exits must discharge to the exterior of the building except that a maximum of 50% of the number and capacity of the exit enclosures are allowed to exit through areas on the level of discharge if the exit enclosures discharge to a free and unobstructed path of travel to an exterior exit that is readily visible from the discharge of the exit enclosure; the entire area of the level of exit discharge is separated from areas below by construction consistent with the rating of the exit enclosure; and the egress path and all areas open to the egress path on the level of exit discharge must be fully sprinklered (780 CMR 1028.1).

i. For new additions or new buildings greater than four stories, at least one accessible means of egress must be an elevator complying with 780 CMR 1009.4 unless a horizontal exit is provided (780 CMR 1009.2.1).

    - Standby power must be provided for the elevator to be considered an accessible means of egress (780 CMR 1009.4).

    Standby power will be required for the Freshman Wing in either of the Add/Reno Options and in the New Building Option since the buildings are 5 stories tall.

j. A two-way communication system is required at each elevator landing on accessible floors that are one or more stories above or below the level of exit discharge (780 CMR 1009.8).

k. An approved barrier must be provided at the level of exit discharge where a stair enclosure continues below its level of exit discharge (780 CMR 1023.8).

l. At least one passenger elevator must be sized to accommodate the loading and transportation of an ambulance gurney or stretcher sized 24" wide by 84" long with 5" radius corners (524 CMR 17.40(1)).

9. Required Fire Protection Systems:

The following fire protection systems are required:

- Automatic sprinkler system: required throughout existing buildings that are substantially renovated or undergo an addition (MGL c. 148 s. 26G).

  It is expected that all design options will include full sprinkler protection throughout all new and existing building areas.

- Fire Alarm (IEBC 804.4.1 & 804.2): although the IEBC allows existing previously approved fire alarm systems to remain regardless of the level of renovation, full compliance with the MA Architectural Access Board's Regulations (see below) will require a compliant fire alarm system throughout the building. The existing buildings currently contain a fire alarm system with deficient notification device coverage (no strobes in classrooms). To comply with current code provisions, new and existing areas require a voice/alarm communication system (IBC 907.2.3).

- Standpipe System (IBC): standpipe systems are required throughout the new buildings since they include floors greater than 30 feet above the lowest level of fire department access (IBC 905.3.1).

- Fire extinguishers (527 CMR 1 Section 13.6 & IBC 906.1). Fire extinguishers must be located throughout the building so that the maximum travel distance to an extinguisher is less than 75 feet.

- Carbon Monoxide Detection: required in accordance with 780 CMR 915 and 527 CMR 1 Chapter 13.

- Emergency responder radio coverage (780 CMR 916)

10. Energy Code Provisions for Existing Buildings

New work is subject to the 2015 International Energy Conservation Code (IECC) or ANSI/ASHRAE/IESNA 90.1 with Massachusetts Amendments (Massachusetts Energy Code). Level 3 alterations to existing buildings are permitted without requiring the entire building to comply with the energy requirements of the International Energy Conservation Code (IECC). The alterations (new elements) shall conform to the energy requirements of the IECC as they relate to new construction only (IEBC 811.1).

The Massachusetts Stretch Energy Code, as adopted by the City of Lowell, does not apply to existing buildings or additions to existing buildings. However it does apply to new buildings greater than 100,000 sqft. in area (780 CMR Appendix AA 101.2).

11. Ventilation Requirements

All reconfigured spaces must provide existing mechanical ventilation not less than 5cfm of outdoor air per person and not less than 15 cfm of ventilation air per person, or natural ventilation as required by the International Mechanical Code (i.e. exterior openings equal to 4% of floor area) (IEBC Section 809).

12. Structural Provisions for Existing Buildings

Structural alterations to the existing buildings must be evaluated by a registered structural engineer to determine compliance with the IEBC.

13. Accessibility for Persons with Disabilities

Massachusetts Architectural Access Board Regulations

Alterations to the building must comply with the requirements of the Massachusetts Architectural Access Board Regulations (521 CMR). For existing building alterations the requirements of 521 CMR are based on the cost of the proposed work:

A. If the cost of the proposed work is **less than $100,000,** only the new work must comply.

B. If the cost of the proposed work is **greater than $100,000** then all new work must comply and the existing building must include an accessible public entrance, toilet room, telephone and drinking fountain (if public phones and drinking fountains are provided) (521 CMR Section 3.3.1(b)). Exempt work when calculating the cost of work includes roof repair or replacement, window repair or replacement, and repointing and masonry repair work unless the exempt work exceeds $500,000.

C. If the cost of the proposed work is **greater than 30% of the full and fair cash value** of the existing building, the entire building is required to comply with 521 CMR (521 CMR Section 3.3.2). There is no exempt work, i.e. the entire project costs apply to determining the 30% criteria.

The cost of all work performed on a building in any 36 month period must be added together in determining the applicability of 521 CMR (521 CMR Section 3.5). The full and fair cash value of the existing building is determined by using the 100% equalized assessed value of the building on record with the city assessor's office.

It is anticipated that the cost of the renovations and additions to the existing buildings will exceed the 30% threshold, and therefore all portions of the building open to the general public (students, visitors, etc) must be upgraded to comply in full with the current

requirements of 521 CMR. Any employee-only areas such as staff lounges, staff bathrooms, and staff work areas are not required to comply with 521 CMR, as long as student and public access is not permitted. It should be noted that the Access Board expects to extend their jurisdiction to employee areas.

Major upgrades required to meet full compliance with the provisions of 521 CMR will likely include the following building features (note that a comprehensive accessibility survey was not conducted, but should be completed if 30% trigger is reached in any existing building):

- All public entrances must be accessible (521 CMR 25.1)

  Due to security reasons, the only entrances used are the main entrance located between the existing Field House and 1980 Building and the entrance into the 1922 Building used for access to the auditorium, both located along Father Morissette Boulevard. All other exterior doors are exit-only. The two main entrances appear generally accessible. However the ramp provided at the entrance into the 1922 Building is not provided with compliant handrails. The handrail is not provided with both a high and a low rail as required by 521 CMR 24.5.

  It is our understanding the building's entrances are being evaluated to determine which entrances are used by the public (teachers and students). 521 CMR 25.1 (below) requires all public entrances to be accessible. The MAAB definition for "Entrance" is provided below as well.

  > **(521 CMR 25.1):** All public entrance(s) of a building or tenancy in a building shall be accessible. Public entrances are any entrances that are not solely service entrances, loading entrances, or entrances restricted to employee use only.
  >
  > **ENTRANCE (521 CMR 5.1):** Any access point to a building or portion of a building or facility used for the purpose of entering. An entrance includes the approach walk, stairs, lifts, ramp or other vertical access leading to the entrance platform; the entrance platform itself; vestibules, if provided; the entry door(s) or gate(s); and the hardware of the entry door(s) or gate(s).

- All public and common use areas must be accessible and provided with an accessible route thereto (521 CMR Section 12.2.2 and 20.1).

  Most areas of the buildings were generally accessible and along an accessible route via elevators. The existing elevator sizes appeared to meet the minimum threshold (4' x 4'), however the controls would need to be updated to comply with MAAB (Braille, height, etc.). Note that a stretcher-sized elevator is not required in existing buildings regardless of the level of renovation, but would be required in any new additions (524 CMR).

- Accessible toilet rooms are required in each toilet room location (521 CMR 30.1).

  Some of the existing restrooms are not accessible due to dimensional and clear space issues. The bathrooms observed in the 1922 Building and 1980 Building appeared to be generally accessible but would need some slight modifications to meet the MAAB.

- Accessible Handrails & Stair Nosings (521 CMR 27.4)

  Handrails in many locations throughout the buildings were not compliant with the MAAB due to improper extensions at the top and bottom, or handrails were only provided on one side of the stair. Stairs must be provided with handrails on each side and must extend at least 12 inches beyond the top riser and parallel with the floor. At the bottom, handrails must extend at least 12 inches plus the width of one tread beyond the bottom riser. The handrail shall continue to slope for a distance of the width of one tread from the bottom riser; the remainder of the extension shall be horizontal. The ramp located in the basement of the 1922 Building is not provided with handrails. The majority of stairs throughout the 1922 and 1980 Buildings were provided with a compliant handrail on one side, however the handrail on the other side were typically not compliant with the extension requirements. Some stairs also included abrupt nosings that would have to be altered to comply.



Typical Stair Handrails

- Accessible Wheelchair Seating (521 CMR 14.4)

  Designated wheelchair spaces are required to be provided based on the total number of seats in the assembly space. The auditorium in the 1922 Building was not provided with wheelchair spaces on the balcony level and they were not clearly designated on the main level.





Auditorium Balcony Seating

- Accessible Door Hardware (521 CMR 26.11)

  In the 1922 Building is was observed that some doors are provided with knobs for opening devices. Doors must have operating devices that have a shape that is easy to operate with one hand and that does not require tight grasping (521 CMR 26.11.1). Lever operated mechanisms are required.



Example Door Hardware

- Accessible Lab Benches (521 CMR 12.4)

  The science classrooms in the 1922 Building were not provided with accessible lab benches. At least 5% of each type of sink, counter or other work areas in classrooms and labs must be made accessible.



Example Lab Bench

Americans with Disabilities Act Guidelines

The ADA Guidelines are not enforced by the Commonwealth of Massachusetts, they can only be enforced through a civil lawsuit or complaint filed with the U.S. Department of Justice. Compliance with the ADA Guidelines is triggered by renovations to the existing building. All renovations to the building must be made to ensure that, to the maximum

extent feasible, the altered portions of the facility are readily accessible to and usable by individuals with disabilities (28 CFR Part 36 Section 36.402(a)). Alterations made to provide an accessible path of travel to altered areas and accessible facilities (i.e. provide accessible toilet facilities) are not required if the cost exceeds 20% of the total cost of the alteration (28 CFR Part 36 Section 36.403(f)). However, if the cost to meet these accessibility requirements does exceed 20%, alterations are still required to the maximum extent that the area can be made accessible without exceeding the 20% criteria (28 CFR Part 36 Section 36.403(g)). The ADA also contains less stringent dimensional requirements for some building elements in an existing building where it is infeasible to meet the requirements for new construction (ADA Section 4.1.6).

14. Minimum Number of Toilet Room Fixtures

The Massachusetts Plumbing Code (248 CMR) regulates the number of plumbing fixtures required throughout buildings. The minimum number of plumbing fixtures is established by 248 CMR 10.10(18) Table 1 based on the building use and the expected population as determined by the local Plumbing Inspector per 248 CMR 10.10 (18)(2). The Plumbing Inspector must approve the building population; however, the building population can generally be based on the designer's determination of the actual number of people expected within the building. The Plumbing Code expects that the building population will be divided evenly between male and female for the purpose of determining fixture counts. Any distribution other than 50/50 must be justified to the Plumbing Inspector.

If the existing number of toilet room fixtures are altered (i.e. to make existing toilet rooms accessible) the number provided is subject to the minimum requirements of 248 CMR. The following analysis was completed using the maximum expected population of the 1980 and 1922 Buildings provided by the architect.

1922 & 1980 Buildings

Classification		Water Closets		Male Urinals [A]	Lavatories (each sex)	Drinking Fountains	Service Sink
		Female	Male				
Staff	170 Females 170 Males	1 per 20	1 per 25	33%	1 per 40	N/R	1 per Floor
	Required fixtures	8.5	6.8		4.25	0	
	Total Required Fixtures	9	5	2	5	0	
Students	1,320 Females 1,320 Males	1 per 30	1 per 90	1 per 90	1 per 90	1 per 75	1 Per Floor
	Required fixtures	44	14.67	14.67	14.67	35.2	
	Total Required Fixtures	44	15	15	15	36	

[A] Urinals may be substituted for toilets up to the percentage shown of the required number.

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LOWELL HIGH SCHOOL
Lowell, Massachusetts

PSR Pricing Narrative - Structural
March 28, 2018
PE Project #67150.01

INTRODUCTION

Foley Buhl Roberts & Associates, Inc. (FBRA) is collaborating with Perkins Eastman (PE) and their consultants in the evaluation of renovation/addition and new construction options for the Lowell High School in Lowell, Massachusetts. The purpose of this *Preferred Schematic Report* is to outline the basis of the structural design, describe the proposed structural systems and summarize the anticipated scope of structural work for required for the proposed addition/renovation and new construction options. Outline Structural Specifications are also included. This report should be used in conjunction with the preliminary Architectural Drawings and the documents of the other disciplines, in preparing the preliminary cost estimate.

Lowell High School, located along Father Morissette Boulevard/French Street in Lowell, is comprised of four main buildings: The 1922 Building, the 1980 Building (Academic Wing and Fieldhouse/Natatorium), the Freshman Academy and the Steam Plant. The 1980 Building is the only building on the campus located on the west side of the Merrimack Canal. It is connected to the 1922 Building by two enclosed pedestrian bridges, spanning over the canal between the buildings at their Second Floor levels. The Freshman Academy (originally the Lowell Trade School) and Steam Plant buildings are located on the east side of the High School's campus, one block over from the 1922 Building. The 1922 Building and the 1980 Building are included in the current design options and are described below. The Freshman Academy and the Steam Plant will be returned to the City and be repurposed. Refer to previous reports for information on these buildings.

The three-story, 1922 Building has a full basement and is located on the east side of the Merrimack Canal. The facility consists of three main sections: the original Coburn Hall Building constructed in 1892, the 1992 (Classroom/Auditorium) addition, constructed on the north side of Coburn Hall and the 1997 addition, constructed at the north end of the 1922 addition. The 1997 addition is structurally separated from the 1922 addition at each level by an expansion joint. Each level of the facility is comprised mainly of classrooms. The Auditorium (a triple-height space) is located on the First Floor, at the northern end of the 1922 addition.

The 1980 Building is a steel and concrete framed building comprised of a three-story Academic Wing and a two-story Fieldhouse/Natatorium that are connected by a glazed lobby. The 1980 Building underwent minor renovations along with a small addition in 1997. The two pedestrian bridges, which connect the 1980 Building and the 1922 Building were constructed at different times; the south bridge was built with the 1980 Building and the north bridge was constructed during the 1997 renovations to the school.

Structural conditions at the Lowell High School were reviewed at the site on August 26, 2016 and on September 8, 2016. FBRA also conducted site reviews of Lowell High School buildings in July 2013, as part of the Comprehensive Facilities Assessment | Master Plan Report prepared for the Lowell Public Schools District. As original drawings for the 1922 Building (except for the 1997 addition) were not available, a program of limited structural investigations was conducted during the weekends of March 18/19, 2017 and March 25/26, 2017 to determine the general layout and details of the floor and roof structure in these buildings.

Available geotechnical/subsurface soils information for the Lowell High School was limited; however, the December 8, 1995 Geotechnical Engineering Report prepared by GZA GeoEnvironmental, Inc. for the 1997 addition to the 1922 Building and the addition to the 1980 Academic Wing (south end) was made available to the Design Team. Additional subsurface explorations were conducted in March 2017 by Geotechnical Partnership, Inc. (GPI). Refer to the March 24, 2017 *Feasibility Phase Geotechnical Data Summary Report* and the March 28, 2018 *PSR Pricing Narrative - Geotechnical* for further information.

Refer to FBRA's, *Existing Conditions Evaluation/Base Repair Structural Report* (updated May 4, 2017) and the reports prepared by PE and their consultants for additional information. Code related issues are addressed in the *Code Report* prepared by the Hastings Consulting dated March 23, 2018.

I. PROPOSED OPTIONS

With reference to the March 20, 2018 (Addition/Renovation Option 2A and New Option A - Expanded Site) and the March 25 2018 (Addition Renovation Option 3A) Preliminary Architectural Drawings prepared by PE, the following options are being considered:

Addition/Renovation Option 2A:

Addition/Renovation Option 2A proposes the full renovation of the 1980 Academic Wing, with limited structural alterations, and two (2) small, three-story additions at the south end of the building. The existing Fieldhouse/Natatorium would be demolished and a new, two-story, Gymnasium Wing would be constructed at the southwest section of the site. A new, five-story Freshman Academy Wing would be constructed at the northwest section of the site, connecting to the 1980 Building on the east side and to the new Gymnasium Wing on the south side. The existing pedestrian bridges that span the Merrimack Canal and connect these two facilities would be removed and replaced by two (2) new, two-tier enclosed bridges. A full renovation (with limited structural alterations) of the 1922 Building is also planned. The existing Freshman Academy and the Steam Plant would be returned to the City and be repurposed.

Addition/Renovation Option 3A at Expanded Existing Site:

This option is similar to Option 2A; however, the new Gymnasium Wing would be constructed further to the south, on the adjacent, 75 Arcand Drive site, to be acquired by the City. The existing Freshman Academy and the Steam Plant would be returned to the City and be repurposed.

New Option A - Expanded Site:

In this option, the entire 1980 Building (including the Academic Wing, the Field House /Natatorium and the existing pedestrian bridges) would be demolished, and a new, five-story High School would be constructed on the existing site and on the adjacent, 75 Arcand Drive site to the south (to be acquired). The existing Freshman Academy, the 1922 Building and the Steam Plant would be returned to the City and be repurposed.

Refer to the above-referenced, Preliminary Architectural Documents for additional information and for gross floor areas of the proposed options.

II. BASIS OF DESIGN - NEW CONSTRUCTION (ALL OPTIONS)

The basis of the structural design for new construction (all options) is presented in this section.

Codes and Design Standards

Building Code:	Massachusetts State Building Code (780 CMR) - Ninth Edition.
Concrete:	ACI 318 and ACI 301; latest editions.
Masonry:	ACI 530 and ACI 530.1; latest editions.
Structural Steel:	AISC "Specification for Structural Steel Buildings" and AISC "Code of Standard Practice"; latest editions
Steel Deck:	Steel Deck Institute (SDI) – Referenced Standards; latest editions.

Design Loads/Parameters

Live Loads:

Classrooms (with partition allowance):	65 PSF
Upper Floor Corridors:	80 PSF
Open plan areas:	100 PSF
Stairs and First Floor Corridors (Including Pedestrian Bridges):	100 PSF
Library/Media Center:	100 PSF
Mechanical Areas:	150 PSF

Snow Loads (Lowell):

Basic Ground Snow Load:	50 PSF
Minimum Flat Roof Snow Load:	30 PSF

Wind Loads (Lowell):

Wind Speed (Ultimate)	134 MPH

Seismic Parameters (Lowell):

Spectral Response – Short Periods:	S_S = 0.235g
Spectral Response – 1-Second Periods:	S_D = 0.074g
Occupancy Category:	III
Seismic Design Category:	B
Site Class:	D
Structural System:	Building Frame System
Lateral Load Resisting System:	Steel Braced Frames (*Not Specifically Detailed for Seismic Resistance*)
Response Modification Factor (R):	3.0
System Overstrength Factor (Ω_0):	3.0
Deflection Amplification Factor (C_d):	3.0

Foundations:

Foundations for the 1997 addition to the 1922 Building on the east side of the Merrimack Canal are spread footings, designed on the basis of a 4.0 tons per square foot allowable bearing capacity. It appears that Coburn Hall is supported on conventional spread footings as well. The Academic Wing and most of the Fieldhouse/Natatorium at the 1980 Building are supported on a pile foundation. The balance of the Fieldhouse/Natatorium is supported on conventional spread footings, designed on the basis of a 4.0 tons per square foot allowable bearing capacity. Foundations for the building on the 75 Arcand Drive property are unknown; however, conditions are assumed to be similar to those at the 1980 Building site. Additional subsurface soils investigations are planned.

Available geotechnical/subsurface soils information for the Lowell High School was limited; however, the December 8, 1995 Geotechnical Engineering Report prepared by GZA GeoEnvironmental, Inc. for the 1997 addition to the 1922 Building and the addition to the 1980 Academic Wing (south end) was made available to the Design Team. Additional subsurface explorations were conducted in March 2017 by Geotechnical Partnership, Inc. (GPI). Refer to the March 24, 2017 *Feasibility Phase Geotechnical Data Summary Report* and the March 28, 2018 *PSR Pricing Narrative - Geotechnical* for further information. The foundation related comments that follow in this report are based on the recommendations provided in these reports.

Borings taken by GPI in March 2017 (nine (9) total borings; two observation wells) indicate a subsurface soils profile with fill, overlying a layer of loose to medium dense glacial fluvial (alluvial) soils above glacial till. The thickness of the various soil materials varies. Bedrock was encountered in several borings at depths ranging from 18 feet to 39 feet. Accordingly, bedrock is not expected to be a factor in the design and construction of the proposed new additions. Groundwater was encountered at depths ranging from 8.0 feet to 12.0 feet below the ground surface (Elevation 26.7"+/- and Elevation 21.5'+/-, respectively); a seasonal high water elevation of EL. 24.5' has been recommended for this site. Under Addition/Renovation Options 2A and 3A, groundwater is not expected to be an issue during construction or in service, as no basements are planned. A partial Basement Level (at Elevation 22.0'+/-) is planned for New Option A - Expanded Site; groundwater will be an issue both during construction (dewatering required) and in service. The Basement Level slab will be structured to resist hydrostatic uplift (as well as dead and live loads). As this level will reside in the permanent water table, both the slab and the walls will be fully waterproofed. Additional groundwater readings will need to be taken to further evaluate the impact of groundwater on this construction.

Liquefaction of the soils is not considered to be a concern.

As the existing fills are not suitable for the support of footings, and significant solid waste (abandoned foundations and debris) was encountered below grade, GPI has recommended that a pile foundation be used for new construction (additions and the new building) at this site. Piles would be the driven conical point pipe type; 10.75" diameter with a 190 Kip (95 Ton) capacity, driven to bear in the dense glacial till, weathered rock or on bedrock (30 to 50 feet long). Alternate foundation systems include drilled concrete micropiles and ground improvement (i.e. rammed aggregate piers). Refer to the March 28, 2018 *PSR Pricing Narrative - Geotechnical* for further information.

Construction Classification:

New construction (Addition/Renovation Options 2A and 3A and New Option A - Expanded Site will be Type IB (Noncombustible, Protected; to be confirmed). Floor construction (except slabs on steel floor deck) and roof construction (including the steel roof deck) will require applied fireproofing to achieve the required fire resistance rating. In all options, the new construction will be fully sprinklered. Other (less restrictive) construction types may ultimately be allowed, pending the further evaluation of fire wall/building separation issues (refer to expansion joint comments in the following section).

Sustainable Design Considerations:

Sustainable design considerations will be incorporated in the building design (LEED v4).

III. STRUCTURAL SYSTEMS DESCRIPTIONS - NEW CONSTRUCTION (ALL OPTIONS)

Structural systems for new construction in all options (Addition/Renovation Options 2A and 3A and New Option A - Expanded Site) are described in this section. The anticipated scope of structural work in the existing buildings (Addition/Renovation Options 2A and 3A) is described in the **Section V** below.

Structural Bays/Spans: Structural bays/spans will vary; however, the average structural bay will be square or rectangular, approximately 1000 square feet in area. Roof construction over the New Gymnasium Wing (Addition/Renovation Options 2A and 3A) will clear span the space. Fourth Floor construction in New Option A - Expanded Site (at the two-story Media Center) will clear span the Gymnasium below (approximately 125 feet). Roof construction over the Auditorium in New Option A - Expanded Site will clear span the north-south width of the space, approximately 85 feet.

Story Heights/Floor Elevations: Typical story heights will be 13'-4". Refer to the Preliminary Architectural Drawings for additional information.

Foundations: As noted earlier in this report, the preliminary foundation design for Addition/Renovation Options 2A and 3A and New Option A - Expanded Site is based on 190 Ton capacity, conical point pipe piles.

Drainage: Foundation and underslab drainage systems will be required in cases where an occupied floor level will be located below the exterior finished grade (Basement Level of New Option A - Expanded Site).

Lowest Level Floor Construction for the new additions on the existing site (Addition/Renovation Options 2A and 3A) will be a 10" thick, reinforced concrete structural slab, underlain by a vapor barrier and rigid insulation (with stick clips).

The Basement slab in New Option A - Expanded Site will be a 12" thick, reinforced concrete structural slab, underlain by a vapor barrier and rigid insulation (with stick clips). A 12" thick layer of compacted gravel will be placed on top of the slab, and will serve as a sub-base for a 5" thick concrete slab on grade (reinforced with 6x6-W2.9 x W2.9 WWF). Two (2) integral sump pits will be provided in the slab on grade. Sub-slab piping and utilities will be located in the 12" thick layer of compacted gravel, to avoid penetrating the waterproofed slab below. In the event that there is a breach in the waterproofing system, water which enters the layer of compacted gravel can flow to the sump pits and be pumped out of the building.

In all options, intermediate slab support piles (one per structural bay) will be driven at the intersection of the diagonal centerlines of each structural bay. Piping, conduit and other sub-slab utilities will be hung from the structural slabs.

Typical Upper Level Floor Construction: Composite structural steel framing: 4½" thick (minimum), normal weight concrete topping slab on a 2" deep, 18 gauge, composite type, galvanized steel floor deck (6½" minimum total slab thickness), reinforced with welded wire fabric, spanning to composite wide flange steel beams. Steel beams span to composite wide flange steel girders that are supported by wide flange steel columns or HSS (tube) steel columns. All composite steel beams and girders will be *unshored.* Composite action will be achieved by field welding ¾" diameter x 5" long headed shear studs through the deck, to the top flanges of the beams and girders. To avoid compromising composite action, conduit or other, similar embedded items *should not* be placed in the concrete slab on steel deck construction. Slabs on composite steel floor deck will be placed at the required elevation, adding concrete to compensate for the deflection of the (unshored) steel framing (assume an approximate average of ¾" additional concrete required over the bay area).

Fourth Floor Construction – Media Center - New Option A - Expanded Site: Fourth floor construction at the Media Center (over the Gymnasium) in New Option A - Expanded Site will be similar to that described above for the typical floor construction; however, composite steel beams will span approximately 32.5 feet to 10+/- feet deep (fireproofed) steel trusses (four total) that clear span the space. Composite steel floor deck will be the cellular, acoustic type. A further evaluation of acoustic issues will be required; construction of a secondary, isolated (floating) slab may be necessary to achieve the desired acoustical separation.

Roof Construction: Typical roof framing for all new construction will consist of a 3" deep, 18 gauge, Type DR galvanized steel roof deck spanning to wide flange steel beams. Steel beams are typically supported by wide flange steel girders, which span to wide flange steel columns or HSS (tube) steel columns. Steel beams over the Auditorium in New Option A - Expanded Site will clear span the space.

The New Gymnasium Wing superstructure in Addition/Renovation Options 2A and 3A will be a clear-spanning, pre-engineered steel framed building, designed and constructed by a Specialty Contractor. The pre-engineered building will be supported on a composite steel floor system at Level 2, constructed by the General Contractor.

Where practical, roof drainage will be achieved by sloping the steel to the internal drains. Some areas of tapered insulation should be anticipated, at locations where it is not practical to slope the steel.

Concrete slabs on composite steel deck will be provided below rooftop mechanical units, for acoustical purposes. Screens will be provided around rooftop equipment for acoustic and aesthetic purposes.

Pedestrian Bridges (Addition/Renovation Options 2A and 3A): The existing pedestrian bridges will be demolished and removed to accommodate the construction of two (2) new, two-tier pedestrian bridges (approximately 165 feet long) which will connect the Second and Third Levels of the 1980 Academic Wing and the 1922 Building. The bridges will be steel framed, with supports on the east and west sides of the canal (creating three (3) spans). An expansion joint will be provided at each end of each bridge at each level. The new bridges will have a pile foundation.

Steel Framing Connections: Type 2 simple framing connections (shear only); double clip angles typically.

Columns: Typical columns will be wide flange steel sections or HSS (tube) steel sections.

Lateral Force Resisting System: Lateral (wind and seismic) forces will be resisted by steel bracing, for reasons of economy, stiffness, reduced structural depth and smaller column sizes. Bracing members will be square or rectangular HSS sections. Brace configurations may include chevrons, inverted chevrons ("V"), or single diagonals in short bays, as required by architectural considerations. The bases of all braced frames will be tied together below the lowest level slab on grade with 2'-0" wide x 2'-6" deep reinforced concrete grade beams.

Expansion (Seismic) Joints: In Addition/Renovation Options 2A and 3A, the two, small additions at the south end of the 1980 Building will be structurally attached to the existing building. The new Freshman Academy Wing and the Gymnasium Wing will be separated from the 1980 Academic Wing by an expansion (seismic) joint. The New Freshman Academy Wing will also be structurally separated from the New Gymnasium Wing. A further evaluation fire wall/building separation issues at expansion joint locations (impacting permissible construction types) will be conducted.

The three, east-west classroom wings in the new school constructed in New Option A - Expanded Site will be separated from the Gymnasium/Media Center Wing and the Auditorium by an expansion/seismic joint. A further evaluation fire wall/building separation issues at expansion joint locations (impacting permissible construction types) will be conducted.

Elevator Shafts: New elevator shafts will be 8" thick, 100% solid grouted, reinforced concrete masonry unit (CMU) construction, supported on 12" thick reinforced concrete elevator pit walls and a 2'-0" thick reinforced concrete elevator pit mat.

Exterior Walls: Exterior walls will typically be masonry veneer (cavity wall construction), with areas of glazed curtainwall and architectural panels. A galvanized, light gauge steel stud backup wall (16 gauge minimum thickness) will be constructed at masonry veneer areas. Vertical slip joints will be provided in the metal stud backup system at each level. Due to the height of the proposed additions (Addition/Renovation Options 2A and 3A) and the new building (New Option A - Expanded Site), continuous galvanized steel relieving angles will be required to limit the height of masonry veneer to 30 feet or less. Intermediate, HSS Steel girts will be provided at the west Gymnasium exterior wall (New Option A - Expanded Site), to laterally support the wall construction at mid-height.

IV. ESTIMATED STRUCTURAL QUANTITIES - NEW CONSTRUCTION (ALL OPTIONS)

Approximate structural quantities for new construction in all options (Addition/Renovation Options 2A and 3A and New Option A - Expanded Site) are presented in this section. Refer to the Structural Systems Descriptions in **Section III** above for steel floor and roof deck types/gauges, slab on grade, and slab on steel deck information, and elevator shaft construction.

FOUNDATIONS/CONCRETE:

The estimated quantities of foundation concrete and reinforcing for the various options are summarized below.

Typical Perimeter Frost Walls, Footings and Pilasters (All Options):

*18" thick, 4'-6" deep continuous grade beams (no footings), including an 8" wide masonry shelf, with continuous top and bottom reinforcing (**90.0+/- plf**), spanning to pile caps. The outside surface of perimeter grade beams will receive a troweled-on bituminous mastic. The bottom of the grade beam will be a minimum of 4'- 0" minimum below the exterior*

*finish grade for frost protection. Pilasters at perimeter column locations/pile caps will be 24 inches square, with **40 plf** reinforcing.*

Typical Full Height Basement Walls (New Option A - Expanded Site Only):

16" thick including an 8" wide masonry shelf, with horizontal and vertical reinforcing each face (7.0+/- psf). A continuous, reinforced concrete pile cap with one (1) 95 Ton, conical point pipe pile spaced at 3'-0" o.c. (staggered) will be provided at the base of the wall. The outside surface of perimeter basement walls will be fully waterproofed.

Typical Interior Column Pile Supports (New Option A - Expanded Site):

Six (6), 95 Ton, conical point pipe piles with a reinforced concrete pile cap at each column location.

Typical Perimeter Column Pile Supports (New Option A - Expanded Site):

Classroom Wings:

Three (3), 95 Ton, conical point pipe piles with a reinforced concrete pile cap at each column location.

Gymnasium/Media Center Wing:

Four (4), 95 Ton, conical point pipe piles with a reinforced concrete pile cap at each column location.

Typical Interior Column Pile Supports (Addition/Renovation Options 2A and 3A):

Gymnasium Wing:

Two (2), 95 Ton, conical point pipe piles with a reinforced concrete pile cap at each column location.

New Freshman Academy Wing:

Six (6), 95 Ton, conical point pipe piles with a reinforced concrete pile cap at each column location.

Typical Perimeter Column Pile Supports (Addition/Renovation Options 2A and 3A):

South Additions - 1980 Academic Building (3 ST):

Two (2), 95 Ton, conical point pipe piles with a reinforced concrete pile cap at each column location.

Gymnasium Wing (2 ST):

Two (2), 95 Ton, conical point pipe piles with a reinforced concrete pile cap at each column location.

New Freshman Academy Wing:

Three (3), 95 Ton, conical point pipe piles with a reinforced concrete pile cap at each column location.

Typical Intermediate Slab Support Pile (All Options):

Provide one (1), 95 Ton, conical point pipe intermediate slab support pile per 800+/- square feet of the lowest level floor. Locally thicken the structural slab on grade to 18" deep at each slab support pile.

Grade Beams at Lateral Bracing Bays (All Options):

2'-0" wide x 2'-6" deep with 75 pounds of reinforcing per foot.

Assume 60 linear feet of grade beam required for each 5,000 square feet of new building footprint.

Lowest Level Reinforced Concrete Floor Slab (Addition/Renovation Options 2A and 3A):

10" thick with 7.0 psf reinforcing.

Lowest Level Reinforced Concrete Floor Slab (New Option A - Expanded Site):

12" thick with 8.5 psf reinforcing; fully waterproofed.

Welded Wire Fabric for Concrete Topping Slabs on Steel Floor Deck (All Options):

6x6 - W2.9 x W2.9 WWF

Welded Wire Fabric for Concrete Slabs on Grade (New Options A – Expanded Site):

6x6 - W2.9 x W2.9 WWF

Pedestrian Bridge Foundations (Addition/Renovation Options 2A and 3A (4 Locations)):

8'-0" wide x 16'-0" long x 3'- 6" deep foundation mat with 4,000 pounds of reinforcing, supported on eight (8), 95 Ton, conical point pipe piles.

STRUCTURAL STEEL:

The estimated weight of structural steel for the various options is summarized below (including, beams, columns, bracing, plates, relieving angles, frames, connections, etc., but excluding equipment screens, entry canopies and miscellaneous metal components).

Addition/Renovation Options 2A and 3A:

1980 Building South Additions: ***14.0 psf***

New Gymnasium Wing (Level 2 only; excluding the Pre-Engineered Gymnasium Superstructure above): ***12.5 psf***

Two Pedestrian Bridges: ***185.0 Tons***

Freshman Academy Wing: ***15.25 psf***

New Option A - Expanded Site:

Average Weight - Entire Building: ***15.50 psf***

V. SCOPE OF STRUCTURAL WORK - RENOVATIONS (OPTIONS 2A AND 3A)

Comments relating to proposed renovations, alterations and additions to Lowell High School (Renovation/Addition Options 2A and 3A) are presented in this section. Renovations, alterations, repairs and additions to existing buildings in Massachusetts are governed by the provisions of the Massachusetts State Building Code (MSBC - 9th Edition) and the Massachusetts Existing Building Code (MEBC). These documents are based on amended versions of the 2015 International Building Code (IBC) and the 2015 International Existing Building Code (IEBC), respectively.

The area of reconfigured spaces in the renovated 1922 Building and the 1980 Building may ultimately exceed 50% of the total floor area; accordingly, the proposed renovations to these buildings would be classified as *Level 3 Alterations*. Seismic hazards such as anchorage of floor and roof diaphragms to masonry walls, bracing of chimneys and parapets, etc. will need to be addressed by code.

Modifications to existing masonry walls which contribute to the lateral force resistance for each building will be minimized. Accordingly, the demand-to-capacity ratio of lateral load resisting elements in each of the buildings will not be increased by more than 10%; a seismic retrofit of the buildings to withstand full or reduced seismic loads required by the current code will not be required.

No change in use is proposed and live load requirements throughout the buildings are expected to be generally unchanged.

Refer to FBRA's previously referenced, *Existing Conditions Evaluation/Base Repair Structural Report* (updated May 4, 2017) and the reports prepared by PE and their consultants for further information.

1922 Building

Items below apply to both Addition/Renovation Options (2A and 3A), unless otherwise noted.

1. Building Exterior: In general, the existing yellow brick and mortar around the building's exterior are in good condition, with a few exceptions:

    - In a several locations, steel lintels over punched windows are showing signs of distress (lintel is sagging, rust is present, brick above is displaced, etc.); specifically those over the lower level basement windows. *Assume that approximately 10% lintel replacement; the balance of lintels should be cleaned and coated.*
    - There are open joints in the brick and stone in limited areas, were repointing is required. *Assume that less than 10% of the façade area requires repointing.*
    - Concrete spalling/deterioration around the aluminum railing posts at the Auditorium entrance was observed. *Remove and replace the existing railings with properly designed railings and repair the damaged concrete.*

- Sections of the masonry cornice around the perimeter of the building were damaged or missing in some locations. *Evaluate the condition of the cornice around the building perimeter; repair/reset cornice units as required.*
- Downspouts from roof gutters discharge directly adjacent to the basement walls of the 1892 building. *All downspouts should be properly piped away from the building (to a drainage structure), to eliminate roof rainwater from being discharged adjacent to basement walls.*

2. Roof: The roof was not accessed during FBRA's site visits. However, per the referenced, 2013 Master Plan Report, the pitched roof of the original 1892 building was recently replaced. Per the same report, the roofing over the remainder of the facility is in poor condition and likely in need of replacement. Evidence of roof leaks was observed throughout the facility. PE has reviewed the existing roofs; replacement of the flat roofs is required. Gale Associates, Inc. is currently preparing roof replacement documents for the 1922 and 1997 additions; refer to the *Roof Replacement and Associated Work* (Drawings and Specifications, 95% Submission dated February 2, 2018). Both additions will be re-roofed; masonry parapets will be braced as well. This work is scheduled to be completed in October, 2018; accordingly, there will be no roof repair work required in Addition/Renovation Options 2A and 3A (only that which is required to accommodate the proposed renovations).

3. Masonry Partitions: Interior masonry partitions generally appear to be in satisfactory condition. The anchorage/bracing of interior masonry partitions to the floor and roof construction as well of the height-to-thickness ratios will need to be evaluated. *The preliminary cost estimate should include an allowance to anchor/brace the tops of all (non-structural) interior masonry partitions (approximately 4'-0" o.c. spacing of anchors/braces).*

4. The anchorage of exterior masonry walls to the floor and roof construction will need to be evaluated. *The preliminary cost estimate should include an allowance to anchor all exterior masonry walls (approximately 4'-0" o.c. spacing of anchors).*

5. The centrally located, Attic Level Mezzanine addition in the original 1892 building will be removed. Existing Attic Floor spaces on the east and west sides of the building will be utilized for MEP/FP purposes. *Preliminary cost estimates should carry an allowance to reinforce these areas to support new equipment ($5.00/SF +/-).*

6. Efflorescence was observed on the north façade of the 1997 addition. *Clean/restore exterior masonry surfaces.*

7. Terrazzo flooring has cracked in some areas; elsewhere (tile) flooring has failed (potentially due sub-slab to moisture conditions). *Repair areas of damaged and/or deteriorated flooring as required.*

8. The railing at the front of the Auditorium Balcony is only 33"+/- high and does not meet current code requirements. *Remove the existing railing and install a new, code compliant railing system.*

9. Install galvanized steel frames for new rooftop MEP/FP equipment, as required. Provide a galvanized steel frame/architectural panel, visual and acoustic screen around all rooftop units.

10. Core existing slabs for MEP/FP services, as required.

11. Create new openings, chases, etc. in the floor and roof construction, as required to accommodate new MEP/FP services.

12. Create new openings in floor and roof construction, as required to accommodate new light wells, overlooks, skylights, etc. as necessary to achieve the architectural design. Refer to the Preliminary Architectural Drawings for additional information.

13. Miscellaneous structural work relating to accessibility issues (ramps, lifts, etc.)

1980 Building

Items below apply to the Addition/Renovation Options 2A and 3A, unless otherwise noted. The existing Field House/Natatorium will be demolished and removed in either option.

1. Building Exterior:

    - Horizontal cracks in the masonry supported by the continuous relieving angles provided at each level were observed at the Academic Wing. *Further evaluation of as-built details/conditions is recommended. These conditions exist throughout each of the buildings and represent a potential hazardous situation. The preliminary cost estimate should include costs to repair the brick and relieving angle system.*
    - Staining and spalling of the brick façade at the integral downspouts around the perimeter of the Fieldhouse was observed. The integral downspout system does not appear to be functioning as intended. *Further evaluation and design/installation of an alternate downspout detailing recommended. Cleaning and repair of adjacent masonry will also be required.*
    - Cement board panels around the building are in various stages of deterioration (broken, detached, missing, open joints, etc.). *Repair/replacement of panels required.*
    - Some cracks were observed in exposed foundation walls; including one location at the northwest corner of the Academic Wing. *Repair by epoxy injection recommended, to prevent further freeze-thaw deterioration.*

2. Masonry Walls: Interior (stack bond) masonry walls are generally in satisfactory condition. However, cracking was observed in the stair well on the west end of the Fieldhouse. Further review of stairwell masonry construction is recommended. The anchorage/bracing of interior masonry partitions to the floor and roof construction as well of the height-to-thickness ratios will need to be evaluated. *The preliminary cost estimate should include an allowance to anchor/brace the tops of all (non-structural) interior masonry partitions (approximately 4'-0" o.c. spacing of anchors/braces).*

3. The anchorage of exterior masonry walls to the floor and roof construction will need to be evaluated. *The preliminary cost estimate should include an allowance to anchor all exterior masonry walls (approximately 4'-0" o.c. spacing of anchors).*

4. Roof: The roof was not accessed during FBRA's site visits. However, evidence of roof leaks was observed throughout the building. PE *has reviewed the existing roofs; replacement of the flat roofs is required. Drainage issues should be evaluated and addressed as part of the new roof design. As the ultimate design wind speed exceeds 115 MPH, roof diaphragms, diaphragm connections, roof to wall*

connections, etc. will need to be evaluated per Section 707.3.2 of the 2015 IEBC. FBRA does not expect that there will be any significant issues to address in the 1980 Building.

5. Install galvanized steel frames for new rooftop MEP/FP equipment, as required, Provide a galvanized steel frame/architectural panel, visual and acoustic screen around all rooftop units.

6. Two (2) new openings in the steel framed floor and roof construction are planned in Addition/Renovation Option 3A, to create new light wells (open to the exterior) down through the building. The openings will be located, sized and configured to minimize the extent of required structural modifications. Existing slab on steel forms/open web steel joist floor construction will need to be saw cut and removed (between column lines) at each opening at the Second and Third Floors of the building. Similarly, the steel deck (1½" deep)/ open web steel joist roof construction will also need to be saw cut and removed to accommodate the new light wells.

7. Core existing slabs for MEP/FP services, as required.

8. Create new openings, chases, etc. in floor and roof construction, as required to accommodate new MEP/FP services.

9. Create new openings in floor and roof construction, as required to accommodate new overlooks, skylights, etc. as necessary to achieve the architectural design. Refer to the Preliminary Architectural Drawings for additional information.

10. Miscellaneous structural work relating to accessibility issues (ramps, lifts, etc.)

OUTLINE STRUCTURAL SPECIFICATIONS:

Concrete:

- All concrete shall be normal weight, 4,000 psi at 28 days, except foundation walls and footings, which shall be normal weight, 3,000 psi and exterior (exposed) concrete (paving) which shall be normal weight, 4,500 psi.

- Portland Cement: ASTM C150, Type I or II.

- Fly Ash: ASTM C618, Class F. Replacement of cement content with fly ash is limited to 20% (by weight). Fly ash is not permitted in exterior, exposed concrete, slabs on grade or slabs on steel deck.

- All concrete shall be proportioned with 3/4" maximum aggregate, ASTM C 33, except 3/8" maximum aggregate shall be used at toppings less than 2" thick (e.g. metal pan stairs).

- All reinforcing shall be ASTM A 615 deformed bars, Grade 60.

- All welded wire fabric shall conform to ASTM A 185.

- Reinforcing bars, steel wire, welded wire fabric, and miscellaneous steel accessories shall contain a minimum of 25% (combined) post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with Submittal Requirements.

- Concrete products manufactured within 500 miles (by air) of the project site shall be documented in accordance with Submittal Requirements.

- Cure all concrete by moisture retention methods, approved by Architect; curing compounds shall not be used.

Reinforced Concrete Masonry (New Elevator Shafts):

- Masonry construction shall conform to ACI 530/ASCE 5/TMS 402 "Building Code Requirements for Masonry Structures", latest edition.

- Masonry strength, f'm shall not be less than 1350 psi.

- Requirements for load bearing block strength shall be as required for specified masonry strength (f'm) but shall not be less than 2000 psi on the net area of the block.

- Grout shall conform to ASTM C476, Type Fine, and shall be of strength required for specified masonry strength (F'm) but not less than 3000 psi.

- Mortar for reinforced masonry shall conform to ASTM C 270 Type S and shall be of strength required for specified masonry strength (f'm) but not less than 1800 psi.

- Reinforcing bars shall conform to ASTM A 615 Grade 60 deformed bars. Lap all continuous bars 48 diameters and provide bar positioners. Assume No. 5 bars at 2'-8" o.c. vertically and horizontal bond beams with 2 – No. 5 continuous at 4'-0" o.c.

- Joint reinforcing shall be 9 gauge ladder type conforming to ASTM A 82. Provide prefabricated corners and tees. Walls shall be reinforced horizontally with joint reinforcing at 16 inches on centers unless otherwise noted.

- Reinforcing bars, steel wire and miscellaneous accessories shall contain a minimum of 25% (combined) post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with Submittal Requirements.

- Elevator shaft walls shall be 100% solid grouted (all cores); low lift grouting.

- Masonry products manufactured within 500 miles (by air) of the project site shall be documented in accordance with Submittal Requirements.

Structural Steel:

- Structural steel shapes shall conform to ASTM A 992, Fy = 50 ksi.

- Steel tubes (HSS) shall conform to ASTM A 500, Grade B, Fy=46 ksi.

- Structural steel plates and bars shall conform to ASTM A 36, Fy = 36 ksi.

- Steel members shall contain a minimum of 25% (combined) post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the Submittal Requirements.

- Steel manufactured within 500 miles (by air) of the project site shall be documented in accordance with the Submittal Requirements.

- Anchor Bolts: Anchor bolts at column base plates shall conform to ASTM F1554 – Grade 36 and shall be headed type. Provide a minimum of four (4), ¾" diameter anchor bolts at all columns; additional bolts and/or larger diameter will be required at bracing locations.

- Bolted connections shall be ASTM A 325, Type N (bearing) bolts, except slip-critical bolts shall be used at lateral brace beam connections.

- Shear connectors shall be ¾" diameter, 5" long, headed Nelson studs conforming to ASTM A 108.

- Shop and field welding shall be AWS D1.1 E70XX electrodes.

- Surface treatment for typical structural steel: SSPC Surface Preparation No. 3 (Power Tool Cleaning). Structural steel shall be left unprimed.

- Surface treatment for Exposed to View Structural Steel (E.V.S.S.) in the Gymnasium of New Option A - Expanded Site and the pre-engineered Gymnasium Wing superstructure in Addition/Renovation Options 2A and 3A shall be SSPC Surface Preparation No. 6. All exposed steel shall receive one coat of shop primer that is compatible with the finish paint.

- All exterior, exposed structural steel shall be hot-dipped galvanized.

Steel Deck:

- Typical steel roof deck shall be 3" deep, 18 gauge, Type DR, conforming to ASTM A653, Grade 33 (minimum), galvanized in accordance with ASTM A 653, coating class G-60.

- Acoustic steel roof deck (over the Gymnasium in New Option A - Expanded Site) shall be 3" deep, 20/20 gauge cellular type, conforming to ASTM A653, Grade 33 (minimum), galvanized in accordance with ASTM A 653, coating class G-60. Acoustic steel roof deck shall be shop treated and painted with a primer that is compatible with the finish paint.

- Typical steel floor deck shall be 2" deep, 18 Gauge, composite type, conforming to ASTM A 653, Grade 33, galvanized in accordance with ASTM A 653, coating class G-60. Steel floor deck for the Media Center floor (over the Gymnasium below) in New Option A - Expanded Site will be the cellular acoustic composite type (18/20 gauge).

- All steel floor deck and roof deck accessories (pour stops, finish strips, closures, etc.) shall be the same finish as the deck; 18 gauge minimum.

- Steel deck shall contain a minimum of 25% (combined) post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the Submittal Requirements.

- Steel deck manufactured within 500 miles (by air) of the project site shall be documented in accordance with the Submittal Requirements.

- Provide 14 gauge sump pans at roof drains.

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LOWELL HIGH SCHOOL
Lowell, Massachusetts

Existing Conditions Evaluation / Base Repair Structural Report
October 21, 2016 - Updated May 4, 2017
PE Project #67150.00

INTRODUCTION

Foley Buhl Roberts & Associates, Inc. (FBRA) is collaborating with *Perkins Eastman (PE)* and their consultants in the review and evaluation of structural issues/conditions at the Lowell High School in Lowell, MA. The purpose of this report is to identify and describe the structural systems of the various buildings and to comment on the structural issues/conditions observed. Recommended repairs to the subject buildings are also identified. Potential Renovation/Addition and New Construction options will be addressed in a future, separate narrative; however, general comments are provided at the end of this report.

Structural conditions at the Lowell High School were reviewed at the site on August 26, 2016 and on September 8, 2016. FBRA also conducted site reviews of Lowell High School buildings in July 2013, as part of the Comprehensive Facilities Assessment | Master Plan Report prepared for the Lowell Public Schools District. As original drawings for the 1922 building (except for the 1995 addition) and the Freshman Academy were not available, a program of limited structural investigations was conducted during the weekends of March 18/19, 2017and March 25/26, 2017 to determine the general layout and details of the floor and roof structure in these buildings. No structural materials testing were performed in conducting this study.

Available geotechnical/subsurface soils information for the Lowell High School was limited; however, the December 8, 1995 Geotechnical Engineering Report prepared by GZA GeoEnvironmental, Inc. for the 1995 addition to the 1922 Building and the addition to the Lord Academic Wing (south end) was made available to the Design Team. Additional subsurface explorations were conducted in March 2017 by Geotechnical Partnership, Inc. (GPI). Refer to the March 24, 2017 *Feasibility Phase Geotechnical Data Summary Report* for further information.

Refer to the Existing Conditions/Base Repair reports prepared by PE and the other consultants for further information. Code related issues are addressed in the *Existing Conditions Code Report* prepared by the Sullivan Code Group of R. W. Sullivan Engineering, dated September 16, 2016. Gross floor areas noted in this report were obtained from 2013 *Comprehensive Facilities Assessment* and are subject to confirmation.

GENERAL OVERVIEW

The Lowell High School is comprised of four main buildings (1922 Building, Lord/Fieldhouse, the Freshman Academy and the Steam Plant), located along Father Morissette Boulevard/French Street in Lowell. The Lord building is the only building on the campus located on the west side of the Merrimack Canal. It is connected to the 1922 Building by two enclosed pedestrian bridges, spanning over the canal between the buildings at their Second Floor levels. The Freshman Academy (originally the Lowell Trade School) and Steam Plant buildings are located on the east side of the High School's campus, one block over from the 1922 Building. Separate descriptions of each building are provided below.

I. 1922 BUILDING

Structural conditions at the 1922 Building were reviewed at the site on August 26, 2016 and September 8, 2016. Additional structural investigations were conducted in March 2017.

The following documents for this building were reviewed in the preparation of this report:

Addition to the Lowell High School: Henry L. Rourke Architect; Various HVAC and Electrical Drawings, prepared by Richard D. Kimball Co. Engineers, undated (Circa 1917).
Alterations to Coburn Hall: Structural Drawing S1, prepared by James E. MacDonald Assoc., Inc., dated February 15, 1980.

Alterations to Coburn Hall: Architectural Drawings A1 to A11, prepared by Paul L. Davies & Associates/William J. Gavin & Associates, dated February 15, 1980.

Improvements to Lowell High School: Structural Drawings S-1 and S-2, prepared by Andrew S. Pike & Associates, dated July 11, 1983.

Improvements to Lowell High School: Architectural Drawings A-1 to A-7, prepared by Davies & Gavin, Architects, Inc., dated July 22, 1983.

Lowell High School Renovations – Task 1: Structural Drawings S001 to S504 and Architectural Drawings A101 to A03, prepared by Sverdrup Facilities Inc., dated December 11, 1995.

Lowell High School Renovations – Task 2: Structural Drawings S001 to S512 and Architectural Drawings A001 to A811, prepared by Sverdrup Facilities Inc., dated December 11, 1995.

Lowell Public Schools - Comprehensive Facilities Assessment: Master Plan Report and Existing Conditions Documentation, prepared by OMR Architects, dated July 2013.

Original Structural and Architectural Drawings were not available for the 1892 and 1922 sections of the building at the time of this report. The descriptions of Structural and Architectural systems provided within this report for these sections were derived from observations on site or obtained from the renovation and alteration drawings listed above.

A. General Description

The 1922 Building consists of the three main parts: the original Coburn Hall Building, constructed in 1892, a significant classroom/Auditorium addition, constructed on the north side of Coburn Hall in 1922, and the smaller, 1995 addition to the north end of the 1922 building. The 1995 addition is separated from the 1922 building at each level by an expansion joint. The three-story 1922 Building has a full basement and is located on the east side of the Merrimack Canal, which separates it from the Lord Building. The total, gross floor area of the building is approximately 322,000 square feet.

Each level of the building is comprised mainly of classrooms. The Auditorium, a triple-height space, is located on the First Floor at the north end of the 1922 building.

B. Structural Systems Description

General Construction: Pitched roof construction of the original 1892 section of the building is wood framed, supported by steel and wood trusses. The existing wood framing and trusses

underwent extensive repairs/reinforcing during the 1995 renovations to the building. The First, Second and Third Floor construction of the 1892 portion of the building consists of tongue and groove wood plank on wood joists spanning to brick masonry bearing walls. The existing wood framing at these levels also underwent extensive repairs/reinforcing during the 1995 renovations to the building.

Due to a lack of existing drawings and the presence of hard finishes which obscure the structure, the flat roof construction of the 1922 portion of the building is largely unknown. However, access to various roof areas was gained during the March 2017 structural investigations. Typical roof construction of the 1922 addition is steel framed with trusses and beams supporting a concrete slab. Exploratory openings were made in March 2017 to review floor framing in this section of the building. Typical floor construction is a one-way reinforced concrete joist/rib slab supported by masonry bearing walls and by steel beams and columns.

Flat roof construction of the 1995 addition is steel framed, with metal deck spanning to steel joists and beams/girders supported by steel columns. The First, Second and Third Floor construction of the 1995 addition consists of concrete slab on metal deck spanning to steel beams supported by steel girders and columns.

Lowest level construction is a concrete slab on grade with a mixture of fieldstone and concrete foundations.

Structural Materials: Structural material strengths for the 1892 and 1922 portions of the building are not available. Material strengths for the 1995 addition and renovation are as follows:

Minimum 28 - Day concrete compressive strength for concrete:
- Foundations and Slabs on Grade – 3,000 psi
- Flat Work – 4,000 psi

Steel reinforcing is deformed bars conforming to ASTM A615, Grade 60.

Allowable bending stress for Structural Steel:
- Rolled Shapes and Plates – ASTM A36 (36,000 psi)
- Steel Tubes (Round) – ASTM A500 Grade B (42,000 psi)
- Steel Tubes (Rectangular) – ASTM A500 Grade B (46,000 psi)
- Steel Pipes – ASTM A53 Grade B (35,000 psi)

Subsurface Soils and Foundations: Subsurface conditions for the 1892 and 1922 portions of the building are not available. Brick and field stone foundation walls in these areas were observed on site. Conventional spread footings for the 1995 addition were proportioned on the basis of a 4.0 tons per square foot (tsf) maximum allowable bearing pressure.

Story Heights: Story heights are as follows:

Basement to First:	13’-3”
First to Second:	13’-6”
Second to Third:	13’-7”
Third to Roof:	21’-3”

Design Live Loads: Design live loads for the 1892 and 1922 portions of the building are not available. Loads for the 1995 addition and renovation are as follows:

Library:	130 psf
Classrooms:	50 psf
Corridors:	100 psf
Stairs:	100 psf
Snow:	30 psf

The building structure appears to have performed satisfactorily over time; there are no indications of structural overstress or failure. A comprehensive investigation and evaluation of the floor and roof structural capacity is beyond the scope of this report. Note that the current code requires a flat roof design snow load (non-drift areas) of 38.5 psf.

Expansion Joints: The 1995 addition is separated from the 1922 building by an expansion joint at each level. No other expansion joints are present within the building.

Roof Construction: Construction of the pitched low roof areas on the east and west ends of the 1892 building consists of 7/8" wood sheathing over 2x10 and 2x8 rafters spaced at 18" on centers and supported by 6x12 purlins. The wood purlins span to wood trusses. During the 1995 renovations, 12" deep steel bar joists were added between existing rafters to reinforce the roof structure at areas susceptible to snow drift loading. Steel members (channels and angles) were also installed to reinforce the existing valley and ridge beams, purlins and wood trusses at that time. An Attic space is present below the low roof areas of the 1892 building. Attic floor construction consists of ¾" plywood sheathing over 2x10 and 2x8 joists spanning to 6x8 beams and/or masonry bearing walls. In 1995, the Attic Floor was reinforced with 12" and 14" deep steel bar joists, installed at 3'-0" on centers between the existing 2x8 and 2x10 wood joists, respectively.

Construction of the high, pitched roof area over the middle portion of the 1892 building consists of 1" wood sheathing spanning to 2x10 rafters spaced at 16" on centers supported by 6x12 purlins. The wood purlins span to steel trusses spaced at approximately 16'-0" on centers. Similar to the low roof structure, steel members were installed to reinforce the existing purlins and steel trusses in 1995. A structural grid for a new suspended ceiling, consisting of steel channels and cold formed metal studs hung from the bottom chords of the existing steel trusses, was also installed at that time.

Typical roof construction of the 1922 addition is steel framed with trusses and beams supporting a concrete slab. Refer to the schematic framing diagrams in Appendix B for additional information.

Roof construction of the 1995 addition consists of 1½" deep, 20 gauge metal decking over steel joists spaced at approximately 5'-4" on centers. Steel joists span to wide flange steel girders supported by wide flange steel columns.

Upper Floor Construction: Second and Third Floor construction for the 1892 portion of the building consists of 2-3/4" thick tongue and groove planks spanning to 10x16 wood joists, reinforced with 9" deep steel channels on each side. Floor joists are supported by steel wide flange beams and/or masonry bearing walls. First Floor construction for the 1892 portion of the building consists of 2¾" thick tongue and groove planks spanning to 8x14 wood joists, reinforced with 9" deep steel channels on each side. Joists span to 10x14 wood beams, with 12" deep steel channel reinforcing.

Typical floor construction in the 1922 addition is a one-way reinforced concrete joist/rib slab supported by masonry bearing walls and by steel beams and columns. Refer to the schematic framing diagrams in Appendix B for additional information
First, Second and Third Floor construction of the 1995 addition consists of a 2½" thick concrete topping slab over 2" deep, 20 gauge composite metal floor deck (4½" total slab thickness) spanning to wide flange steel beams spaced at approximately 5'-4" on centers. The steel beams span to wide flange steel girders, which are supported by wide flange steel columns.

Wall Construction: Exterior wall construction for the 1892 portion of the building consists of brick bearing walls, approximately 28" thick. The exterior walls of the 1922 addition are masonry construction as well.

Exterior wall construction for the 1995 addition consists of a light gauge stud backup with brick veneer and punched window units. A continuous relieving angle was provided at each framed level of the 1995 addition.

Interior partitions are typically light gauge metal stud wall construction within the 1995 addition and wood stud walls and/or brick masonry bearing walls within the 1892 building. Partitions in the 1922 addition are typically masonry.

Fire Resistance: Construction types vary throughout the building; ranging from unprotected wood and steel framing (original 1892 building), reinforced concrete construction (1922 addition) and structural steel (1995 addition). Per the previously referenced Code Report, the mix of different construction types in the original building and the 1922 addition results in a minimum of Type IIIB Construction (Combustible interior – no fire-resistance rating; 2 hour noncombustible exterior wall). The 1995 addition is protected steel framing; potentially Type IIIA Construction (1 hour rating). Further evaluation of the existing conditions and construction types permitted by the Code is required to determine what measures may or may not be necessary to address fire rating issues. The 1922 Building appears to be fully sprinklered.

Lateral Load Resistance: The lateral load resisting system for the 1995 addition consists of steel braced frames in the north-south direction and steel moment frames in the east-west direction. There is no defined lateral load resisting system in the 1892 building or the 1922 addition; by default, lateral loads are resisted by the (unreinforced) masonry walls.

C. Structural Conditions/Recommended Repairs

Structural Conditions at the 1922 Building were reviewed at the site (to the extent possible) on August 26, 2016 and September 8, 2016. Additional structural investigations were conducted in March 2017. Generally speaking, floor and roof construction appear to be in satisfactory condition; there is no evidence of structural distress that would indicate significantly overstressed, deteriorated or failed structural members.

Foundations appear to be performing adequately; there are no signs of significant, total or differential settlements.

Floors and roofs appear to have been constructed in general accordance with the Structural Drawings that were available.

Structural/structurally related conditions observed on site are summarized below; recommended repairs are noted in *italics*:

1. Building Exterior: In general, the existing yellow brick and mortar around the building's exterior are in good condition, with a few exceptions:

    - In a several locations, steel lintels over punched windows are showing signs of distress (lintel is sagging, rust is present, brick above is displaced, etc.); specifically those over the lower level basement windows. *Assume that approximately 10% lintel replacement; the balance of lintels should be cleaned and coated.*
    - There are open joints in the brick and stone in limited areas, were repointing is required. *Assume that less than 10% of the façade area requires repointing.*
    - Concrete spalling/deterioration around the aluminum railing posts at the Auditorium entrance was observed. *Remove and replace the existing railings with properly designed railings and repair the damaged concrete.*
    - Sections of the masonry cornice around the perimeter of the building were damaged or missing in some locations. *Evaluate the condition of the cornice around the building perimeter; repair/reset cornice units as required.*
    - Downspouts from roof gutters discharge directly adjacent to the basement walls of the 1892 building. *All downspouts should be properly piped away from the building (to a drainage structure), to eliminate roof rainwater from being discharged adjacent to basement walls.*

2. Roof: The roof was not accessed during our site visits. However, per the referenced, 2013 Master Plan Report, the pitched roof of the original 1892 building was recently replaced. Per the same report, the roofing over the remainder of the building is in poor condition and likely in need of replacement. Evidence of roof leaks was observed throughout the building. *PE has reviewed the existing roofs; replacement of the flat roofs is required. Drainage issues should be evaluated and addressed as part of the new roof design.*

3. Masonry Partitions: Interior masonry partitions generally appear to be in satisfactory condition. The anchorage/bracing of interior masonry partitions to the floor and roof construction as well of the height-to-thickness ratios will need to be evaluated and addressed (per code) if the building is renovated in the future (or undergoes a voluntary repair). *The preliminary cost estimate should include an allowance to anchor/brace the tops of all (non-structural) interior masonry partitions (approximately 4'-0" o.c. spacing of anchors/braces).*

4. The anchorage of exterior masonry walls to the floor and roof construction will need to be evaluated and addressed (per code) if the building is renovated in the future (or undergoes a voluntary repair). *The preliminary cost estimate should include an allowance to anchor the tops of all exterior masonry walls (approximately 4'-0" o.c. spacing of anchors).*

5. Efflorescence was observed on the north façade of the 1995 addition. *Clean/restore masonry surface in conjunction with future renovations to the building.*

6. Terrazzo flooring has cracked in some areas; elsewhere (tile) flooring has failed (potentially due sub-slab to moisture conditions). *Repair areas of damaged and/or deteriorated flooring as required, in conjunction future renovations to the building.*

7. The railing at the front of the Auditorium Balcony is only 33"+/- high and does not meet current code requirements. *Remove the existing railing and install a new, code compliant railing system.*

Refer to Appendix A at the end of this report, for photographs of structural/structural conditions that require repair and Appendix B for schematic framing diagrams of the 1922 addition.

II. LORD BUILDING

Structural conditions at the Lord Building were reviewed at the site on August 26, 2016 and September 8, 2016.

The following documents for this building were reviewed in the preparation of this report:

*Additions to the Lowell High Schoo*l: Structural Drawings S1 to S26 and Architectural Drawings A-01 to A-55, prepared by Lev Zetlin Associates Inc., dated May 26, 1978.

Alterations to the Lowell High School: Structural Drawings SS-1 to SS-5 and Architectural Drawings AA-01 to AA-22, prepared by Lev Zetlin Associates Inc., dated May 26, 1978.

Lowell High School Renovations – Task 1: Structural Drawings S001 to S504 and Architectural Drawings A101 to A403, prepared by Sverdrup Facilities Inc., dated December 11, 1995.

Lowell High School Renovations – Task 2: Structural Drawings S001 to S512 and Architectural Drawings A001 to A811, prepared by Sverdrup Facilities Inc., dated December 11, 1995.

Lowell Public Schools - Comprehensive Facilities Assessment: Master Plan Report and Existing Conditions Documentation, prepared by OMR Architects, dated July 2013.

A. General Description

The Lord Building is a steel and concrete framed building comprised of a three-story Academic Building and a two-story Fieldhouse/Natatorium that are connected by a glazed lobby. The Lord Building, located on the eastern bank of the Merrimack Canal, was constructed in 1980 and underwent minor renovations and an addition in 1995. Two enclosed pedestrian bridges, spanning over the canal, connect the Second Floors of the Lord and the 1922 Building. The two bridges were constructed at different times: the south bridge at the same time as the Lord Building and the north bridge during the 1995 renovations to the school. The total, gross floor area of the building is approximately 211,330 square feet.

The Cafeteria, Kitchen and Administrative offices are located on the First Floor of the Academic Building. To the west, a long ramp off the glazed lobby connects the lowest level of the Fieldhouse/Natatorium to the main building. The Pool, Locker Rooms and Wresting and Weight Rooms are located at this level. On the Second Floor, a block of Classrooms is located between the Library to the south and the Little Theatre to the north. The Field House is also located this level. Additional Classrooms and the school's TV Studio compose the Third Floor.

B. Structural Systems Description

***General Construction*:** Roof construction of the Academic Building is steel framed, with metal deck spanning to steel joists and beams/girders supported by steel columns. The Fieldhouse roof construction consists of metal deck spanning to steel trusses, supported by steel bents which clear span the hexagonal space. Second and Third Floor construction of the Academic Building consists of a concrete slab on metal deck spanning to steel joists and beams/girders supported by steel columns. Second Floor construction of the Fieldhouse is similar, with the exception of the structure located over the Pool. Floor construction in this area consists of a

reinforced concrete slab spanning to concrete encased wide flange steel beams, supported by steel columns. First Floor construction for both buildings consists of a concrete slab on grade, varying in thickness and reinforcing. Building columns are typically supported on pile foundations, as is the small, steel framed addition on the south end of the Academic Building constructed in 1995.

Structural Materials: Structural material strengths are noted on the original Structural Drawings as follows:

Minimum 28 - Day concrete compressive strength for concrete:
- Piles – 4,400 psi
- Framed Slabs – 4,000 psi
- Slab on Grade – 3,000 psi
- All others – 3,500 psi

Steel reinforcing is deformed bars conforming to ASTM A615, Grade 60.

Structural steel has an allowable bending stress of 50,000 psi.

Subsurface Soils and Foundations: Spread footings (portions of the Fieldhouse/Natatorium) were proportioned on the basis of a 6.0 tons per square foot (tsf) maximum allowable bearing pressure on the natural soils and 4.0 tsf maximum on controlled fill. However, the majority of the Lord Building is supported on a pile foundation. Grade beams (also serving as tie beams) of various size and reinforcing have been provided between pile caps and below perimeter walls and interior shear walls.

Story Heights: Story heights are as follows:

First to Second (Academic Building):	18’-0”
First to Second (Field House):	20’-0”
Second to Third (Academic Building):	13’-4”
Second to Roof (Field House):	21’-4” (to eave)
Third to Roof (Academic Building):	13’-4”

Design Live Loads: Design live loads are noted on the original Structural Drawings as follows:

Classrooms:	50 psf
Open Classrooms:	100 psf
Corridors:	100 psf
Locker and Assembly Rooms:	100 psf
Toilets:	60 psf
Others:	80 psf
Snow:	30 psf

The building structure appears to have performed satisfactorily over time; there are no indications of structural overstress or failure. A comprehensive investigation and evaluation of the floor and roof structural capacity is beyond the scope of this report. Note that the current code requires a flat roof design snow load (non-drift areas) of 38.5 psf.

Expansion Joints: There are two expansion joints in the building. One, running north-south, is located on the east side of the corridor linking the Academic Building and the Fieldhouse and is present at the Second Floor only. The second, running east-west, separates the southern portion of the Academic Building (between the Fieldhouse and southern pedestrian bridge)

from the rest of the building. As previously noted, the Lord Building is structurally separated from the 1922 Building by expansion joints located on the west side of each pedestrian bridge.

Roof Construction: Roof construction of the Academic Building consists of 1½" deep, 20 gauge metal decking spanning to steel joists or wide flange beams, spaced at approximately 5'-0" on centers. Joists/beams span to wide flange steel girders supported by rectangular hollow tube (HSS) steel columns. The typical structural bay is 25'-0" by 25'-0".

Roof construction over the Fieldhouse consists of 6" deep, 16/18 gauge cellular metal decking spanning to steel trusses spaced at 18' ± on centers. The trusses, consisting of double angle diagonal members and WT top and bottom chords, are supported by six built-up steel bents, each spanning from one corner of the hexagonal space to a central connection point. Steel wide flange columns, spaced at 26'-0" on centers, are embedded in 12" thick CMU shear walls located at the perimeter of the six-sided Fieldhouse structure.

Second and Third Floor Construction: Second and Third Floor construction of the Academic Building consists of a 3½" concrete topping slab over 9/16", 28 gauge metal deck (4"+/- total slab thickness) spanning to steel joists spaced at approximately 2'-0" on centers. Steel joists span to wide flange steel girders, supported by steel columns. See the roof construction description above for typical bay sizes.

Second Floor construction in the Fieldhouse is similar to that in the Academic Building (described above), except for the portion of floor located over the Pool. At this location, the concrete slab on deck is replaced by a 10" thick reinforced concrete slab supported by 36" deep, concrete encased, wide flange steel beams. The concrete encased beams, spaced at 25'-0" on centers, span 60'-0" to rectangular hollow tube steel columns located on the east and west sides of the Pool.

Foundations and First Floor Construction: As previously noted, the building is supported by reinforced concrete grade beams (at exterior walls and below CMU shear walls) and pile foundations. First Floor slab on grade construction varies throughout the building. Below the southern portion of the Academic Building, an 8" thick, structural concrete slab on grade has been provided. The slab on grade is supported by 3'-0" deep x 1'-8" wide reinforced concrete grade beams running along the major east-west column lines.

First Floor construction for the remainder of the Academic Building consists of an 8" thick concrete slab on grade, reinforced with welded wire fabric, thickened to 14" for 2'-0" wide strips on all major column lines.

First Floor construction of the Fieldhouse consists of a 4" thick concrete slab on grade reinforced with welded wire fabric. Below the Pool, an 8" thick concrete slab has been provided. Columns at the perimeter of the Pool are supported by conventional spread footings. A 10" thick reinforced concrete slab with integral beams, supported by reinforced concrete columns on spread footings, completes the First Floor construction over the partial basement (Pool Chemical Room) on the west side of the Fieldhouse.

Pedestrian Bridge Construction: Although constructed at different times, the structure of the two, three-span pedestrian bridges is similar. The south bridge, built in 1980, is constructed with 6" deep, 16/18 gauge metal deck with a 4" concrete topping slab spanning to 36" deep, upturned wide flange steel beams running along each side of the bridge. Embedded within the slab are 8" deep steel channels, spaced at 4'-0" on centers along the length of the bridge, which tie/brace the bottom flanges of the upturned beams on each side of the bridge. The upturned steel beams are supported on each side of the Merrimack Canal by 24" deep wide flange steel girders (with 3/8" full height face plates each side); each supported at midpoint by a

single 20" diameter steel pipe column on pile foundations. Slide bearing pads have been provided at the each end of each bridge, where they tie into the 1922 and Lord Buildings, and also above the W24 girder located on the east side of the canal (however, not at the W24 girder located on the west side of the canal).

The north bridge, built in 1995, is constructed with 2" deep metal deck and a 2½" concrete topping slab (4½" total slab thickness), spanning to 8" deep steel channels spaced at 4'-0" on centers. Similar to the 1980 bridge, the channels span to 36" deep, upturned wide flange steel beams which are supported by 24" deep steel girders on 20" diameter steel columns with a pile foundation. Slide bearing conditions are similar to the older bridge.

Wall Construction: Exterior wall construction consists of brick veneer and/or split face concrete block, cement asbestos panels, glazing, and continuous or punched window units. Concrete block backup wall thicknesses vary from 8" to 12". A continuous relieving angle is provided at each framed level around the entire perimeter of the building.

Interior partitions (classroom demising walls, corridors, etc.) are typically light gauge metal stud wall construction or interior CMU shear walls strategically located throughout the building.

Fire Resistance: The unprotected steel framing has no fire resistance rating (Type IIB Construction). The Academic Building appears to be fully sprinklered; however, sprinklers have not been provided in the Fieldhouse/Natatorium. It appears that a fire wall was provided in the original construction, separating the Academic Building from the Fieldhouse/Natatorium (different uses) and allowing each to be noncombustible, unprotected construction. As the 1922 Building is connected to the Lord Building via the two pedestrian bridges, additional measures (i.e. fire/smoke rated doors at the ends of the bridges) would be required to consider the buildings to be fire separated (note that they are structurally separated, due to the presence of the aforementioned expansion joints).

Lateral Load Resistance: The Lord Building was designed and constructed following the introduction of seismic code provisions in Massachusetts. Lateral loads are resisted by reinforced masonry shear walls, strategically located throughout the Academic Building and the Fieldhouse/Natatorium.

C. Structural Conditions/Recommended Repairs

Structural Conditions at the Lord Building were reviewed at the site (to the extent possible) on August 26, 2016 and September 8, 2016. Generally speaking, floor and roof construction appear to be in satisfactory condition; there is no evidence of structural distress that would indicate significantly overstressed, deteriorated or failed structural members.

Foundations appear to be performing adequately; there are no signs of significant, total or differential settlements.

Floors and roofs appear to have been constructed in general accordance with the original Structural Drawings.

Structural/structurally related conditions observed on site are summarized below; recommended repairs are noted in *italics*:

1. Building Exterior:

    - Horizontal cracks in the masonry supported by the continuous relieving angles provided at each level were observed at the Academic Building and at the Fieldhouse/Natatorium. *Further evaluation of as-built details/conditions is recommended. These conditions exist throughout each of the buildings and represent a potential hazardous situation. The preliminary cost estimate should include costs to repair the brick and relieving angle system.*
    - Soffit construction (aluminum panel) is sagging/damaged in the area over the exhaust for the below ground Pool Room. *Repair/replacement of aluminum soffit required.*
    - Staining and spalling of the brick façade at the integral downspouts around the perimeter of the Fieldhouse was observed. The integral downspout system does not appear to be functioning as intended. *Further evaluation and design/installation of an alternate downspout detailing recommended. Cleaning of adjacent masonry will also be required.*
    - Cement board panels around the building are in various stages of deterioration (broken, detached, missing, open joints, etc.). *Repair/replacement of panels required.*
    - Some cracks were observed in exposed foundation walls; including one location at the northwest corner of the Academic Wing. *Repair by epoxy injection recommended, to prevent further freeze-thaw deterioration.*

2. Masonry Walls: Interior (stack bond) masonry walls are generally in satisfactory condition. However, cracking was observed in the stair well on the west end of the Fieldhouse. Further review of stairwell masonry construction is recommended. The anchorage/bracing of interior masonry partitions to the floor and roof construction as well of the height-to-thickness ratios will need to be evaluated and addressed (per code) if the building is renovated in the future (or undergoes a voluntary repair). *The preliminary cost estimate should include an allowance to anchor/brace the tops of all (non-structural) interior masonry partitions (approximately 4'-0" o.c. spacing of anchors/braces).*

3. The anchorage of exterior masonry walls to the floor and roof construction will need to be evaluated and addressed (per code) if the building is renovated in the future (or undergoes a voluntary repair). *The preliminary cost estimate should include an allowance to anchor the tops of all exterior masonry walls (approximately 4'-0" o.c. spacing of anchors).*

4. Pool Deck: The Pool area was not accessed during either recent site visit; however, FBRA observed deterioration of the concrete slab pool deck (from below) in 2013. The reinforced concrete structure in this area should be evaluated and repaired as required. *The preliminary cost estimate should include costs for concrete repairs to the entire pool deck (chipping, cleaning, rebar coating, patching, etc.).*

5. The condition of the Field House floor (above the pool) was not determined. Due to the deleterious nature of the swimming pool environment, FBRA recommends that this construction be inspected for signs of distress/deterioration (currently obscured by finishes).

6. Roof: The roof was not accessed during the either site visit. However, evidence of roof leaks was observed throughout the building. *PE has reviewed the existing roofs; replacement of the flat roofs is required. Drainage issues should be evaluated and addressed as part of the new roof design.*

Refer to Appendix A at the end of this report, for photographs of structural/structural conditions that require repair.

III. FRESHMAN ACADEMY

Structural conditions at the Freshman Academy were reviewed at the site on September 8, 2016. Additional structural investigations were conducted in March 2017.

The following documents for this building were reviewed in the preparation of this report:

Renovations for the Arts & City Schools: Structural Drawings S1 to S7, prepared by Engineers Design Group Inc., dated July 29, 1985.

Renovations for the Arts & City Schools: Architectural Drawings A1 to A44, prepared by HMFH Architects Inc., dated July 29, 1985.

The Magnet Arts & City Schools Renovations: Various Architectural (Reflected Ceiling Plans), HVAC and Electrical Drawings, prepared by Sverdrup Facilities, Inc., dated April 2, 1997.

Lowell Public Schools - Comprehensive Facilities Assessment: Master Plan Report and Existing Conditions Documentation, prepared by OMR Architects, dated July 2013.

Original Structural and Architectural Drawings were not available for the 1900 and 1939 sections of the building at the time of this report. The descriptions of Structural and Architectural systems provided within this report for these sections were derived from observations on site or obtained from the renovation and alteration drawings listed above.

A. General Description

The Freshman Academy is comprised of an original, three-story wood and steel framed structure, with a full basement, constructed in 1900 (one block east of the 1922 Building), fronting Paige Street. An attached, two-story steel and concrete framed addition (of similar size), with a partial basement was constructed in 1939 on the north side of the original building. The facility underwent significant renovations 1985. The total, gross floor area of the building is approximately 92,760 square feet.

The Cafeteria/Multi-Purpose Room, Kitchen and Theater are located in the Basement of the 1900 portion of the building. The 1939 steel framed portion of the facility is mostly unexcavated at this level, except for the middle third of the building, which houses a few Classrooms. Administrative Offices and Classrooms are located on the First Floor, which also hosts a central Courtyard with large skylights. Classrooms compose the Second and Third Floors. An Elevator Penthouse, constructed as a part of the 1985 renovations, and a Mechanical Room are located on the west side of the 1939 portion of the building at the Third Floor level.

B. Structural Systems Description

Structural Description: The original (1900) building is primarily wood framed. Third and Second Floor construction consists of wood flooring over wood joists. First Floor construction

is similar, with wood floor joists spanning to large steel trusses which clear span the Cafeteria and Theater spaces below. The 1939 (addition) portion of the building is concrete and steel framed, with roof construction consisting of metal deck spanning to steel joists and beams/girders. Second Floor construction consists of concrete slab on metal deck spanning to steel joists and beams/girders. First Floor construction consists mainly of concrete slab on grade construction. Floor construction over the middle third of the addition (where a basement is present below) is concrete slab on metal deck, spanning to steel joists. The central Courtyard, located at the First Floor between the 1900 and 1939 buildings, is constructed with metal deck spanning to wide flange steel beams. Three steel framed skylight openings allow natural light to pass into the basement corridor below. The lowest level construction is concrete slab on grade. Structural information related to existing foundation was not available. Refer to the schematic framing diagrams in Appendix B for additional information.

Structural Materials: Structural material strengths for the building were not available.

Subsurface Soils and Foundations: No subsurface soils information was available. It is assumed that the building is supported on a spread footing foundation. Foundation walls in the original building are mortared field stone; concrete foundation walls were constructed in the 1939 addition.

Story Heights: Story heights are as follows:

Basement to First:	11’-0”
First to Second:	13’-0”
Second to Third:	13’-6”
Third to Roof:	13’-3”

Design Live Loads: Design live load information is not available for the building; however, the floor structure appears to be performing satisfactorily under the current use.

Expansion Joints: There is no expansion joint between the original building and the 1939 addition.

Exterior Walls: Exterior wall construction is load bearing unreinforced masonry (approximately 16” thick at the 1939 addition).

Fire Resistance: Wood and steel framed floor and roof construction has no fire resistance rating, other than that which may be provided by the original plaster ceilings. Per the Code Report, the minimum classification for this building would be Type IIIB Construction (combustible interior – 1 hour fire resistance rating; 2 hour noncombustible exterior wall). The Freshman Academy appears to be fully sprinklered.

Lateral Load Resistance: There is no defined lateral load resisting system; by default, lateral loads are resisted by the (unreinforced) masonry walls.

C. Structural Conditions/Recommended Repairs

Structural Conditions at the Freshman Academy were reviewed at the site (to the extent possible) on September 8, 2016. Generally speaking, floor and roof construction appear to be in satisfactory condition; there is no evidence of structural distress that would indicate significantly overstressed, deteriorated or failed structural members.

Foundations appear to be performing adequately; there are no signs of significant, total or differential settlements.

Structural/structurally related conditions observed on site are summarized below; recommended repairs are noted in *italics*:

1. Building Exterior:

    - Patching and repointing of concrete and masonry elements in the original 1900 building were observed in various locations adjacent to the 1939 Addition. *Similar repairs are recommended elsewhere, on the exterior of the original 1900 building.*
    - Brick joints in the 1939 addition generally appear to be in satisfactory condition; however, joints in the original building are typically in poor condition. *The preliminary cost estimate should include costs for repointing 10% of the 1939 addition and 100% of the original 1900 building.*
    - Face brick at the original building and the addition (the east side in particular) has spalled in a number of locations; this brick is vulnerable to further deterioration resulting from freeze-thaw action. *Remove and replace face brick in limited areas of each building.*
    - Cracks in stone window sills were observed in limited locations (1939 addition). *Repair stone sills as required*.
    - Steel loose lintels at the 1939 addition have corroded in a number of locations; rust-jacking of the brick has occurred. There are no steel lintels at the original building (brick arches provided). *Remove and replace approximately 10% of the lintels; elsewhere, clean and coat the existing lintels.*

2. Further review of the (low) skylight/roof between the original building and the 1939 addition is recommended. This is an area where significant snow and rainwater can accumulate. *The preliminary cost estimate should include costs for a separately piped, overflow drain system to prevent a potential unsafe accumulation of rainwater on this roof. Costs for reinforcing this roof (approximately $20.00/SF) should be included as well.*

3. Masonry Walls: Interior masonry walls are generally in satisfactory condition. The anchorage/bracing of interior masonry partitions to the floor and roof construction as well of the height-to-thickness ratios will need to be evaluated and addressed (per code) if the building is renovated in the future (or undergoes a voluntary repair). *The preliminary cost estimate should include an allowance to anchor/brace the tops of all (non-structural) interior masonry partitions (approximately 4'-0" o.c. spacing of anchors/braces).*

4. The anchorage of exterior masonry walls to floor and roof construction will need to be evaluated and addressed (per code) if the building is renovated in the future (or undergoes a voluntary repair). *The preliminary cost estimate should include an allowance to anchor the tops of all exterior masonry walls (approximately 4'-0" o.c. spacing of anchors).*

5. Water damage to ceilings was observed in a number of locations, relating to roof leakage. *PE has reviewed the existing roofs; replacement of the flat roofs is required. Drainage issues should be evaluated and addressed as part of the new roof design.*

6. Flooring has failed in a number of locations and the substrate appears to be "punk". A gypsum leveling course may be present, which has deteriorated over time from high traffic and routine maintenance (mopping). *Further evaluation is recommended. The preliminary cost estimate should include costs to remove and replace flooring/leveling materials.*

Refer to Appendix A at the end of this report, for photographs of structural/structural conditions that require repair and Appendix B for schematic framing diagrams.

IV. STEAM PLANT

Structural conditions at the Steam Plant were reviewed at the site on September 8, 2016.

The following documents for this building were reviewed in the preparation of this report:

Addition to the Lowell High School: Henry L. Rourke Architect; Various HVAC and Electrical Drawings (Including the Steam Plant), prepared by Richard D. Kimball Co. Engineers, undated (Circa 1917).

Lowell Steam Plant: Architectural Drawings A101 to A401, prepared by Sverdrup Facilities Inc., dated April 22, 1996.
Lowell Public Schools - Comprehensive Facilities Assessment: Master Plan Report and Existing Conditions Documentation, prepared by OMR Architects, dated July 2013.

Original Structural and Architectural Drawings were not available for the Steam Plant at the time of this report (only HVAC and Electrical Drawings were available). The descriptions of Structural and Architectural systems provided within this report for this building were derived from observations on site or obtained from the renovation and alteration drawings listed above.

A. General Description

The Steam Plant is a one-story concrete and steel framed structure, with brick bearing walls, constructed in 1939 and renovated in 1996. The approximately 2,500 square foot building houses the major mechanical equipment (generator and boiler) for the adjacent Freshman Academy. A clerestory space, with louvers on all sides, projects up above the main roof at the center of the building. An access ladder extends from the ground floor to a small grated platform at roof level. A full height CMU enclosure was constructed around the Generator/Electrical Room during the 1996 renovations. At the southwest corner of the building, a stairway leads down to a passageway/storage area below the neighboring National Park Service building and a tunnel below Kirk Street to the Lord Building.

B. Structural Systems Description

General Construction: The building is steel and concrete framed with brick bearing walls. Roof construction consists of concrete slab over steel trusses which clear span the space to brick bearing walls on building's north and south sides. First Floor construction consists of concrete slab on grade with concrete pads below the larger pieces of equipment. Structural information related to existing foundation construction is limited.

Structural Materials: Structural material strengths for the building are not available.

Subsurface Soils and Foundations: Subsurface soils and foundation information for the building are not available.

Story Heights: Story height information for the building was not determined.

Design Live Loads: Design live load information is not available for the building.

Expansion Joints: There are no expansion joints within the building.

Roof Construction: Roof construction consists of concrete slab supported by concrete encased steel beams, which span to three equally spaced steel trusses. Steel trusses clear span the building and are supported by perimeter brick bearing walls on the north and south sides of the building.

Floor Construction: Floor construction consists of concrete slab on grade (thickness unknown). Concrete housekeeping pads have been provided for equipment.

Wall Construction: Exterior wall construction consists of brick bearing walls (approximately 16" thick). A full height enclosure, consisting of 12" thick CMU wall construction, was installed around the Electrical Room as part of the 1996 renovations. Continuous concrete footings were provided below the interior CMU walls.

Fire Resistance: The unprotected steel roof framing has no fire resistance rating (Type IIB Construction). The Steam Plant has not been equipped with a sprinkler system.

Lateral Load Resistance: There is no defined lateral load resisting system; by default, lateral loads are resisted by the (unreinforced) masonry walls.

C. Structural Conditions/Recommended Repairs

Structural Conditions at the Steam Plant were reviewed at the site (to the extent possible) on September 8, 2016. Generally speaking, floor and roof construction appear to be in satisfactory condition; there is no evidence of structural distress that would indicate significantly overstressed, deteriorated or failed structural members.

Foundations appear to be performing adequately; there are no signs of significant, total or differential settlements.

Structural/structurally related conditions observed during our site visit are summarized below; recommended repairs are noted in *italics*:

1. Building Exterior:

    - Patching and repointing of masonry elements were conducted during the 1996 renovations. *Similar repairs are recommended for the brick stack (see photos).*

    - Masonry Walls: There are areas where the existing brick bearing walls are showing signs of deterioration, specifically at the building's southwest corner where an exterior ramp was constructed tight to the exterior wall. *The preliminary cost estimate should include costs to repair the brick construction (see photos).*

2. Masonry Walls: Interior masonry walls surrounding the Generator/Electrical Room are generally in satisfactory condition. The anchorage/bracing of these walls to the roof construction as well of the height-to-thickness ratios will need to be evaluated and

addressed (per code) if the building is renovated in the future (or undergoes a voluntary repair). *The preliminary cost estimate should include an allowance to anchor/brace the tops of (non-structural) these walls (approximately 4'-0" o.c. spacing of anchors/braces).*

3. The anchorage of exterior masonry walls to the roof construction will need to be evaluated and addressed (per code) if the building is renovated in the future (or undergoes a voluntary repair). *The preliminary cost estimate should include an allowance to anchor the tops of all exterior masonry walls (approximately 4'-0" o.c. spacing of anchors).*

Refer to the APPENDIX at the end of this report, for photographs of structural/structural conditions that require repair.

MARCH 2017 FIELD INVESTIGATIONS

With the exception of the Lord Building (including the Fieldhouse/Natatorium) and the 1995 addition to the 1922 Building, limited structural documentation was available. In particular, there were no structural documents for the 1922 addition to the 1922 Building and the Freshman Academy (both the original building and the 1939 addition). Accordingly, FBRA recommended that finishes be removed in selected locations during the Feasibility Study, so the general details of the floor and roof construction in these buildings can be determined. This information was deemed to be crucial in determining the structural feasibility of reinforcing, modifying, adding to, or removing portions of the existing floor and roof construction, as well as the approximate costs involved in doing so. Limited structural investigations were conducted in March 2017 at 1922 Addition and the Freshman Academy to gain a general understanding of the floor and roof structural systems and the typical framing layout. Refer to schematic framing diagrams in Appendix B for additional information.

RENOVATIONS AND ADDITIONS – MEBC REQUIREMENTS

General comments relating to potential renovations, alterations and additions to the Lowell High School are presented in this section. Renovations, alterations, repairs and additions to existing buildings in Massachusetts are governed by the provisions of the Massachusetts State Building Code (MSBC – 8th Edition) and the Massachusetts Existing Building Code (MEBC). These documents are based on amended versions of the 2009 International Building Code (IBC) and the 2009 International Existing Building Code (IEBC), respectively.

The MEBC defines three (3) compliance methods for the repair, alteration, change of occupancy, addition or relocation of an existing building. The method of compliance is chosen by the Design Team (based on the project scope and cost considerations) and cannot be combined with other methods.

The Prescriptive Compliance Method (IEBC Chapter 3) duplicates Sections 3403 through 3411 of Chapter 34 in the IBC and prescribes specific minimum requirements for construction related to additions, alterations, repairs, fire escapes, glass replacement, change of occupancy, historic buildings, moved buildings and accessibility. A complete structural evaluation of the building is required by the Massachusetts Amendments. If the impact of the proposed alterations and additions to structural elements carrying gravity loads and lateral loads is minimal (less than 5% and 10% respectively), seismic upgrades to an existing building are generally not required.

The *Work Area Compliance Method* (IEBC Chapters 4 through 12) is based on a proportional approach to compliance, where upgrades to an existing building are triggered by the type and extent of work. The Work Area Compliance Method includes requirements for three levels of

alterations, in addition to requirements for repairs, changes in occupancy, additions, historic buildings or moved buildings. A complete seismic evaluation of the existing building is required under the following conditions: Level 2 alterations where the demand to capacity ratio of lateral load resisting elements has been increased by more than 10%, all Level 3 alterations, a change in occupancy to a higher category, and where structurally attached additions (vertical or horizontal) are planned.

The *Performance Compliance Method* (IEBC Chapter13) duplicates Section 3412 of Chapter 34 in the IBC and provides for evaluating a building based on fire safety, means of egress and general safety (19 parameters total). This method allows for the evaluation of the existing building to demonstrate that proposed alterations, while not meeting new construction requirements, will maintain existing conditions to at their current levels (at a minimum) or improve conditions, as required. A structural investigation and analysis of the existing building is required to determine the adequacy of the structural systems for the proposed alteration, addition or change of occupancy. A report of the investigation and evaluation, along with proposed compliance alternatives must be submitted to the code official for approval.

The previously referenced, Sullivan Code Group report is based on the Work Area Compliance Method.

Additions – General Comments - MEBC

The design and construction of any addition to the Lowell High School would be conducted in accordance with the Code for new construction. Any proposed additions should be structurally separated from the existing, adjacent construction by an expansion (seismic) joint to avoid an increase in gravity loads or lateral loads to existing structural elements. Refer to the Code Report for a discussion of fire separation issues (i.e. fire wall requirements) relating to potential additions to the existing buildings.

Renovations/Alterations – General Comments - MEBC

Where proposed alterations to existing structural elements carrying gravity loads result in a stress increase of over 5%, the affected element will need to be reinforced or replaced to comply with the Code for new construction. Proposed alterations to existing structural elements carrying lateral load (i.e. existing, unreinforced masonry walls) which result in an increase in the demand - capacity ratio of over 10% should be avoided, if possible. Essentially, this means that removal of, or major alterations to the existing, exterior unreinforced masonry bearing walls in the original building and subsequent additions should be minimized.

Additional Comments – Seismic Issues

- None of the buildings which comprise the Lowell High School meet current seismic code requirements. With the exception of the Lord Building (reinforced masonry shear walls) the lateral force resisting system is not well defined for any of the buildings. By default, lateral force resistance is provided by interior and exterior (unreinforced) masonry walls.

- The code generally does not require a seismic retrofit/upgrade, provided the use stays the same (as will be the case for this project), structural alterations are not considered to be “substantial”, and the *demand-to-capacity ratio* of any element resisting lateral loads (i.e. masonry walls), *does not increase by more than 10% over current levels*. “Demand” is the seismic force (proportional to mass); adding significant mass to the building should be avoided (major additions should be structurally separated). “Capacity” is the capacity of the walls to resist lateral forces. Creating new, large openings in masonry walls or removing

large sections of the walls should be avoided; otherwise, they would need to be replaced elsewhere (with new, reinforced masonry or concrete walls), making the argument that the stresses in the remaining, existing walls do not increase by more than 10%. If the modifications are such that this argument cannot be made, then the building would need to be retrofitted/upgraded to resist 50% to 75% of the seismic loading required by the code for new construction (% depends on the extent of structural alterations). This would have a significant cost impact.

- If the "Work Area" (defined as the area of reconfigured spaces within the building) less than 50% of the total area, the renovation would be classified as a *Level 2 Alteration* – no seismic upgrades would be necessary unless the 10% requirement noted above is not met. If the work area exceeds 50% of the total area of the building, the renovation would be classified as a *Level 3 Alteration.* Certain seismic hazards (anchorage of floor and roof diaphragms to masonry walls, bracing of chimneys, bracing of parapets, etc.) would need to be addressed. No further seismic upgrades would be required unless the 10% requirement noted above is not met.

- In either a *Level 2* or a *Level 3 Alteration,* if the 10% requirement cannot be met, and the structural alterations are not considered to be "substantial" (see below), the building would need to be evaluated and reinforced to withstand 50% of the seismic loading required by the code for new construction (significant cost impact).

- If a *Level 3 Substantial Structural Alteration* is proposed, where more than 30% of the total floor and roof area is structurally altered, the building will need to be evaluated and reinforced to withstand full wind loading and 75% of the seismic loading required by the code for new construction (again, a significant cost impact).

End of Existing Conditions Evaluation/Base Repair Structural Report

APPENDIX A - PHOTOGRAPHS

1922 Building
Lord
Freshman Academy
Steam Plant

1922 BUILDING



Photo K-1: Flooring failure - possible sub-slab moisture issues.



Photo K-2: Cracks in terrazzo flooring.



Photo K-3: Ceiling damage from roof leakage.



Photo K-4: Water damage at north foundation wall of Coburn. Basement reportedly has flooded in the past.

.



Photo K-5: Steel channel reinforcing of original wood joists in Coburn.



Photo K-6: Joint deterioration above stone watertable course.



Photo K-7: Rust-jacking of face brick - upwards and outwards.



Photo K-8: Missing cornice stone.



Photo K-9: Downspout discharges adjacent to basement wall.



Photo K-10: Damaged concrete at embedded (aluminum) railing post.

LORD/FIELDHOUSE



Photo L-1: Fieldhouse roof structure.



Photo L-2: Crack in CMU wall at stair on west side of Fieldhouse.



Photo L-3: Ceiling damage due to roof leakage.



Photo L-4: Deterioration/open joints at cement board enclosures (typical condition).



Photo L-5: Cracked brick at relieving angle (typical condition).



Photo L-6: Deteriorated/failed masonry at roof edge (Fieldhouse).



Photo L-7: Deterioration, discoloration and efflorescence at integral downspouts.



Photo L-8: Vertical crack in brick at corner.



Photo L-9: Cracked brick at relieving angle.



Photo L-10: Exposed, rusted steel and deck at Fieldhouse.



Photo L-11: Deteriorated cement board panels, discoloration at downspout.



Photo L-12: Cracked Brick at relieving angle.



Photo L-13: Fieldhouse downspout - not piped to a drainage structure; erosion occurring.



Photo L-14: Crack at NE corner of Academic Building

FRESHMAN ACADEMY



Photo FA-1: Past brick repairs to original (1900) building, open joints at foundation stones.



Photo FA-2: Flooring failure in 1900 building - possible gypsum based underlayment present.



Photo FA-3: Steel transfer trusses at Cafeteria (1900 Building).



Photo FA-4: Steel transfer trusses at Auditorium (1900 Building).



Photo FA-5: Deteriorated/failed brick joints and rusting lintels (1900 Building).

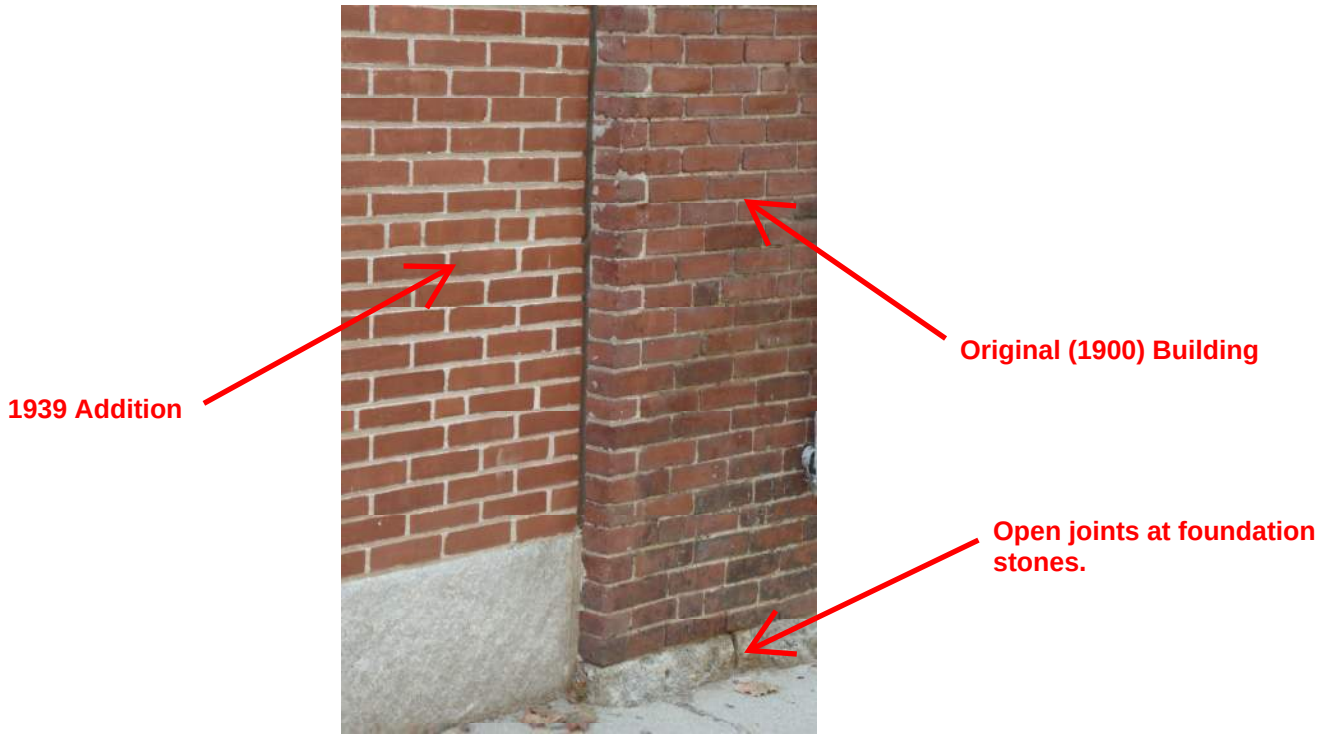


Photo FA-6: Joint between (original) 1900 building and 1939 addition.



Photo FA-7: Cracked stone sill at 1900 building.



Photo FA-8: Open joint at foundation stone and deteriorated face brick.

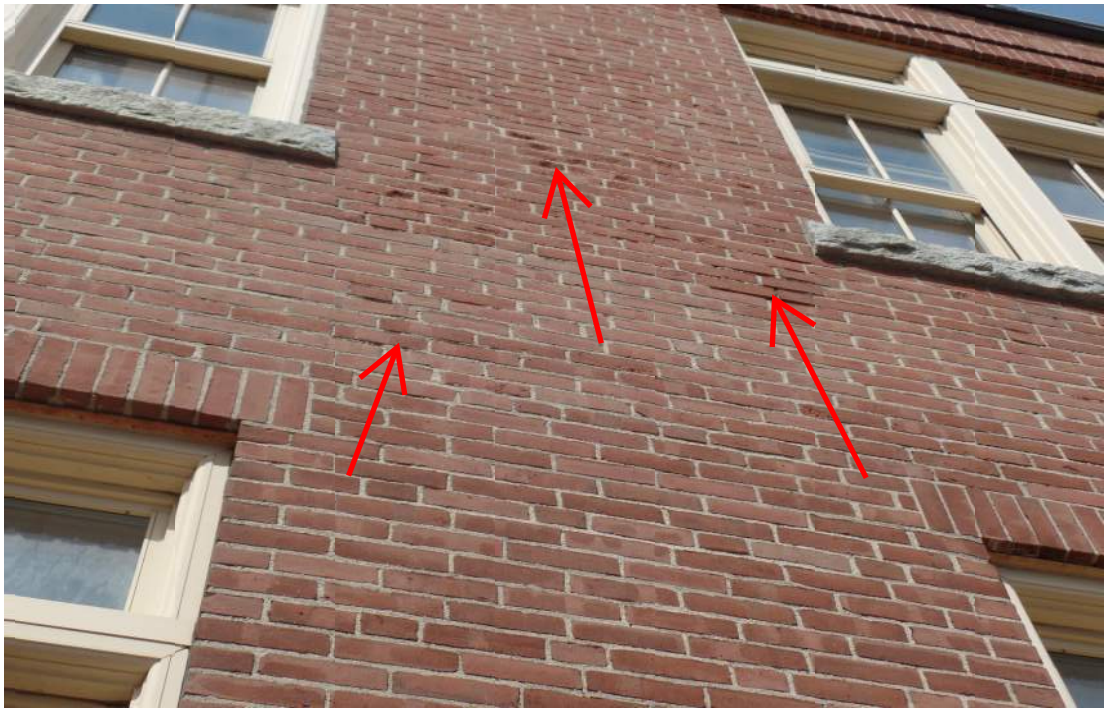


Photo FA-9: Deteriorated face brick at 1900 building.



Photo FA-10: Ceiling damage due to roof leakage.

STEAM PLANT



Photo SP-1: Interior of plant, showing tall brick masonry exterior walls and roof construction.



Photo SP-2: Brick deterioration at SW corner of building, adjacent to drain leader.



Photo SP-3: Masonry deterioration below roof at the southwest corner.



Photo SP-4: Wood roof construction below sidewalk between the Steam Plant and the adjacent NPS Building.



Photo SP-5: Wood roof construction below sidewalk between the Steam Plant and the adjacent NPS Building.



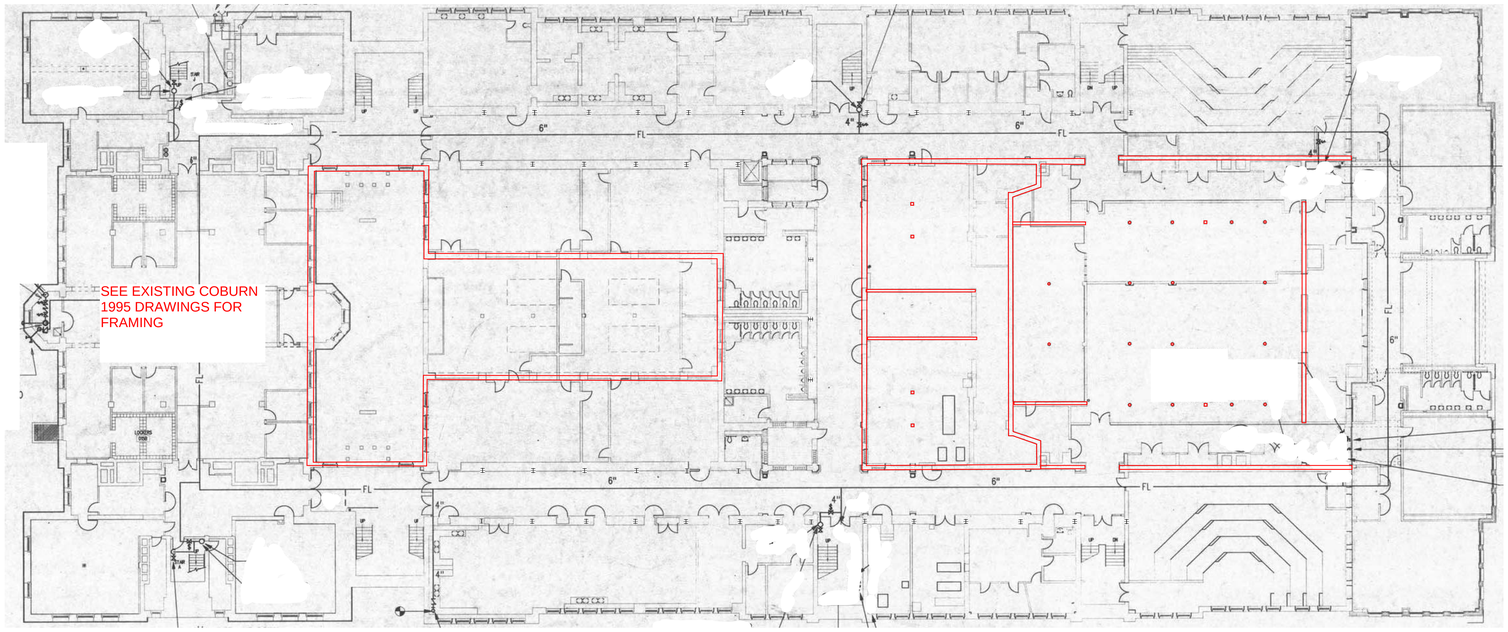
Photo SP-6: North elevation of Steam Plant, with stack in the background



Photos SP-7 and SP-8: Stack repointing required.

APPENDIX B – SCHEMATIC FRAMING DIAGRAMS

1922 Building
Freshman Academy

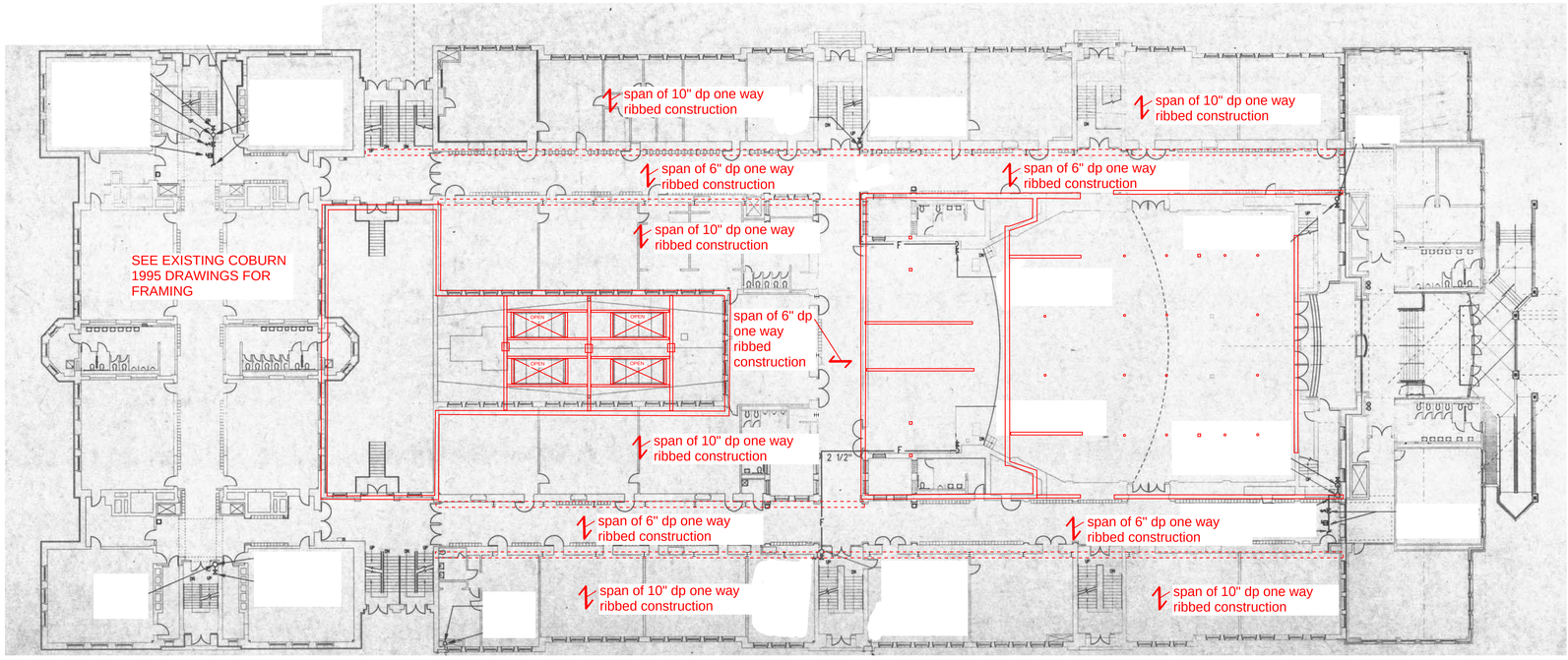


GROUND FLOOR PLANS

N

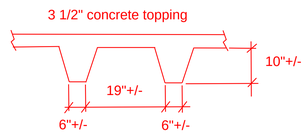
LOWELL HIGH SCHOOL 1922 BUILDING
GROUND FLOOR PLAN
FBRA SITE INVESTIGATIONS

3-28-2017

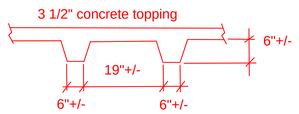


FIRST FLOOR PLANS

N



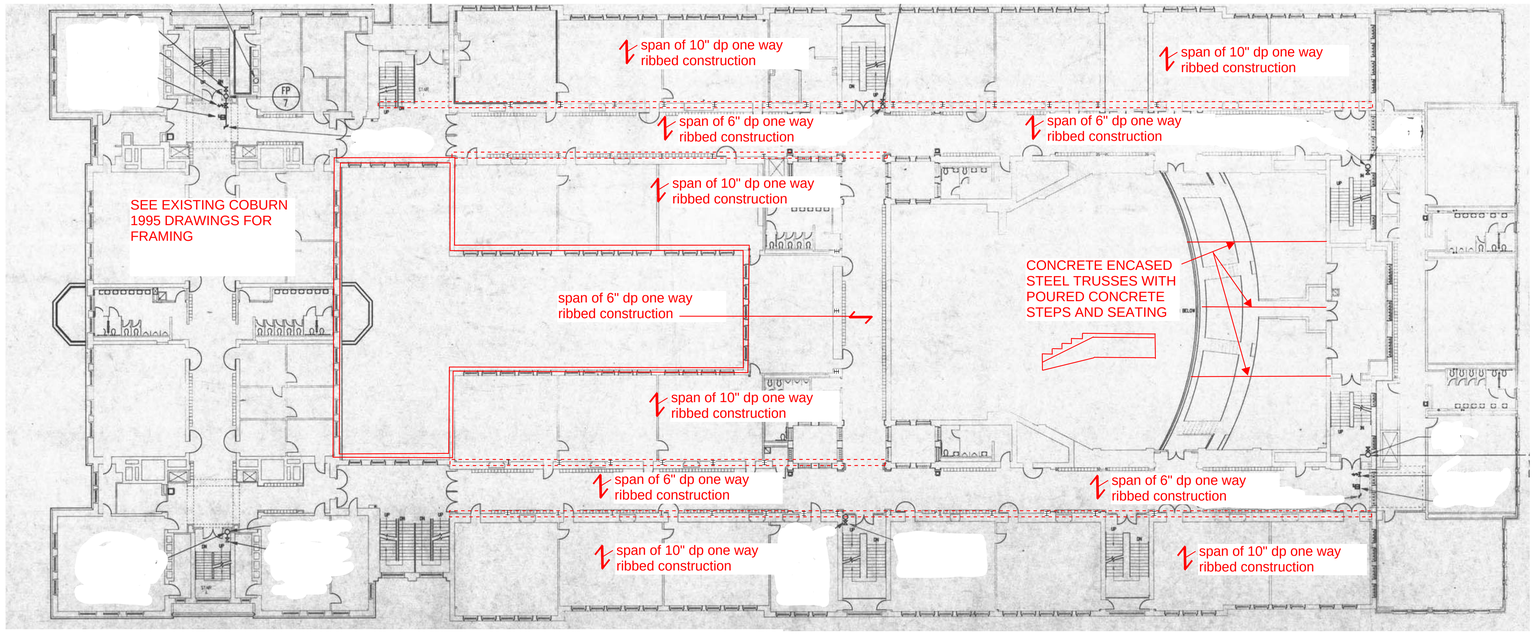
10" DEEP PAN SYSTEM



6" DEEP PAN SYSTEM

LOWELL HIGH SCHOOL 1922 BUILDING
FIRST FLOOR FRAMING PLAN
FBRA SITE INVESTIGATIONS

3-28-2017



SECOND FLOOR PLANS

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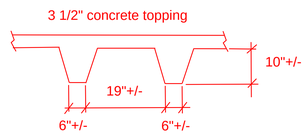

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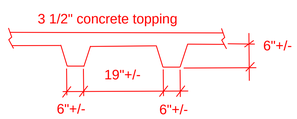

6" DEEP PAN SYSTEM

LOWELL HIGH SCHOOL 1922 BUILDING
SECOND FLOOR FRAMING PLAN
FBRA SITE INVESTIGATIONS

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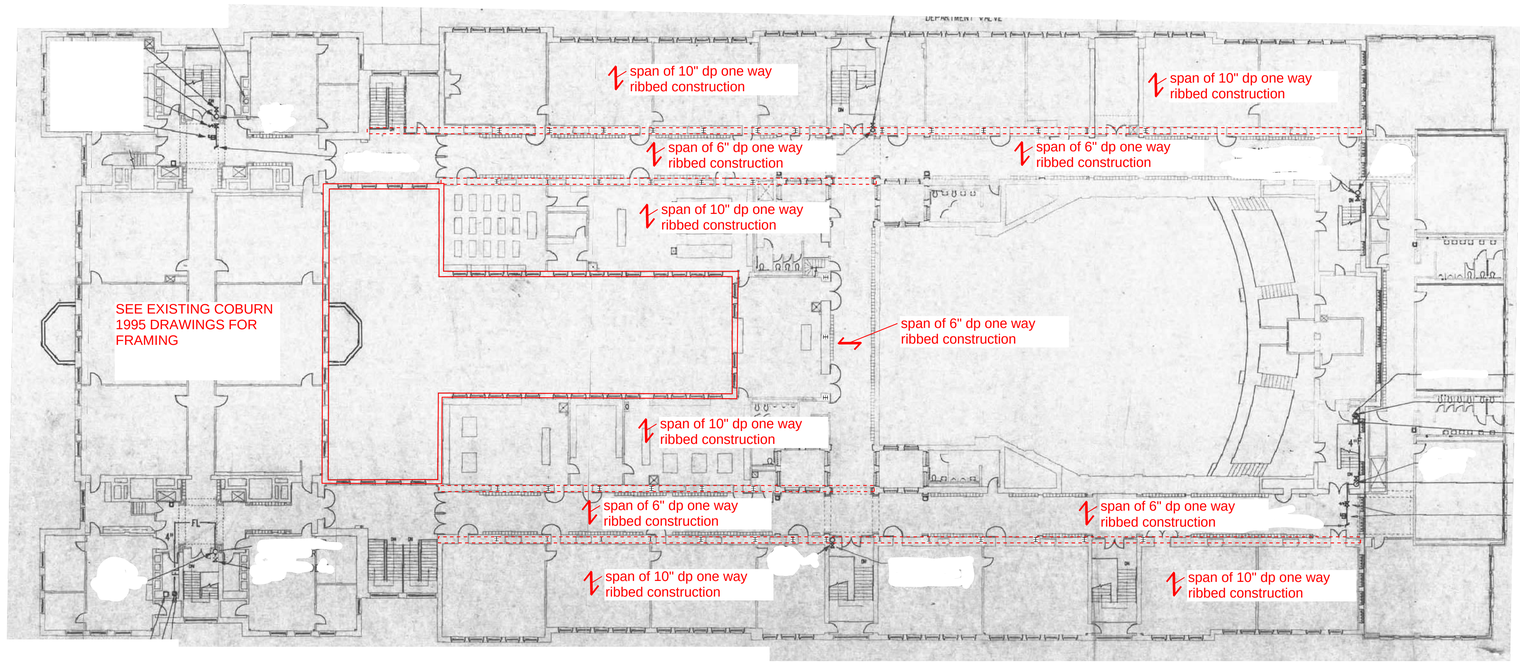

THIRD FLOOR PLANS

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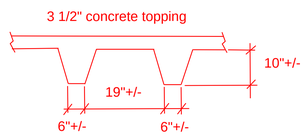
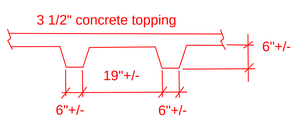


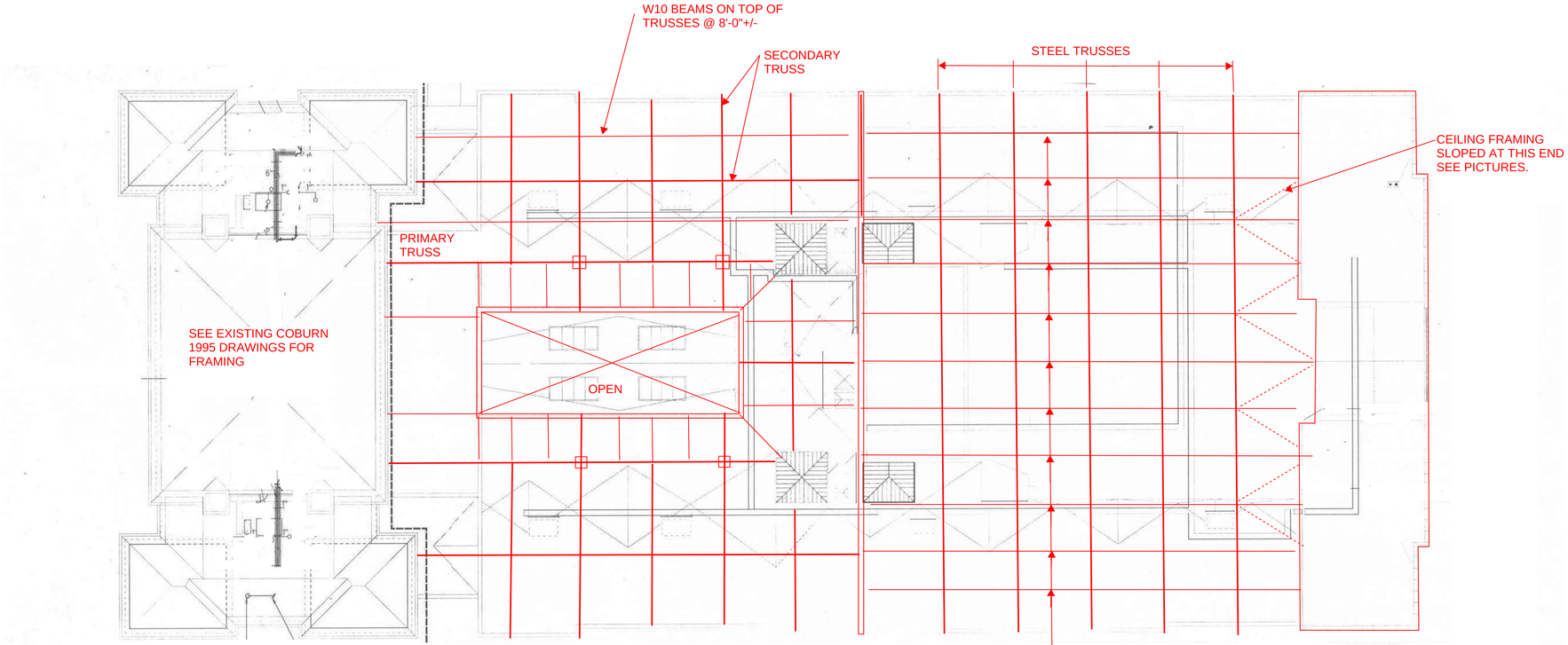
10" DEEP PAN SYSTEM



6" DEEP PAN SYSTEM

LOWELL HIGH SCHOOL 1922 BUILDING
THIRD FLOOR FRAMING PLAN
FBRA SITE INVESTIGATIONS

3-28-2017



ROOF FRAMIN PLAN

N

LOWELL HIGH SCHOOL 1922 BUILDING
ROOF FRAMING PLAN
FBRA SITE INVESTIGATIONS

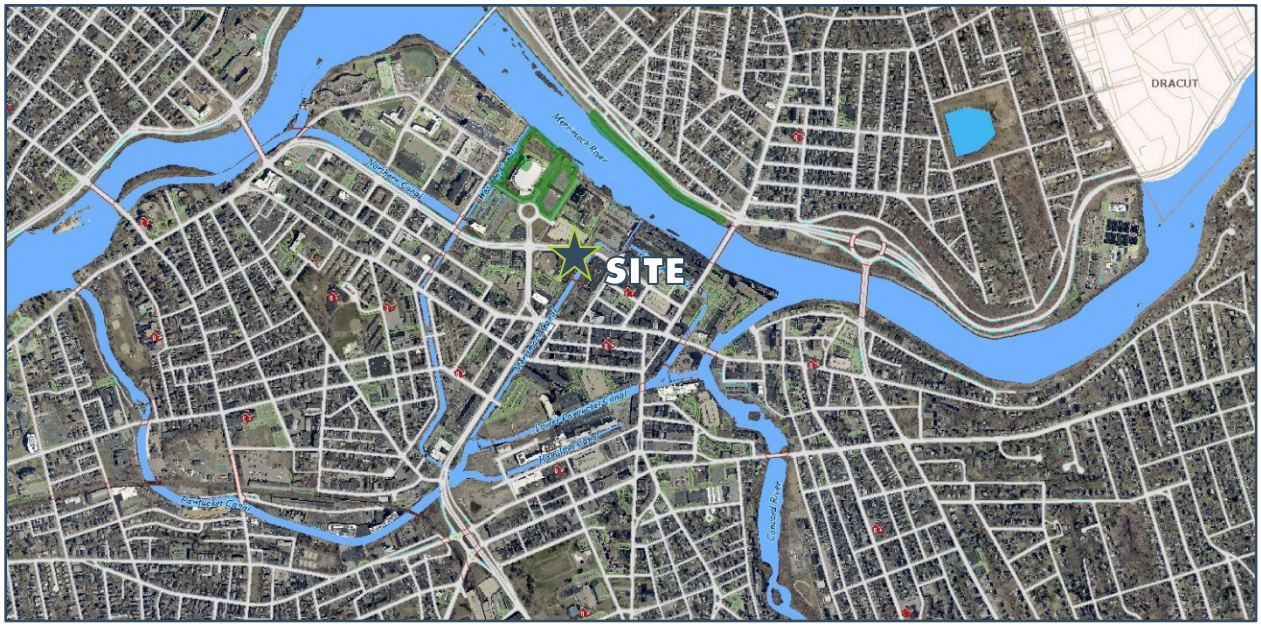
3-28-2017

Perkins Eastman

Lowell High School

Lowell, Massachusetts

Traffic Impact Analysis



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May 2017

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7.0 Appendices

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1.0 Introduction

1.1 Purpose of Study

This traffic study was prepared at the request of Perkins Eastman in connection with its study to renovate or replace the Lowell High School in Lowell, Massachusetts. During the preliminary evaluation of alternatives phase of the project, Perkins Eastman has developed alternatives on various parcels of land in the Downtown area. For the benefit of the boards and the citizens of Lowell, the traffic impacts of the site have been evaluated. The study analyzes traffic use attributable to the proposed high school renovation/replacement at the site and discusses transportation impacts in the vicinity.

1.2 Description of Project

The existing high school campus is located in the heart of Downtown in the City of Lowell. The proposed project includes evaluating options of full renovation, addition/renovation, new buildings, etc. to the existing Lowell High School downtown campus to accommodate the future needs of the community.

The existing Lowell High School has approximately 3,255 high school students (as of April 2017 per the student survey, see Appendix G) and 440 daytime employees. The projected student population for all design alternatives is 3,520 high school students and 500± (estimated) daytime employees.

There are three alternatives being evaluated for this study. Two of the alternatives are the Addition/Renovation Option 2A and the Addition/Renovation Option 3A (see Figure Nos. 1 and 2, respectively). It is anticipated that the Addition/Renovation Option 2A and the Addition/Renovation Option 3B would be fully constructed by 2025 and 2026, respectively. A third option, New Option A, (shown in Figure No. 3) was also developed by the design team and would be fully constructed in 2025.

Similar to current operations, all of the proposed alternatives will not provide on-site parking and will continue to rely on the neighboring George Ayotte parking garage, public transit, etc. for students and staff to utilize when traveling to and from the high school.

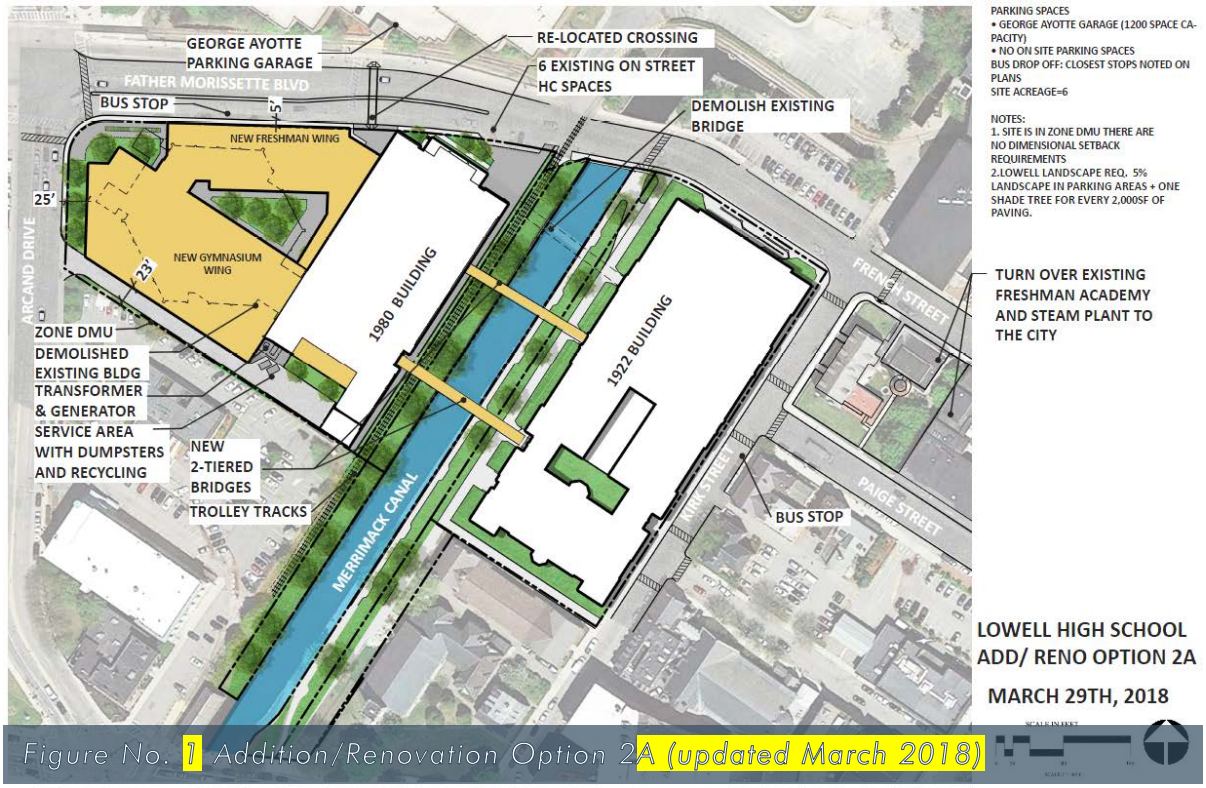

Figure No. 1 Addition/Renovation Option 2A (updated March 2018)

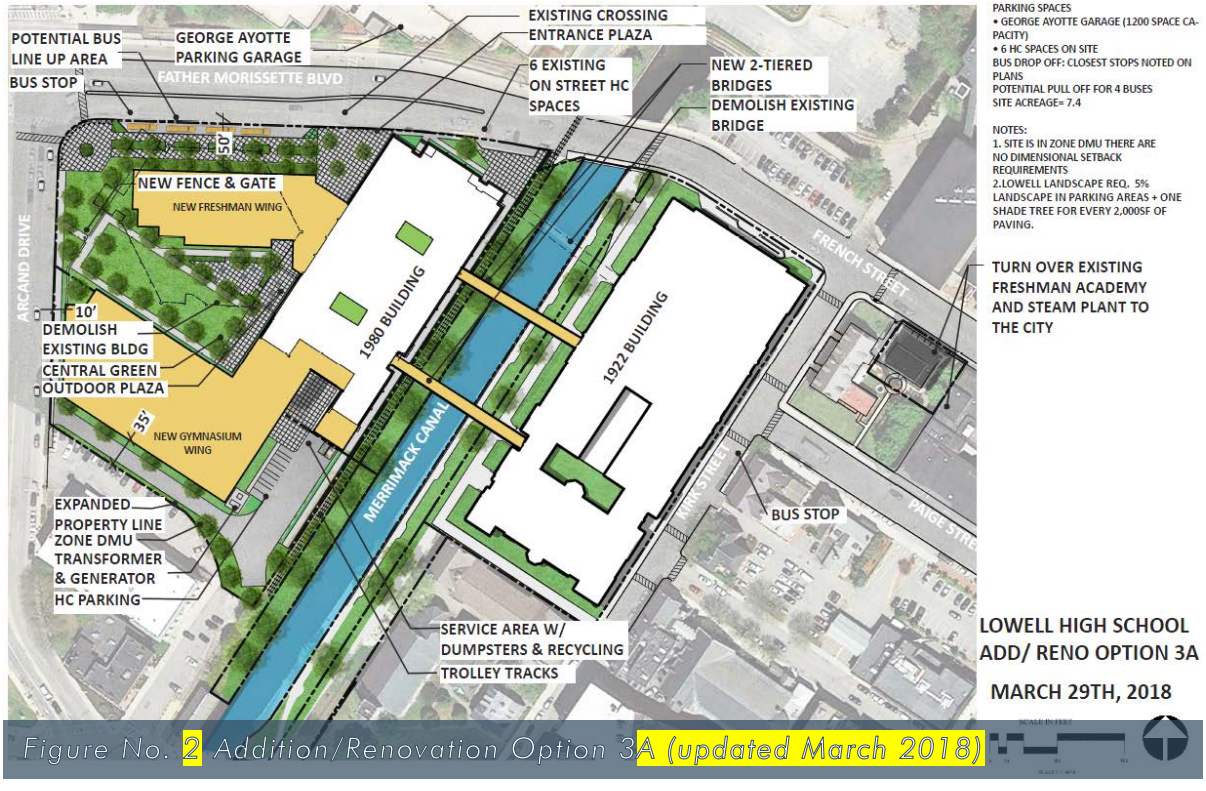

Figure No. 2 Addition/Renovation Option 3A (updated March 2018)

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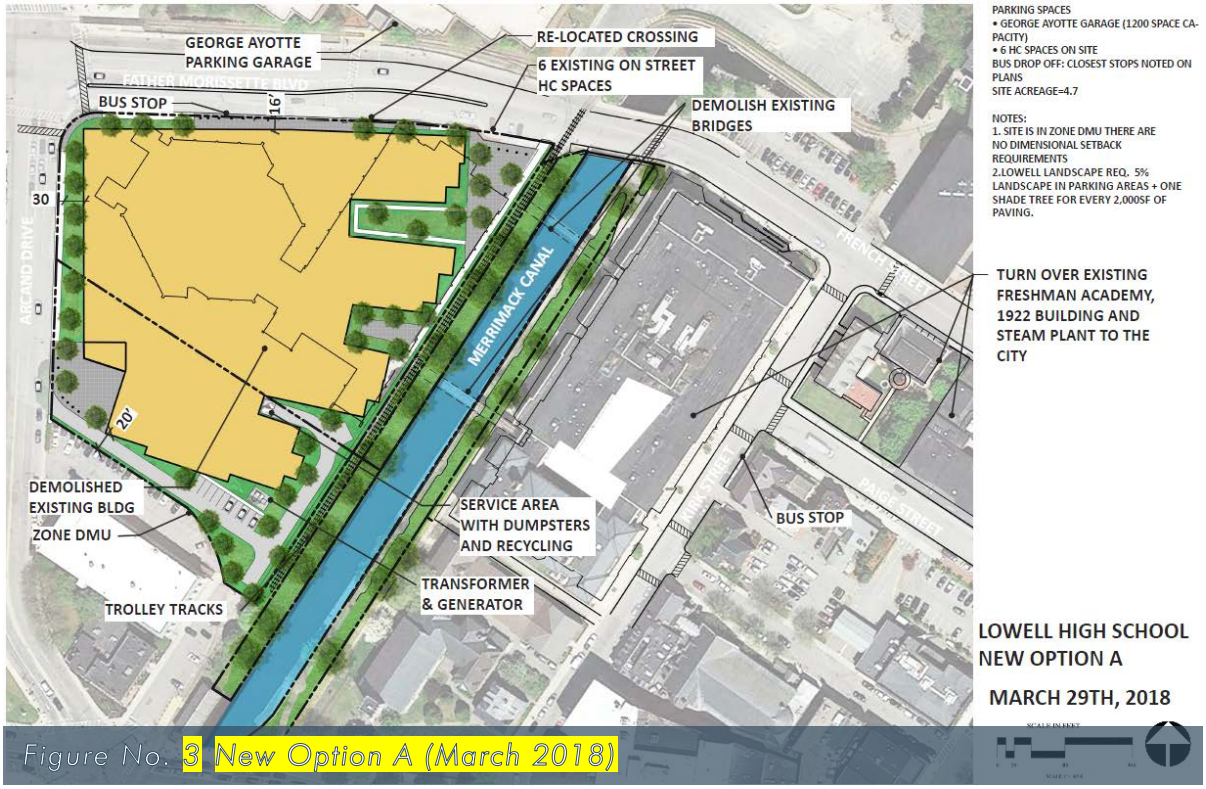


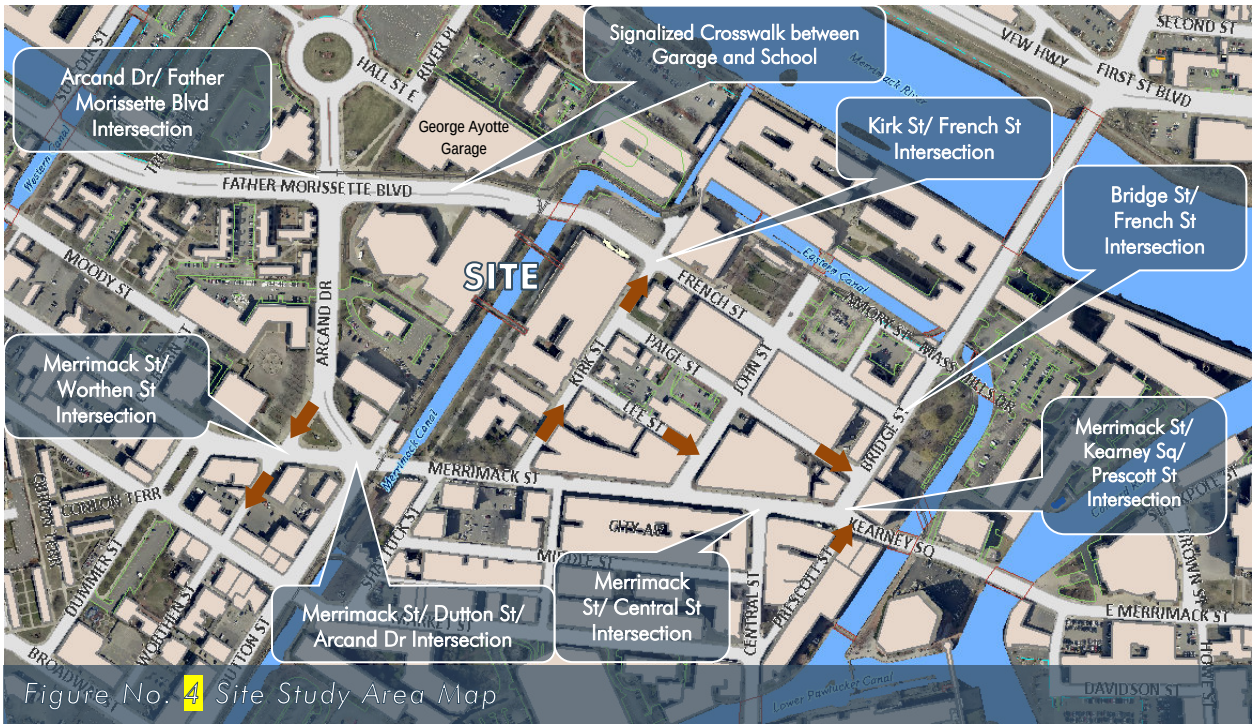
Figure No. 3 New Option A (March 2018)

2.0 Existing Conditions

2.1 Study Area

2.1.1 Surrounding Roadways

The existing high school campus is nestled in the heart of the City's downtown. Traffic volumes are heavy on Bridge Street, which is classified as an urban principal arterial, as presented in the online MassDOT Road Inventory Interactive Map, which is based on the Year-End 2011 Road Inventory File maintained by the Massachusetts Office of Transportation Planning. By definition, an arterial highway emphasizes a high level of mobility for through traffic while providing access to local roadways. Father Morissette Boulevard, French Street, Arcand Street, and Merrimack Street are classified as urban minor arterials. Traffic volumes on Kirk Street and Paige Street, which are classified as urban collectors on the online MassDOT Road Inventory Interactive Map, are low. Land use in the area is mixed institutional, commercial, and residential.



Father Morissette Boulevard in the vicinity of the existing school is a multi-lane, divided two-way roadway in front of the existing Field House and Lord Building. At the Merrimack Canal, Father Morissette Boulevard narrows and east of the canal Father Morissette Boulevard becomes French Street. French Street in the vicinity of the 1922 Building and Freshmen Academy, is a two-lane, undivided two-way, roadway with shoulders that can accommodate on-street parking, although the majority is signed as a tow zone. Kirk Street between Merrimack Street and French Street is a one-lane, one-way (in the northbound direction) roadway with shoulders on either side that can accommodate on-street parking. Paige Street between Kirk Street and John Street is a two-lane, two-way roadway with shoulders that can accommodate on-street parking, although parking is prohibited on the northern side of the roadway.

The signalized, four-way intersection of Father Morissette Boulevard and Arcand Drive is located to the west of the existing school campus. To the west of the intersection, Father Morissette Boulevard is a five-lane, divided two-way bituminous roadway, with two westbound travel lanes, a concrete median island, three eastbound travel lanes (a left turn lane, a through lane, and a right turn lane), and narrow shoulders. To the east of the intersection, Father Morissette Boulevard is a four-lane, divided two-way bituminous roadway, with three westbound travel lanes (two left turn lanes and a shared through/right turn lane), a concrete median island, one wide eastbound travel lane, and narrow shoulders. To the north of the intersection, Arcand Drive is a four-lane, divided two-way bituminous roadway, with two southbound travel lanes and two northbound travel lanes. There is a sign posted for the southbound approach prohibiting left turns from 2PM to 3PM on Mondays through Fridays from September to June. To the south of the intersection, Arcand Drive is a five-lane, undivided two-way bituminous roadway, with two southbound travel lanes, three northbound travel lanes (a left

turn lane, a through lane, and a right turn lane), an on-street parking shoulder on the west side, and a narrow shoulder on the east side. There are concrete sidewalks on both sides of Father Morissette Boulevard and Arcand Drive. This traffic signal operates with an exclusive pedestrian phase when activated by a pedestrian pushbutton. There are curb ramps, pedestrian signal heads, and pedestrian pushbuttons associated with the marked crosswalks across all four approaches of this intersection.

The signalized, mid-block crosswalk across Father Morissette Boulevard is located between the George Ayotte parking garage and the existing Lord Building. At the crosswalk, Father Morissette Boulevard is a four-lane, divided two-way bituminous roadway, with one wide westbound travel lane transitioning into three westbound travel lanes (two left turn lanes and a shared through/right turn lane), a concrete median island with a narrow at grade opening, one wide eastbound travel lane, a narrow shoulder on the south side of the road, and no marked shoulder on the north side of the road. There are concrete sidewalks on either side of Father Morissette Boulevard. There are curb ramps on both sides of Father Morissette Boulevard for the signalized crosswalk. The curb ramp on the north side of Father Morissette has an adjacent wooden landing at the railroad crossing. Both sides of the crosswalk have pedestrian pushbuttons and pedestrian signal heads. The concrete median on Father Morissette Boulevard has a ramp opening to allow pedestrians to navigate through the median and across the street.

The unsignalized, four-way intersection of French Street and Kirk Street is located adjacent to the existing school campus. French Street at its intersection with Kirk Street is a two-lane, two-way bituminous roadway with one eastbound travel lane, one westbound travel lane, and wide unmarked shoulders on both sides of the roadway. Kirk Street at its intersection with French Street is a northbound one-way, one-lane bituminous roadway with wide unmarked shoulders. There is parking on the east side of the roadway. Kirk Street is the stop-controlled approach at this intersection. There is a two-lane, two-way unmarked bituminous driveway at the northern side of the intersection. There are concrete sidewalks on both sides of Kirk Street and French Street, except for the northern side of French Street to the west of the driveway where it is a bituminous sidewalk. There are curb ramps associated with the marked crosswalk across Kirk Street and the one marked crosswalk across French Street, on the east side of Kirk Street. The curb ramps on Kirk Street are located behind the stop sign, which did not have a stop bar associated with it when reviewed in the field. There are non-ADA compliant curb ramps across the driveway opening on the north side of the intersection. There also is curb ramp on the southwest corner of the intersection, which is not associated with a marked crosswalk.

The signalized, three-way intersection of Bridge Street and French Street is located to the east of the existing school campus. Bridge Street at its intersection with French Street is a four-lane, two-way bituminous roadway with two southbound travel lanes and two northbound travel lanes. French Street at its intersection with Bridge Street is a three-lane, two-way bituminous roadway with one westbound travel lane, and two eastbound turning lanes, which consists of one left turn lane and one right turn lane. There is parking on the north side of the roadway. There are concrete sidewalks on both sides of Bridge Street and French Street. There are curb ramps associated with the marked crosswalks

across Bridge Street on both the northern and southern side of French Street, as well as curb ramps associated with the marked crosswalk across the French Street approach at this intersection. There are pedestrian signal heads only for the southern marked crosswalk across Bridge Street. The existing pushbutton on the southwest corner is operational for the southern crosswalk across Bridge Street, but the existing pedestrian pushbutton on the southeast corner is not functioning. There are no pedestrian signal heads or pushbuttons associated with the northern Bridge Street crosswalk or the French Street crosswalk. The City currently has a proposed project in the design phase to upgrade the traffic signal, which includes upgrading the pedestrian accommodations at this intersection.

The signalized four-way intersection of Merrimack Street and Worthen Street, which is set to flashing, is located to the southwest of the existing school campus. Merrimack Street at its intersection with Worthen Street is a two-lane, two-way bituminous roadway with one eastbound travel lane and one westbound travel lane for each approach and parking lanes on both sides. To the north of the intersection, Worthen Street is a two-lane, one-way bituminous roadway, with one southbound right turn lane, one southbound through lane and a parking lane on the west side of the roadway. There are no traffic signs or pavement markings that would prohibit southbound vehicles from turning left and heading eastbound on Merrimack Street when reviewed in the field. Worthen Street to the south of the intersection is a one-lane, one-way bituminous roadway for vehicles to travel southbound away from the intersection. The Merrimack Street approaches have a flashing yellow signal indication and the Worthen Street approach has a flashing red signal indication. All of the pedestrian signal heads and pushbuttons at this intersection were covered when reviewed in the field. There are concrete sidewalks on both sides of Merrimack Street and Worthen Street. There are curb ramps associated with both of the marked crosswalks across Worthen Street. There are curb ramps associated with the one marked crosswalk across Merrimack Street, which is located to the west of Worthen Street.

The signalized, five-way intersection of Merrimack Street, Dutton Street, and Arcand Drive is located to the southwest of the existing school campus. Merrimack Street at its intersection with Arcand Drive and Dutton Street, is a three-lane, two-way bituminous roadway. To west of the intersection, Merrimack Street has an eastbound through lane, an eastbound right turn lane, and a westbound travel lane. Left turns from the eastbound approach are prohibited. There is parking on the north side of this approach. To east of the intersection, Merrimack Street has a westbound left turn lane, a westbound shared through/right lane, an eastbound travel lane, a narrow northern shoulder, and a southern parking shoulder. There is a trolley rail crossing Merrimack Street on the west side of the intersection. Arcand Drive at its intersection with Merrimack Street and Dutton Street is a four-lane, two-way bituminous roadway with two northbound travel lanes and two southbound travel lanes. To the north of the intersection, Dutton Street is a narrow two-lane, two-way bituminous roadway that provides access for perpendicular street parking. To the south of the intersection, Dutton Street is a four-lane, two-way bituminous roadway with two southbound travel lanes and two northbound travel lanes. There are concrete sidewalks on both sides of Merrimack Street, both sides of Arcand Drive, and the west side of Dutton Street. There are curb ramps or sidewalk cut-outs associated with the marked crosswalks across each leg of the intersection. There are pedestrian signal heads and

pushbuttons at every crosswalk except for the crosswalk across the Dutton Street southbound approach. The northwest curb ramp at the corner of Merrimack Street and Arcand Drive is not aligned with the Arcand Drive approach crosswalk and is located at a low point in the roadway, which causes water to pond at the bottom of the ramp.

The signalized, three-way intersection of Merrimack Street and Central Street is located to the southeast of the existing school campus. Merrimack Street to the east of its intersection with Central Street is a three-lane, two-way bituminous roadway with a westbound left turn lane, a westbound through lane, and one eastbound travel lane with a narrow shoulder on the north side of the roadway. There is parking on the south side of the roadway beyond a sidewalk bump-out. Merrimack Street to the west of its intersection with Central Street is a two-lane, two-way bituminous roadway with one eastbound travel lane and one westbound travel lane. There is parking on the south side of the roadway. Central Street at its intersection with Merrimack Street is a two-lane, two-way bituminous roadway with a shared northbound left and right turn lane and a southbound travel lane. Central Street has cobble stone gutter on both sides of the roadway. There is concrete sidewalk on both sides of Merrimack Street and Central Street, however, there is granite and concrete sidewalk on the north side of Merrimack Street and a bituminous sidewalk on the southeast corner of the intersection. The crosswalks and the center of the intersection consist of cobblestones and pavers. There are curb ramps and crosswalks at each leg of the intersection. The curb ramps associated with the crosswalks across Merrimack Street are not located directly across from each other. The width of the curb ramps at the southeast corner on the intersection is too narrow. There are pedestrian signal heads and pushbuttons at each leg of the intersection, however, the pushbutton at the northwest corner of the intersection was observed to not function properly. Some of the pedestrian pushbutton location and mounting heights at this intersection are not within the recommended limits per guidelines from ADA and the *Manual on Uniform Traffic Control Devices* (MUTCD).

The signalized, four-way intersection of Merrimack Street, Bridge Street, Kearney Square, and Prescott Street is located to the southeast of the existing school campus. Merrimack Street at its intersection with Bridge Street, Kearney Square, and Prescott Street is a three-lane, two-way bituminous roadway with one eastbound through lane and two westbound travel lanes, one of which is a left turn lane at its intersection with Central Street. Left turns from Merrimack Street eastbound onto Bridge Street are prohibited. Bridge Street at its intersection with Merrimack Street, Kearney Square, and Prescott Street is four-lane, two-way bituminous roadway with one southbound left turn lane, one southbound right turn lane, and two northbound travel lanes. Kearney Square at its intersection with Merrimack Street, Bridge Street, and Prescott Street is a three-lane, two-way bituminous roadway with one westbound right turn lane, one westbound through lane, and one eastbound travel lane. There is parking on the south side of the roadway. Prescott Street at its intersection with Merrimack Street, Bridge Street, and Kearney Square is a two-lane, one-way bituminous roadway with two northbound travel lanes. There is concrete sidewalk on both sides of Bridge Street, Kearney Square, and Prescott Street. There is concrete sidewalk on the south side of Merrimack Street and a brick and concrete sidewalk on the north side. There are marked crosswalks across all four approaches at the intersection and most are

accessible by curb ramps. There is no curb ramp, however, within the marked crosswalk across Prescott Street on the southwest corner of the intersection. There is flush curb north of the Prescott Street crosswalk on the southwest corner of the intersection, which is non-ADA compliant and is inaccessible due to obstructions. The width of the curb ramp on the northwest corner of the intersection is too narrow. There are pedestrian signal heads and pushbuttons at each leg of the intersection, however, the pushbutton at the southwest corner of the intersection is inaccessible for the Prescott Street crossing.

2.1.2 Mode of Transportation

The Lowell High School administration conducted multiple student mode of transportation surveys (in January and April 2017) and a staff mode of transportation survey (in April 2017). The survey information can be found in Appendix G. Based on the survey information, Figure Nos. 5 and 6 were developed to show the approximate mode of transportation for students and staff, respectively.

Figure No. 5
Estimated Student Mode of Transportation for the Site
Based on January and April 2017 Survey Results

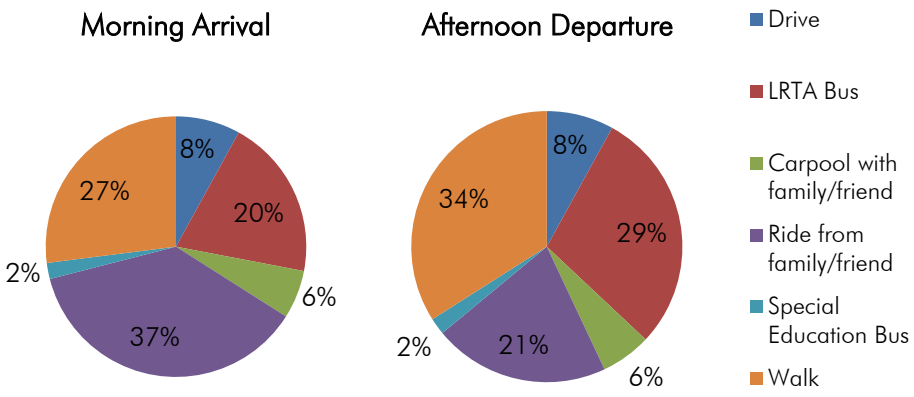
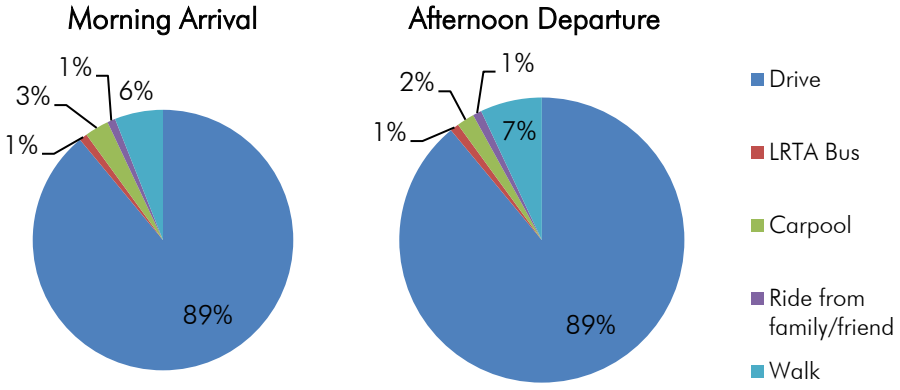


Figure No. 6
Estimated Staff Mode of Transportation for the Site
Based on April 2017 Survey Results



The April 2017 staff survey also gathered additional information about when staff arrived and departed from the school. The survey indicated that approximately 75% of the staff arrived within the school A.M. peak hour of 7:15 to 8:15. The survey also indicated that approximately 70% of the staff departed during the school P.M. peak hour of 2:30 to 3:30.

2.1.3 Parking

The existing high school does not have its own on-site parking facility. There is limited staff parking available behind the Riddick Field House that is accessible from a narrow driveway on Father Morissette Boulevard located directly east of Arcand Drive. There are six (6) perpendicular handicap designated parking spaces located on Father Morissette Boulevard located in front of the Lord Building, directly west of the canal.

The student and staff surveys indicate that the majority of those who drive will park their vehicles in the George Ayotte Parking Garage. In accordance with the City Ordinances Article IX, Chapter 266, a discounted rate is offered to all students within the City of Lowell public school system at the George Ayotte Parking Garage as well as five (5) other facilities throughout the city (Davidson Street Lot, Joseph Downes Parking Garage, Leo A. Roy Parking Garage, Lower Locks Parking Facility, and Edward J. Early, Jr. Parking Garage).

Based on the April 2017 student and staff surveys (as discussed in Section 2.1.2), approximately 90% of the staff population (400± staff) and 10% of the student population (325± students) park near the high school. Therefore, it was estimated that there were approximately 725 vehicles parking near the existing high school on a daily basis in the spring of 2017.

2.1.4 Busing

Unlike the lower grades, the City does not currently provide a school busing program for the general high school student population. There are special education students that are transported to and from the high school by approximately 10 vehicles (i.e. wheelchair vans, yellow buses, and other smaller vehicles). Many of these vehicles wait on Kirk Street adjacent to the 1922 Building during afternoon dismissal.

The City does provide transportation for afterschool athletics programs from the existing high school to the Cawley Stadium, the boat house, and other locations. There are approximately 7 buses that will bring students to activities, but the students must provide transport from the program locations back to their homes at the end of the program. On game days, there can be up to four additional buses that transport students to games.

Many students utilize the discounted student bus pass for the Lowell Regional Transit Authority (LRTA) buses. Approximately 7 LRTA buses arrive prior to dismissal and park along the north side of Paige Street between Kirk Street and John Street. An additional 4± LRTA buses also park along the south side of French Street in front of the existing school campus prior to dismissal. A map of the existing Lowell High School Bus Locations for afternoon dismissal from the LRTA website is shown in Figure No. 7.

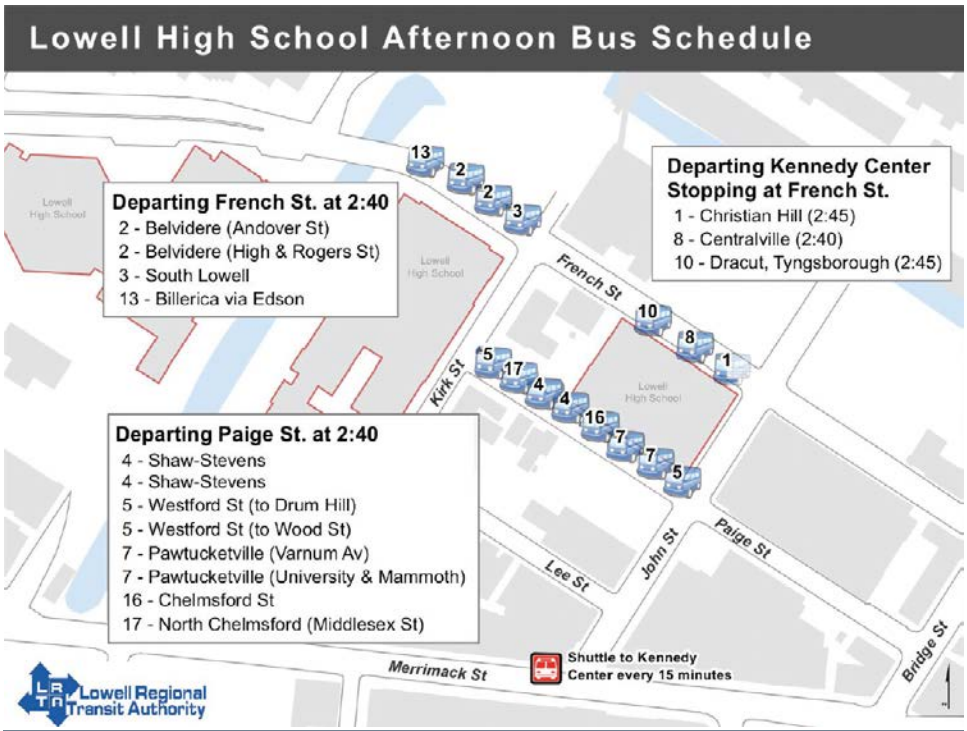


Figure No. 7 Lowell High School Bus Locations (Source: LRTA.com)

Just before the afternoon dismissal, city police officers block vehicular traffic on Paige Street west of John Street and Kirk Street north of Merrimack Street. After the LRTA buses have loaded the students,

police officers allow only the LRTA buses to travel south (contraflow) on Kirk Street and temporarily block traffic on Merrimack Street to allow LRTA to continue their bus routes on Merrimack Street.

Additional city police officers patrol Father Morissette Boulevard/French Street during afternoon dismissal to help facilitate pedestrian and vehicular movements during dismissal.

2.1.5 Drop-off and Pick-up Area

The existing high school does not have any signed or official drop-off and pick-up areas for family or friends transporting students to and from the school. During dismissal, vehicles waiting for students were observed standing along Father Morissette Boulevard/French Street, Kirk Street, Paige Street, and John Street. Based on the April 2017 Student Survey it appears that the locations of where the students are being dropped-off and picked-up varies dependent on the time of day, as shown in Figure Nos. 8 and 9. Many more vehicles opt for locations further away from the school to pick-up students during dismissal period.

Figure No. 8
Student Drop-off Locations during A.M. Arrival
Based on April 2017 Survey Results

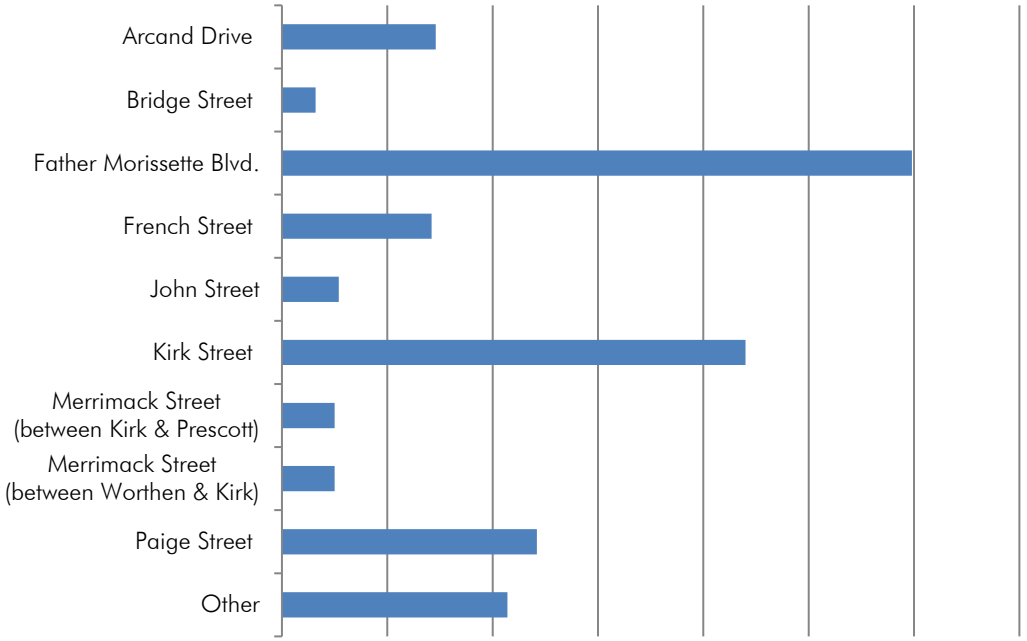
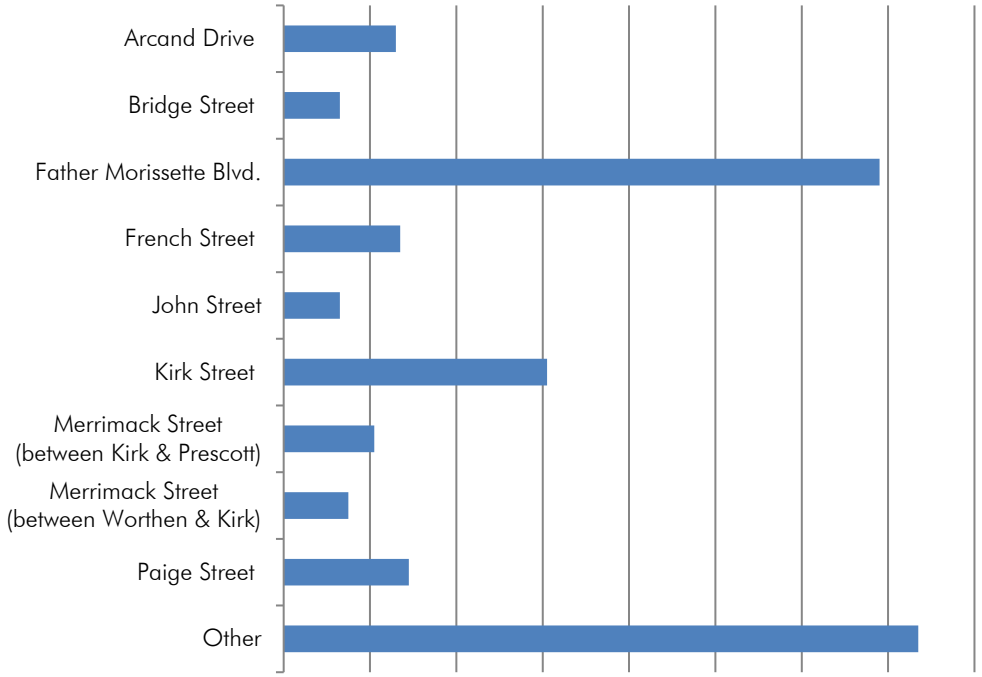


Figure No. 9
Student Pick-up Locations during P.M. Arrival
Based on April 2017 Survey Results



2.1.6 Walking

Based on the student surveys, it is estimated that approximately ¼ of the high school students walk to school in the morning and approximately $^1/_3$ of the high school students walk home in the afternoon.

2.2 Data Collection

Traffic turning movement counts were conducted between the hours of 6:00 and 10:00 A.M. and 2:00 and 6:00 P.M. on Wednesday, March 29, 2017. The traffic count data is shown in Appendix A.

The calculated school A.M. peak hour for the existing Lowell High School is 7:15 – 8:15 and the school P.M. peak hour is 2:30 – 3:30.

These peak hours were utilized for the analysis of all the study intersections since the school renovation is the focus of this report.

Pertinent field observations including existing stopping sight distance, location of existing utilities, posted speed limits, traffic control devices, etc. were made on April 12, April 27, and May 9, 2017. Crash data (Appendix D) for the period from January 2014 through March 2017, was obtained from the Lowell Police Department. Continuous traffic speed data was obtained using road tubes or radar on Wednesday, March 29, 2017 and is shown in Appendix E.

3.0 Traffic Forecasts

3.1 Observed Traffic Volumes

Existing traffic volumes for the study areas were developed from traffic data obtained by Precision Data Industries, LLC (PDI) on Wednesday, March 29, 2017.

The school hours for the existing Lowell High School are from 7:50 A.M. to 2:30 P.M. The school A.M. and school P.M. peak hours used for purposes of the analysis of this study, as indicated in Section 2.2, will be between 7:15 and 8:15 and 2:30 and 3:30, respectively.

Table No. 1 summarizes the two-way (or one-way, as applicable) existing traffic volumes for the studied roadways in the site area during the school A.M. and school P.M. peak hours.

Table No. 1
March 2017 Existing Traffic Volumes

Intersection/ Roadway/	2-Way or 1-Way Volume	Peak Hour	
		School A.M. Volume (vehicles per hour)	School P.M. Volume (vehicles per hour)
Father Morissette Boulevard/ Arcand Drive			
Father Morissette Blvd	2	919	710
Arcand Dr	2	1,035	697
French Street/ Kirk Street/ Driveway			
French St	2	917	488
Kirk St	1	257	99
Driveway	2	32	9
French Street/ Bridge Street			
French St	2	728	474
Bridge St	2	1,075	1,307
Merrimack Street/ Worthen Street			
Merrimack St	2	728	657
Worthen St	1	125	107
Merrimack Street/ Dutton Street/ Arcand Drive			
Merrimack St	2	849	674
Dutton St	2	1,169	870
Arcand Dr	2	910	607
Merrimack Street/ Central Street			
Merrimack St	2	922	838
Central St	2	873	726
Merrimack Street/ Bridge Street/ Kearney Square/ Prescott Street			
Merrimack St	2	874	839
Bridge St	2	1,067	1,181
Kearney Sq	2	1,025	850
Prescott St	1	446	635

The total 24-hour two-way traffic volume (from the road tube counts) on Father Morissette Boulevard in the vicinity of the existing high school near the existing signalized mid-block crosswalk is approximately 8,000 vehicles per day. The total 24-hour two-way traffic volume on Arcand Drive in the vicinity of the existing high school is approximately 9,000 vehicles per day.

3.2 Area Traffic Growth Rate

The Northern Middlesex Council of Governments (NMCOG) is the regional planning agency for the Greater Lowell region. NMCOG indicates an annual traffic growth rate of 0.16% for the City of Lowell based on data collected between 2008 and 2016. NMCOG recommends the study use a conservative annual traffic growth rate 0.5% for the City of Lowell.

3.3 Forecasted Traffic Volumes

3.3.1 Vehicle Trip Generation

The traffic anticipated to be generated by the high school development was added to the turning movement count volumes adjusted by the traffic growth rate for use in determining levels of service (LOS) in the capacity analysis calculations.

To evaluate the traffic impacts of the proposed development, it is necessary to determine the amount of traffic expected to be generated by the proposed development. Typically, the trip generation calculations are based on data compiled in *Trip Generation* (9th edition), an informational report published by the Institute of Transportation Engineers (ITE). *Trip Generation* is a tool for planners, transportation professionals, zoning boards, and others who are interested in estimating the number of vehicle trips generated by a proposed development or land use. This document is based on more than 5,500 trip generation studies submitted to the Institute by public agencies, developers, consulting firms, and associations.

However, more specific information from the traffic turning movement counts and mode of transportation surveys conducted for the existing Lowell High School have been used for the trip generation and distribution. The mode of transportation surveys identified three basic vehicular modes that a student uses to travel to and from the high school: (1) driving and parking, (2) riding with family and friends, or (3) riding the bus.

The largest generator of vehicle trips of these three modes is a student that is transported by rides from family and friends. This is because a student that is transported by rides from family and friends will generate two trips per student (a vehicle going to and from the site) during both morning arrival and afternoon dismissal. A student that drives and parks on-site will generate one trip to arrive in the morning and one trip in the afternoon for dismissal. Although school buses also generate two trips during both morning arrival and afternoon dismissal, the capacity of a bus versus a standard vehicle is much greater, which results in a net decrease in generated vehicle trips to and from the site. An example of this principle is shown in Figure No. 10.

Figure No. 10
Number of Vehicle Trips Generated During a School Peak Hour
Based on Vehicle Mode

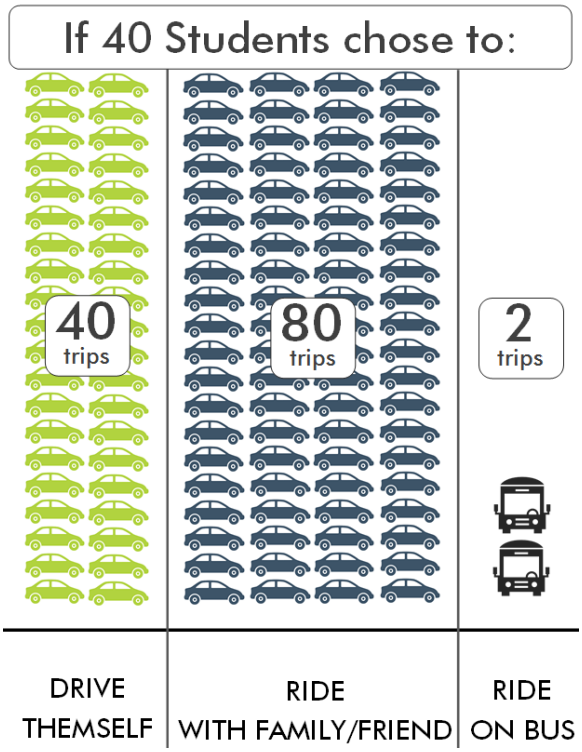


Figure No. 10 shows when 40 students travel to or from school, 40 vehicle trips are anticipated if each student drives themself, 80 vehicle trips are anticipated if each student rides with a family or friend, and 2 vehicle trips are anticipated if each student rides the bus during each school peak hour.

As stated in Section 1.2, the existing Lowell High School has approximately 3,255 high school students and 440 daytime employees. All of the proposed alternatives for Lowell High School will be designed to accommodate 3,520 high school students and estimated to have 500± daytime employees. A ratio has been developed for the additional new trips from the existing and proposed student and staff populations for the site. The additional new trips for the site were developed and distributed based on the anticipated future transportation modes of the students and staff (see Section 3.3.2). The trip generation calculations and the distribution of the traffic anticipated by the school are shown in Appendix B.

3.3.2 Future Modes of Transportation

The build analysis was based on the observed traffic patterns and the modes of travel that students and staff indicated in the April 2017 surveys and previously discussed in Section 2.1.

The vehicle volumes anticipated to be generated by the proposed high school development at the site during the school A.M. and school P.M. peak hours, can be found in Table No. 2.

Table No. 2
Anticipated Generated New Vehicle Trips Summary

Time Period	Direction	New Vehicle Trips
School A.M. Peak Hour	Enter	159
	Exit	91
School P.M. Peak Hour	Enter	35
	Exit	100

The distribution of the anticipated new vehicle trips by direction were based upon the existing trip patterns observed in the traffic count data and the expected usage of the roadways for the school. These trips were added to the no-build volumes for analysis of the build conditions. The trip generation calculations and the distribution of the traffic anticipated by the school are shown in Appendix B.

4.0 Capacity Analysis

4.1 General

Capacity analyses in this report focus on the peak hours of traffic volume for the high school because they represent the most critical periods for operations and have the highest capacity requirements. If traffic operates at acceptable levels of service during the peak hours, then it will operate at acceptable levels during the remaining hours of the day.

The intersection capacity analysis was prepared using the *Highway Capacity Manual* (HCM), 2010 edition, published by the Transportation Research Board. The analysis utilizes the concept of Level of Service. The term "level of service" is defined as a qualitative measure describing operational conditions within a traffic stream based on service measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience. There are six levels of service utilized for the analysis. They are given letter designations from A to F, with Level of Service A representing the most favorable operating conditions and Level of Service F the least. Level of Service F is assigned to the movement if the volume-to-capacity ratio for the movement exceeds 1.0, regardless of the control delay. The level of service criteria for both unsignalized and signalized intersections is shown in Table No. 3.

The computer software, Synchro 8, was utilized to perform the capacity analysis for the study area.

Table No. 3
Level of Service Criteria for Unsignalized and Signalized Intersections
Source: Highway Capacity Manual, 2010

Level Of Service	Average Total Delay (Second/Vehicle)	
	Unsignalized Intersection	Signalized Intersection
A	≤10	≤10
B	>10 and ≤15	>10 and ≤20
C	>15 and ≤25	>20 and ≤35
D	>25 and ≤35	>35 and ≤55
E	>35 and ≤50	>55 and ≤80
F	>50	>80

The existing traffic counts were adjusted with the recommended conservative annual growth rate of 0.5% as discussed in Section 3.2. The capacity analysis presented in Section 4.2 is based on the February 2017 Preliminary Design Program (PDP) feasibility study and used the study's anticipated build year of 2024 with the recommended annual growth rate of 0.5% for the site.

Since that time the design process and study period for this project has been extended so the City and the MSBA could evaluate the school site selection options, which ultimately resulted in the Downtown site being pursued. This has caused a shift in the project's timeline and has revised the anticipated build year to be 2026 as discussed in Section 1.2. The existing traffic counts adjusted to a 2024 build year with an annual growth rate of 0.5% will remain in this study since this adjustment is also a conservative analysis for the updated 2026 build year (i.e. an annual growth rate of 0.4%± applied over nine years). The adjustment to the existing traffic counts more than doubles the City's recent historical annual growth rate (i.e. 0.16%) provided by the NMCOG.

4.2 Intersections

4.2.1 Unsignalized Intersections

Since the intersection of Merrimack Street and Worthen Street is operating under flashing red and yellow setting, this intersection was modeled as an unsignalized intersection with Worthen Street acting as the stop-controlled approach. Unsignalized intersection capacity analysis for the intersections of French Street and Kirk Street and Merrimack Street and Worthen Street was undertaken using the school A.M. and school P.M. peak hour traffic volumes under no-build and build conditions. The capacity analysis computations are included in Appendix C. A summary of the level of service for these intersections is shown in Table Nos. 4 and 5 for the school A.M. and school P.M. peak hour, respectively.

Table No. 4
School A.M. Peak Hour - Level of Service Summary
Unsignalized Intersection

Intersection/ Critical Movement	Level of Service (Delay-Second/Vehicle)	
	2024 No-Build	2024 Build
French Street/ Kirk Street/ Driveway		
Eastbound Approach	A (0.8)	A (0.8)
Northbound Approach	F (210.3)	F (*)
Southbound Approach	C (15.4)	C (16.6)
Merrimack Street/ Worthen Street		
Westbound Approach	A (0.5)	A (0.5)
Southbound Approach	B (11.3)	B (11.4)

(* Delay exceeds 300 seconds)

Table No. 5
School P.M. Peak Hour - Level of Service Summary
Unsignalized Intersection

Intersection/ Critical Movement	Level of Service (Delay-Second/Vehicle)	
	2024 No-Build	2024 Build
French Street/ Kirk Street		
Eastbound Approach	A (0.1)	A (0.1)
Northbound Approach	B (14.4)	C (15.3)
Southbound Approach	A (9.7)	A (9.8)
Merrimack Street/ Worthen Street		
Westbound Approach	A (0.3)	A (0.3)
Southbound Approach	B (11.3)	B (11.4)

Under both no-build and build conditions, the unsignalized capacity analysis shows that Kirk Street will operate at LOS F during the school A.M. peak hour. Under build conditions, the unsignalized capacity analysis shows that Kirk Street will have an increase of about 1 second per vehicle during the school P.M. peak hour.

Under both no-build and build conditions, the unsignalized capacity analysis shows that the intersection of Merrimack Street and Worthen Street will continue to operate at excellent levels of service during the school A.M. and school P.M. peak hours.

4.2.2 Signalized Intersections

Signalized intersection capacity analysis for the intersections of Father Morissette Boulevard and Arcand Drive; French Street and Bridge Street; Merrimack Street, Dutton Street, and Arcand Drive; Merrimack Street and Central Street; and Merrimack Street, Kearney Square, and Prescott Street was undertaken using the school A.M. and school P.M. peak hour traffic volumes under no-build and build conditions. The capacity analysis computations are included in Appendix C. A summary of the level of service for these intersections is shown in Table Nos. 6 and 7 for the school A.M. and school P.M. peak hour, respectively.

Table No. 6
School A.M. Peak Hour - Level of Service Summary
Signalized Intersections

Intersection/ Critical Movement	Level of Service (Delay-Second/Vehicle)	
	2024 No-Build	2024 Build
Father Morissette Boulevard/ Arcand Drive		
Overall Intersection	D (36.6)	D (40.9)
Eastbound Approach	C (33.2)	D (36.6)
Westbound Approach	C (31.1)	C (33.1)
Northbound Approach	D (42.9)	D (49.8)
Southbound Approach	D (39.8)	D (43.4)
French Street/ Bridge Street		
Overall Intersection	C (20.0)	C (20.1)
Eastbound Approach	A (7.7)	A (8.0)
Northbound Approach	D (37.6)	D (38.9)
Southbound Approach	B (13.0)	B (13.0)
Merrimack Street/ Dutton Street/ Arcand Drive		
Overall Intersection	C (34.6)	D (35.6)
Eastbound Approach	C (25.2)	C (26.8)
Westbound Approach	C (31.2)	C (34.0)
Northbound Approach	D (39.2)	D (39.2)
Southbound Approach (Arcand)	D (40.7)	D (40.2)
Southbound Approach (Dutton)	D (46.0)	D (47.0)
Merrimack Street/ Central Street		
Overall Intersection	D (40.1)	D (40.3)
Eastbound Approach	C (25.9)	C (26.0)
Westbound Approach	D (53.1)	D (52.4)
Northbound Approach	C (27.0)	C (28.7)
Merrimack Street/ Kearney Square/ Prescott Street		
Overall Intersection	C (24.6)	C (25.7)
Eastbound Approach	B (12.8)	B (12.2)
Westbound Approach	C (31.9)	C (32.6)
Northbound Approach	B (18.6)	B (19.6)
Southbound Left Turn Lane	D (46.9)	D (46.2)
Southbound Right Turn Lane	B (13.0)	B (16.5)

Table No. 7
School P.M. Peak Hour - Level of Service Summary
Signalized Intersections

Intersection/ Critical Movement	Level of Service (Delay-Second/Vehicle)	
	2024 No-Build	2024 Build
Father Morissette Boulevard/ Arcand Drive		
Overall Intersection	C (22.3)	C (24.0)
Eastbound Approach	B (12.8)	B (13.2)
Westbound Approach	B (19.5)	B (19.5)
Northbound Approach	C (32.6)	D (37.0)
Southbound Approach	C (22.7)	C (23.3)
French Street/ Bridge Street		
Overall Intersection	B (19.0)	B (19.3)
Eastbound Approach	A (9.0)	A (9.2)
Northbound Approach	C (27.0)	C (28.0)
Southbound Approach	B (14.8)	B (14.8)
Merrimack Street/ Dutton Street/ Arcand Drive		
Overall Intersection	C (29.9)	C (30.5)
Eastbound Approach	B (15.2)	B (15.9)
Westbound Approach	C (22.7)	C (23.6)
Northbound Approach	D (40.5)	D (40.6)
Southbound Approach (Arcand)	D (35.3)	D (35.6)
Southbound Approach (Dutton)	D (40.0)	D (41.0)
Merrimack Street/ Central Street		
Overall Intersection	C (23.6)	C (23.8)
Eastbound Approach	C (29.6)	C (29.8)
Westbound Approach	B (17.5)	B (17.8)
Northbound Approach	C (32.7)	C (32.8)
Merrimack Street/ Kearney Square/ Prescott Street		
Overall Intersection	C (21.9)	C (22.0)
Eastbound Approach	B (16.1)	B (16.0)
Westbound Approach	C (31.4)	C (31.7)
Northbound Approach	B (19.4)	B (19.6)
Southbound Left Turn Lane	D (40.0)	D (40.0)
Southbound Right Turn Lane	A (9.7)	A (9.8)

Under build conditions, the signalized capacity analysis shows that the study intersections will continue to operate at equivalent levels of services with similar delays as experienced under no-build conditions during both the school A.M. and school P.M. peak hours.

5.0 Safety Analysis

5.1 Geometrics

The geometric configurations of the intersections affected by traffic generated by the proposed improvements were examined with regard to safe stopping sight distance using principles presented in *A Policy on Geometric Design of Highways and Streets*, 2011, of the American Association of State Highway and Transportation Officials (AASHTO). AASHTO provides recommendations for necessary sight distance at intersections. For this analysis, the minimum safe stopping distance for the roadways based on the determined design speed is found in AASHTO, Table 3-1, Stopping Sight Distance on Level Roadways, P. 3-4.

A design speed of 30 mph was utilized for Arcand Drive in the vicinity of the existing Field House based on the observed 85th percentile speed of 31 mph for northbound traffic and 30 mph for southbound traffic. The minimum safe stopping distance for roadways with a design speed of 30 mph is 200 feet, as required by AASHTO. The existing sight distance at the proposed Arcand Drive driveway for the Full Renovation and the Addition/Renovation Option 2 alternatives is in excess of the minimum sight distance required. The existing sight distance to the south at the proposed Arcand Drive driveway for the Addition/Renovation Option 3 alternatives is approximately 125 feet. The sight distance to the south at the proposed Addition/Renovation Option 3 driveway can be improved with the trimming or elimination of the shrubs on the adjacent property and/or the reconfiguration of the on-street parking to the south of the proposed driveway.

5.2 Crash History

Crash data for the study area was obtained from the Lowell Police Department for the period from January 1, 2014 through March 30, 2017. A summary of the data received is contained in Appendix D. There were 126 crashes within the study area of the site, as shown in Table No. 8.

There was one crash on Merrimack Street between Cardinal O' Connell Parkway and Worthen Street. It was a rear-end crash that occurred in snow, which did not result in injuries.

There were five crashes at the intersection of Merrimack Street and Worthen Street. These crashes include four sideswipe crashes and one crash involved hitting an object. Two of these crashes occurred in the rain. None of these crashes resulted in injuries.

There were eleven crashes at the intersection of Merrimack Street, Arcand Drive, and Dutton Street. These crashes include four angle crashes, three rear-end crashes, three sideswipe crashes, and one crash involved hitting a bicyclist, which resulted in an injury. Two of these crashed occurred in the rain.

Table No. 8
Summary of Crashes
Source: Lowell Police Department

Crash Location	Jan. 1, 2014 - March 30, 2017
Merrimack Street between Cardinal O' Connell Parkway and Worthen Street	1
Intersection of Merrimack Street and Worthen Street	5
Intersection of Merrimack Street, Arcand Drive, and Dutton Street	11
Merrimack Street between Arcand Drive and Shattuck Street	2
Intersection of Merrimack Street and Kirk Street	3
Merrimack Street between Kirk Street and Palmer Street	2
Intersection of Merrimack Street and Palmer Street	5
Merrimack Street between Palmer Street and John Street	9
Intersection of Merrimack Street and John Street	1
Merrimack Street between John Street and Central Street	2
Intersection of Merrimack Street and Central Street	5
Merrimack Street between Central Street and Bridge Street	1
Intersection of Merrimack Street, Bridge Street, Kearney Square, and Prescott Street	4
Intersection of Paige Street and Bridge Street	3
Paige Street between John Street and Bridge Street	2
Paige Street between Kirk Street and John Street	1
Intersection of French Street and Kirk Street	3
French Street between Kirk Street and John Street	2
French Street between John Street and Brookings Street	1
Intersection of French Street and Brookings Street	1
Intersection of French Street and John Street	14
Intersection of French Street and Bridge Street	6
John Street at 75 John Street Parking Garage Entrance	4
Intersection of John Street and Paige Street	2
Intersection of John Street and Lee Street	1
Kirk Street between Merrimack Street and Lee Street	2
Intersection of Kirk Street and Lee Street	1
Intersection of Father Morissette Blvd. and Arcand Drive	10
Father Morissette Blvd. between Arcand Drive and Post Office Square	2
Intersection of Father Morissette Blvd. and Post Office Square	3
Arcand Drive between Father Morissette Blvd. and Merrimack Street	9
Within Ayotte Parking Garage Structure	8
TOTAL	126

There were two crashes on Merrimack Street between Arcand Drive and Shattuck Street. These crashes include two sideswipe crashes, one of that occurred in snow and one that occurred in rain. Neither of these crashes resulted in injuries.

There were three crashes at the intersection of Merrimack Street and Kirk Street. These crashes include a sideswipe crash, a rear-end crash, and an angle crash. None of these crashes resulted in injuries.

There were two crashes on Merrimack Street between Kirk Street and Palmer Street. These crashes include an angle crash and a rear-end crash. Neither of these crashes resulted in injuries.

There were five crashes at the intersection of Merrimack Street and Palmer Street. These crashes include three rear-end crashes and two sideswipe crashes. None of these crashes resulted in injuries.

There were nine crashes on Merrimack Street between Palmer Street and John Street. These crashes include four rear-end crashes, two unknown crashes, an angle crash, a sideswipe crash, and one crashed involved hitting a pedestrian. One of these crashes occurred in rain. Two of these crashes resulted in injuries.

There was one crash at the intersection of Merrimack Street and John Street. It was a rear-end crash, which did not result in injuries.

There were two crashes on Merrimack Street between John Street and Central Street. These crashes include one sideswipe crash and one crash involved hitting an object, which resulted in an injury.

There were five crashes at the intersection of Merrimack Street and Central Street. These crashes include three sideswipe crashes, a rear-end crash, and a crash involved hitting a pedestrian. One of these crashes occurred in the rain and two of these crashes resulted in injuries.

There was one crash on Merrimack Street between Central Street and Bridge Street. It was an angle crash, which did not result in injuries.

There were four crashes at the intersection of Merrimack Street, Bridge Street, Kearney Square, and Prescott Street. These crashes include two sideswipe crashes and two angle crashes. None of these crashes resulted in injuries.

There were three crashes at the intersection of Paige Street and Bridge Street. These crashes include two angle crashes and one head-on crash. None of these crashes resulted in injuries.

There were two crashes on Paige Street between John Street and Bridge Street. These crashes include two rear-end crashes and neither resulted in injuries.

There was one crash on Paige Street between Kirk Street and John Street. It was an angle crash and did not result in injuries.

There were three crashes at the intersection of French Street and Kirk Street. There were two rear-end crashes and one sideswipe crash. None of these crashes resulted in injuries.

There were two crashes on French Street between Kirk Street and John Street. These crashes include one sideswipe crash and one crash involved hitting a pedestrian, which resulted in injuries. There was one crash on French Street between John Street and Brookings Street, which involved hitting a pedestrian and resulted in injuries.

There was one crash at the intersection of French Street and Brookings Street. It was a rear-end crash that occurred in the rain and resulted in injuries.

There were fourteen crashes at the intersection of French Street and John Street. These crashes include five angle crashes, five rear-end crashes, three sideswipe crashes, and one unknown crash. Two of these crashes occurred in snow and one crash resulted in injuries.

There were six crashes at the intersection of French Street and Bridge Street. These crashes include two angle crashes, two head-on crashes, one crash involved hitting a bike, and one crash involved hitting a pedestrian, which resulted in injuries.

There were four crashes at the 75 John Street Parking Garage Entrance. These crashes include three angle crashes and one crash involved hitting a pedestrian. One of these crashes occurred in the rain and none of these crashes resulted in injuries.

There were two crashes at the intersection of John Street and Paige Street. These crashes include a rear-end crash and a crash involved hitting a pedestrian, which resulted in injuries.

There was one crash at the intersection of John Street and Lee Street. It was an angle crash and did not result in injuries.

There were two crashes on Kirk Street between Merrimack Street and Lee Street. These crashes were sideswipe crashes, neither of which resulted in injuries.

There was one crash at the intersection of Kirk Street and Lee Street. It was a sideswipe crash that occurred in the snow and did not result in injuries.

There were ten crashes at the intersection of Father Morissette Boulevard and Arcand Drive. These crashes include three sideswipe crashes, two angle crashes, two rear-end crashes, a crash involved hitting an object, a crash involved hitting a bicyclist, and a crash involved hitting a pedestrian, which resulted in injuries. Two of these crashes occurred in the rain and one of these crashes occurred in the snow.

There were two crashes on Father Morissette Boulevard between Arcand Drive and Post Office Square. These crashes include two rear-end crashes, neither of which resulted in injuries.

There were three crashes at the intersection of Father Morissette Boulevard and Post Office Square. These crashes include two sideswipe crashes and an angle crash. One of these crashes occurred in the rain and none of these crashes resulted in injuries.

There were nine crashes on Arcand Drive between Father Morissette Boulevard and Merrimack Street. These crashes include four sideswipe crashes, two angle crashes, one rear-to-rear crash, one head-on crash, and one crash involved hitting an object. One of these crashes occurred in the snow and none of these crashes resulted in injuries.

There were eight crashes in the Ayotte Parking Garage Structure. These crashes include three angle crashes, two sideswipe crashes, two unknown crashes, and a rear-end crash. None of these crashes resulted in injuries.

Based on the extended study limits, the number of signalized intersections, and volume of traffic, the number and type of crashes that occurred over this nearly three and a half year period does not indicate the presence of unusual conditions that might be worsened by the addition of the proposed school.

5.3 Site Circulation

Once a finalized site plan has been developed, it will be reviewed with regard to layout and vehicular/pedestrian circulation. The proposed site will be designed to accommodate the safe movement of emergency vehicles to and from the development.

6.0 Conclusions and Recommendations

This traffic impact analysis was conducted to evaluate the impacts on surrounding roadways and intersections due to the renovations to the Lowell High School building site in Lowell, Massachusetts.

The Lowell High School is currently 'functioning' with a large existing student and staff population. The proposed increase in the student and staff population is relatively small in comparison to the existing populations. Traffic impacts are expected on the surrounding roadway network when the majority of the 4,000 people estimated to use the facility will arrive and depart within a short time frame.

The unsignalized and signalized intersection capacity analysis shows that the proposed Lowell High School under build conditions will continue to operate at equivalent levels of services and similar delays as experienced under no-build conditions during both the school A.M. and school P.M. peak hours.

The sight distance at the proposed school driveway on Arcand Drive should be addressed once an alternative is chosen to ensure the minimum sight distance required is provided. There are no existing

unsafe conditions in the vicinity of the development that might be worsened by the design alternatives proposed for the existing school campus.

Based upon the analyses, traffic operations on the surrounding roadways and intersections in the area will experience minimal change with the proposed school renovation alternatives. No reduction in safety will occur due to the renovated school alternatives as proposed.

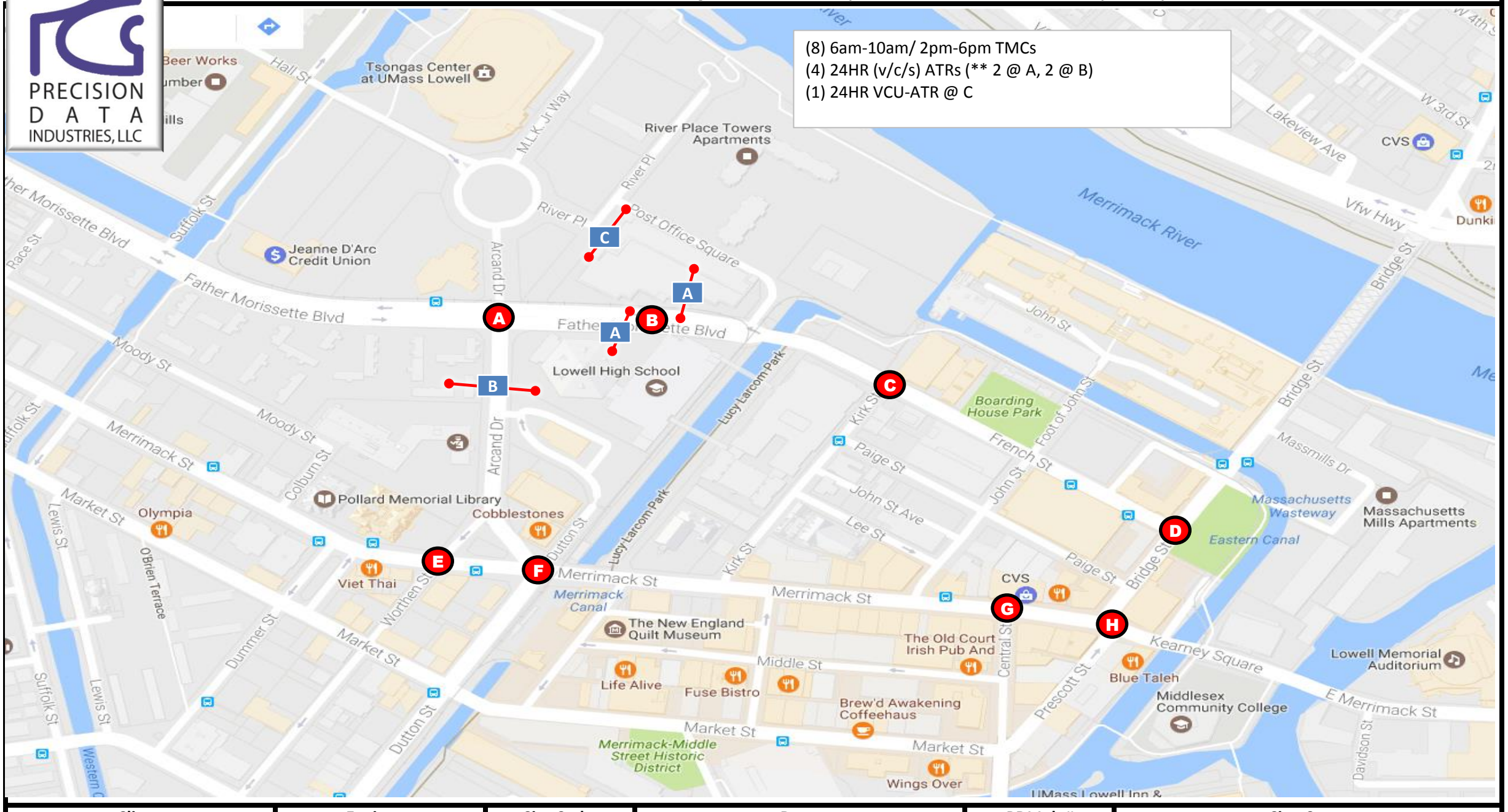
APPENDIX A

Traffic Counts

This sheet is for double sided printing purposes

Location Map: 175563 Lowell, MA

Precision Data Industries, LLC 46 Morton Street, Framingham, MA 01702 ph: 508-875-0100 email: datarequests@pdillc.com



Client:	Engineer:	Site Code:	Date:	PDI Job #	City, State:
Bryant Associates	T. Brayton	216092	Wednesday 3/29/2017	175563	Lowell, MA

This sheet is for double sided printing purposes

PDI File #: **175563 A**
Location: **N: Arcand Drive S: Arcand Drive**
Location: **E: Father Morisette Boulevard W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars, Heavy Vehicles, and Buses (Combined)

	Arcand Drive					Father Morisette Boulevard					Arcand Drive					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
6:00 AM	1	3	1	0	5	11	15	9	0	35	2	6	5	0	13	25	5	3	0	33	86
6:15 AM	0	4	3	0	7	11	11	20	0	42	7	13	9	0	29	21	11	3	0	35	113
6:30 AM	2	9	3	0	14	14	16	12	0	42	11	21	17	0	49	24	15	7	0	46	151
6:45 AM	4	15	4	0	23	17	21	28	2	68	19	40	14	1	74	32	26	13	0	71	236
Total	7	31	11	0	49	53	63	69	2	187	39	80	45	1	165	102	57	26	0	185	586
7:00 AM	5	14	3	0	22	28	26	24	3	81	23	41	25	0	89	51	37	29	0	117	309
7:15 AM	7	19	9	0	35	24	26	36	2	88	47	81	32	0	160	55	52	19	0	126	409
7:30 AM	15	23	21	0	59	25	51	65	1	142	63	67	32	0	162	66	79	19	0	164	527
7:45 AM	15	35	25	0	75	28	54	60	1	143	33	31	38	0	102	72	65	16	0	153	473
Total	42	91	58	0	191	105	157	185	7	454	166	220	127	0	513	244	233	83	0	560	1718
8:00 AM	7	11	8	0	26	20	31	38	0	89	14	28	27	0	69	62	41	13	0	116	300
8:15 AM	5	14	12	0	31	19	32	14	0	65	11	37	32	0	80	56	31	18	0	105	281
8:30 AM	6	8	7	0	21	24	23	17	0	64	10	34	46	0	90	46	31	14	0	91	266
8:45 AM	8	13	4	0	25	20	33	15	0	68	13	23	45	0	81	46	35	16	0	97	271
Total	26	46	31	0	103	83	119	84	0	286	48	122	150	0	320	210	138	61	0	409	1118
9:00 AM	9	8	2	0	19	17	29	30	1	77	7	19	36	0	62	41	47	16	0	104	262
9:15 AM	5	9	5	0	19	15	32	20	2	69	11	23	49	0	83	46	22	15	0	83	254
9:30 AM	3	9	5	0	17	15	32	25	0	72	12	23	43	0	78	49	20	13	0	82	249
9:45 AM	6	10	4	0	20	11	26	30	2	69	13	21	37	0	71	28	19	6	0	53	213
Total	23	36	16	0	75	58	119	105	5	287	43	86	165	0	294	164	108	50	0	322	978
Grand Total	98	204	116	0	418	299	458	443	14	1214	296	508	487	1	1292	720	536	220	0	1476	4400
Approach %	23.4	48.8	27.8	0.0		24.6	37.7	36.5	1.2		22.9	39.3	37.7	0.1		48.8	36.3	14.9	0.0		
Total %	2.2	4.6	2.6	0.0	9.5	6.8	10.4	10.1	0.3	27.6	6.7	11.5	11.1	0.0	29.4	16.4	12.2	5.0	0.0	33.5	
Exiting Leg Total					1027					962					1368					1043	4400
Cars	75	199	114	0	388	298	437	407	13	1155	255	503	470	0	1228	695	521	195	0	1411	4182
% Cars	76.5	97.5	98.3	0.0	92.8	99.7	95.4	91.9	92.9	95.1	86.1	99.0	96.5	0.0	95.0	96.5	97.2	88.6	0.0	95.6	95.0
Exiting Leg Total					996					903					1301					982	4182
Heavy Vehicles	5	2	0	0	7	0	7	7	1	15	11	2	10	1	24	14	7	6	0	27	73
% Heavy Vehicles	5.1	1.0	0.0	0.0	1.7	0.0	1.5	1.6	7.1	1.2	3.7	0.4	2.1	100.0	1.9	1.9	1.3	2.7	0.0	1.8	1.7
Exiting Leg Total					8					19					24					22	73
Buses	18	3	2	0	23	1	14	29	0	44	30	3	7	0	40	11	8	19	0	38	145
% Buses	18.4	1.5	1.7	0.0	5.5	0.3	3.1	6.5	0.0	3.6	10.1	0.6	1.4	0.0	3.1	1.5	1.5	8.6	0.0	2.6	3.3
Exiting Leg Total					23					40					43					39	145

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:00 AM	Arcand Drive					Father Morisette Boulevard					Arcand Drive					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
7:00 AM	5	14	3	0	22	28	26	24	3	81	23	41	25	0	89	51	37	29	0	117	309
7:15 AM	7	19	9	0	35	24	26	36	2	88	47	81	32	0	160	55	52	19	0	126	409
7:30 AM	15	23	21	0	59	25	51	65	1	142	63	67	32	0	162	66	79	19	0	164	527
7:45 AM	15	35	25	0	75	28	54	60	1	143	33	31	38	0	102	72	65	16	0	153	473
Total Volume	42	91	58	0	191	105	157	185	7	454	166	220	127	0	513	244	233	83	0	560	1718
% Approach Total	22.0	47.6	30.4	0.0		23.1	34.6	40.7	1.5		32.4	42.9	24.8	0.0		43.6	41.6	14.8	0.0		
PHF	0.700	0.650	0.580	0.000	0.637	0.938	0.727	0.712	0.583	0.794	0.659	0.679	0.836	0.000	0.792	0.847	0.737	0.716	0.000	0.854	0.815
Cars	35	91	57	0	183	105	152	177	7	441	150	220	124	0	494	238	229	76	0	543	1661
Cars %	83.3	100.0	98.3	0.0	95.8	100.0	96.8	95.7	100.0	97.1	90.4	100.0	97.6	0.0	96.3	97.5	98.3	91.6	0.0	97.0	96.7
Heavy Vehicles	1	0	0	0	1	0	1	3	0	4	7	0	2	0	9	2	1	1	0	4	18
Heavy Vehicles %	2.4	0.0	0.0	0.0	0.5	0.0	0.6	1.6	0.0	0.9	4.2	0.0	1.6	0.0	1.8	0.8	0.4	1.2	0.0	0.7	1.0
Buses	6	0	1	0	7	0	4	5	0	9	9	0	1	0	10	4	3	6	0	13	39
Buses %	14.3	0.0	1.7	0.0	3.7	0.0	2.5	2.7	0.0	2.0	5.4	0.0	0.8	0.0	1.9	1.6	1.3	7.2	0.0	2.3	2.3

PDI File #: **175563 A**
Location: **N: Arcand Drive S: Arcand Drive**
Location: **E: Father Morisette Boulevard W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars, Heavy Vehicles, and Buses (Combined)

	Arcand Drive					Father Morisette Boulevard					Arcand Drive					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
Cars Enter Leg	35	91	57	0	183	105	152	177	7	441	150	220	124	0	494	238	229	76	0	543	1661
Heavy Enter Leg	1	0	0	0	1	0	1	3	0	4	7	0	2	0	9	2	1	1	0	4	18
Bus Enter Leg	6	0	1	0	7	0	4	5	0	9	9	0	1	0	10	4	3	6	0	13	39
Total Entering Leg	42	91	58	0	191	105	157	185	7	454	166	220	127	0	513	244	233	83	0	560	1718
Cars Exiting Leg					401					443					506					311	1661
Heavy Exiting Leg					1					8					5					4	18
Buses Exiting Leg					6					13					9					11	39
Total Exiting Leg					408					464					520					326	1718

PDI File #: **175563 A**
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Location: **E: Father Morisette Boulevard W: Father Morisette Boulevard**
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Client: **Bryant Associates/ T. Brayton**
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Office: 508-875-0100 Fax: 508-875-0118
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Cars

	Arcand Drive					Father Morisette Boulevard					Arcand Drive					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
6:00 AM	1	3	1	0	5	11	13	7	0	31	1	6	5	0	12	24	5	3	0	32	80
6:15 AM	0	4	3	0	7	11	10	19	0	40	7	13	9	0	29	17	11	3	0	31	107
6:30 AM	2	9	3	0	14	14	16	11	0	41	9	21	15	0	45	23	14	6	0	43	143
6:45 AM	4	14	4	0	22	17	19	26	2	64	16	40	13	0	69	31	25	12	0	68	223
Total	7	30	11	0	48	53	58	63	2	176	33	80	42	0	155	95	55	24	0	174	553
7:00 AM	4	14	3	0	21	28	25	22	3	78	20	41	23	0	84	51	36	27	0	114	297
7:15 AM	5	19	9	0	33	24	25	34	2	85	42	81	31	0	154	52	50	18	0	120	392
7:30 AM	12	23	21	0	56	25	49	62	1	137	58	67	32	0	157	66	78	18	0	162	512
7:45 AM	14	35	24	0	73	28	53	59	1	141	30	31	38	0	99	69	65	13	0	147	460
Total	35	91	57	0	183	105	152	177	7	441	150	220	124	0	494	238	229	76	0	543	1661
8:00 AM	6	9	8	0	23	19	29	32	0	80	12	26	26	0	64	61	38	12	0	111	278
8:15 AM	3	13	11	0	27	19	30	11	0	60	9	35	31	0	75	55	31	15	0	101	263
8:30 AM	3	8	7	0	18	24	22	15	0	61	8	34	46	0	88	44	29	13	0	86	253
8:45 AM	6	13	4	0	23	20	32	11	0	63	10	23	42	0	75	44	35	13	0	92	253
Total	18	43	30	0	91	82	113	69	0	264	39	118	145	0	302	204	133	53	0	390	1047
9:00 AM	7	8	2	0	17	17	29	29	1	76	6	19	35	0	60	41	46	15	0	102	255
9:15 AM	2	9	5	0	16	15	30	20	2	67	9	22	46	0	77	44	21	13	0	78	238
9:30 AM	3	8	5	0	16	15	32	21	0	68	10	23	43	0	76	46	20	10	0	76	236
9:45 AM	3	10	4	0	17	11	23	28	1	63	8	21	35	0	64	27	17	4	0	48	192
Total	15	35	16	0	66	58	114	98	4	274	33	85	159	0	277	158	104	42	0	304	921
Grand Total	75	199	114	0	388	298	437	407	13	1155	255	503	470	0	1228	695	521	195	0	1411	4182
Approach %	19.3	51.3	29.4	0.0		25.8	37.8	35.2	1.1		20.8	41.0	38.3	0.0		49.3	36.9	13.8	0.0		
Total %	1.8	4.8	2.7	0.0	9.3	7.1	10.4	9.7	0.3	27.6	6.1	12.0	11.2	0.0	29.4	16.6	12.5	4.7	0.0	33.7	
Exiting Leg Total					996					903					1301					982	4182

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:00 AM	Arcand Drive					Father Morisette Boulevard					Arcand Drive					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
7:00 AM	4	14	3	0	21	28	25	22	3	78	20	41	23	0	84	51	36	27	0	114	297
7:15 AM	5	19	9	0	33	24	25	34	2	85	42	81	31	0	154	52	50	18	0	120	392
7:30 AM	12	23	21	0	56	25	49	62	1	137	58	67	32	0	157	66	78	18	0	162	512
7:45 AM	14	35	24	0	73	28	53	59	1	141	30	31	38	0	99	69	65	13	0	147	460
Total Volume	35	91	57	0	183	105	152	177	7	441	150	220	124	0	494	238	229	76	0	543	1661
% Approach Total	19.1	49.7	31.1	0.0		23.8	34.5	40.1	1.6		30.4	44.5	25.1	0.0		43.8	42.2	14.0	0.0		
PHF	0.625	0.650	0.594	0.000	0.627	0.938	0.717	0.714	0.583	0.782	0.647	0.679	0.816	0.000	0.787	0.862	0.734	0.704	0.000	0.838	0.811
Entering Leg	35	91	57	0	183	105	152	177	7	441	150	220	124	0	494	238	229	76	0	543	1661
Exiting Leg					401					443					506					311	1661
Total					584					884					1000					854	3322

PDI File #: **175563 A**
Location: **N: Arcand Drive S: Arcand Drive**
Location: **E: Father Morisette Boulevard W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Heavy Vehicles

	Arcand Drive					Father Morisette Boulevard					Arcand Drive					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
6:00 AM	0	0	0	0	0	0	2	1	0	3	0	0	0	0	0	1	0	0	0	1	4
6:15 AM	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0	1	2
6:30 AM	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	1	0	2	3
6:45 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
Total	0	1	0	0	1	0	2	3	0	5	0	0	0	1	1	3	0	1	0	4	11
7:00 AM	0	0	0	0	0	0	0	0	0	0	2	0	1	0	3	0	0	0	0	0	3
7:15 AM	1	0	0	0	1	0	0	1	0	1	2	0	1	0	3	1	0	0	0	1	6
7:30 AM	0	0	0	0	0	0	0	1	0	1	2	0	0	0	2	0	1	0	0	1	4
7:45 AM	0	0	0	0	0	0	1	1	0	2	1	0	0	0	1	1	0	1	0	2	5
Total	1	0	0	0	1	0	1	3	0	4	7	0	2	0	9	2	1	1	0	4	18
8:00 AM	0	1	0	0	1	0	0	1	0	1	1	2	0	0	3	1	1	0	0	2	7
8:15 AM	1	0	0	0	1	0	1	0	0	1	0	0	1	0	1	1	0	1	0	2	5
8:30 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	0	2	3
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	0	0	1	0	1	4
Total	1	1	0	0	2	0	1	1	0	2	2	2	4	0	8	3	2	2	0	7	19
9:00 AM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2
9:15 AM	1	0	0	0	1	0	1	0	0	1	0	0	2	0	2	2	1	0	0	3	7
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	0	4	4
9:45 AM	1	0	0	0	1	0	2	0	1	3	2	0	2	0	4	1	2	1	0	4	12
Total	3	0	0	0	3	0	3	0	1	4	2	0	4	0	6	6	4	2	0	12	25
Grand Total	5	2	0	0	7	0	7	7	1	15	11	2	10	1	24	14	7	6	0	27	73
Approach %	71.4	28.6	0.0	0.0		0.0	46.7	46.7	6.7		45.8	8.3	41.7	4.2		51.9	25.9	22.2	0.0		
Total %	6.8	2.7	0.0	0.0	9.6	0.0	9.6	9.6	1.4	20.5	15.1	2.7	13.7	1.4	32.9	19.2	9.6	8.2	0.0	37.0	
Exiting Leg Total					8					19					24					22	73

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

9:00 AM	Arcand Drive					Father Morisette Boulevard					Arcand Drive					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
9:00 AM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2
9:15 AM	1	0	0	0	1	0	1	0	0	1	0	0	2	0	2	2	1	0	0	3	7
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	0	4	4
9:45 AM	1	0	0	0	1	0	2	0	1	3	2	0	2	0	4	1	2	1	0	4	12
Total Volume	3	0	0	0	3	0	3	0	1	4	2	0	4	0	6	6	4	2	0	12	25
% Approach Total	100.0	0.0	0.0	0.0		0.0	75.0	0.0	25.0		33.3	0.0	66.7	0.0		50.0	33.3	16.7	0.0		
PHF	0.750	0.000	0.000	0.000	0.750	0.000	0.375	0.000	0.250	0.333	0.250	0.000	0.500	0.000	0.375	0.500	0.500	0.500	0.000	0.750	0.521
Entering Leg	3	0	0	0	3	0	3	0	1	4	2	0	4	0	6	6	4	2	0	12	25
Exiting Leg					2					7					6					10	25
Total					5					11					12					22	50

PDI File #: **175563 A**
Location: **N: Arcand Drive S: Arcand Drive**
Location: **E: Father Morisette Boulevard W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Buses

	Arcand Drive					Father Morisette Boulevard					Arcand Drive					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
6:00 AM	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	0	0	0	0	0	2
6:15 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	3	0	0	0	3	4
6:30 AM	0	0	0	0	0	0	0	0	0	0	2	0	2	0	4	0	1	0	0	1	5
6:45 AM	0	0	0	0	0	0	2	2	0	4	3	0	1	0	4	1	1	1	0	3	11
Total	0	0	0	0	0	0	3	3	0	6	6	0	3	0	9	4	2	1	0	7	22
7:00 AM	1	0	0	0	1	0	1	2	0	3	1	0	1	0	2	0	1	2	0	3	9
7:15 AM	1	0	0	0	1	0	1	1	0	2	3	0	0	0	3	2	2	1	0	5	11
7:30 AM	3	0	0	0	3	0	2	2	0	4	3	0	0	0	3	0	0	1	0	1	11
7:45 AM	1	0	1	0	2	0	0	0	0	0	2	0	0	0	2	2	0	2	0	4	8
Total	6	0	1	0	7	0	4	5	0	9	9	0	1	0	10	4	3	6	0	13	39
8:00 AM	1	1	0	0	2	1	2	5	0	8	1	0	1	0	2	0	2	1	0	3	15
8:15 AM	1	1	1	0	3	0	1	3	0	4	2	2	0	0	4	0	0	2	0	2	13
8:30 AM	3	0	0	0	3	0	1	2	0	3	1	0	0	0	1	1	1	1	0	3	10
8:45 AM	2	0	0	0	2	0	1	4	0	5	3	0	0	0	3	2	0	2	0	4	14
Total	7	2	1	0	10	1	5	14	0	20	7	2	1	0	10	3	3	6	0	12	52
9:00 AM	1	0	0	0	1	0	0	1	0	1	1	0	1	0	2	0	0	1	0	1	5
9:15 AM	2	0	0	0	2	0	1	0	0	1	2	1	1	0	4	0	0	2	0	2	9
9:30 AM	0	1	0	0	1	0	0	4	0	4	2	0	0	0	2	0	0	2	0	2	9
9:45 AM	2	0	0	0	2	0	1	2	0	3	3	0	0	0	3	0	0	1	0	1	9
Total	5	1	0	0	6	0	2	7	0	9	8	1	2	0	11	0	0	6	0	6	32
Grand Total	18	3	2	0	23	1	14	29	0	44	30	3	7	0	40	11	8	19	0	38	145
Approach %	78.3	13.0	8.7	0.0		2.3	31.8	65.9	0.0		75.0	7.5	17.5	0.0		28.9	21.1	50.0	0.0		
Total %	12.4	2.1	1.4	0.0	15.9	0.7	9.7	20.0	0.0	30.3	20.7	2.1	4.8	0.0	27.6	7.6	5.5	13.1	0.0	26.2	
Exiting Leg Total					23					40					43					39	145

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

8:00 AM	Arcand Drive					Father Morisette Boulevard					Arcand Drive					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
8:00 AM	1	1	0	0	2	1	2	5	0	8	1	0	1	0	2	0	2	1	0	3	15
8:15 AM	1	1	1	0	3	0	1	3	0	4	2	2	0	0	4	0	0	2	0	2	13
8:30 AM	3	0	0	0	3	0	1	2	0	3	1	0	0	0	1	1	1	1	0	3	10
8:45 AM	2	0	0	0	2	0	1	4	0	5	3	0	0	0	3	2	0	2	0	4	14
Total Volume	7	2	1	0	10	1	5	14	0	20	7	2	1	0	10	3	3	6	0	12	52
% Approach Total	70.0	20.0	10.0	0.0		5.0	25.0	70.0	0.0		70.0	20.0	10.0	0.0		25.0	25.0	50.0	0.0		
PHF	0.583	0.500	0.250	0.000	0.833	0.250	0.625	0.700	0.000	0.625	0.583	0.250	0.250	0.000	0.625	0.375	0.375	0.750	0.000	0.750	0.867
Entering Leg	7	2	1	0	10	1	5	14	0	20	7	2	1	0	10	3	3	6	0	12	52
Exiting Leg					9					11					19					13	52
Total					19					31					29					25	104

PDI File #: **175563 A**
Location: **N: Arcand Drive S: Arcand Drive**
Location: **E: Father Morisette Boulevard W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Bicycles (on Roadway and Crosswalks)

	Arcand Drive							Father Morisette Boulevard							Arcand Drive							Father Morisette Boulevard							
	North							East							South							West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
Approach %	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	100.0	
Exiting Leg Total							0							1							0							0	1

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

8:15 AM	Arcand Drive							Father Morisette Boulevard							Arcand Drive							Father Morisette Boulevard							
	North							East							South							West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.250	0.250
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
Exiting Leg							0							1							0							0	1
Total							0							1							0							1	2

PDI File #: **175563 A**
Location: **N: Arcand Drive S: Arcand Drive**
Location: **E: Father Morisette Boulevard W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Pedestrians

	Arcand Drive (North)							Father Morisette Boulevard (East)							Arcand Drive (South)							Father Morisette Boulevard (West)							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
6:00 AM	0	0	0	0	0	2	2	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
6:15 AM	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6:45 AM	0	0	0	0	0	2	2	0	0	0	0	0	1	1	0	0	0	0	0	5	5	0	0	0	0	0	3	3	11
Total	0	0	0	0	0	5	5	0	0	0	0	1	2	3	0	0	0	0	0	5	5	0	0	0	0	0	3	3	16
7:00 AM	0	0	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	2	1	3	0	0	0	0	0	0	0	8
7:15 AM	0	0	0	0	0	8	8	0	0	0	0	0	0	0	0	0	0	0	1	10	11	0	0	0	0	1	1	2	21
7:30 AM	0	0	0	0	7	3	10	0	0	0	0	0	1	1	0	0	0	0	0	22	22	0	0	0	0	0	1	1	34
7:45 AM	0	0	0	0	3	1	4	0	0	0	0	2	0	2	0	0	0	0	0	38	38	0	0	0	0	0	1	1	45
Total	0	0	0	0	10	17	27	0	0	0	0	2	1	3	0	0	0	0	3	71	74	0	0	0	0	1	3	4	108
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	2	1	3	0	0	0	0	3	6	9	0	0	0	0	1	2	3	15
8:15 AM	0	0	0	0	0	3	3	0	0	0	0	0	3	3	0	0	0	0	2	1	3	0	0	0	0	1	5	6	15
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
8:45 AM	0	0	0	0	0	2	2	0	0	0	0	0	1	1	0	0	0	0	1	0	1	0	0	0	0	0	4	4	8
Total	0	0	0	0	0	5	5	0	0	0	0	3	7	10	0	0	0	0	6	7	13	0	0	0	0	2	11	13	41
9:00 AM	0	0	0	0	2	0	2	0	0	0	0	0	1	1	0	0	0	0	2	0	2	0	0	0	0	0	0	0	5
9:15 AM	0	0	0	0	1	1	2	0	0	0	0	1	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	4
9:30 AM	0	0	0	0	3	1	4	0	0	0	0	1	1	2	0	0	0	0	3	1	4	0	0	0	0	2	0	2	12
9:45 AM	0	0	0	0	1	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	5
Total	0	0	0	0	7	4	11	0	0	0	0	2	2	4	0	0	0	0	5	2	7	0	0	0	0	4	0	4	26
Grand Total	0	0	0	0	17	31	48	0	0	0	0	8	12	20	0	0	0	0	14	85	99	0	0	0	0	7	17	24	191
Approach %	0.0	0.0	0.0	0.0	35.4	64.6		0.0	0.0	0.0	0.0	40.0	60.0		0.0	0.0	0.0	0.0	14.1	85.9		0.0	0.0	0.0	0.0	29.2	70.8		
Total %	0.0	0.0	0.0	0.0	8.9	16.2	25.1	0.0	0.0	0.0	0.0	4.2	6.3	10.5	0.0	0.0	0.0	0.0	7.3	44.5	51.8	0.0	0.0	0.0	0.0	3.7	8.9	12.6	
Exiting Leg Total							48							20							99							24	191

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:15 AM	Arcand Drive (North)							Father Morisette Boulevard (East)							Arcand Drive (South)							Father Morisette Boulevard (West)							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
7:15 AM	0	0	0	0	0	8	8	0	0	0	0	0	0	0	0	0	0	0	1	10	11	0	0	0	0	1	1	2	21
7:30 AM	0	0	0	0	7	3	10	0	0	0	0	0	1	1	0	0	0	0	0	22	22	0	0	0	0	0	1	1	34
7:45 AM	0	0	0	0	3	1	4	0	0	0	0	2	0	2	0	0	0	0	0	38	38	0	0	0	0	0	1	1	45
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	2	1	3	0	0	0	0	3	6	9	0	0	0	0	1	2	3	15
Total Volume	0	0	0	0	10	12	22	0	0	0	0	4	2	6	0	0	0	0	4	76	80	0	0	0	0	2	5	7	115
% Approach Total	0.0	0.0	0.0	0.0	45.5	54.5		0.0	0.0	0.0	0.0	66.7	33.3		0.0	0.0	0.0	0.0	5.0	95.0		0.0	0.0	0.0	0.0	28.6	71.4		
PHF	0.000	0.000	0.000	0.000	0.357	0.375	0.550	0.000	0.000	0.000	0.000	0.500	0.500	0.500	0.000	0.000	0.000	0.000	0.333	0.500	0.526	0.000	0.000	0.000	0.000	0.500	0.625	0.583	0.639
Entering Leg	0	0	0	0	10	12	22	0	0	0	0	4	2	6	0	0	0	0	4	76	80	0	0	0	0	2	5	7	115
Exiting Leg							22							6							80							7	115
Total							44							12							160							14	230

PDI File #: **175563 AA**
Location: **N: Arcand Drive S: Arcand Drive**
Location: **E: Father Morisette Boulevard W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars, Heavy Vehicles, and Buses (Combined)

	Arcand Drive					Father Morisette Boulevard					Arcand Drive					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	8	25	8	0	41	7	37	34	2	80	15	13	40	0	68	48	31	4	0	83	272
2:15 PM	7	31	10	0	48	1	34	25	0	60	4	12	44	0	60	43	22	5	0	70	238
2:30 PM	10	25	8	0	43	6	33	18	0	57	11	13	48	0	72	29	32	7	0	68	240
2:45 PM	9	22	10	0	41	5	38	18	0	61	22	12	46	0	80	33	27	6	0	66	248
Total	34	103	36	0	173	19	142	95	2	258	52	50	178	0	280	153	112	22	0	287	998
3:00 PM	9	25	10	0	44	6	33	12	0	51	13	14	68	0	95	41	35	6	0	82	272
3:15 PM	8	38	8	0	54	4	39	28	0	71	15	22	64	0	101	60	26	2	1	89	315
3:30 PM	15	45	37	0	97	9	39	19	0	67	13	28	52	0	93	48	32	4	0	84	341
3:45 PM	16	28	15	0	59	9	25	21	0	55	19	19	52	0	90	34	23	7	0	64	268
Total	48	136	70	0	254	28	136	80	0	244	60	83	236	0	379	183	116	19	1	319	1196
4:00 PM	7	36	18	0	61	6	38	35	1	80	12	27	72	0	111	50	40	10	0	100	352
4:15 PM	5	21	7	0	33	3	28	22	0	53	20	21	77	0	118	56	38	4	0	98	302
4:30 PM	11	23	9	0	43	4	43	22	0	69	12	31	70	0	113	43	43	1	0	87	312
4:45 PM	5	22	10	0	37	6	38	29	0	73	30	25	58	0	113	36	40	10	0	86	309
Total	28	102	44	0	174	19	147	108	1	275	74	104	277	0	455	185	161	25	0	371	1275
5:00 PM	9	26	21	0	56	9	45	23	2	79	25	43	90	0	158	55	39	3	0	97	390
5:15 PM	8	22	16	0	46	7	45	22	1	75	17	29	70	0	116	54	40	5	0	99	336
5:30 PM	7	20	13	0	40	14	50	33	0	97	25	24	64	0	113	29	30	8	0	67	317
5:45 PM	5	9	6	0	20	12	38	28	3	81	25	42	71	0	138	25	26	9	0	60	299
Total	29	77	56	0	162	42	178	106	6	332	92	138	295	0	525	163	135	25	0	323	1342
Grand Total	139	418	206	0	763	108	603	389	9	1109	278	375	986	0	1639	684	524	91	1	1300	4811
Approach %	18.2	54.8	27.0	0.0		9.7	54.4	35.1	0.8		17.0	22.9	60.2	0.0		52.6	40.3	7.0	0.1		
Total %	2.9	8.7	4.3	0.0	15.9	2.2	12.5	8.1	0.2	23.1	5.8	7.8	20.5	0.0	34.1	14.2	10.9	1.9	0.0	27.0	
Exiting Leg Total					574					1017					1491					1729	4811
Cars	112	409	206	0	727	108	593	383	9	1093	243	370	976	0	1589	678	518	63	1	1260	4669
% Cars	80.6	97.8	100.0	0.0	95.3	100.0	98.3	98.5	100.0	98.6	87.4	98.7	99.0	0.0	96.9	99.1	98.9	69.2	100.0	96.9	97.0
Exiting Leg Total					541					976					1470					1682	4669
Heavy Vehicles	3	6	0	0	9	0	3	2	0	5	6	4	8	0	18	3	2	5	0	10	42
% Heavy Vehicles	2.2	1.4	0.0	0.0	1.2	0.0	0.5	0.5	0.0	0.5	2.2	1.1	0.8	0.0	1.1	0.4	0.4	5.5	0.0	0.8	0.9
Exiting Leg Total					9					8					11					14	42
Buses	24	3	0	0	27	0	7	4	0	11	29	1	2	0	32	3	4	23	0	30	100
% Buses	17.3	0.7	0.0	0.0	3.5	0.0	1.2	1.0	0.0	1.0	10.4	0.3	0.2	0.0	2.0	0.4	0.8	25.3	0.0	2.3	2.1
Exiting Leg Total					24					33					10					33	100

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

4:45 PM	Arcand Drive					Father Morisette Boulevard					Arcand Drive					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
4:45 PM	5	22	10	0	37	6	38	29	0	73	30	25	58	0	113	36	40	10	0	86	309
5:00 PM	9	26	21	0	56	9	45	23	2	79	25	43	90	0	158	55	39	3	0	97	390
5:15 PM	8	22	16	0	46	7	45	22	1	75	17	29	70	0	116	54	40	5	0	99	336
5:30 PM	7	20	13	0	40	14	50	33	0	97	25	24	64	0	113	29	30	8	0	67	317
Total Volume	29	90	60	0	179	36	178	107	3	324	97	121	282	0	500	174	149	26	0	349	1352
% Approach Total	16.2	50.3	33.5	0.0		11.1	54.9	33.0	0.9		19.4	24.2	56.4	0.0		49.9	42.7	7.4	0.0		
PHF	0.806	0.865	0.714	0.000	0.799	0.643	0.890	0.811	0.375	0.835	0.808	0.703	0.783	0.000	0.791	0.791	0.931	0.650	0.000	0.881	0.867
Cars	23	86	60	0	169	36	176	107	3	322	86	120	281	0	487	174	148	19	0	341	1319
Cars %	79.3	95.6	100.0	0.0	94.4	100.0	98.9	100.0	100.0	99.4	88.7	99.2	99.6	0.0	97.4	100.0	99.3	73.1	0.0	97.7	97.6
Heavy Vehicles	0	2	0	0	2	0	0	0	0	0	3	1	1	0	5	0	1	1	0	2	9
Heavy Vehicles %	0.0	2.2	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	3.1	0.8	0.4	0.0	1.0	0.0	0.7	3.8	0.0	0.6	0.7
Buses	6	2	0	0	8	0	2	0	0	2	8	0	0	0	8	0	0	6	0	6	24
Buses %	20.7	2.2	0.0	0.0	4.5	0.0	1.1	0.0	0.0	0.6	8.2	0.0	0.0	0.0	1.6	0.0	0.0	23.1	0.0	1.7	1.8

PDI File #: **175563 AA**
Location: **N: Arcand Drive S: Arcand Drive**
Location: **E: Father Morisette Boulevard W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars, Heavy Vehicles, and Buses (Combined)

	Arcand Drive					Father Morisette Boulevard					Arcand Drive					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
Cars Enter Leg	23	86	60	0	169	36	176	107	3	322	86	120	281	0	487	174	148	19	0	341	1319
Heavy Enter Leg	0	2	0	0	2	0	0	0	0	0	3	1	1	0	5	0	1	1	0	2	9
Bus Enter Leg	6	2	0	0	8	0	2	0	0	2	8	0	0	0	8	0	0	6	0	6	24
Total Entering Leg	29	90	60	0	179	36	178	107	3	324	97	121	282	0	500	174	149	26	0	349	1352
Cars Exiting Leg					175					297					367					480	1319
Heavy Exiting Leg					2					4					2					1	9
Buses Exiting Leg					6					8					2					8	24
Total Exiting Leg					183					309					371					489	1352

PDI File #: **175563 AA**
Location: **N: Arcand Drive S: Arcand Drive**
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City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
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Cars

	Arcand Drive					Father Morisette Boulevard					Arcand Drive					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	6	24	8	0	38	7	36	31	2	76	13	13	38	0	64	45	30	2	0	77	255
2:15 PM	6	30	10	0	46	1	34	24	0	59	3	12	42	0	57	42	19	3	0	64	226
2:30 PM	8	25	8	0	41	6	31	18	0	55	8	12	47	0	67	29	32	5	0	66	229
2:45 PM	7	22	10	0	39	5	38	18	0	61	19	11	46	0	76	33	27	5	0	65	241
Total	27	101	36	0	164	19	139	91	2	251	43	48	173	0	264	149	108	15	0	272	951
3:00 PM	7	24	10	0	41	6	33	12	0	51	12	14	68	0	94	41	35	4	0	80	266
3:15 PM	7	38	8	0	53	4	38	28	0	70	14	22	63	0	99	60	26	2	1	89	311
3:30 PM	14	45	37	0	96	9	39	19	0	67	11	28	52	0	91	48	32	3	0	83	337
3:45 PM	13	28	15	0	56	9	25	21	0	55	16	18	51	0	85	34	23	4	0	61	257
Total	41	135	70	0	246	28	135	80	0	243	53	82	234	0	369	183	116	13	1	313	1171
4:00 PM	5	35	18	0	58	6	37	35	1	79	11	27	71	0	109	50	39	7	0	96	342
4:15 PM	4	20	7	0	31	3	27	20	0	50	18	20	77	0	115	55	38	1	0	94	290
4:30 PM	8	23	9	0	40	4	42	22	0	68	11	31	70	0	112	42	43	1	0	86	306
4:45 PM	4	21	10	0	35	6	37	29	0	72	25	24	57	0	106	36	40	7	0	83	296
Total	21	99	44	0	164	19	143	106	1	269	65	102	275	0	442	183	160	16	0	359	1234
5:00 PM	7	24	21	0	52	9	45	23	2	79	23	43	90	0	156	55	38	2	0	95	382
5:15 PM	7	21	16	0	44	7	44	22	1	74	15	29	70	0	114	54	40	3	0	97	329
5:30 PM	5	20	13	0	38	14	50	33	0	97	23	24	64	0	111	29	30	7	0	66	312
5:45 PM	4	9	6	0	19	12	37	28	3	80	21	42	70	0	133	25	26	7	0	58	290
Total	23	74	56	0	153	42	176	106	6	330	82	138	294	0	514	163	134	19	0	316	1313
Grand Total	112	409	206	0	727	108	593	383	9	1093	243	370	976	0	1589	678	518	63	1	1260	4669
Approach %	15.4	56.3	28.3	0.0		9.9	54.3	35.0	0.8		15.3	23.3	61.4	0.0		53.8	41.1	5.0	0.1		
Total %	2.4	8.8	4.4	0.0	15.6	2.3	12.7	8.2	0.2	23.4	5.2	7.9	20.9	0.0	34.0	14.5	11.1	1.3	0.0	27.0	
Exiting Leg Total					541					976					1470					1682	4669

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

4:45 PM	Arcand Drive					Father Morisette Boulevard					Arcand Drive					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
4:45 PM	4	21	10	0	35	6	37	29	0	72	25	24	57	0	106	36	40	7	0	83	296
5:00 PM	7	24	21	0	52	9	45	23	2	79	23	43	90	0	156	55	38	2	0	95	382
5:15 PM	7	21	16	0	44	7	44	22	1	74	15	29	70	0	114	54	40	3	0	97	329
5:30 PM	5	20	13	0	38	14	50	33	0	97	23	24	64	0	111	29	30	7	0	66	312
Total Volume	23	86	60	0	169	36	176	107	3	322	86	120	281	0	487	174	148	19	0	341	1319
% Approach Total	13.6	50.9	35.5	0.0		11.2	54.7	33.2	0.9		17.7	24.6	57.7	0.0		51.0	43.4	5.6	0.0		
PHF	0.821	0.896	0.714	0.000	0.813	0.643	0.880	0.811	0.375	0.830	0.860	0.698	0.781	0.000	0.780	0.791	0.925	0.679	0.000	0.879	0.863
Entering Leg	23	86	60	0	169	36	176	107	3	322	86	120	281	0	487	174	148	19	0	341	1319
Exiting Leg					175					297					367					480	1319
Total					344					619					854					821	2638

PDI File #: **175563 AA**
Location: **N: Arcand Drive S: Arcand Drive**
Location: **E: Father Morisette Boulevard W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Heavy Vehicles

	Arcand Drive					Father Morisette Boulevard					Arcand Drive					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	0	1	0	0	1	0	0	2	0	2	1	0	1	0	2	1	0	0	0	1	6
2:15 PM	0	1	0	0	1	0	0	0	0	0	0	0	1	0	1	1	1	1	0	3	5
2:30 PM	0	0	0	0	0	0	0	0	0	0	2	1	1	0	4	0	0	0	0	0	4
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
Total	0	2	0	0	2	0	0	2	0	2	3	2	3	0	8	2	1	1	0	4	16
3:00 PM	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	3
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
Total	1	1	0	0	2	0	0	0	0	0	0	0	2	0	2	0	0	1	0	1	5
4:00 PM	1	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	2	0	2	4
4:15 PM	0	1	0	0	1	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	3
4:30 PM	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	1	0	0	0	1	3
4:45 PM	0	0	0	0	0	0	0	0	0	0	1	1	1	0	3	0	0	1	0	1	4
Total	2	1	0	0	3	0	2	0	0	2	1	2	2	0	5	1	0	3	0	4	14
5:00 PM	0	1	0	0	1	0	0	0	0	0	1	0	0	0	1	0	1	0	0	1	3
5:15 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:30 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1
5:45 PM	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	0	0	0	0	0	2
Total	0	2	0	0	2	0	1	0	0	1	2	0	1	0	3	0	1	0	0	1	7
Grand Total	3	6	0	0	9	0	3	2	0	5	6	4	8	0	18	3	2	5	0	10	42
Approach %	33.3	66.7	0.0	0.0		0.0	60.0	40.0	0.0		33.3	22.2	44.4	0.0		30.0	20.0	50.0	0.0		
Total %	7.1	14.3	0.0	0.0	21.4	0.0	7.1	4.8	0.0	11.9	14.3	9.5	19.0	0.0	42.9	7.1	4.8	11.9	0.0	23.8	
Exiting Leg Total					9					8					11					14	42

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:00 PM	Arcand Drive					Father Morisette Boulevard					Arcand Drive					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	0	1	0	0	1	0	0	2	0	2	1	0	1	0	2	1	0	0	0	1	6
2:15 PM	0	1	0	0	1	0	0	0	0	0	0	0	1	0	1	1	1	1	0	3	5
2:30 PM	0	0	0	0	0	0	0	0	0	0	2	1	1	0	4	0	0	0	0	0	4
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
Total Volume	0	2	0	0	2	0	0	2	0	2	3	2	3	0	8	2	1	1	0	4	16
% Approach Total	0.0	100.0	0.0	0.0		0.0	0.0	100.0	0.0		37.5	25.0	37.5	0.0		50.0	25.0	25.0	0.0		
PHF	0.000	0.500	0.000	0.000	0.500	0.000	0.000	0.250	0.000	0.250	0.375	0.500	0.750	0.000	0.500	0.500	0.250	0.250	0.000	0.333	0.667
Entering Leg	0	2	0	0	2	0	0	2	0	2	3	2	3	0	8	2	1	1	0	4	16
Exiting Leg					3					4					6					3	16
Total					5					6					14					7	32

PDI File #: **175563 AA**
Location: **N: Arcand Drive S: Arcand Drive**
Location: **E: Father Morisette Boulevard W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Buses

	Arcand Drive					Father Morisette Boulevard					Arcand Drive					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	2	0	0	0	2	0	1	1	0	2	1	0	1	0	2	2	1	2	0	5	11
2:15 PM	1	0	0	0	1	0	0	1	0	1	1	0	1	0	2	0	2	1	0	3	7
2:30 PM	2	0	0	0	2	0	2	0	0	2	1	0	0	0	1	0	0	2	0	2	7
2:45 PM	2	0	0	0	2	0	0	0	0	0	3	0	0	0	3	0	0	1	0	1	6
Total	7	0	0	0	7	0	3	2	0	5	6	0	2	0	8	2	3	6	0	11	31
3:00 PM	1	0	0	0	1	0	0	0	0	0	1	0	0	0	1	0	0	1	0	1	3
3:15 PM	1	0	0	0	1	0	1	0	0	1	1	0	0	0	1	0	0	0	0	0	3
3:30 PM	1	0	0	0	1	0	0	0	0	0	2	0	0	0	2	0	0	1	0	1	4
3:45 PM	3	0	0	0	3	0	0	0	0	0	3	1	0	0	4	0	0	3	0	3	10
Total	6	0	0	0	6	0	1	0	0	1	7	1	0	0	8	0	0	5	0	5	20
4:00 PM	1	1	0	0	2	0	1	0	0	1	1	0	0	0	1	0	1	1	0	2	6
4:15 PM	1	0	0	0	1	0	0	2	0	2	2	0	0	0	2	1	0	3	0	4	9
4:30 PM	2	0	0	0	2	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	3
4:45 PM	1	1	0	0	2	0	1	0	0	1	4	0	0	0	4	0	0	2	0	2	9
Total	5	2	0	0	7	0	2	2	0	4	8	0	0	0	8	1	1	6	0	8	27
5:00 PM	2	1	0	0	3	0	0	0	0	0	1	0	0	0	1	0	0	1	0	1	5
5:15 PM	1	0	0	0	1	0	1	0	0	1	2	0	0	0	2	0	0	2	0	2	6
5:30 PM	2	0	0	0	2	0	0	0	0	0	1	0	0	0	1	0	0	1	0	1	4
5:45 PM	1	0	0	0	1	0	0	0	0	0	4	0	0	0	4	0	0	2	0	2	7
Total	6	1	0	0	7	0	1	0	0	1	8	0	0	0	8	0	0	6	0	6	22
Grand Total	24	3	0	0	27	0	7	4	0	11	29	1	2	0	32	3	4	23	0	30	100
Approach %	88.9	11.1	0.0	0.0		0.0	63.6	36.4	0.0		90.6	3.1	6.3	0.0		10.0	13.3	76.7	0.0		
Total %	24.0	3.0	0.0	0.0	27.0	0.0	7.0	4.0	0.0	11.0	29.0	1.0	2.0	0.0	32.0	3.0	4.0	23.0	0.0	30.0	
Exiting Leg Total					24					33					10					33	100

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:00 PM	Arcand Drive					Father Morisette Boulevard					Arcand Drive					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	2	0	0	0	2	0	1	1	0	2	1	0	1	0	2	2	1	2	0	5	11
2:15 PM	1	0	0	0	1	0	0	1	0	1	1	0	1	0	2	0	2	1	0	3	7
2:30 PM	2	0	0	0	2	0	2	0	0	2	1	0	0	0	1	0	0	2	0	2	7
2:45 PM	2	0	0	0	2	0	0	0	0	0	3	0	0	0	3	0	0	1	0	1	6
Total Volume	7	0	0	0	7	0	3	2	0	5	6	0	2	0	8	2	3	6	0	11	31
% Approach Total	100.0	0.0	0.0	0.0		0.0	60.0	40.0	0.0		75.0	0.0	25.0	0.0		18.2	27.3	54.5	0.0		
PHF	0.875	0.000	0.000	0.000	0.875	0.000	0.375	0.500	0.000	0.625	0.500	0.000	0.500	0.000	0.667	0.250	0.375	0.750	0.000	0.550	0.705
Entering Leg	7	0	0	0	7	0	3	2	0	5	6	0	2	0	8	2	3	6	0	11	31
Exiting Leg					6					9					4					12	31
Total					13					14					12					23	62

PDI File #: **175563 AA**
Location: **N: Arcand Drive S: Arcand Drive**
Location: **E: Father Morisette Boulevard W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Bicycles (on Roadway and Crosswalks)

	Arcand Drive							Father Morisette Boulevard							Arcand Drive							Father Morisette Boulevard							
	North							East							South							West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3:30 PM	0	0	0	0	0	0	0	0	2	0	0	0	0	2	1	0	0	0	0	0	1	0	0	0	0	0	0	0	3
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	3	0	0	0	0	3	1	0	0	0	0	0	1	0	0	0	0	0	0	0	4
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	3	0	0	0	0	3	1	0	0	0	0	0	1	0	0	0	0	1	0	1	5
Approach %	0.0	0.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0	0.0		100.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	100.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	60.0	0.0	0.0	0.0	0.0	60.0	20.0	0.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	20.0	0.0	20.0	
Exiting Leg Total							0							1							0							4	5

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

3:15 PM	Arcand Drive							Father Morisette Boulevard							Arcand Drive							Father Morisette Boulevard							
	North							East							South							West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
3:15 PM	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3:30 PM	0	0	0	0	0	0	0	0	2	0	0	0	0	2	1	0	0	0	0	0	1	0	0	0	0	0	0	0	3
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Total Volume	0	0	0	0	0	0	0	0	3	0	0	0	0	3	1	0	0	0	0	0	1	0	0	0	0	1	0	1	5
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0	0.0		100.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	100.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.375	0.000	0.000	0.000	0.000	0.375	0.250	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.250	0.000	0.250	0.417
Entering Leg	0	0	0	0	0	0	0	0	3	0	0	0	0	3	1	0	0	0	0	0	1	0	0	0	0	1	0	1	5
Exiting Leg							0							1							0							4	5
Total							0							4							1							5	10

PDI File #: **175563 AA**
Location: **N: Arcand Drive S: Arcand Drive**
Location: **E: Father Morisette Boulevard W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Pedestrians

	Arcand Drive (North)							Father Morisette Boulevard (East)							Arcand Drive (South)							Father Morisette Boulevard (West)							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
2:00 PM	0	0	0	0	4	1	5	0	0	0	0	2	1	3	0	0	0	0	6	1	7	0	0	0	0	1	1	2	17
2:15 PM	0	0	0	0	0	2	2	0	0	0	0	1	5	6	0	0	0	0	4	1	5	0	0	0	0	1	1	2	15
2:30 PM	0	0	0	0	1	1	2	0	0	0	0	1	1	2	0	0	0	0	1	1	2	0	0	0	0	2	0	2	8
2:45 PM	0	0	0	0	1	2	3	0	0	0	0	1	0	1	0	0	0	0	0	1	1	0	0	0	0	1	0	1	6
Total	0	0	0	0	6	6	12	0	0	0	0	5	7	12	0	0	0	0	11	4	15	0	0	0	0	5	2	7	46
3:00 PM	0	0	0	0	1	3	4	0	0	0	0	3	3	6	0	0	0	0	3	4	7	0	0	0	0	2	0	2	19
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	2	2	4	7
3:30 PM	0	0	0	0	1	0	1	0	0	0	0	2	0	2	0	0	0	0	0	1	1	0	0	0	0	2	1	3	7
3:45 PM	0	0	0	0	3	4	7	0	0	0	0	0	2	2	0	0	0	0	0	1	1	0	0	0	0	4	1	5	15
Total	0	0	0	0	5	7	12	0	0	0	0	5	8	13	0	0	0	0	3	6	9	0	0	0	0	10	4	14	48
4:00 PM	0	0	0	0	4	2	6	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	2	9
4:15 PM	0	0	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	0	1	15	16	0	0	0	0	1	0	1	21
4:30 PM	0	0	0	0	2	1	3	0	0	0	0	3	1	4	0	0	0	0	2	1	3	0	0	0	0	0	1	1	11
4:45 PM	0	0	0	0	6	0	6	0	0	0	0	4	0	4	0	0	0	0	0	1	1	0	0	0	0	1	2	3	14
Total	0	0	0	0	16	3	19	0	0	0	0	7	2	9	0	0	0	0	3	17	20	0	0	0	0	2	5	7	55
5:00 PM	0	0	0	0	2	0	2	0	0	0	0	1	3	4	0	0	0	0	0	1	1	0	0	0	0	0	0	0	7
5:15 PM	0	0	0	0	6	2	8	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
5:30 PM	0	0	0	0	3	0	3	0	0	0	0	2	4	6	0	0	0	0	0	1	1	0	0	0	0	0	3	3	13
5:45 PM	0	0	0	0	2	0	2	0	0	0	0	0	1	1	0	0	0	0	3	0	3	0	0	0	0	2	3	5	11
Total	0	0	0	0	13	2	15	0	0	0	0	4	9	13	0	0	0	0	3	2	5	0	0	0	0	2	6	8	41
Grand Total	0	0	0	0	40	18	58	0	0	0	0	21	26	47	0	0	0	0	20	29	49	0	0	0	0	19	17	36	190
Approach %	0.0	0.0	0.0	0.0	69.0	31.0		0.0	0.0	0.0	0.0	44.7	55.3		0.0	0.0	0.0	0.0	40.8	59.2		0.0	0.0	0.0	0.0	52.8	47.2		
Total %	0.0	0.0	0.0	0.0	21.1	9.5	30.5	0.0	0.0	0.0	0.0	11.1	13.7	24.7	0.0	0.0	0.0	0.0	10.5	15.3	25.8	0.0	0.0	0.0	0.0	10.0	8.9	18.9	
Exiting Leg Total							58							47							49							36	190

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

3:45 PM	Arcand Drive (North)							Father Morisette Boulevard (East)							Arcand Drive (South)							Father Morisette Boulevard (West)							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
3:45 PM	0	0	0	0	3	4	7	0	0	0	0	0	2	2	0	0	0	0	0	1	1	0	0	0	0	4	1	5	15
4:00 PM	0	0	0	0	4	2	6	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	2	9
4:15 PM	0	0	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	0	1	15	16	0	0	0	0	1	0	1	21
4:30 PM	0	0	0	0	2	1	3	0	0	0	0	3	1	4	0	0	0	0	2	1	3	0	0	0	0	0	1	1	11
Total Volume	0	0	0	0	13	7	20	0	0	0	0	3	4	7	0	0	0	0	3	17	20	0	0	0	0	5	4	9	56
% Approach Total	0.0	0.0	0.0	0.0	65.0	35.0		0.0	0.0	0.0	0.0	42.9	57.1		0.0	0.0	0.0	0.0	15.0	85.0		0.0	0.0	0.0	0.0	55.6	44.4		
PHF	0.000	0.000	0.000	0.000	0.813	0.438	0.714	0.000	0.000	0.000	0.000	0.250	0.500	0.438	0.000	0.000	0.000	0.000	0.375	0.283	0.313	0.000	0.000	0.000	0.000	0.313	0.500	0.450	0.667
Entering Leg	0	0	0	0	13	7	20	0	0	0	0	3	4	7	0	0	0	0	3	17	20	0	0	0	0	5	4	9	56
Exiting Leg							20							7							20							9	56
Total							40							14							40							18	112

PDI File #: **175563 B**
Location: **S: Pedestrian Crossing Signal**
Location: **E: Father Morissette Boulevard W: Father Morissette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Class:

Cars, Heavy Vehicles, and Buses (Combined)

	Father Morissette Boulevard				Pedestrian Crossing Signal				Father Morissette Boulevard				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
6:00 AM	37	0	0	37	0	0	0	0	0	9	0	9	46
6:15 AM	42	0	0	42	0	0	0	0	0	20	0	20	62
6:30 AM	41	0	0	41	0	0	0	0	0	27	0	27	68
6:45 AM	77	0	0	77	1	0	0	1	0	47	0	47	125
Total	197	0	0	197	1	0	0	1	0	103	0	103	301
7:00 AM	72	0	0	72	0	0	0	0	0	63	0	63	135
7:15 AM	108	0	0	108	0	0	0	0	0	113	0	113	221
7:30 AM	137	0	0	137	0	0	0	0	0	150	0	150	287
7:45 AM	149	0	0	149	0	0	0	0	0	138	0	138	287
Total	466	0	0	466	0	0	0	0	0	464	0	464	930
8:00 AM	72	0	0	72	0	0	0	0	0	66	0	66	138
8:15 AM	73	0	0	73	0	0	0	0	0	55	0	55	128
8:30 AM	64	0	0	64	0	0	0	0	0	52	0	52	116
8:45 AM	70	0	0	70	0	0	0	0	0	51	0	51	121
Total	279	0	0	279	0	0	0	0	0	224	0	224	503
9:00 AM	71	0	0	71	0	0	0	0	0	58	0	58	129
9:15 AM	72	0	0	72	0	0	0	0	0	38	0	38	110
9:30 AM	69	0	0	69	0	0	0	0	0	38	0	38	107
9:45 AM	68	0	0	68	0	0	0	0	0	36	0	36	104
Total	280	0	0	280	0	0	0	0	0	170	0	170	450
Grand Total	1222	0	0	1222	1	0	0	1	0	961	0	961	2184
Approach %	100.0	0.0	0.0		100.0	0.0	0.0		0.0	100.0	0.0		
Total %	56.0	0.0	0.0	56.0	0.0	0.0	0.0	0.0	0.0	44.0	0.0	44.0	
Exiting Leg Total				962				0				1222	2184
Cars	1165	0	0	1165	1	0	0	1	0	902	0	902	2068
% Cars	95.3	0.0	0.0	95.3	100.0	0.0	0.0	100.0	0.0	93.9	0.0	93.9	94.7
Exiting Leg Total				903				0				1165	2068
Heavy Vehicles	17	0	0	17	0	0	0	0	0	16	0	16	33
% Heavy Vehicles	1.4	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	1.7	0.0	1.7	1.5
Exiting Leg Total				16				0				17	33
Buses	40	0	0	40	0	0	0	0	0	43	0	43	83
% Buses	3.3	0.0	0.0	3.3	0.0	0.0	0.0	0.0	0.0	4.5	0.0	4.5	3.8
Exiting Leg Total				43				0				40	83

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:15 AM	Father Morissette Boulevard				Pedestrian Crossing Signal				Father Morissette Boulevard				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
7:15 AM	108	0	0	108	0	0	0	0	0	113	0	113	221
7:30 AM	137	0	0	137	0	0	0	0	0	150	0	150	287
7:45 AM	149	0	0	149	0	0	0	0	0	138	0	138	287
8:00 AM	72	0	0	72	0	0	0	0	0	66	0	66	138
Total Volume	466	0	0	466	0	0	0	0	0	467	0	467	933
% Approach Total	100.0	0.0	0.0		0.0	0.0	0.0		0.0	100.0	0.0		
PHF	0.782	0.000	0.000	0.782	0.000	0.000	0.000	0.000	0.000	0.778	0.000	0.778	0.813
Cars	447	0	0	447	0	0	0	0	0	445	0	445	892
Cars %	95.9	0.0	0.0	95.9	0.0	0.0	0.0	0.0	0.0	95.3	0.0	95.3	95.6
Heavy Vehicles	6	0	0	6	0	0	0	0	0	6	0	6	12
Heavy Vehicles %	1.3	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	1.3	0.0	1.3	1.3
Buses	13	0	0	13	0	0	0	0	0	16	0	16	29
Buses %	2.8	0.0	0.0	2.8	0.0	0.0	0.0	0.0	0.0	3.4	0.0	3.4	3.1

PDI File #: **175563 B**
Location: **S: Pedestrian Crossing Signal**
Location: **E: Father Morissette Boulevard W: Father Morissette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Class: **Cars, Heavy Vehicles, and Buses (Combined)**

	Father Morissette Boulevard				Pedestrian Crossing Signal				Father Morissette Boulevard				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
Cars Enter Leg	447	0	0	447	0	0	0	0	0	445	0	445	892
Heavy Enter Leg	6	0	0	6	0	0	0	0	0	6	0	6	12
Bus Enter Leg	13	0	0	13	0	0	0	0	0	16	0	16	29
Total Entering Leg	466	0	0	466	0	0	0	0	0	467	0	467	933
Cars Exiting Leg				445				0				447	892
Heavy Exiting Leg				6				0				6	12
Buses Exiting Leg				16				0				13	29
Total Exiting Leg				467				0				466	933

PDI File #: **175563 B**
Location: **S: Pedestrian Crossing Signal**
Location: **E: Father Morissette Boulevard W: Father Morissette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars

	Father Morissette Boulevard				Pedestrian Crossing Signal				Father Morissette Boulevard				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
6:00 AM	32	0	0	32	0	0	0	0	0	8	0	8	40
6:15 AM	40	0	0	40	0	0	0	0	0	17	0	17	57
6:30 AM	40	0	0	40	0	0	0	0	0	24	0	24	64
6:45 AM	72	0	0	72	1	0	0	1	0	43	0	43	116
Total	184	0	0	184	1	0	0	1	0	92	0	92	277
7:00 AM	70	0	0	70	0	0	0	0	0	60	0	60	130
7:15 AM	103	0	0	103	0	0	0	0	0	106	0	106	209
7:30 AM	134	0	0	134	0	0	0	0	0	145	0	145	279
7:45 AM	147	0	0	147	0	0	0	0	0	134	0	134	281
Total	454	0	0	454	0	0	0	0	0	445	0	445	899
8:00 AM	63	0	0	63	0	0	0	0	0	60	0	60	123
8:15 AM	69	0	0	69	0	0	0	0	0	52	0	52	121
8:30 AM	59	0	0	59	0	0	0	0	0	49	0	49	108
8:45 AM	68	0	0	68	0	0	0	0	0	48	0	48	116
Total	259	0	0	259	0	0	0	0	0	209	0	209	468
9:00 AM	70	0	0	70	0	0	0	0	0	56	0	56	126
9:15 AM	70	0	0	70	0	0	0	0	0	35	0	35	105
9:30 AM	65	0	0	65	0	0	0	0	0	36	0	36	101
9:45 AM	63	0	0	63	0	0	0	0	0	29	0	29	92
Total	268	0	0	268	0	0	0	0	0	156	0	156	424
Grand Total	1165	0	0	1165	1	0	0	1	0	902	0	902	2068
Approach %	100.0	0.0	0.0		100.0	0.0	0.0		0.0	100.0	0.0		
Total %	56.3	0.0	0.0	56.3	0.0	0.0	0.0	0.0	0.0	43.6	0.0	43.6	
Exiting Leg Total				903				0				1165	2068

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:00 AM	Father Morissette Boulevard				Pedestrian Crossing Signal				Father Morissette Boulevard				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
7:00 AM	70	0	0	70	0	0	0	0	0	60	0	60	130
7:15 AM	103	0	0	103	0	0	0	0	0	106	0	106	209
7:30 AM	134	0	0	134	0	0	0	0	0	145	0	145	279
7:45 AM	147	0	0	147	0	0	0	0	0	134	0	134	281
Total Volume	454	0	0	454	0	0	0	0	0	445	0	445	899
% Approach Total	100.0	0.0	0.0		0.0	0.0	0.0		0.0	100.0	0.0		
PHF	0.772	0.000	0.000	0.772	0.000	0.000	0.000	0.000	0.000	0.767	0.000	0.767	0.800
Entering Leg	454	0	0	454	0	0	0	0	0	445	0	445	899
Exiting Leg				445				0				454	899
Total				899				0				899	1798

PDI File #: **175563 B**
Location: **S: Pedestrian Crossing Signal**
Location: **E: Father Morissette Boulevard W: Father Morissette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Heavy Vehicles

	Father Morissette Boulevard				Pedestrian Crossing Signal				Father Morissette Boulevard				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
6:00 AM	4	0	0	4	0	0	0	0	0	0	0	0	4
6:15 AM	1	0	0	1	0	0	0	0	0	1	0	1	2
6:30 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	6	0	0	6	0	0	0	0	0	1	0	1	7
7:00 AM	0	0	0	0	0	0	0	0	0	2	0	2	2
7:15 AM	2	0	0	2	0	0	0	0	0	1	0	1	3
7:30 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
7:45 AM	2	0	0	2	0	0	0	0	0	1	0	1	3
Total	4	0	0	4	0	0	0	0	0	5	0	5	9
8:00 AM	2	0	0	2	0	0	0	0	0	3	0	3	5
8:15 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
8:30 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3	0	0	3	0	0	0	0	0	4	0	4	7
9:00 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
9:15 AM	1	0	0	1	0	0	0	0	0	1	0	1	2
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	3	0	0	3	0	0	0	0	0	4	0	4	7
Total	4	0	0	4	0	0	0	0	0	6	0	6	10
Grand Total	17	0	0	17	0	0	0	0	0	16	0	16	33
Approach %	100.0	0.0	0.0		0.0	0.0	0.0		0.0	100.0	0.0		
Total %	51.5	0.0	0.0	51.5	0.0	0.0	0.0	0.0	0.0	48.5	0.0	48.5	
Exiting Leg Total				16				0				17	33

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:15 AM	Father Morissette Boulevard				Pedestrian Crossing Signal				Father Morissette Boulevard				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
7:15 AM	2	0	0	2	0	0	0	0	0	1	0	1	3
7:30 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
7:45 AM	2	0	0	2	0	0	0	0	0	1	0	1	3
8:00 AM	2	0	0	2	0	0	0	0	0	3	0	3	5
Total Volume	6	0	0	6	0	0	0	0	0	6	0	6	12
% Approach Total	100.0	0.0	0.0		0.0	0.0	0.0		0.0	100.0	0.0		
PHF	0.750	0.000	0.000	0.750	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.500	0.600
Entering Leg	6	0	0	6	0	0	0	0	0	6	0	6	12
Exiting Leg				6				0				6	12
Total				12				0				12	24

PDI File #: **175563 B**
Location: **S: Pedestrian Crossing Signal**
Location: **E: Father Morissette Boulevard W: Father Morissette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Class: **Buses**

	Father Morissette Boulevard				Pedestrian Crossing Signal				Father Morissette Boulevard				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
6:00 AM	1	0	0	1	0	0	0	0	0	1	0	1	2
6:15 AM	1	0	0	1	0	0	0	0	0	2	0	2	3
6:30 AM	0	0	0	0	0	0	0	0	0	3	0	3	3
6:45 AM	5	0	0	5	0	0	0	0	0	4	0	4	9
Total	7	0	0	7	0	0	0	0	0	10	0	10	17
7:00 AM	2	0	0	2	0	0	0	0	0	1	0	1	3
7:15 AM	3	0	0	3	0	0	0	0	0	6	0	6	9
7:30 AM	3	0	0	3	0	0	0	0	0	4	0	4	7
7:45 AM	0	0	0	0	0	0	0	0	0	3	0	3	3
Total	8	0	0	8	0	0	0	0	0	14	0	14	22
8:00 AM	7	0	0	7	0	0	0	0	0	3	0	3	10
8:15 AM	3	0	0	3	0	0	0	0	0	3	0	3	6
8:30 AM	5	0	0	5	0	0	0	0	0	2	0	2	7
8:45 AM	2	0	0	2	0	0	0	0	0	3	0	3	5
Total	17	0	0	17	0	0	0	0	0	11	0	11	28
9:00 AM	1	0	0	1	0	0	0	0	0	1	0	1	2
9:15 AM	1	0	0	1	0	0	0	0	0	2	0	2	3
9:30 AM	4	0	0	4	0	0	0	0	0	2	0	2	6
9:45 AM	2	0	0	2	0	0	0	0	0	3	0	3	5
Total	8	0	0	8	0	0	0	0	0	8	0	8	16
Grand Total	40	0	0	40	0	0	0	0	0	43	0	43	83
Approach %	100.0	0.0	0.0		0.0	0.0	0.0		0.0	100.0	0.0		
Total %	48.2	0.0	0.0	48.2	0.0	0.0	0.0	0.0	0.0	51.8	0.0	51.8	
Exiting Leg Total				43				0				40	83

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:15 AM	Father Morissette Boulevard				Pedestrian Crossing Signal				Father Morissette Boulevard				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
7:15 AM	3	0	0	3	0	0	0	0	0	6	0	6	9
7:30 AM	3	0	0	3	0	0	0	0	0	4	0	4	7
7:45 AM	0	0	0	0	0	0	0	0	0	3	0	3	3
8:00 AM	7	0	0	7	0	0	0	0	0	3	0	3	10
Total Volume	13	0	0	13	0	0	0	0	0	16	0	16	29
% Approach Total	100.0	0.0	0.0		0.0	0.0	0.0		0.0	100.0	0.0		
PHF	0.464	0.000	0.000	0.464	0.000	0.000	0.000	0.000	0.000	0.667	0.000	0.667	0.725
Entering Leg	13	0	0	13	0	0	0	0	0	16	0	16	29
Exiting Leg				16				0				13	29
Total				29				0				29	58

PDI File #: **175563 B**
Location: **S: Pedestrian Crossing Signal**
Location: **E: Father Morissette Boulevard W: Father Morissette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Class:

Bicycles (on Roadway and Crosswalks)

	Father Morissette Boulevard						Pedestrian Crossing Signal						Father Morissette Boulevard						
	East						South						West						
	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	U-Turn	CW-NB	CW-SB	Total	Total
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	2
Total	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	2
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	3	0	0	0	2	5	0	0	0	0	0	0	5
7:30 AM	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1
7:45 AM	0	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
Total	0	3	0	0	0	3	3	0	0	0	3	6	0	0	0	0	0	0	9
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Grand Total	0	4	0	0	0	4	3	0	0	0	3	6	0	1	0	0	1	2	12
Approach %	0.0	100.0	0.0	0.0	0.0		50.0	0.0	0.0	0.0	50.0		0.0	50.0	0.0	0.0	50.0		
Total %	0.0	33.3	0.0	0.0	0.0	33.3	25.0	0.0	0.0	0.0	25.0	50.0	0.0	8.3	0.0	0.0	8.3	16.7	
Exiting Leg Total						4						7						1	12

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:00 AM	Father Morissette Boulevard						Pedestrian Crossing Signal						Father Morissette Boulevard						
	East						South						West						
	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	U-Turn	CW-NB	CW-SB	Total	Total
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	3	0	0	0	2	5	0	0	0	0	0	0	5
7:30 AM	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1
7:45 AM	0	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
Total Volume	0	3	0	0	0	3	3	0	0	0	3	6	0	0	0	0	0	0	9
% Approach Total	0.0	100.0	0.0	0.0	0.0		50.0	0.0	0.0	0.0	50.0		0.0	0.0	0.0	0.0	0.0		
PHF	0.000	0.250	0.000	0.000	0.000	0.250	0.250	0.000	0.000	0.000	0.375	0.300	0.000	0.000	0.000	0.000	0.000	0.000	0.450
Entering Leg	0	3	0	0	0	3	3	0	0	0	3	6	0	0	0	0	0	0	9
Exiting Leg						3						6						0	9
Total						6						12						0	18

PDI File #: **175563 B**
Location: **S: Pedestrian Crossing Signal**
Location: **E: Father Morissette Boulevard W: Father Morissette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Pedestrians

	Father Morissette Boulevard						Pedestrian Crossing Signal						Father Morissette Boulevard						
	East						South						West						
	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	U-Turn	CW-NB	CW-SB	Total	Total
6:00 AM	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	2	2	4
6:15 AM	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	5	5	6
6:30 AM	0	0	0	5	1	6	0	0	0	0	1	1	0	0	0	2	21	23	30
6:45 AM	0	0	0	2	2	4	0	0	0	2	2	4	0	0	0	6	39	45	53
Total	0	0	0	9	3	12	0	0	0	2	4	6	0	0	0	8	67	75	93
7:00 AM	0	0	0	5	0	5	0	0	0	1	3	4	0	0	0	0	69	69	78
7:15 AM	0	0	0	6	0	6	0	0	0	1	33	34	0	0	0	3	134	137	177
7:30 AM	0	0	0	2	0	2	0	0	0	4	51	55	0	0	0	2	207	209	266
7:45 AM	0	0	0	1	0	1	0	0	0	0	29	29	0	0	0	0	160	160	190
Total	0	0	0	14	0	14	0	0	0	6	116	122	0	0	0	5	570	575	711
8:00 AM	0	0	0	4	0	4	0	0	0	2	5	7	0	0	0	2	16	18	29
8:15 AM	0	0	0	1	0	1	0	0	0	1	2	3	0	0	0	0	6	6	10
8:30 AM	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	1	6	7	9
8:45 AM	0	0	0	1	0	1	0	0	0	0	1	1	0	0	0	0	5	5	7
Total	0	0	0	8	0	8	0	0	0	3	8	11	0	0	0	3	33	36	55
9:00 AM	0	0	0	0	0	0	0	0	0	1	2	3	0	0	0	0	1	1	4
9:15 AM	0	0	0	0	0	0	0	0	0	0	6	6	0	0	0	2	1	3	9
9:30 AM	0	0	0	0	0	0	0	0	0	5	4	9	0	0	0	0	3	3	12
9:45 AM	0	0	0	0	0	0	0	0	0	1	2	3	0	0	0	2	2	4	7
Total	0	0	0	0	0	0	0	0	0	7	14	21	0	0	0	4	7	11	32
Grand Total	0	0	0	31	3	34	0	0	0	18	142	160	0	0	0	20	677	697	891
Approach %	0.0	0.0	0.0	91.2	8.8		0.0	0.0	0.0	11.3	88.8		0.0	0.0	0.0	2.9	97.1		
Total %	0.0	0.0	0.0	3.5	0.3	3.8	0.0	0.0	0.0	2.0	15.9	18.0	0.0	0.0	0.0	2.2	76.0	78.2	
Exiting Leg Total						34						160						697	891

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:00 AM	Father Morissette Boulevard						Pedestrian Crossing Signal						Father Morissette Boulevard						
	East						South						West						
	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	U-Turn	CW-NB	CW-SB	Total	Total
7:00 AM	0	0	0	5	0	5	0	0	0	1	3	4	0	0	0	0	69	69	78
7:15 AM	0	0	0	6	0	6	0	0	0	1	33	34	0	0	0	3	134	137	177
7:30 AM	0	0	0	2	0	2	0	0	0	4	51	55	0	0	0	2	207	209	266
7:45 AM	0	0	0	1	0	1	0	0	0	0	29	29	0	0	0	0	160	160	190
Total Volume	0	0	0	14	0	14	0	0	0	6	116	122	0	0	0	5	570	575	711
% Approach Total	0.0	0.0	0.0	100.0	0.0		0.0	0.0	0.0	4.9	95.1		0.0	0.0	0.0	0.9	99.1		
PHF	0.000	0.000	0.000	0.583	0.000	0.583	0.000	0.000	0.000	0.375	0.569	0.555	0.000	0.000	0.000	0.417	0.688	0.688	0.668
Entering Leg	0	0	0	14	0	14	0	0	0	6	116	122	0	0	0	5	570	575	711
Exiting Leg						14						122						575	711
Total						28						244						1150	1422

PDI File #: **175563 BB**
Location: **S: Pedestrian Crossing Signal**
Location: **E: Father Morissette Boulevard W: Father Morissette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Class:

Cars, Heavy Vehicles, and Buses (Combined)

	Father Morissette Boulevard				Pedestrian Crossing Signal				Father Morissette Boulevard				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
2:00 PM	80	0	0	80	0	0	0	0	0	53	0	53	133
2:15 PM	60	0	0	60	0	0	0	0	0	39	0	39	99
2:30 PM	57	0	0	57	0	0	0	0	0	49	0	49	106
2:45 PM	62	0	0	62	0	0	0	0	0	59	0	59	121
Total	259	0	0	259	0	0	0	0	0	200	0	200	459
3:00 PM	57	0	0	57	0	0	0	0	1	55	0	56	113
3:15 PM	69	0	0	69	2	0	0	2	0	49	0	49	120
3:30 PM	62	0	0	62	0	0	0	0	0	82	0	82	144
3:45 PM	63	0	0	63	0	0	0	0	0	62	0	62	125
Total	251	0	0	251	2	0	0	2	1	248	0	249	502
4:00 PM	77	0	0	77	0	0	0	0	0	69	0	69	146
4:15 PM	51	0	0	51	0	0	0	0	0	70	0	70	121
4:30 PM	69	0	0	69	0	0	0	0	0	64	0	64	133
4:45 PM	78	0	0	78	0	0	0	0	0	75	0	75	153
Total	275	0	0	275	0	0	0	0	0	278	0	278	553
5:00 PM	79	0	0	79	0	0	0	0	0	85	0	85	164
5:15 PM	75	0	0	75	0	0	0	0	0	75	0	75	150
5:30 PM	99	0	0	99	0	0	0	0	0	66	0	66	165
5:45 PM	81	0	0	81	0	0	0	0	1	62	0	63	144
Total	334	0	0	334	0	0	0	0	1	288	0	289	623
Grand Total	1119	0	0	1119	2	0	0	2	2	1014	0	1016	2137
Approach %	100.0	0.0	0.0		100.0	0.0	0.0		0.2	99.8	0.0		
Total %	52.4	0.0	0.0	52.4	0.1	0.0	0.0	0.1	0.1	47.4	0.0	47.5	
Exiting Leg Total				1016				2				1119	2137
Cars	1103	0	0	1103	2	0	0	2	2	973	0	975	2080
% Cars	98.6	0.0	0.0	98.6	100.0	0.0	0.0	100.0	100.0	96.0	0.0	96.0	97.3
Exiting Leg Total				975				2				1103	2080
Heavy Vehicles	5	0	0	5	0	0	0	0	0	7	0	7	12
% Heavy Vehicles	0.4	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.7	0.6
Exiting Leg Total				7				0				5	12
Buses	11	0	0	11	0	0	0	0	0	34	0	34	45
% Buses	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	3.4	0.0	3.3	2.1
Exiting Leg Total				34				0				11	45

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

4:45 PM	Father Morissette Boulevard				Pedestrian Crossing Signal				Father Morissette Boulevard				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
4:45 PM	78	0	0	78	0	0	0	0	0	75	0	75	153
5:00 PM	79	0	0	79	0	0	0	0	0	85	0	85	164
5:15 PM	75	0	0	75	0	0	0	0	0	75	0	75	150
5:30 PM	99	0	0	99	0	0	0	0	0	66	0	66	165
Total Volume	331	0	0	331	0	0	0	0	0	301	0	301	632
% Approach Total	100.0	0.0	0.0		0.0	0.0	0.0		0.0	100.0	0.0		
PHF	0.836	0.000	0.000	0.836	0.000	0.000	0.000	0.000	0.000	0.885	0.000	0.885	0.958
Cars	329	0	0	329	0	0	0	0	0	289	0	289	618
Cars %	99.4	0.0	0.0	99.4	0.0	0.0	0.0	0.0	0.0	96.0	0.0	96.0	97.8
Heavy Vehicles	0	0	0	0	0	0	0	0	0	3	0	3	3
Heavy Vehicles %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.5
Buses	2	0	0	2	0	0	0	0	0	9	0	9	11
Buses %	0.6	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	3.0	0.0	3.0	1.7

PDI File #: **175563 BB**
Location: **S: Pedestrian Crossing Signal**
Location: **E: Father Morissette Boulevard W: Father Morissette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Class: **Cars, Heavy Vehicles, and Buses (Combined)**

	Father Morissette Boulevard				Pedestrian Crossing Signal				Father Morissette Boulevard				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
Cars Enter Leg	329	0	0	329	0	0	0	0	0	289	0	289	618
Heavy Enter Leg	0	0	0	0	0	0	0	0	0	3	0	3	3
Bus Enter Leg	2	0	0	2	0	0	0	0	0	9	0	9	11
Total Entering Leg	331	0	0	331	0	0	0	0	0	301	0	301	632
Cars Exiting Leg				289				0				329	618
Heavy Exiting Leg				3				0				0	3
Buses Exiting Leg				9				0				2	11
Total Exiting Leg				301				0				331	632

PDI File #: **175563 BB**
Location: **S: Pedestrian Crossing Signal**
Location: **E: Father Morissette Boulevard W: Father Morissette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars

	Father Morissette Boulevard				Pedestrian Crossing Signal				Father Morissette Boulevard				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
2:00 PM	75	0	0	75	0	0	0	0	0	49	0	49	124
2:15 PM	60	0	0	60	0	0	0	0	0	35	0	35	95
2:30 PM	55	0	0	55	0	0	0	0	0	47	0	47	102
2:45 PM	62	0	0	62	0	0	0	0	0	56	0	56	118
Total	252	0	0	252	0	0	0	0	0	187	0	187	439
3:00 PM	57	0	0	57	0	0	0	0	1	54	0	55	112
3:15 PM	68	0	0	68	2	0	0	2	0	48	0	48	118
3:30 PM	62	0	0	62	0	0	0	0	0	80	0	80	142
3:45 PM	63	0	0	63	0	0	0	0	0	59	0	59	122
Total	250	0	0	250	2	0	0	2	1	241	0	242	494
4:00 PM	76	0	0	76	0	0	0	0	0	67	0	67	143
4:15 PM	48	0	0	48	0	0	0	0	0	68	0	68	116
4:30 PM	68	0	0	68	0	0	0	0	0	63	0	63	131
4:45 PM	77	0	0	77	0	0	0	0	0	70	0	70	147
Total	269	0	0	269	0	0	0	0	0	268	0	268	537
5:00 PM	79	0	0	79	0	0	0	0	0	82	0	82	161
5:15 PM	74	0	0	74	0	0	0	0	0	73	0	73	147
5:30 PM	99	0	0	99	0	0	0	0	0	64	0	64	163
5:45 PM	80	0	0	80	0	0	0	0	1	58	0	59	139
Total	332	0	0	332	0	0	0	0	1	277	0	278	610
Grand Total	1103	0	0	1103	2	0	0	2	2	973	0	975	2080
Approach %	100.0	0.0	0.0		100.0	0.0	0.0		0.2	99.8	0.0		
Total %	53.0	0.0	0.0	53.0	0.1	0.0	0.0	0.1	0.1	46.8	0.0	46.9	
Exiting Leg Total				975				2				1103	2080

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

4:45 PM	Father Morissette Boulevard				Pedestrian Crossing Signal				Father Morissette Boulevard				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
4:45 PM	77	0	0	77	0	0	0	0	0	70	0	70	147
5:00 PM	79	0	0	79	0	0	0	0	0	82	0	82	161
5:15 PM	74	0	0	74	0	0	0	0	0	73	0	73	147
5:30 PM	99	0	0	99	0	0	0	0	0	64	0	64	163
Total Volume	329	0	0	329	0	0	0	0	0	289	0	289	618
% Approach Total	100.0	0.0	0.0		0.0	0.0	0.0		0.0	100.0	0.0		
PHF	0.831	0.000	0.000	0.831	0.000	0.000	0.000	0.000	0.000	0.881	0.000	0.881	0.948
Entering Leg	329	0	0	329	0	0	0	0	0	289	0	289	618
Exiting Leg				289				0				329	618
Total				618				0				618	1236

PDI File #: **175563 BB**
Location: **S: Pedestrian Crossing Signal**
Location: **E: Father Morissette Boulevard W: Father Morissette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Heavy Vehicles

	Father Morissette Boulevard				Pedestrian Crossing Signal				Father Morissette Boulevard				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
2:00 PM	2	0	0	2	0	0	0	0	0	2	0	2	4
2:15 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
2:30 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2	0	0	2	0	0	0	0	0	4	0	4	6
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	1	0	0	1	0	0	0	0	0	0	0	0	1
4:30 PM	1	0	0	1	0	0	0	0	0	0	0	0	1
4:45 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
Total	2	0	0	2	0	0	0	0	0	1	0	1	3
5:00 PM	0	0	0	0	0	0	0	0	0	2	0	2	2
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	1	0	0	1	0	0	0	0	0	0	0	0	1
Total	1	0	0	1	0	0	0	0	0	2	0	2	3
Grand Total	5	0	0	5	0	0	0	0	0	7	0	7	12
Approach %	100.0	0.0	0.0		0.0	0.0	0.0		0.0	100.0	0.0		
Total %	41.7	0.0	0.0	41.7	0.0	0.0	0.0	0.0	0.0	58.3	0.0	58.3	
Exiting Leg Total				7				0				5	12

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:00 PM	Father Morissette Boulevard				Pedestrian Crossing Signal				Father Morissette Boulevard				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
2:00 PM	2	0	0	2	0	0	0	0	0	2	0	2	4
2:15 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
2:30 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	2	0	0	2	0	0	0	0	0	4	0	4	6
% Approach Total	100.0	0.0	0.0		0.0	0.0	0.0		0.0	100.0	0.0		
PHF	0.250	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.500	0.375
Entering Leg	2	0	0	2	0	0	0	0	0	4	0	4	6
Exiting Leg				4				0				2	6
Total				6				0				6	12

PDI File #: **175563 BB**
Location: **S: Pedestrian Crossing Signal**
Location: **E: Father Morissette Boulevard W: Father Morissette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Buses

	Father Morissette Boulevard				Pedestrian Crossing Signal				Father Morissette Boulevard				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
2:00 PM	3	0	0	3	0	0	0	0	0	2	0	2	5
2:15 PM	0	0	0	0	0	0	0	0	0	3	0	3	3
2:30 PM	2	0	0	2	0	0	0	0	0	1	0	1	3
2:45 PM	0	0	0	0	0	0	0	0	0	3	0	3	3
Total	5	0	0	5	0	0	0	0	0	9	0	9	14
3:00 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
3:15 PM	1	0	0	1	0	0	0	0	0	1	0	1	2
3:30 PM	0	0	0	0	0	0	0	0	0	2	0	2	2
3:45 PM	0	0	0	0	0	0	0	0	0	3	0	3	3
Total	1	0	0	1	0	0	0	0	0	7	0	7	8
4:00 PM	1	0	0	1	0	0	0	0	0	2	0	2	3
4:15 PM	2	0	0	2	0	0	0	0	0	2	0	2	4
4:30 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
4:45 PM	1	0	0	1	0	0	0	0	0	4	0	4	5
Total	4	0	0	4	0	0	0	0	0	9	0	9	13
5:00 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
5:15 PM	1	0	0	1	0	0	0	0	0	2	0	2	3
5:30 PM	0	0	0	0	0	0	0	0	0	2	0	2	2
5:45 PM	0	0	0	0	0	0	0	0	0	4	0	4	4
Total	1	0	0	1	0	0	0	0	0	9	0	9	10
Grand Total	11	0	0	11	0	0	0	0	0	34	0	34	45
Approach %	100.0	0.0	0.0		0.0	0.0	0.0		0.0	100.0	0.0		
Total %	24.4	0.0	0.0	24.4	0.0	0.0	0.0	0.0	0.0	75.6	0.0	75.6	
Exiting Leg Total				34				0				11	45

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:00 PM	Father Morissette Boulevard				Pedestrian Crossing Signal				Father Morissette Boulevard				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
2:00 PM	3	0	0	3	0	0	0	0	0	2	0	2	5
2:15 PM	0	0	0	0	0	0	0	0	0	3	0	3	3
2:30 PM	2	0	0	2	0	0	0	0	0	1	0	1	3
2:45 PM	0	0	0	0	0	0	0	0	0	3	0	3	3
Total Volume	5	0	0	5	0	0	0	0	0	9	0	9	14
% Approach Total	100.0	0.0	0.0		0.0	0.0	0.0		0.0	100.0	0.0		
PHF	0.417	0.000	0.000	0.417	0.000	0.000	0.000	0.000	0.000	0.750	0.000	0.750	0.700
Entering Leg	5	0	0	5	0	0	0	0	0	9	0	9	14
Exiting Leg				9				0				5	14
Total				14				0				14	28

PDI File #: **175563 BB**
Location: **S: Pedestrian Crossing Signal**
Location: **E: Father Morissette Boulevard W: Father Morissette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Bicycles (on Roadway and Crosswalks)

	Father Morissette Boulevard						Pedestrian Crossing Signal						Father Morissette Boulevard						
	East						South						West						
	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	U-Turn	CW-NB	CW-SB	Total	Total
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Grand Total	3	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
Approach %	100.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		
Total %	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Exiting Leg Total						0						0						3	3

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:00 PM	Father Morissette Boulevard						Pedestrian Crossing Signal						Father Morissette Boulevard						
	East						South						West						
	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	U-Turn	CW-NB	CW-SB	Total	Total
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Approach Total	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg						0						0						0	0
Total						0						0						0	0

PDI File #: **175563 BB**
Location: **S: Pedestrian Crossing Signal**
Location: **E: Father Morissette Boulevard W: Father Morissette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Pedestrians

	Father Morissette Boulevard						Pedestrian Crossing Signal						Father Morissette Boulevard						
	East						South						West						
	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	U-Turn	CW-NB	CW-SB	Total	Total
2:00 PM	0	0	0	0	2	2	0	0	0	4	1	5	0	0	0	6	3	9	16
2:15 PM	0	0	0	0	0	0	0	0	0	2	2	4	0	0	0	1	0	1	5
2:30 PM	0	0	0	1	1	2	0	0	0	1	3	4	0	0	0	8	1	9	15
2:45 PM	0	0	0	0	1	1	0	0	0	0	4	4	0	0	0	7	3	10	15
Total	0	0	0	1	4	5	0	0	0	7	10	17	0	0	0	22	7	29	51
3:00 PM	0	0	0	0	0	0	0	0	0	2	3	5	0	0	0	1	5	6	11
3:15 PM	0	0	0	0	11	11	0	0	0	0	5	5	0	0	0	29	6	35	51
3:30 PM	0	0	0	0	6	6	0	0	0	1	5	6	0	0	0	20	1	21	33
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	8	8
Total	0	0	0	0	17	17	0	0	0	3	13	16	0	0	0	58	12	70	103
4:00 PM	0	0	0	0	0	0	0	0	0	1	2	3	0	0	0	2	0	2	5
4:15 PM	0	0	0	0	0	0	0	0	0	0	18	18	0	0	0	4	1	5	23
4:30 PM	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	2	1	3	5
4:45 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	2	3	4
Total	0	0	0	0	1	1	0	0	0	2	21	23	0	0	0	9	4	13	37
5:00 PM	0	0	0	0	0	0	0	0	0	2	1	3	0	0	0	1	2	3	6
5:15 PM	0	0	0	3	0	3	0	0	0	1	4	5	0	0	0	1	13	14	22
5:30 PM	0	0	0	1	0	1	0	0	0	0	3	3	0	0	0	1	15	16	20
5:45 PM	0	0	0	1	0	1	0	0	0	2	3	5	0	0	0	4	32	36	42
Total	0	0	0	5	0	5	0	0	0	5	11	16	0	0	0	7	62	69	90
Grand Total	0	0	0	6	22	28	0	0	0	17	55	72	0	0	0	96	85	181	281
Approach %	0.0	0.0	0.0	21.4	78.6		0.0	0.0	0.0	23.6	76.4		0.0	0.0	0.0	53.0	47.0		
Total %	0.0	0.0	0.0	2.1	7.8	10.0	0.0	0.0	0.0	6.0	19.6	25.6	0.0	0.0	0.0	34.2	30.2	64.4	
Exiting Leg Total						28						72						181	281

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:45 PM	Father Morissette Boulevard						Pedestrian Crossing Signal						Father Morissette Boulevard						
	East						South						West						
	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	U-Turn	CW-NB	CW-SB	Total	Total
2:45 PM	0	0	0	0	1	1	0	0	0	0	4	4	0	0	0	7	3	10	15
3:00 PM	0	0	0	0	0	0	0	0	0	2	3	5	0	0	0	1	5	6	11
3:15 PM	0	0	0	0	11	11	0	0	0	0	5	5	0	0	0	29	6	35	51
3:30 PM	0	0	0	0	6	6	0	0	0	1	5	6	0	0	0	20	1	21	33
Total Volume	0	0	0	0	18	18	0	0	0	3	17	20	0	0	0	57	15	72	110
% Approach Total	0.0	0.0	0.0	0.0	100.0		0.0	0.0	0.0	15.0	85.0		0.0	0.0	0.0	79.2	20.8		
PHF	0.000	0.000	0.000	0.000	0.409	0.409	0.000	0.000	0.000	0.375	0.850	0.833	0.000	0.000	0.000	0.491	0.625	0.514	0.539
Entering Leg	0	0	0	0	18	18	0	0	0	3	17	20	0	0	0	57	15	72	110
Exiting Leg						18						20						72	110
Total						36						40						144	220

PDI File #: **175563 C**
Location: **N: Driveway S: Kirk Street**
Location: **E: French Street W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars, Heavy Vehicles, and Buses (Combined)

	Driveway					French Street					Kirk Street					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
6:00 AM	0	0	0	0	0	0	29	0	0	29	0	0	4	0	4	0	14	1	0	15	48
6:15 AM	0	0	0	0	0	0	30	0	0	30	3	0	4	0	7	0	27	1	0	28	65
6:30 AM	0	0	0	0	0	0	39	0	0	39	4	0	5	0	9	0	31	0	0	31	79
6:45 AM	0	0	0	0	0	0	63	0	0	63	5	0	14	0	19	0	46	0	0	46	128
Total	0	0	0	0	0	0	161	0	0	161	12	0	27	0	39	0	118	2	0	120	320
7:00 AM	0	0	0	0	0	0	60	0	0	60	7	0	21	0	28	0	44	0	1	45	133
7:15 AM	1	0	0	0	1	0	79	0	1	80	18	0	42	0	60	0	106	2	2	110	251
7:30 AM	2	0	2	0	4	2	102	0	0	104	31	0	53	0	84	0	115	3	2	120	312
7:45 AM	8	0	0	0	8	0	89	0	0	89	33	0	59	0	92	0	106	7	1	114	303
Total	11	0	2	0	13	2	330	0	1	333	89	0	175	0	264	0	371	12	6	389	999
8:00 AM	1	0	0	0	1	3	57	0	0	60	9	0	12	0	21	0	62	1	0	63	145
8:15 AM	1	0	0	0	1	0	58	0	0	58	6	0	9	0	15	0	60	4	0	64	138
8:30 AM	1	0	0	0	1	0	58	0	0	58	13	0	6	0	19	0	53	2	0	55	133
8:45 AM	1	0	0	0	1	0	64	0	0	64	8	0	6	0	14	0	59	0	0	59	138
Total	4	0	0	0	4	3	237	0	0	240	36	0	33	0	69	0	234	7	0	241	554
9:00 AM	1	0	0	0	1	0	60	0	0	60	5	0	5	0	10	0	50	2	1	53	124
9:15 AM	0	0	1	0	1	0	64	0	0	64	5	0	7	0	12	0	37	1	0	38	115
9:30 AM	0	0	0	0	0	0	66	0	0	66	13	0	9	0	22	0	37	1	0	38	126
9:45 AM	0	0	1	0	1	0	63	0	0	63	8	0	6	0	14	0	40	0	1	41	119
Total	1	0	2	0	3	0	253	0	0	253	31	0	27	0	58	0	164	4	2	170	484
Grand Total	16	0	4	0	20	5	981	0	1	987	168	0	262	0	430	0	887	25	8	920	2357
Approach %	80.0	0.0	20.0	0.0		0.5	99.4	0.0	0.1		39.1	0.0	60.9	0.0		0.0	96.4	2.7	0.9		
Total %	0.7	0.0	0.2	0.0	0.8	0.2	41.6	0.0	0.0	41.9	7.1	0.0	11.1	0.0	18.2	0.0	37.6	1.1	0.3	39.0	
Exiting Leg Total					30					1060					0					1267	2357
Cars	13	0	4	0	17	4	946	0	1	951	166	0	243	0	409	0	832	24	6	862	2239
% Cars	81.3	0.0	100.0	0.0	85.0	80.0	96.4	0.0	100.0	96.4	98.8	0.0	92.7	0.0	95.1	0.0	93.8	96.0	75.0	93.7	95.0
Exiting Leg Total					28					1003					0					1208	2239
Heavy Vehicles	3	0	0	0	3	1	12	0	0	13	2	0	3	0	5	0	12	1	2	15	36
% Heavy Vehicles	18.8	0.0	0.0	0.0	15.0	20.0	1.2	0.0	0.0	1.3	1.2	0.0	1.1	0.0	1.2	0.0	1.4	4.0	25.0	1.6	1.5
Exiting Leg Total					2					14					0					20	36
Buses	0	0	0	0	0	0	23	0	0	23	0	0	16	0	16	0	43	0	0	43	82
% Buses	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.0	0.0	2.3	0.0	0.0	6.1	0.0	3.7	0.0	4.8	0.0	0.0	4.7	3.5
Exiting Leg Total					0					43					0					39	82

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:15 AM	Driveway					French Street					Kirk Street					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
7:15 AM	1	0	0	0	1	0	79	0	1	80	18	0	42	0	60	0	106	2	2	110	251
7:30 AM	2	0	2	0	4	2	102	0	0	104	31	0	53	0	84	0	115	3	2	120	312
7:45 AM	8	0	0	0	8	0	89	0	0	89	33	0	59	0	92	0	106	7	1	114	303
8:00 AM	1	0	0	0	1	3	57	0	0	60	9	0	12	0	21	0	62	1	0	63	145
Total Volume	12	0	2	0	14	5	327	0	1	333	91	0	166	0	257	0	389	13	5	407	1011
% Approach Total	85.7	0.0	14.3	0.0		1.5	98.2	0.0	0.3		35.4	0.0	64.6	0.0		0.0	95.6	3.2	1.2		
PHF	0.375	0.000	0.250	0.000	0.438	0.417	0.801	0.000	0.250	0.800	0.689	0.000	0.703	0.000	0.698	0.000	0.846	0.464	0.625	0.848	0.810
Cars	10	0	2	0	12	4	318	0	1	323	90	0	159	0	249	0	369	12	5	386	970
Cars %	83.3	0.0	100.0	0.0	85.7	80.0	97.2	0.0	100.0	97.0	98.9	0.0	95.8	0.0	96.9	0.0	94.9	92.3	100.0	94.8	95.9
Heavy Vehicles	2	0	0	0	2	1	3	0	0	4	1	0	0	0	1	0	5	1	0	6	13
Heavy Vehicles %	16.7	0.0	0.0	0.0	14.3	20.0	0.9	0.0	0.0	1.2	1.1	0.0	0.0	0.0	0.4	0.0	1.3	7.7	0.0	1.5	1.3
Buses	0	0	0	0	0	0	6	0	0	6	0	0	7	0	7	0	15	0	0	15	28
Buses %	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.0	1.8	0.0	0.0	4.2	0.0	2.7	0.0	3.9	0.0	0.0	3.7	2.8

PDI File #: **175563 C**
Location: **N: Driveway S: Kirk Street**
Location: **E: French Street W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars, Heavy Vehicles, and Buses (Combined)

	Driveway					French Street					Kirk Street					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
Cars Enter Leg	10	0	2	0	12	4	318	0	1	323	90	0	159	0	249	0	369	12	5	386	970
Heavy Enter Leg	2	0	0	0	2	1	3	0	0	4	1	0	0	0	1	0	5	1	0	6	13
Bus Enter Leg	0	0	0	0	0	0	6	0	0	6	0	0	7	0	7	0	15	0	0	15	28
Total Entering Leg	12	0	2	0	14	5	327	0	1	333	91	0	166	0	257	0	389	13	5	407	1011
Cars Exiting Leg					16					462					0					492	970
Heavy Exiting Leg					2					6					0					5	13
Buses Exiting Leg					0					15					0					13	28
Total Exiting Leg					18					483					0					510	1011

PDI File #: **175563 C**
Location: **N: Driveway S: Kirk Street**
Location: **E: French Street W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
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46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars

	Driveway					French Street					Kirk Street					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
6:00 AM	0	0	0	0	0	0	24	0	0	24	0	0	4	0	4	0	13	1	0	14	42
6:15 AM	0	0	0	0	0	0	29	0	0	29	3	0	3	0	6	0	25	1	0	26	61
6:30 AM	0	0	0	0	0	0	39	0	0	39	4	0	4	0	8	0	28	0	0	28	75
6:45 AM	0	0	0	0	0	0	60	0	0	60	5	0	12	0	17	0	43	0	0	43	120
Total	0	0	0	0	0	0	152	0	0	152	12	0	23	0	35	0	109	2	0	111	298
7:00 AM	0	0	0	0	0	0	60	0	0	60	7	0	19	0	26	0	43	0	0	43	129
7:15 AM	0	0	0	0	0	0	78	0	1	79	18	0	39	0	57	0	97	1	2	100	236
7:30 AM	2	0	2	0	4	2	100	0	0	102	31	0	52	0	83	0	113	3	2	118	307
7:45 AM	8	0	0	0	8	0	87	0	0	87	33	0	59	0	92	0	102	7	1	110	297
Total	10	0	2	0	12	2	325	0	1	328	89	0	169	0	258	0	355	11	5	371	969
8:00 AM	0	0	0	0	0	2	53	0	0	55	8	0	9	0	17	0	57	1	0	58	130
8:15 AM	1	0	0	0	1	0	56	0	0	56	5	0	8	0	13	0	55	4	0	59	129
8:30 AM	0	0	0	0	0	0	55	0	0	55	13	0	3	0	16	0	51	2	0	53	124
8:45 AM	1	0	0	0	1	0	63	0	0	63	8	0	5	0	13	0	56	0	0	56	133
Total	2	0	0	0	2	2	227	0	0	229	34	0	25	0	59	0	219	7	0	226	516
9:00 AM	1	0	0	0	1	0	59	0	0	59	5	0	5	0	10	0	48	2	1	51	121
9:15 AM	0	0	1	0	1	0	64	0	0	64	5	0	6	0	11	0	34	1	0	35	111
9:30 AM	0	0	0	0	0	0	62	0	0	62	13	0	9	0	22	0	35	1	0	36	120
9:45 AM	0	0	1	0	1	0	57	0	0	57	8	0	6	0	14	0	32	0	0	32	104
Total	1	0	2	0	3	0	242	0	0	242	31	0	26	0	57	0	149	4	1	154	456
Grand Total	13	0	4	0	17	4	946	0	1	951	166	0	243	0	409	0	832	24	6	862	2239
Approach %	76.5	0.0	23.5	0.0		0.4	99.5	0.0	0.1		40.6	0.0	59.4	0.0		0.0	96.5	2.8	0.7		
Total %	0.6	0.0	0.2	0.0	0.8	0.2	42.3	0.0	0.0	42.5	7.4	0.0	10.9	0.0	18.3	0.0	37.2	1.1	0.3	38.5	
Exiting Leg Total					28					1003					0					1208	2239

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:15 AM	Driveway					French Street					Kirk Street					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
7:15 AM	0	0	0	0	0	0	78	0	1	79	18	0	39	0	57	0	97	1	2	100	236
7:30 AM	2	0	2	0	4	2	100	0	0	102	31	0	52	0	83	0	113	3	2	118	307
7:45 AM	8	0	0	0	8	0	87	0	0	87	33	0	59	0	92	0	102	7	1	110	297
8:00 AM	0	0	0	0	0	2	53	0	0	55	8	0	9	0	17	0	57	1	0	58	130
Total Volume	10	0	2	0	12	4	318	0	1	323	90	0	159	0	249	0	369	12	5	386	970
% Approach Total	83.3	0.0	16.7	0.0		1.2	98.5	0.0	0.3		36.1	0.0	63.9	0.0		0.0	95.6	3.1	1.3		
PHF	0.313	0.000	0.250	0.000	0.375	0.500	0.795	0.000	0.250	0.792	0.682	0.000	0.674	0.000	0.677	0.000	0.816	0.429	0.625	0.818	0.790
Entering Leg	10	0	2	0	12	4	318	0	1	323	90	0	159	0	249	0	369	12	5	386	970
Exiting Leg					16					462					0					492	970
Total					28					785					249					878	1940

PDI File #: **175563 C**
Location: **N: Driveway S: Kirk Street**
Location: **E: French Street W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Heavy Vehicles

	Driveway (North)					French Street (East)					Kirk Street (South)					Father Morisette Boulevard (West)					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
6:00 AM	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	4
6:15 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	5	0	0	5	0	0	1	0	1	0	0	0	0	0	6
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
7:15 AM	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	1	1	0	2	4
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	3
Total	1	0	0	0	1	0	3	0	0	3	0	0	0	0	0	0	2	1	1	4	8
8:00 AM	1	0	0	0	1	1	0	0	0	1	1	0	0	0	1	0	3	0	0	3	6
8:15 AM	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2	0	1	0	0	1	3
8:30 AM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
Total	2	0	0	0	2	1	0	0	0	1	2	0	2	0	4	0	4	0	0	4	11
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	4	0	1	5	9
Total	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	6	0	1	7	11
Grand Total	3	0	0	0	3	1	12	0	0	13	2	0	3	0	5	0	12	1	2	15	36
Approach %	100.0	0.0	0.0	0.0		7.7	92.3	0.0	0.0		40.0	0.0	60.0	0.0		0.0	80.0	6.7	13.3		
Total %	8.3	0.0	0.0	0.0	8.3	2.8	33.3	0.0	0.0	36.1	5.6	0.0	8.3	0.0	13.9	0.0	33.3	2.8	5.6	41.7	
Exiting Leg Total					2					14					0					20	36

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:15 AM	Driveway (North)					French Street (East)					Kirk Street (South)					Father Morisette Boulevard (West)					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
7:15 AM	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	1	1	0	2	4
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	3
8:00 AM	1	0	0	0	1	1	0	0	0	1	1	0	0	0	1	0	3	0	0	3	6
Total Volume	2	0	0	0	2	1	3	0	0	4	1	0	0	0	1	0	5	1	0	6	13
% Approach Total	100.0	0.0	0.0	0.0		25.0	75.0	0.0	0.0		100.0	0.0	0.0	0.0		0.0	83.3	16.7	0.0		
PHF	0.500	0.000	0.000	0.000	0.500	0.250	0.375	0.000	0.000	0.500	0.250	0.000	0.000	0.000	0.250	0.000	0.417	0.250	0.000	0.500	0.542
Entering Leg	2	0	0	0	2	1	3	0	0	4	1	0	0	0	1	0	5	1	0	6	13
Exiting Leg					2					6					0					5	13
Total					4					10					1					11	26

PDI File #: **175563 C**
Location: **N: Driveway S: Kirk Street**
Location: **E: French Street W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Buses

	Driveway					French Street					Kirk Street					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
6:00 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	2
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2	0	0	2	3
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	3
6:45 AM	0	0	0	0	0	0	3	0	0	3	0	0	2	0	2	0	3	0	0	3	8
Total	0	0	0	0	0	0	4	0	0	4	0	0	3	0	3	0	9	0	0	9	16
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	1	0	0	1	3
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	0	8	0	0	8	11
7:30 AM	0	0	0	0	0	0	2	0	0	2	0	0	1	0	1	0	2	0	0	2	5
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	3
Total	0	0	0	0	0	0	2	0	0	2	0	0	6	0	6	0	14	0	0	14	22
8:00 AM	0	0	0	0	0	0	4	0	0	4	0	0	3	0	3	0	2	0	0	2	9
8:15 AM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	4	0	0	4	6
8:30 AM	0	0	0	0	0	0	3	0	0	3	0	0	3	0	3	0	2	0	0	2	8
8:45 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	4
Total	0	0	0	0	0	0	10	0	0	10	0	0	6	0	6	0	11	0	0	11	27
9:00 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	2
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2	0	0	2	3
9:30 AM	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	2	0	0	2	6
9:45 AM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	4	0	0	4	6
Total	0	0	0	0	0	0	7	0	0	7	0	0	1	0	1	0	9	0	0	9	17
Grand Total	0	0	0	0	0	0	23	0	0	23	0	0	16	0	16	0	43	0	0	43	82
Approach %	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0		0.0	0.0	100.0	0.0		0.0	100.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.0	28.0	0.0	0.0	28.0	0.0	0.0	19.5	0.0	19.5	0.0	52.4	0.0	0.0	52.4	
Exiting Leg Total					0					43					0					39	82

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:15 AM	Driveway					French Street					Kirk Street					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	0	8	0	0	8	11
7:30 AM	0	0	0	0	0	0	2	0	0	2	0	0	1	0	1	0	2	0	0	2	5
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	3
8:00 AM	0	0	0	0	0	0	4	0	0	4	0	0	3	0	3	0	2	0	0	2	9
Total Volume	0	0	0	0	0	0	6	0	0	6	0	0	7	0	7	0	15	0	0	15	28
% Approach Total	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0		0.0	0.0	100.0	0.0		0.0	100.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.375	0.000	0.000	0.375	0.000	0.000	0.583	0.000	0.583	0.000	0.469	0.000	0.000	0.469	0.636
Entering Leg	0	0	0	0	0	0	6	0	0	6	0	0	7	0	7	0	15	0	0	15	28
Exiting Leg					0					15					0					13	28
Total					0					21					7					28	56

PDI File #: **175563 C**
Location: **N: Driveway S: Kirk Street**
Location: **E: French Street W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
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Class:

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Bicycles (on Roadway and Crosswalks)

	Driveway							French Street							Kirk Street							Father Morisette Boulevard							
	North							East							South							West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1
Total	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	2
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00 AM	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Grand Total	0	0	0	0	1	0	1	0	1	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	3
Approach %	0.0	0.0	0.0	0.0	100.0	0.0		0.0	100.0	0.0	0.0	0.0	0.0		0.0	0.0	100.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	33.3	0.0	33.3	0.0	33.3	0.0	0.0	0.0	0.0	33.3	0.0	0.0	33.3	0.0	0.0	0.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Exiting Leg Total							1							0							0							2	3

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:00 AM	Driveway							French Street							Kirk Street							Father Morisette Boulevard							
	North							East							South							West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
7:00 AM	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1
Total Volume	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	2
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0	0.0		0.0	0.0	100.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.250	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.500
Entering Leg	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	2
Exiting Leg							0							0							0							2	2
Total							0							1							1							2	4

PDI File #: **175563 C**
Location: **N: Driveway S: Kirk Street**
Location: **E: French Street W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Pedestrians

	Driveway							French Street							Kirk Street							Father Morisette Boulevard							
	North							East							South							West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
6:00 AM	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1
6:30 AM	0	0	0	0	1	3	4	0	0	0	0	2	1	3	0	0	0	0	2	1	3	0	0	0	0	0	2	2	12
6:45 AM	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	3	1	4	0	0	0	0	0	0	0	5
Total	0	0	0	0	2	4	6	0	0	0	0	2	1	3	0	0	0	0	6	2	8	0	0	0	0	0	2	2	19
7:00 AM	0	0	0	0	0	2	2	0	0	0	0	1	0	1	0	0	0	0	3	7	10	0	0	0	0	0	0	0	13
7:15 AM	0	0	0	0	4	1	5	0	0	0	0	2	1	3	0	0	0	0	5	13	18	0	0	0	0	0	0	0	26
7:30 AM	0	0	0	0	4	7	11	0	0	0	0	27	0	27	0	0	0	0	28	8	36	0	0	0	0	0	0	0	74
7:45 AM	0	0	0	0	4	2	6	0	0	0	0	29	1	30	0	0	0	0	25	9	34	0	0	0	0	0	2	2	72
Total	0	0	0	0	12	12	24	0	0	0	0	59	2	61	0	0	0	0	61	37	98	0	0	0	0	0	2	2	185
8:00 AM	0	0	0	0	0	1	1	0	0	0	0	1	2	3	0	0	0	0	1	2	3	0	0	0	0	0	1	1	8
8:15 AM	0	0	0	0	2	0	2	0	0	0	0	1	0	1	0	0	0	0	13	5	18	0	0	0	0	0	1	1	22
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	2	3	5	0	0	0	0	3	1	4	0	0	0	0	0	1	1	10
8:45 AM	0	0	0	0	3	0	3	0	0	0	0	3	2	5	0	0	0	0	1	10	11	0	0	0	0	0	1	1	20
Total	0	0	0	0	5	1	6	0	0	0	0	7	7	14	0	0	0	0	18	18	36	0	0	0	0	0	4	4	60
9:00 AM	0	0	0	0	4	1	5	0	0	0	0	0	0	0	0	0	0	0	5	2	7	0	0	0	0	0	0	0	12
9:15 AM	0	0	0	0	2	1	3	0	0	0	0	0	1	1	0	0	0	0	7	2	9	0	0	0	0	0	1	1	14
9:30 AM	0	0	0	0	2	1	3	0	0	0	0	1	0	1	0	0	0	0	1	4	5	0	0	0	0	0	0	0	9
9:45 AM	0	0	0	0	1	4	5	0	0	0	0	0	0	0	0	0	0	0	18	14	32	0	0	0	0	1	0	1	38
Total	0	0	0	0	9	7	16	0	0	0	0	1	1	2	0	0	0	0	31	22	53	0	0	0	0	1	1	2	73
Grand Total	0	0	0	0	28	24	52	0	0	0	0	69	11	80	0	0	0	0	116	79	195	0	0	0	0	1	9	10	337
Approach %	0.0	0.0	0.0	0.0	53.8	46.2		0.0	0.0	0.0	0.0	86.3	13.8		0.0	0.0	0.0	0.0	59.5	40.5		0.0	0.0	0.0	0.0	10.0	90.0		
Total %	0.0	0.0	0.0	0.0	8.3	7.1	15.4	0.0	0.0	0.0	0.0	20.5	3.3	23.7	0.0	0.0	0.0	0.0	34.4	23.4	57.9	0.0	0.0	0.0	0.0	0.3	2.7	3.0	
Exiting Leg Total							52							80							195							10	337

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:00 AM	Driveway							French Street							Kirk Street							Father Morisette Boulevard							
	North							East							South							West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
7:00 AM	0	0	0	0	0	2	2	0	0	0	0	1	0	1	0	0	0	0	3	7	10	0	0	0	0	0	0	0	13
7:15 AM	0	0	0	0	4	1	5	0	0	0	0	2	1	3	0	0	0	0	5	13	18	0	0	0	0	0	0	0	26
7:30 AM	0	0	0	0	4	7	11	0	0	0	0	27	0	27	0	0	0	0	28	8	36	0	0	0	0	0	0	0	74
7:45 AM	0	0	0	0	4	2	6	0	0	0	0	29	1	30	0	0	0	0	25	9	34	0	0	0	0	0	2	2	72
Total Volume	0	0	0	0	12	12	24	0	0	0	0	59	2	61	0	0	0	0	61	37	98	0	0	0	0	0	2	2	185
% Approach Total	0.0	0.0	0.0	0.0	50.0	50.0		0.0	0.0	0.0	0.0	96.7	3.3		0.0	0.0	0.0	0.0	62.2	37.8		0.0	0.0	0.0	0.0	0.0	100.0		
PHF	0.000	0.000	0.000	0.000	0.750	0.429	0.545	0.000	0.000	0.000	0.000	0.509	0.500	0.508	0.000	0.000	0.000	0.000	0.545	0.712	0.681	0.000	0.000	0.000	0.000	0.000	0.250	0.250	0.625
Entering Leg	0	0	0	0	12	12	24	0	0	0	0	59	2	61	0	0	0	0	61	37	98	0	0	0	0	0	2	2	185
Exiting Leg							24							61							98							2	185
Total							48							122							196							4	370

PDI File #: **175563 CC**
Location: **N: Driveway S: Kirk Street**
Location: **E: French Street W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars, Heavy Vehicles, and Buses (Combined)

	Driveway					French Street					Kirk Street					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	0	0	0	0	0	0	70	0	0	70	7	0	12	0	19	0	58	0	0	58	147
2:15 PM	0	0	0	0	0	0	50	0	0	50	13	1	13	0	27	0	39	0	0	39	116
2:30 PM	1	0	0	0	1	0	48	0	0	48	7	0	15	0	22	0	52	1	0	53	124
2:45 PM	1	0	0	0	1	0	50	0	0	50	7	0	13	0	20	0	53	1	0	54	125
Total	2	0	0	0	2	0	218	0	0	218	34	1	53	0	88	0	202	2	0	204	512
3:00 PM	1	0	0	0	1	0	34	0	0	34	14	0	22	0	36	0	63	1	0	64	135
3:15 PM	3	0	0	0	3	0	65	0	0	65	12	0	9	0	21	0	55	0	0	55	144
3:30 PM	1	0	1	0	2	0	48	0	0	48	17	0	10	0	27	0	98	0	0	98	175
3:45 PM	0	0	0	0	0	0	51	0	0	51	12	0	9	0	21	0	64	1	0	65	137
Total	5	0	1	0	6	0	198	0	0	198	55	0	50	0	105	0	280	2	0	282	591
4:00 PM	0	0	1	0	1	0	63	0	0	63	9	0	13	0	22	0	73	0	0	73	159
4:15 PM	0	0	0	0	0	0	47	0	0	47	9	0	15	0	24	0	70	1	0	71	142
4:30 PM	0	0	1	0	1	0	66	0	0	66	18	0	7	0	25	0	70	0	0	70	162
4:45 PM	2	0	0	0	2	1	68	0	0	69	17	0	13	0	30	0	73	1	0	74	175
Total	2	0	2	0	4	1	244	0	0	245	53	0	48	0	101	0	286	2	0	288	638
5:00 PM	2	0	0	0	2	1	59	0	0	60	15	0	19	0	34	0	86	0	0	86	182
5:15 PM	0	0	0	0	0	1	63	0	0	64	16	0	15	0	31	0	69	1	0	70	165
5:30 PM	2	0	1	0	3	0	76	0	0	76	12	0	21	0	33	0	62	1	0	63	175
5:45 PM	1	0	0	0	1	0	67	0	0	67	18	0	14	0	32	0	59	0	0	59	159
Total	5	0	1	0	6	2	265	0	0	267	61	0	69	0	130	0	276	2	0	278	681
Grand Total	14	0	4	0	18	3	925	0	0	928	203	1	220	0	424	0	1044	8	0	1052	2422
Approach %	77.8	0.0	22.2	0.0		0.3	99.7	0.0	0.0		47.9	0.2	51.9	0.0		0.0	99.2	0.8	0.0		
Total %	0.6	0.0	0.2	0.0	0.7	0.1	38.2	0.0	0.0	38.3	8.4	0.0	9.1	0.0	17.5	0.0	43.1	0.3	0.0	43.4	
Exiting Leg Total					12					1251					0					1159	2422
Cars	14	0	4	0	18	3	912	0	0	915	201	1	213	0	415	0	1002	8	0	1010	2358
% Cars	100.0	0.0	100.0	0.0	100.0	100.0	98.6	0.0	0.0	98.6	99.0	100.0	96.8	0.0	97.9	0.0	96.0	100.0	0.0	96.0	97.4
Exiting Leg Total					12					1207					0					1139	2358
Heavy Vehicles	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	0	9	0	0	9	14
% Heavy Vehicles	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.9	0.6
Exiting Leg Total					0					9					0					5	14
Buses	0	0	0	0	0	0	8	0	0	8	2	0	7	0	9	0	33	0	0	33	50
% Buses	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.9	1.0	0.0	3.2	0.0	2.1	0.0	3.2	0.0	0.0	3.1	2.1
Exiting Leg Total					0					35					0					15	50

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

4:45 PM	Driveway					French Street					Kirk Street					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
4:45 PM	2	0	0	0	2	1	68	0	0	69	17	0	13	0	30	0	73	1	0	74	175
5:00 PM	2	0	0	0	2	1	59	0	0	60	15	0	19	0	34	0	86	0	0	86	182
5:15 PM	0	0	0	0	0	1	63	0	0	64	16	0	15	0	31	0	69	1	0	70	165
5:30 PM	2	0	1	0	3	0	76	0	0	76	12	0	21	0	33	0	62	1	0	63	175
Total Volume	6	0	1	0	7	3	266	0	0	269	60	0	68	0	128	0	290	3	0	293	697
% Approach Total	85.7	0.0	14.3	0.0		1.1	98.9	0.0	0.0		46.9	0.0	53.1	0.0		0.0	99.0	1.0	0.0		
PHF	0.750	0.000	0.250	0.000	0.583	0.750	0.875	0.000	0.000	0.885	0.882	0.000	0.810	0.000	0.941	0.000	0.843	0.750	0.000	0.852	0.957
Cars	6	0	1	0	7	3	264	0	0	267	59	0	66	0	125	0	278	3	0	281	680
Cars %	100.0	0.0	100.0	0.0	100.0	100.0	99.2	0.0	0.0	99.3	98.3	0.0	97.1	0.0	97.7	0.0	95.9	100.0	0.0	95.9	97.6
Heavy Vehicles	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	4	0	0	4	5
Heavy Vehicles %	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	1.4	0.7
Buses	0	0	0	0	0	0	1	0	0	1	1	0	2	0	3	0	8	0	0	8	12
Buses %	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.4	1.7	0.0	2.9	0.0	2.3	0.0	2.8	0.0	0.0	2.7	1.7

PDI File #: **175563 CC**
Location: **N: Driveway S: Kirk Street**
Location: **E: French Street W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars, Heavy Vehicles, and Buses (Combined)

	Driveway (North)					French Street (East)					Kirk Street (South)					Father Morisette Boulevard (West)					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
Cars Enter Leg	6	0	1	0	7	3	264	0	0	267	59	0	66	0	125	0	278	3	0	281	680
Heavy Enter Leg	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	4	0	0	4	5
Bus Enter Leg	0	0	0	0	0	0	1	0	0	1	1	0	2	0	3	0	8	0	0	8	12
Total Entering Leg	6	0	1	0	7	3	266	0	0	269	60	0	68	0	128	0	290	3	0	293	697
Cars Exiting Leg					6					338					0					336	680
Heavy Exiting Leg					0					4					0					1	5
Buses Exiting Leg					0					9					0					3	12
Total Exiting Leg					6					351					0					340	697

PDI File #: **175563 CC**
Location: **N: Driveway S: Kirk Street**
Location: **E: French Street W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars

	Driveway					French Street					Kirk Street					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	0	0	0	0	0	0	67	0	0	67	7	0	11	0	18	0	53	0	0	53	138
2:15 PM	0	0	0	0	0	0	50	0	0	50	12	1	13	0	26	0	35	0	0	35	111
2:30 PM	1	0	0	0	1	0	47	0	0	47	7	0	14	0	21	0	50	1	0	51	120
2:45 PM	1	0	0	0	1	0	50	0	0	50	7	0	13	0	20	0	50	1	0	51	122
Total	2	0	0	0	2	0	214	0	0	214	33	1	51	0	85	0	188	2	0	190	491
3:00 PM	1	0	0	0	1	0	34	0	0	34	14	0	22	0	36	0	62	1	0	63	134
3:15 PM	3	0	0	0	3	0	64	0	0	64	12	0	8	0	20	0	54	0	0	54	141
3:30 PM	1	0	1	0	2	0	48	0	0	48	17	0	10	0	27	0	96	0	0	96	173
3:45 PM	0	0	0	0	0	0	51	0	0	51	12	0	9	0	21	0	61	1	0	62	134
Total	5	0	1	0	6	0	197	0	0	197	55	0	49	0	104	0	273	2	0	275	582
4:00 PM	0	0	1	0	1	0	62	0	0	62	9	0	12	0	21	0	71	0	0	71	155
4:15 PM	0	0	0	0	0	0	45	0	0	45	9	0	14	0	23	0	68	1	0	69	137
4:30 PM	0	0	1	0	1	0	64	0	0	64	18	0	7	0	25	0	69	0	0	69	159
4:45 PM	2	0	0	0	2	1	66	0	0	67	17	0	12	0	29	0	68	1	0	69	167
Total	2	0	2	0	4	1	237	0	0	238	53	0	45	0	98	0	276	2	0	278	618
5:00 PM	2	0	0	0	2	1	59	0	0	60	15	0	19	0	34	0	83	0	0	83	179
5:15 PM	0	0	0	0	0	1	63	0	0	64	16	0	14	0	30	0	67	1	0	68	162
5:30 PM	2	0	1	0	3	0	76	0	0	76	11	0	21	0	32	0	60	1	0	61	172
5:45 PM	1	0	0	0	1	0	66	0	0	66	18	0	14	0	32	0	55	0	0	55	154
Total	5	0	1	0	6	2	264	0	0	266	60	0	68	0	128	0	265	2	0	267	667
Grand Total	14	0	4	0	18	3	912	0	0	915	201	1	213	0	415	0	1002	8	0	1010	2358
Approach %	77.8	0.0	22.2	0.0		0.3	99.7	0.0	0.0		48.4	0.2	51.3	0.0		0.0	99.2	0.8	0.0		
Total %	0.6	0.0	0.2	0.0	0.8	0.1	38.7	0.0	0.0	38.8	8.5	0.0	9.0	0.0	17.6	0.0	42.5	0.3	0.0	42.8	
Exiting Leg Total					12					1207					0					1139	2358

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:00 PM	Driveway					French Street					Kirk Street					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	0	0	0	0	0	0	67	0	0	67	7	0	11	0	18	0	53	0	0	53	138
2:15 PM	0	0	0	0	0	0	50	0	0	50	12	1	13	0	26	0	35	0	0	35	111
2:30 PM	1	0	0	0	1	0	47	0	0	47	7	0	14	0	21	0	50	1	0	51	120
2:45 PM	1	0	0	0	1	0	50	0	0	50	7	0	13	0	20	0	50	1	0	51	122
Total Volume	2	0	0	0	2	0	214	0	0	214	33	1	51	0	85	0	188	2	0	190	491
% Approach Total	100.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0		38.8	1.2	60.0	0.0		0.0	98.9	1.1	0.0		
PHF	0.500	0.000	0.000	0.000	0.500	0.000	0.799	0.000	0.000	0.799	0.688	0.250	0.911	0.000	0.817	0.000	0.887	0.500	0.000	0.896	0.889
Entering Leg	2	0	0	0	2	0	214	0	0	214	33	1	51	0	85	0	188	2	0	190	491
Exiting Leg					3					221					0					267	491
Total					5					435					85					457	982

PDI File #: **175563 CC**
Location: **N: Driveway S: Kirk Street**
Location: **E: French Street W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Heavy Vehicles

	Driveway					French Street					Kirk Street					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	4
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	5	0	0	5	6
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
4:30 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
4:45 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	2
Total	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	1	0	0	1	4
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	2
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
5:45 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Total	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	4
Grand Total	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	0	9	0	0	9	14
Approach %	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.0	35.7	0.0	0.0	35.7	0.0	0.0	0.0	0.0	0.0	0.0	64.3	0.0	0.0	64.3	
Exiting Leg Total					0					9					0					5	14

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:00 PM	Driveway					French Street					Kirk Street					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	4
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	5	0	0	5	6
% Approach Total	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.417	0.000	0.000	0.417	0.375
Entering Leg	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	5	0	0	5	6
Exiting Leg					0					5					0					1	6
Total					0					6					0					6	12

PDI File #: **175563 CC**
Location: **N: Driveway S: Kirk Street**
Location: **E: French Street W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Buses

	Driveway					French Street					Kirk Street					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	0	0	0	0	0	0	2	0	0	2	0	0	1	0	1	0	2	0	0	2	5
2:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	3	0	0	3	4
2:30 PM	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	0	1	0	0	1	3
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	3
Total	0	0	0	0	0	0	3	0	0	3	1	0	2	0	3	0	9	0	0	9	15
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
3:15 PM	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	0	1	0	0	1	3
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	2
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	3
Total	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	0	7	0	0	7	9
4:00 PM	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	0	2	0	0	2	4
4:15 PM	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	0	2	0	0	2	4
4:30 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	2
4:45 PM	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	0	4	0	0	4	6
Total	0	0	0	0	0	0	4	0	0	4	0	0	3	0	3	0	9	0	0	9	16
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2	0	0	2	3
5:30 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0	1	2
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4	4
Total	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2	0	8	0	0	8	10
Grand Total	0	0	0	0	0	0	8	0	0	8	2	0	7	0	9	0	33	0	0	33	50
Approach %	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0		22.2	0.0	77.8	0.0		0.0	100.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.0	16.0	0.0	0.0	16.0	4.0	0.0	14.0	0.0	18.0	0.0	66.0	0.0	0.0	66.0	
Exiting Leg Total					0					35					0					15	50

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:00 PM	Driveway					French Street					Kirk Street					Father Morisette Boulevard					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	0	0	0	0	0	0	2	0	0	2	0	0	1	0	1	0	2	0	0	2	5
2:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	3	0	0	3	4
2:30 PM	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	0	1	0	0	1	3
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	3
Total Volume	0	0	0	0	0	0	3	0	0	3	1	0	2	0	3	0	9	0	0	9	15
% Approach Total	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0		33.3	0.0	66.7	0.0		0.0	100.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.375	0.000	0.000	0.375	0.250	0.000	0.500	0.000	0.750	0.000	0.750	0.000	0.000	0.750	0.750
Entering Leg	0	0	0	0	0	0	3	0	0	3	1	0	2	0	3	0	9	0	0	9	15
Exiting Leg					0					10					0					5	15
Total					0					13					3					14	30

PDI File #: **175563 CC**
Location: **N: Driveway S: Kirk Street**
Location: **E: French Street W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Bicycles (on Roadway and Crosswalks)

	Driveway							French Street							Kirk Street							Father Morisette Boulevard							
	North							East							South							West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:15 PM	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3:00 PM	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	1	2
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	1	0	1	3
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	1	0	1	0	2	0	0	0	0	2	0	1	0	0	0	0	1	0	0	0	0	1	0	1	5
Approach %	0.0	0.0	0.0	0.0	100.0	0.0		0.0	100.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	100.0	0.0		
Total %	0.0	0.0	0.0	0.0	20.0	0.0	20.0	0.0	40.0	0.0	0.0	0.0	0.0	40.0	0.0	20.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	20.0	0.0	20.0	
Exiting Leg Total							2							0							0							3	5

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

4:00 PM	Driveway							French Street							Kirk Street							Father Morisette Boulevard							
	North							East							South							West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	1	2
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total Volume	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	1	0	1	3
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	100.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.250	0.000	0.250	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.250	0.000	0.250	0.375
Entering Leg	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	1	0	1	3
Exiting Leg							1							0							0							2	3
Total							1							1							1							3	6

PDI File #: **175563 CC**
Location: **N: Driveway S: Kirk Street**
Location: **E: French Street W: Father Morisette Boulevard**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Pedestrians

	Driveway							French Street							Kirk Street							Father Morisette Boulevard							
	North							East							South							West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
2:00 PM	0	0	0	0	0	1	1	0	0	0	0	1	2	3	0	0	0	0	4	5	9	0	0	0	0	1	0	1	14
2:15 PM	0	0	0	0	2	2	4	0	0	0	0	4	1	5	0	0	0	0	0	7	7	0	0	0	0	1	0	1	17
2:30 PM	0	0	0	0	2	4	6	0	0	0	0	0	3	3	0	0	0	0	2	2	4	0	0	0	0	1	0	1	14
2:45 PM	0	0	0	0	1	3	4	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	1	0	1	9
Total	0	0	0	0	5	10	15	0	0	0	0	5	10	15	0	0	0	0	6	14	20	0	0	0	0	4	0	4	54
3:00 PM	0	0	0	0	5	5	10	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	4	0	4	16
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	2
3:30 PM	0	0	0	0	0	4	4	0	0	0	0	1	3	4	0	0	0	0	5	0	5	0	0	0	0	0	0	0	13
3:45 PM	0	0	0	0	4	4	8	0	0	0	0	0	1	1	0	0	0	0	0	1	1	0	0	0	0	3	1	4	14
Total	0	0	0	0	9	13	22	0	0	0	0	1	6	7	0	0	0	0	6	2	8	0	0	0	0	7	1	8	45
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	4	0	4	0	0	0	0	3	7	10	0	0	0	0	0	0	0	14
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	18	19	0	0	0	0	0	0	0	20
4:30 PM	0	0	0	0	1	1	2	0	0	0	0	0	1	1	0	0	0	0	2	1	3	0	0	0	0	0	0	0	6
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	1	2
Total	0	0	0	0	1	1	2	0	0	0	0	4	2	6	0	0	0	0	7	26	33	0	0	0	0	1	0	1	42
5:00 PM	0	0	0	0	6	1	7	0	0	0	0	1	1	2	0	0	0	0	2	2	4	0	0	0	0	2	1	3	16
5:15 PM	0	0	0	0	1	0	1	0	0	0	0	2	0	2	0	0	0	0	0	3	3	0	0	0	0	0	0	0	6
5:30 PM	0	0	0	0	1	3	4	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	1	1	2	8
5:45 PM	0	0	0	0	0	2	2	0	0	0	0	1	1	2	0	0	0	0	5	5	10	0	0	0	0	2	0	2	16
Total	0	0	0	0	8	6	14	0	0	0	0	4	2	6	0	0	0	0	8	11	19	0	0	0	0	5	2	7	46
Grand Total	0	0	0	0	23	30	53	0	0	0	0	14	20	34	0	0	0	0	27	53	80	0	0	0	0	17	3	20	187
Approach %	0.0	0.0	0.0	0.0	43.4	56.6		0.0	0.0	0.0	0.0	41.2	58.8		0.0	0.0	0.0	0.0	33.8	66.3		0.0	0.0	0.0	0.0	85.0	15.0		
Total %	0.0	0.0	0.0	0.0	12.3	16.0	28.3	0.0	0.0	0.0	0.0	7.5	10.7	18.2	0.0	0.0	0.0	0.0	14.4	28.3	42.8	0.0	0.0	0.0	0.0	9.1	1.6	10.7	
Exiting Leg Total							53							34							80							20	187

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:00 PM	Driveway							French Street							Kirk Street							Father Morisette Boulevard							
	North							East							South							West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
2:00 PM	0	0	0	0	0	1	1	0	0	0	0	1	2	3	0	0	0	0	4	5	9	0	0	0	0	1	0	1	14
2:15 PM	0	0	0	0	2	2	4	0	0	0	0	4	1	5	0	0	0	0	0	7	7	0	0	0	0	1	0	1	17
2:30 PM	0	0	0	0	2	4	6	0	0	0	0	0	3	3	0	0	0	0	2	2	4	0	0	0	0	1	0	1	14
2:45 PM	0	0	0	0	1	3	4	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	1	0	1	9
Total Volume	0	0	0	0	5	10	15	0	0	0	0	5	10	15	0	0	0	0	6	14	20	0	0	0	0	4	0	4	54
% Approach Total	0.0	0.0	0.0	0.0	33.3	66.7		0.0	0.0	0.0	0.0	33.3	66.7		0.0	0.0	0.0	0.0	30.0	70.0		0.0	0.0	0.0	0.0	100.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.625	0.625	0.625	0.000	0.000	0.000	0.000	0.313	0.625	0.750	0.000	0.000	0.000	0.000	0.375	0.500	0.556	0.000	0.000	0.000	0.000	1.000	0.000	1.000	0.794
Entering Leg	0	0	0	0	5	10	15	0	0	0	0	5	10	15	0	0	0	0	6	14	20	0	0	0	0	4	0	4	54
Exiting Leg							15							15							20							4	54
Total							30							30							40							8	108

PDI File #: **175563 D**
Location: **N: Bridge Street S: Bridge Street**
Location: **W: French Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars, Heavy Vehicles, and Buses (Combined)

	Bridge Street				Bridge Street				French Street				
	North				South				West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Total
6:00 AM	14	135	0	149	25	8	0	33	5	3	0	8	190
6:15 AM	27	131	0	158	51	9	0	60	12	7	0	19	237
6:30 AM	30	141	0	171	49	9	0	58	13	14	0	27	256
6:45 AM	39	128	0	167	76	23	0	99	16	17	0	33	299
Total	110	535	0	645	201	49	0	250	46	41	0	87	982
7:00 AM	27	138	0	165	86	23	0	109	21	19	0	40	314
7:15 AM	52	103	0	155	82	46	0	128	41	31	0	72	355
7:30 AM	73	80	0	153	59	57	0	116	46	43	0	89	358
7:45 AM	52	79	0	131	94	51	0	145	54	53	0	107	383
Total	204	400	0	604	321	177	0	498	162	146	0	308	1410
8:00 AM	53	118	0	171	78	24	0	102	27	25	0	52	325
8:15 AM	50	138	0	188	66	39	0	105	18	23	0	41	334
8:30 AM	35	127	0	162	84	36	0	120	20	32	0	52	334
8:45 AM	48	130	0	178	82	40	0	122	21	32	0	53	353
Total	186	513	0	699	310	139	0	449	86	112	0	198	1346
9:00 AM	38	111	0	149	74	34	0	108	16	24	0	40	297
9:15 AM	51	125	0	176	107	35	0	142	14	31	0	45	363
9:30 AM	39	120	0	159	89	33	0	122	24	27	0	51	332
9:45 AM	41	101	0	142	105	20	0	125	13	27	0	40	307
Total	169	457	0	626	375	122	0	497	67	109	0	176	1299
Grand Total	669	1905	0	2574	1207	487	0	1694	361	408	0	769	5037
Approach %	26.0	74.0	0.0		71.3	28.7	0.0		46.9	53.1	0.0		
Total %	13.3	37.8	0.0	51.1	24.0	9.7	0.0	33.6	7.2	8.1	0.0	15.3	
Exiting Leg Total				1615				2266				1156	5037
Cars	652	1830	0	2482	1127	477	0	1604	356	378	0	734	4820
% Cars	97.5	96.1	0.0	96.4	93.4	97.9	0.0	94.7	98.6	92.6	0.0	95.4	95.7
Exiting Leg Total				1505				2186				1129	4820
Heavy Vehicles	10	42	0	52	58	2	0	60	2	12	0	14	126
% Heavy Vehicles	1.5	2.2	0.0	2.0	4.8	0.4	0.0	3.5	0.6	2.9	0.0	1.8	2.5
Exiting Leg Total				70				44				12	126
Buses	7	33	0	40	22	8	0	30	3	18	0	21	91
% Buses	1.0	1.7	0.0	1.6	1.8	1.6	0.0	1.8	0.8	4.4	0.0	2.7	1.8
Exiting Leg Total				40				36				15	91

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:15 AM	Bridge Street				Bridge Street				French Street				
	North				South				West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Total
7:15 AM	52	103	0	155	82	46	0	128	41	31	0	72	355
7:30 AM	73	80	0	153	59	57	0	116	46	43	0	89	358
7:45 AM	52	79	0	131	94	51	0	145	54	53	0	107	383
8:00 AM	53	118	0	171	78	24	0	102	27	25	0	52	325
Total Volume	230	380	0	610	313	178	0	491	168	152	0	320	1421
% Approach Total	37.7	62.3	0.0		63.7	36.3	0.0		52.5	47.5	0.0		
PHF	0.788	0.805	0.000	0.892	0.832	0.781	0.000	0.847	0.778	0.717	0.000	0.748	0.928
Cars	222	365	0	587	291	175	0	466	165	148	0	313	1366
Cars %	96.5	96.1	0.0	96.2	93.0	98.3	0.0	94.9	98.2	97.4	0.0	97.8	96.1
Heavy Vehicles	3	7	0	10	17	2	0	19	0	2	0	2	31
Heavy Vehicles %	1.3	1.8	0.0	1.6	5.4	1.1	0.0	3.9	0.0	1.3	0.0	0.6	2.2
Buses	5	8	0	13	5	1	0	6	3	2	0	5	24
Buses %	2.2	2.1	0.0	2.1	1.6	0.6	0.0	1.2	1.8	1.3	0.0	1.6	1.7

PDI File #: **175563 D**
Location: **N: Bridge Street S: Bridge Street**
Location: **W: French Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars, Heavy Vehicles, and Buses (Combined)

	Bridge Street				Bridge Street				French Street				
	North				South				West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Total
Cars Enter Leg	222	365	0	587	291	175	0	466	165	148	0	313	1366
Heavy Enter Leg	3	7	0	10	17	2	0	19	0	2	0	2	31
Bus Enter Leg	5	8	0	13	5	1	0	6	3	2	0	5	24
Total Entering Leg	230	380	0	610	313	178	0	491	168	152	0	320	1421
Cars Exiting Leg				439				530				397	1366
Heavy Exiting Leg				19				7				5	31
Buses Exiting Leg				7				11				6	24
Total Exiting Leg				465				548				408	1421

PDI File #: **175563 D**
Location: **N: Bridge Street S: Bridge Street**
Location: **W: French Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars

	Bridge Street				Bridge Street				French Street				
	North				South				West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Total
6:00 AM	11	131	0	142	22	8	0	30	5	3	0	8	180
6:15 AM	25	127	0	152	49	9	0	58	12	5	0	17	227
6:30 AM	30	136	0	166	47	9	0	56	13	12	0	25	247
6:45 AM	39	123	0	162	70	23	0	93	16	15	0	31	286
Total	105	517	0	622	188	49	0	237	46	35	0	81	940
7:00 AM	27	134	0	161	76	23	0	99	21	17	0	38	298
7:15 AM	48	101	0	149	73	46	0	119	40	30	0	70	338
7:30 AM	71	79	0	150	57	57	0	114	45	43	0	88	352
7:45 AM	52	74	0	126	91	50	0	141	54	52	0	106	373
Total	198	388	0	586	297	176	0	473	160	142	0	302	1361
8:00 AM	51	111	0	162	70	22	0	92	26	23	0	49	303
8:15 AM	50	128	0	178	60	39	0	99	18	18	0	36	313
8:30 AM	34	121	0	155	81	36	0	117	20	31	0	51	323
8:45 AM	47	125	0	172	72	40	0	112	21	29	0	50	334
Total	182	485	0	667	283	137	0	420	85	101	0	186	1273
9:00 AM	38	106	0	144	73	33	0	106	15	23	0	38	288
9:15 AM	51	122	0	173	102	35	0	137	14	28	0	42	352
9:30 AM	39	115	0	154	83	28	0	111	24	26	0	50	315
9:45 AM	39	97	0	136	101	19	0	120	12	23	0	35	291
Total	167	440	0	607	359	115	0	474	65	100	0	165	1246
Grand Total	652	1830	0	2482	1127	477	0	1604	356	378	0	734	4820
Approach %	26.3	73.7	0.0		70.3	29.7	0.0		48.5	51.5	0.0		
Total %	13.5	38.0	0.0	51.5	23.4	9.9	0.0	33.3	7.4	7.8	0.0	15.2	
Exiting Leg Total				1505				2186				1129	4820

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:15 AM	Bridge Street				Bridge Street				French Street				
	North				South				West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Total
7:15 AM	48	101	0	149	73	46	0	119	40	30	0	70	338
7:30 AM	71	79	0	150	57	57	0	114	45	43	0	88	352
7:45 AM	52	74	0	126	91	50	0	141	54	52	0	106	373
8:00 AM	51	111	0	162	70	22	0	92	26	23	0	49	303
Total Volume	222	365	0	587	291	175	0	466	165	148	0	313	1366
% Approach Total	37.8	62.2	0.0		62.4	37.6	0.0		52.7	47.3	0.0		
PHF	0.782	0.822	0.000	0.906	0.799	0.768	0.000	0.826	0.764	0.712	0.000	0.738	0.916
Entering Leg	222	365	0	587	291	175	0	466	165	148	0	313	1366
Exiting Leg				439				530				397	1366
Total				1026				996				710	2732

PDI File #: **175563 D**
Location: **N: Bridge Street S: Bridge Street**
Location: **W: French Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Heavy Vehicles

	Bridge Street				Bridge Street				French Street				
	North				South				West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Total
6:00 AM	2	3	0	5	3	0	0	3	0	0	0	0	8
6:15 AM	2	3	0	5	2	0	0	2	0	1	0	1	8
6:30 AM	0	3	0	3	1	0	0	1	0	0	0	0	4
6:45 AM	0	3	0	3	3	0	0	3	0	0	0	0	6
Total	4	12	0	16	9	0	0	9	0	1	0	1	26
7:00 AM	0	1	0	1	6	0	0	6	0	1	0	1	8
7:15 AM	2	2	0	4	7	0	0	7	0	0	0	0	11
7:30 AM	1	1	0	2	1	0	0	1	0	0	0	0	3
7:45 AM	0	2	0	2	1	1	0	2	0	0	0	0	4
Total	3	6	0	9	15	1	0	16	0	1	0	1	26
8:00 AM	0	2	0	2	8	1	0	9	0	2	0	2	13
8:15 AM	0	5	0	5	4	0	0	4	0	3	0	3	12
8:30 AM	0	6	0	6	1	0	0	1	0	1	0	1	8
8:45 AM	1	1	0	2	8	0	0	8	0	0	0	0	10
Total	1	14	0	15	21	1	0	22	0	6	0	6	43
9:00 AM	0	3	0	3	0	0	0	0	1	1	0	2	5
9:15 AM	0	2	0	2	4	0	0	4	0	1	0	1	7
9:30 AM	0	4	0	4	5	0	0	5	0	0	0	0	9
9:45 AM	2	1	0	3	4	0	0	4	1	2	0	3	10
Total	2	10	0	12	13	0	0	13	2	4	0	6	31
Grand Total	10	42	0	52	58	2	0	60	2	12	0	14	126
Approach %	19.2	80.8	0.0		96.7	3.3	0.0		14.3	85.7	0.0		
Total %	7.9	33.3	0.0	41.3	46.0	1.6	0.0	47.6	1.6	9.5	0.0	11.1	
Exiting Leg Total				70				44				12	126

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

8:00 AM	Bridge Street				Bridge Street				French Street				
	North				South				West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Total
8:00 AM	0	2	0	2	8	1	0	9	0	2	0	2	13
8:15 AM	0	5	0	5	4	0	0	4	0	3	0	3	12
8:30 AM	0	6	0	6	1	0	0	1	0	1	0	1	8
8:45 AM	1	1	0	2	8	0	0	8	0	0	0	0	10
Total Volume	1	14	0	15	21	1	0	22	0	6	0	6	43
% Approach Total	6.7	93.3	0.0		95.5	4.5	0.0		0.0	100.0	0.0		
PHF	0.250	0.583	0.000	0.625	0.656	0.250	0.000	0.611	0.000	0.500	0.000	0.500	0.827
Entering Leg	1	14	0	15	21	1	0	22	0	6	0	6	43
Exiting Leg				27				14				2	43
Total				42				36				8	86

PDI File #: **175563 D**
Location: **N: Bridge Street S: Bridge Street**
Location: **W: French Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Buses

	Bridge Street				Bridge Street				French Street				
	North				South				West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Total
6:00 AM	1	1	0	2	0	0	0	0	0	0	0	0	2
6:15 AM	0	1	0	1	0	0	0	0	0	1	0	1	2
6:30 AM	0	2	0	2	1	0	0	1	0	2	0	2	5
6:45 AM	0	2	0	2	3	0	0	3	0	2	0	2	7
Total	1	6	0	7	4	0	0	4	0	5	0	5	16
7:00 AM	0	3	0	3	4	0	0	4	0	1	0	1	8
7:15 AM	2	0	0	2	2	0	0	2	1	1	0	2	6
7:30 AM	1	0	0	1	1	0	0	1	1	0	0	1	3
7:45 AM	0	3	0	3	2	0	0	2	0	1	0	1	6
Total	3	6	0	9	9	0	0	9	2	3	0	5	23
8:00 AM	2	5	0	7	0	1	0	1	1	0	0	1	9
8:15 AM	0	5	0	5	2	0	0	2	0	2	0	2	9
8:30 AM	1	0	0	1	2	0	0	2	0	0	0	0	3
8:45 AM	0	4	0	4	2	0	0	2	0	3	0	3	9
Total	3	14	0	17	6	1	0	7	1	5	0	6	30
9:00 AM	0	2	0	2	1	1	0	2	0	0	0	0	4
9:15 AM	0	1	0	1	1	0	0	1	0	2	0	2	4
9:30 AM	0	1	0	1	1	5	0	6	0	1	0	1	8
9:45 AM	0	3	0	3	0	1	0	1	0	2	0	2	6
Total	0	7	0	7	3	7	0	10	0	5	0	5	22
Grand Total	7	33	0	40	22	8	0	30	3	18	0	21	91
Approach %	17.5	82.5	0.0		73.3	26.7	0.0		14.3	85.7	0.0		
Total %	7.7	36.3	0.0	44.0	24.2	8.8	0.0	33.0	3.3	19.8	0.0	23.1	
Exiting Leg Total				40				36				15	91

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

8:00 AM	Bridge Street				Bridge Street				French Street				
	North				South				West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Total
8:00 AM	2	5	0	7	0	1	0	1	1	0	0	1	9
8:15 AM	0	5	0	5	2	0	0	2	0	2	0	2	9
8:30 AM	1	0	0	1	2	0	0	2	0	0	0	0	3
8:45 AM	0	4	0	4	2	0	0	2	0	3	0	3	9
Total Volume	3	14	0	17	6	1	0	7	1	5	0	6	30
% Approach Total	17.6	82.4	0.0		85.7	14.3	0.0		16.7	83.3	0.0		
PHF	0.375	0.700	0.000	0.607	0.750	0.250	0.000	0.875	0.250	0.417	0.000	0.500	0.833
Entering Leg	3	14	0	17	6	1	0	7	1	5	0	6	30
Exiting Leg				11				15				4	30
Total				28				22				10	60

PDI File #: **175563 D**
Location: **N: Bridge Street S: Bridge Street**
Location: **W: French Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Bicycles (on Roadway and Crosswalks)

	Bridge Street						Bridge Street						French Street						
	North						South						West						
	Right	Thru	U-Turn	CW-EB	CW-WB	Total	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Left	U-Turn	CW-NB	CW-SB	Total	Total
6:00 AM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
6:15 AM	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1
6:30 AM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	2	0	0	0	2	1	0	0	0	0	1	0	0	0	0	0	0	3
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	2	0	0	0	2	2	0	0	0	0	2	0	0	0	0	0	0	4
Approach %	0.0	100.0	0.0	0.0	0.0		100.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		
Total %	0.0	50.0	0.0	0.0	0.0	50.0	50.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	
Exiting Leg Total						2						2						0	4

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

6:00 AM	Bridge Street						Bridge Street						French Street						
	North						South						West						
	Right	Thru	U-Turn	CW-EB	CW-WB	Total	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Left	U-Turn	CW-NB	CW-SB	Total	Total
6:00 AM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
6:15 AM	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1
6:30 AM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	2	0	0	0	2	1	0	0	0	0	1	0	0	0	0	0	0	3
% Approach Total	0.0	100.0	0.0	0.0	0.0		100.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		
PHF	0.000	0.500	0.000	0.000	0.000	0.500	0.250	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.750
Entering Leg	0	2	0	0	0	2	1	0	0	0	0	1	0	0	0	0	0	0	3
Exiting Leg						1						2						0	3
Total						3						3						0	6

PDI File #: **175563 D**
Location: **N: Bridge Street S: Bridge Street**
Location: **W: French Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Pedestrians

	Bridge Street						Bridge Street						French Street						
	North						South						West						
	Right	Thru	U-Turn	CW-EB	CW-WB	Total	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Left	U-Turn	CW-NB	CW-SB	Total	Total
6:00 AM	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	1	2
6:15 AM	0	0	0	1	0	1	0	0	0	2	0	2	0	0	0	0	4	4	7
6:30 AM	0	0	0	1	3	4	0	0	0	2	3	5	0	0	0	1	1	2	11
6:45 AM	0	0	0	1	1	2	0	0	0	2	5	7	0	0	0	1	4	5	14
Total	0	0	0	4	4	8	0	0	0	6	8	14	0	0	0	2	10	12	34
7:00 AM	0	0	0	1	0	1	0	0	0	3	16	19	0	0	0	1	3	4	24
7:15 AM	0	0	0	0	3	3	0	0	0	7	2	9	0	0	0	1	5	6	18
7:30 AM	0	0	0	1	2	3	0	0	0	6	1	7	0	0	0	2	5	7	17
7:45 AM	0	0	0	1	2	3	0	0	0	4	3	7	0	0	0	0	6	6	16
Total	0	0	0	3	7	10	0	0	0	20	22	42	0	0	0	4	19	23	75
8:00 AM	0	0	0	0	2	2	0	0	0	4	3	7	0	0	0	3	5	8	17
8:15 AM	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	4	5	9	10
8:30 AM	0	0	0	2	1	3	0	0	0	1	3	4	0	0	0	0	4	4	11
8:45 AM	0	0	0	1	0	1	0	0	0	2	4	6	0	0	0	1	4	5	12
Total	0	0	0	4	3	7	0	0	0	7	10	17	0	0	0	8	18	26	50
9:00 AM	0	0	0	0	2	2	0	0	0	4	4	8	0	0	0	4	9	13	23
9:15 AM	0	0	0	0	2	2	0	0	0	3	5	8	0	0	0	4	4	8	18
9:30 AM	0	0	0	0	0	0	0	0	0	2	3	5	0	0	0	3	3	6	11
9:45 AM	0	0	0	4	0	4	0	0	0	5	1	6	0	0	0	4	5	9	19
Total	0	0	0	4	4	8	0	0	0	14	13	27	0	0	0	15	21	36	71
Grand Total	0	0	0	15	18	33	0	0	0	47	53	100	0	0	0	29	68	97	230
Approach %	0.0	0.0	0.0	45.5	54.5		0.0	0.0	0.0	47.0	53.0		0.0	0.0	0.0	29.9	70.1		
Total %	0.0	0.0	0.0	6.5	7.8	14.3	0.0	0.0	0.0	20.4	23.0	43.5	0.0	0.0	0.0	12.6	29.6	42.2	
Exiting Leg Total						33						100						97	230

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:00 AM	Bridge Street						Bridge Street						French Street						
	North						South						West						
	Right	Thru	U-Turn	CW-EB	CW-WB	Total	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Left	U-Turn	CW-NB	CW-SB	Total	Total
7:00 AM	0	0	0	1	0	1	0	0	0	3	16	19	0	0	0	1	3	4	24
7:15 AM	0	0	0	0	3	3	0	0	0	7	2	9	0	0	0	1	5	6	18
7:30 AM	0	0	0	1	2	3	0	0	0	6	1	7	0	0	0	2	5	7	17
7:45 AM	0	0	0	1	2	3	0	0	0	4	3	7	0	0	0	0	6	6	16
Total Volume	0	0	0	3	7	10	0	0	0	20	22	42	0	0	0	4	19	23	75
% Approach Total	0.0	0.0	0.0	30.0	70.0		0.0	0.0	0.0	47.6	52.4		0.0	0.0	0.0	17.4	82.6		
PHF	0.000	0.000	0.000	0.750	0.583	0.833	0.000	0.000	0.000	0.714	0.344	0.553	0.000	0.000	0.000	0.500	0.792	0.821	0.781
Entering Leg	0	0	0	3	7	10	0	0	0	20	22	42	0	0	0	4	19	23	75
Exiting Leg						10						42						23	75
Total						20						84						46	150

PDI File #: **175563 DD**
Location: **N: Bridge Street S: Bridge Street**
Location: **W: French Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars, Heavy Vehicles, and Buses (Combined)

	Bridge Street				Bridge Street				French Street				
	North				South				West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Total
2:00 PM	42	104	0	146	128	33	0	161	31	48	0	79	386
2:15 PM	23	98	0	121	114	12	0	126	22	43	0	65	312
2:30 PM	34	110	0	144	147	13	0	160	25	46	0	71	375
2:45 PM	27	104	0	131	125	18	0	143	27	33	0	60	334
Total	126	416	0	542	514	76	0	590	105	170	0	275	1407
3:00 PM	18	106	0	124	169	12	0	181	32	62	0	94	399
3:15 PM	31	105	0	136	146	25	0	171	27	44	0	71	378
3:30 PM	31	109	0	140	141	23	0	164	56	54	0	110	414
3:45 PM	29	123	0	152	163	14	0	177	38	47	0	85	414
Total	109	443	0	552	619	74	0	693	153	207	0	360	1605
4:00 PM	31	87	0	118	141	18	0	159	40	51	0	91	368
4:15 PM	27	121	0	148	122	13	0	135	29	54	0	83	366
4:30 PM	29	123	0	152	147	14	0	161	53	56	0	109	422
4:45 PM	33	103	0	136	143	19	0	162	33	59	0	92	390
Total	120	434	0	554	553	64	0	617	155	220	0	375	1546
5:00 PM	25	106	0	131	153	19	0	172	55	71	0	126	429
5:15 PM	35	118	0	153	156	14	0	170	41	57	0	98	421
5:30 PM	47	121	0	168	153	25	0	178	36	40	0	76	422
5:45 PM	34	102	0	136	121	23	0	144	30	56	0	86	366
Total	141	447	0	588	583	81	0	664	162	224	0	386	1638
Grand Total	496	1740	0	2236	2269	295	0	2564	575	821	0	1396	6196
Approach %	22.2	77.8	0.0		88.5	11.5	0.0		41.2	58.8	0.0		
Total %	8.0	28.1	0.0	36.1	36.6	4.8	0.0	41.4	9.3	13.3	0.0	22.5	
Exiting Leg Total				3090				2315				791	6196
Cars	491	1708	0	2199	2235	289	0	2524	571	795	0	1366	6089
% Cars	99.0	98.2	0.0	98.3	98.5	98.0	0.0	98.4	99.3	96.8	0.0	97.9	98.3
Exiting Leg Total				3030				2279				780	6089
Heavy Vehicles	1	16	0	17	30	3	0	33	2	8	0	10	60
% Heavy Vehicles	0.2	0.9	0.0	0.8	1.3	1.0	0.0	1.3	0.3	1.0	0.0	0.7	1.0
Exiting Leg Total				38				18				4	60
Buses	4	16	0	20	4	3	0	7	2	18	0	20	47
% Buses	0.8	0.9	0.0	0.9	0.2	1.0	0.0	0.3	0.3	2.2	0.0	1.4	0.8
Exiting Leg Total				22				18				7	47

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

4:30 PM	Bridge Street				Bridge Street				French Street				
	North				South				West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Total
4:30 PM	29	123	0	152	147	14	0	161	53	56	0	109	422
4:45 PM	33	103	0	136	143	19	0	162	33	59	0	92	390
5:00 PM	25	106	0	131	153	19	0	172	55	71	0	126	429
5:15 PM	35	118	0	153	156	14	0	170	41	57	0	98	421
Total Volume	122	450	0	572	599	66	0	665	182	243	0	425	1662
% Approach Total	21.3	78.7	0.0		90.1	9.9	0.0		42.8	57.2	0.0		
PHF	0.871	0.915	0.000	0.935	0.960	0.868	0.000	0.967	0.827	0.856	0.000	0.843	0.969
Cars	122	441	0	563	590	64	0	654	182	237	0	419	1636
Cars %	100.0	98.0	0.0	98.4	98.5	97.0	0.0	98.3	100.0	97.5	0.0	98.6	98.4
Heavy Vehicles	0	4	0	4	9	1	0	10	0	2	0	2	16
Heavy Vehicles %	0.0	0.9	0.0	0.7	1.5	1.5	0.0	1.5	0.0	0.8	0.0	0.5	1.0
Buses	0	5	0	5	0	1	0	1	0	4	0	4	10
Buses %	0.0	1.1	0.0	0.9	0.0	1.5	0.0	0.2	0.0	1.6	0.0	0.9	0.6

PDI File #: **175563 DD**
Location: **N: Bridge Street S: Bridge Street**
Location: **W: French Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Class:

Cars, Heavy Vehicles, and Buses (Combined)

	Bridge Street				Bridge Street				French Street				
	North				South				West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Total
Cars Enter Leg	122	441	0	563	590	64	0	654	182	237	0	419	1636
Heavy Enter Leg	0	4	0	4	9	1	0	10	0	2	0	2	16
Bus Enter Leg	0	5	0	5	0	1	0	1	0	4	0	4	10
Total Entering Leg	122	450	0	572	599	66	0	665	182	243	0	425	1662
Cars Exiting Leg				827				623				186	1636
Heavy Exiting Leg				11				4				1	16
Buses Exiting Leg				4				5				1	10
Total Exiting Leg				842				632				188	1662

PDI File #: **175563 DD**
Location: **N: Bridge Street S: Bridge Street**
Location: **W: French Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars

	Bridge Street				Bridge Street				French Street				
	North				South				West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Total
2:00 PM	39	100	0	139	126	33	0	159	30	45	0	75	373
2:15 PM	23	98	0	121	109	12	0	121	21	40	0	61	303
2:30 PM	33	107	0	140	144	13	0	157	24	44	0	68	365
2:45 PM	27	102	0	129	123	17	0	140	27	31	0	58	327
Total	122	407	0	529	502	75	0	577	102	160	0	262	1368
3:00 PM	18	106	0	124	167	11	0	178	32	62	0	94	396
3:15 PM	31	104	0	135	144	25	0	169	27	44	0	71	375
3:30 PM	31	108	0	139	140	23	0	163	56	53	0	109	411
3:45 PM	29	119	0	148	159	14	0	173	38	45	0	83	404
Total	109	437	0	546	610	73	0	683	153	204	0	357	1586
4:00 PM	31	87	0	118	139	17	0	156	40	51	0	91	365
4:15 PM	26	120	0	146	121	13	0	134	28	52	0	80	360
4:30 PM	29	120	0	149	147	14	0	161	53	56	0	109	419
4:45 PM	33	101	0	134	142	17	0	159	33	55	0	88	381
Total	119	428	0	547	549	61	0	610	154	214	0	368	1525
5:00 PM	25	105	0	130	149	19	0	168	55	70	0	125	423
5:15 PM	35	115	0	150	152	14	0	166	41	56	0	97	413
5:30 PM	47	118	0	165	152	25	0	177	36	38	0	74	416
5:45 PM	34	98	0	132	121	22	0	143	30	53	0	83	358
Total	141	436	0	577	574	80	0	654	162	217	0	379	1610
Grand Total	491	1708	0	2199	2235	289	0	2524	571	795	0	1366	6089
Approach %	22.3	77.7	0.0		88.5	11.5	0.0		41.8	58.2	0.0		
Total %	8.1	28.1	0.0	36.1	36.7	4.7	0.0	41.5	9.4	13.1	0.0	22.4	
Exiting Leg Total				3030				2279				780	6089

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

4:30 PM	Bridge Street				Bridge Street				French Street				
	North				South				West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Total
4:30 PM	29	120	0	149	147	14	0	161	53	56	0	109	419
4:45 PM	33	101	0	134	142	17	0	159	33	55	0	88	381
5:00 PM	25	105	0	130	149	19	0	168	55	70	0	125	423
5:15 PM	35	115	0	150	152	14	0	166	41	56	0	97	413
Total Volume	122	441	0	563	590	64	0	654	182	237	0	419	1636
% Approach Total	21.7	78.3	0.0		90.2	9.8	0.0		43.4	56.6	0.0		
PHF	0.871	0.919	0.000	0.938	0.970	0.842	0.000	0.973	0.827	0.846	0.000	0.838	0.967
Entering Leg	122	441	0	563	590	64	0	654	182	237	0	419	1636
Exiting Leg				827				623				186	1636
Total				1390				1277				605	3272

PDI File #: **175563 DD**
Location: **N: Bridge Street S: Bridge Street**
Location: **W: French Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Heavy Vehicles

	Bridge Street				Bridge Street				French Street				
	North				South				West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Total
2:00 PM	1	2	0	3	1	0	0	1	1	2	0	3	7
2:15 PM	0	0	0	0	5	0	0	5	0	1	0	1	6
2:30 PM	0	2	0	2	3	0	0	3	1	1	0	2	7
2:45 PM	0	0	0	0	2	0	0	2	0	0	0	0	2
Total	1	4	0	5	11	0	0	11	2	4	0	6	22
3:00 PM	0	0	0	0	2	0	0	2	0	0	0	0	2
3:15 PM	0	0	0	0	1	0	0	1	0	0	0	0	1
3:30 PM	0	1	0	1	1	0	0	1	0	0	0	0	2
3:45 PM	0	2	0	2	2	0	0	2	0	0	0	0	4
Total	0	3	0	3	6	0	0	6	0	0	0	0	9
4:00 PM	0	0	0	0	2	1	0	3	0	0	0	0	3
4:15 PM	0	0	0	0	1	0	0	1	0	1	0	1	2
4:30 PM	0	2	0	2	0	0	0	0	0	0	0	0	2
4:45 PM	0	0	0	0	1	1	0	2	0	1	0	1	3
Total	0	2	0	2	4	2	0	6	0	2	0	2	10
5:00 PM	0	0	0	0	4	0	0	4	0	1	0	1	5
5:15 PM	0	2	0	2	4	0	0	4	0	0	0	0	6
5:30 PM	0	3	0	3	1	0	0	1	0	1	0	1	5
5:45 PM	0	2	0	2	0	1	0	1	0	0	0	0	3
Total	0	7	0	7	9	1	0	10	0	2	0	2	19
Grand Total	1	16	0	17	30	3	0	33	2	8	0	10	60
Approach %	5.9	94.1	0.0		90.9	9.1	0.0		20.0	80.0	0.0		
Total %	1.7	26.7	0.0	28.3	50.0	5.0	0.0	55.0	3.3	13.3	0.0	16.7	
Exiting Leg Total				38				18				4	60

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:00 PM	Bridge Street				Bridge Street				French Street				
	North				South				West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Total
2:00 PM	1	2	0	3	1	0	0	1	1	2	0	3	7
2:15 PM	0	0	0	0	5	0	0	5	0	1	0	1	6
2:30 PM	0	2	0	2	3	0	0	3	1	1	0	2	7
2:45 PM	0	0	0	0	2	0	0	2	0	0	0	0	2
Total Volume	1	4	0	5	11	0	0	11	2	4	0	6	22
% Approach Total	20.0	80.0	0.0		100.0	0.0	0.0		33.3	66.7	0.0		
PHF	0.250	0.500	0.000	0.417	0.550	0.000	0.000	0.550	0.500	0.500	0.000	0.500	0.786
Entering Leg	1	4	0	5	11	0	0	11	2	4	0	6	22
Exiting Leg				15				6				1	22
Total				20				17				7	44

PDI File #: **175563 DD**
Location: **N: Bridge Street S: Bridge Street**
Location: **W: French Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Buses

	Bridge Street				Bridge Street				French Street				
	North				South				West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Total
2:00 PM	2	2	0	4	1	0	0	1	0	1	0	1	6
2:15 PM	0	0	0	0	0	0	0	0	1	2	0	3	3
2:30 PM	1	1	0	2	0	0	0	0	0	1	0	1	3
2:45 PM	0	2	0	2	0	1	0	1	0	2	0	2	5
Total	3	5	0	8	1	1	0	2	1	6	0	7	17
3:00 PM	0	0	0	0	0	1	0	1	0	0	0	0	1
3:15 PM	0	1	0	1	1	0	0	1	0	0	0	0	2
3:30 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
3:45 PM	0	2	0	2	2	0	0	2	0	2	0	2	6
Total	0	3	0	3	3	1	0	4	0	3	0	3	10
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	1	1	0	2	0	0	0	0	1	1	0	2	4
4:30 PM	0	1	0	1	0	0	0	0	0	0	0	0	1
4:45 PM	0	2	0	2	0	1	0	1	0	3	0	3	6
Total	1	4	0	5	0	1	0	1	1	4	0	5	11
5:00 PM	0	1	0	1	0	0	0	0	0	0	0	0	1
5:15 PM	0	1	0	1	0	0	0	0	0	1	0	1	2
5:30 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
5:45 PM	0	2	0	2	0	0	0	0	0	3	0	3	5
Total	0	4	0	4	0	0	0	0	0	5	0	5	9
Grand Total	4	16	0	20	4	3	0	7	2	18	0	20	47
Approach %	20.0	80.0	0.0		57.1	42.9	0.0		10.0	90.0	0.0		
Total %	8.5	34.0	0.0	42.6	8.5	6.4	0.0	14.9	4.3	38.3	0.0	42.6	
Exiting Leg Total				22				18				7	47

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:00 PM	Bridge Street				Bridge Street				French Street				
	North				South				West				
	Right	Thru	U-Turn	Total	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Total
2:00 PM	2	2	0	4	1	0	0	1	0	1	0	1	6
2:15 PM	0	0	0	0	0	0	0	0	1	2	0	3	3
2:30 PM	1	1	0	2	0	0	0	0	0	1	0	1	3
2:45 PM	0	2	0	2	0	1	0	1	0	2	0	2	5
Total Volume	3	5	0	8	1	1	0	2	1	6	0	7	17
% Approach Total	37.5	62.5	0.0		50.0	50.0	0.0		14.3	85.7	0.0		
PHF	0.375	0.625	0.000	0.500	0.250	0.250	0.000	0.500	0.250	0.750	0.000	0.583	0.708
Entering Leg	3	5	0	8	1	1	0	2	1	6	0	7	17
Exiting Leg				7				6				4	17
Total				15				8				11	34

PDI File #: **175563 DD**
Location: **N: Bridge Street S: Bridge Street**
Location: **W: French Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Bicycles (on Roadway and Crosswalks)

	Bridge Street (North)						Bridge Street (South)						French Street (West)						
	Right	Thru	U-Turn	CW-EB	CW-WB	Total	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Left	U-Turn	CW-NB	CW-SB	Total	Total
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	2
Total	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	2
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	4
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	1	2	3	5
Total	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	7	2	9	11
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3	3
4:15 PM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	2	3
4:30 PM	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2
Total	0	1	0	0	0	1	1	0	0	0	0	1	0	0	0	3	4	7	9
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
5:15 PM	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	3	0	3	4
Grand Total	0	3	0	1	0	4	1	0	0	0	1	2	0	0	0	13	7	20	26
Approach %	0.0	75.0	0.0	25.0	0.0		50.0	0.0	0.0	0.0	50.0		0.0	0.0	0.0	65.0	35.0		
Total %	0.0	11.5	0.0	3.8	0.0	15.4	3.8	0.0	0.0	0.0	3.8	7.7	0.0	0.0	0.0	50.0	26.9	76.9	
Exiting Leg Total						2						4						20	26

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

3:45 PM	Bridge Street (North)						Bridge Street (South)						French Street (West)						
	Right	Thru	U-Turn	CW-EB	CW-WB	Total	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Left	U-Turn	CW-NB	CW-SB	Total	Total
3:45 PM	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	1	2	3	5
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3	3
4:15 PM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	2	3
4:30 PM	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1
Total Volume	0	3	0	0	0	3	1	0	0	0	0	1	0	0	0	3	5	8	12
% Approach Total	0.0	100.0	0.0	0.0	0.0		100.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	37.5	62.5		
PHF	0.000	0.375	0.000	0.000	0.000	0.375	0.250	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.375	0.625	0.667	0.600
Entering Leg	0	3	0	0	0	3	1	0	0	0	0	1	0	0	0	3	5	8	12
Exiting Leg						1						3						8	12
Total						4						4						16	24

PDI File #: **175563 DD**
Location: **N: Bridge Street S: Bridge Street**
Location: **W: French Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Pedestrians

	Bridge Street						Bridge Street						French Street						
	North						South						West						
	Right	Thru	U-Turn	CW-EB	CW-WB	Total	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Left	U-Turn	CW-NB	CW-SB	Total	Total
2:00 PM	0	0	0	0	0	0	0	0	0	6	2	8	0	0	0	5	6	11	19
2:15 PM	0	0	0	0	1	1	0	0	0	4	4	8	0	0	0	9	14	23	32
2:30 PM	0	0	0	0	1	1	0	0	0	2	3	5	0	0	0	15	7	22	28
2:45 PM	0	0	0	0	2	2	0	0	0	3	1	4	0	0	0	13	6	19	25
Total	0	0	0	0	4	4	0	0	0	15	10	25	0	0	0	42	33	75	104
3:00 PM	0	0	0	1	1	2	0	0	0	3	8	11	0	0	0	10	4	14	27
3:15 PM	0	0	0	0	0	0	0	0	0	8	4	12	0	0	0	12	9	21	33
3:30 PM	0	0	0	1	4	5	0	0	0	6	1	7	0	0	0	7	8	15	27
3:45 PM	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	10	5	15	17
Total	0	0	0	2	5	7	0	0	0	18	14	32	0	0	0	39	26	65	104
4:00 PM	0	0	0	0	0	0	0	0	0	6	3	9	0	0	0	7	1	8	17
4:15 PM	0	0	0	2	0	2	0	0	0	0	2	2	0	0	0	7	4	11	15
4:30 PM	0	0	0	2	0	2	0	0	0	2	4	6	0	0	0	4	3	7	15
4:45 PM	0	0	0	0	2	2	0	0	0	6	3	9	0	0	0	1	5	6	17
Total	0	0	0	4	2	6	0	0	0	14	12	26	0	0	0	19	13	32	64
5:00 PM	0	0	0	0	0	0	0	0	0	1	4	5	0	0	0	6	1	7	12
5:15 PM	0	0	0	1	0	1	0	0	0	3	2	5	0	0	0	8	5	13	19
5:30 PM	0	0	0	2	1	3	0	0	0	5	3	8	0	0	0	4	2	6	17
5:45 PM	0	0	0	2	0	2	0	0	0	1	5	6	0	0	0	7	4	11	19
Total	0	0	0	5	1	6	0	0	0	10	14	24	0	0	0	25	12	37	67
Grand Total	0	0	0	11	12	23	0	0	0	57	50	107	0	0	0	125	84	209	339
Approach %	0.0	0.0	0.0	47.8	52.2		0.0	0.0	0.0	53.3	46.7		0.0	0.0	0.0	59.8	40.2		
Total %	0.0	0.0	0.0	3.2	3.5	6.8	0.0	0.0	0.0	16.8	14.7	31.6	0.0	0.0	0.0	36.9	24.8	61.7	
Exiting Leg Total						23						107						209	339

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:30 PM	Bridge Street						Bridge Street						French Street						
	North						South						West						
	Right	Thru	U-Turn	CW-EB	CW-WB	Total	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Left	U-Turn	CW-NB	CW-SB	Total	Total
2:30 PM	0	0	0	0	1	1	0	0	0	2	3	5	0	0	0	15	7	22	28
2:45 PM	0	0	0	0	2	2	0	0	0	3	1	4	0	0	0	13	6	19	25
3:00 PM	0	0	0	1	1	2	0	0	0	3	8	11	0	0	0	10	4	14	27
3:15 PM	0	0	0	0	0	0	0	0	0	8	4	12	0	0	0	12	9	21	33
Total Volume	0	0	0	1	4	5	0	0	0	16	16	32	0	0	0	50	26	76	113
% Approach Total	0.0	0.0	0.0	20.0	80.0		0.0	0.0	0.0	50.0	50.0		0.0	0.0	0.0	65.8	34.2		
PHF	0.000	0.000	0.000	0.250	0.500	0.625	0.000	0.000	0.000	0.500	0.500	0.667	0.000	0.000	0.000	0.833	0.722	0.864	0.856
Entering Leg	0	0	0	1	4	5	0	0	0	16	16	32	0	0	0	50	26	76	113
Exiting Leg						5						32						76	113
Total						10						64						152	226

PDI File #: **175563 E**
Location: **N: Arcand Drive S: Worthen Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars, Heavy Vehicles, and Buses (Combined)

	Arcand Drive (North)					Merrimack Street (East)					Worthen Street (South)					Merrimack Street (West)					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
6:00 AM	6	2	1	0	9	0	14	1	1	16	1	0	0	0	1	2	29	0	0	31	57
6:15 AM	6	5	1	0	12	0	23	1	0	24	0	0	0	0	0	3	39	0	0	42	78
6:30 AM	9	3	0	0	12	0	28	1	0	29	0	0	0	0	0	2	55	0	0	57	98
6:45 AM	17	5	1	0	23	0	28	0	0	28	0	0	0	0	0	2	69	0	0	71	122
Total	38	15	3	0	56	0	93	3	1	97	1	0	0	0	1	9	192	0	0	201	355
7:00 AM	6	7	1	0	14	0	31	4	0	35	0	0	0	0	0	4	60	0	0	64	113
7:15 AM	15	2	0	0	17	0	52	2	0	54	0	0	0	0	0	5	86	0	0	91	162
7:30 AM	29	8	1	0	38	0	47	5	0	52	0	0	0	0	0	10	128	0	0	138	228
7:45 AM	38	8	0	0	46	0	72	5	0	77	0	0	0	0	0	7	102	0	0	109	232
Total	88	25	2	0	115	0	202	16	0	218	0	0	0	0	0	26	376	0	0	402	735
8:00 AM	20	4	0	0	24	0	48	4	0	52	0	0	0	0	0	4	65	0	0	69	145
8:15 AM	9	1	3	0	13	0	51	2	0	53	0	0	0	0	0	6	71	0	0	77	143
8:30 AM	7	5	0	0	12	0	61	2	0	63	0	0	0	0	0	1	66	0	0	67	142
8:45 AM	17	4	0	0	21	0	65	1	1	67	0	0	0	0	0	4	64	0	0	68	156
Total	53	14	3	0	70	0	225	9	1	235	0	0	0	0	0	15	266	0	0	281	586
9:00 AM	15	5	1	0	21	0	62	1	0	63	0	0	0	0	0	4	74	0	0	78	162
9:15 AM	18	4	1	0	23	0	63	6	0	69	0	0	0	0	0	5	61	0	0	66	158
9:30 AM	20	2	0	0	22	0	60	0	1	61	1	0	1	0	2	4	58	0	0	62	147
9:45 AM	14	5	6	0	25	0	49	4	1	54	0	0	0	0	0	5	55	0	0	60	139
Total	67	16	8	0	91	0	234	11	2	247	1	0	1	0	2	18	248	0	0	266	606
Grand Total	246	70	16	0	332	0	754	39	4	797	2	0	1	0	3	68	1082	0	0	1150	2282
Approach %	74.1	21.1	4.8	0.0		0.0	94.6	4.9	0.5		66.7	0.0	33.3	0.0		5.9	94.1	0.0	0.0		
Total %	10.8	3.1	0.7	0.0	14.5	0.0	33.0	1.7	0.2	34.9	0.1	0.0	0.0	0.0	0.1	3.0	47.4	0.0	0.0	50.4	
Exiting Leg Total					0					1104					177					1001	2282
Cars	228	64	16	0	308	0	702	36	4	742	2	0	1	0	3	66	1027	0	0	1093	2146
% Cars	92.7	91.4	100.0	0.0	92.8	0.0	93.1	92.3	100.0	93.1	100.0	0.0	100.0	0.0	100.0	97.1	94.9	0.0	0.0	95.0	94.0
Exiting Leg Total					0					1049					166					931	2146
Heavy Vehicles	3	4	0	0	7	0	16	3	0	19	0	0	0	0	0	2	17	0	0	19	45
% Heavy Vehicles	1.2	5.7	0.0	0.0	2.1	0.0	2.1	7.7	0.0	2.4	0.0	0.0	0.0	0.0	0.0	2.9	1.6	0.0	0.0	1.7	2.0
Exiting Leg Total					0					17					9					19	45
Buses	15	2	0	0	17	0	36	0	0	36	0	0	0	0	0	0	38	0	0	38	91
% Buses	6.1	2.9	0.0	0.0	5.1	0.0	4.8	0.0	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.0	3.3	4.0
Exiting Leg Total					0					38					2					51	91

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:15 AM	Arcand Drive (North)					Merrimack Street (East)					Worthen Street (South)					Merrimack Street (West)					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
7:15 AM	15	2	0	0	17	0	52	2	0	54	0	0	0	0	0	5	86	0	0	91	162
7:30 AM	29	8	1	0	38	0	47	5	0	52	0	0	0	0	0	10	128	0	0	138	228
7:45 AM	38	8	0	0	46	0	72	5	0	77	0	0	0	0	0	7	102	0	0	109	232
8:00 AM	20	4	0	0	24	0	48	4	0	52	0	0	0	0	0	4	65	0	0	69	145
Total Volume	102	22	1	0	125	0	219	16	0	235	0	0	0	0	0	26	381	0	0	407	767
% Approach Total	81.6	17.6	0.8	0.0		0.0	93.2	6.8	0.0		0.0	0.0	0.0	0.0		6.4	93.6	0.0	0.0		
PHF	0.671	0.688	0.250	0.000	0.679	0.000	0.760	0.800	0.000	0.763	0.000	0.000	0.000	0.000	0.000	0.650	0.744	0.000	0.000	0.737	0.827
Cars	94	22	1	0	117	0	202	15	0	217	0	0	0	0	0	26	363	0	0	389	723
Cars %	92.2	100.0	100.0	0.0	93.6	0.0	92.2	93.8	0.0	92.3	0.0	0.0	0.0	0.0	0.0	100.0	95.3	0.0	0.0	95.6	94.3
Heavy Vehicles	1	0	0	0	1	0	3	1	0	4	0	0	0	0	0	0	7	0	0	7	12
Heavy Vehicles %	1.0	0.0	0.0	0.0	0.8	0.0	1.4	6.3	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.0	1.7	1.6
Buses	7	0	0	0	7	0	14	0	0	14	0	0	0	0	0	0	11	0	0	11	32
Buses %	6.9	0.0	0.0	0.0	5.6	0.0	6.4	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	0.0	0.0	2.7	4.2

PDI File #: **175563 E**
Location: **N: Arcand Drive S: Worthen Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars, Heavy Vehicles, and Buses (Combined)

	Arcand Drive					Merrimack Street					Worthen Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
Cars Enter Leg	94	22	1	0	117	0	202	15	0	217	0	0	0	0	0	26	363	0	0	389	723
Heavy Enter Leg	1	0	0	0	1	0	3	1	0	4	0	0	0	0	0	0	7	0	0	7	12
Bus Enter Leg	7	0	0	0	7	0	14	0	0	14	0	0	0	0	0	0	11	0	0	11	32
Total Entering Leg	102	22	1	0	125	0	219	16	0	235	0	0	0	0	0	26	381	0	0	407	767
Cars Exiting Leg					0					364					63					296	723
Heavy Exiting Leg					0					7					1					4	12
Buses Exiting Leg					0					11					0					21	32
Total Exiting Leg					0					382					64					321	767

PDI File #: **175563 E**
Location: **N: Arcand Drive S: Worthen Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
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PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars

	Arcand Drive (North)					Merrimack Street (East)					Worthen Street (South)					Merrimack Street (West)					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
6:00 AM	5	1	1	0	7	0	13	1	1	15	1	0	0	0	1	2	28	0	0	30	53
6:15 AM	5	5	1	0	11	0	23	1	0	24	0	0	0	0	0	3	37	0	0	40	75
6:30 AM	9	2	0	0	11	0	26	1	0	27	0	0	0	0	0	2	54	0	0	56	94
6:45 AM	15	5	1	0	21	0	25	0	0	25	0	0	0	0	0	2	67	0	0	69	115
Total	34	13	3	0	50	0	87	3	1	91	1	0	0	0	1	9	186	0	0	195	337
7:00 AM	4	7	1	0	12	0	30	4	0	34	0	0	0	0	0	3	59	0	0	62	108
7:15 AM	13	2	0	0	15	0	48	1	0	49	0	0	0	0	0	5	83	0	0	88	152
7:30 AM	28	8	1	0	37	0	42	5	0	47	0	0	0	0	0	10	123	0	0	133	217
7:45 AM	38	8	0	0	46	0	68	5	0	73	0	0	0	0	0	7	98	0	0	105	224
Total	83	25	2	0	110	0	188	15	0	203	0	0	0	0	0	25	363	0	0	388	701
8:00 AM	15	4	0	0	19	0	44	4	0	48	0	0	0	0	0	4	59	0	0	63	130
8:15 AM	8	1	3	0	12	0	49	2	0	51	0	0	0	0	0	5	64	0	0	69	132
8:30 AM	7	4	0	0	11	0	55	1	0	56	0	0	0	0	0	1	64	0	0	65	132
8:45 AM	15	3	0	0	18	0	61	0	1	62	0	0	0	0	0	4	59	0	0	63	143
Total	45	12	3	0	60	0	209	7	1	217	0	0	0	0	0	14	246	0	0	260	537
9:00 AM	14	5	1	0	20	0	55	1	0	56	0	0	0	0	0	4	72	0	0	76	152
9:15 AM	18	4	1	0	23	0	60	6	0	66	0	0	0	0	0	5	54	0	0	59	148
9:30 AM	20	1	0	0	21	0	56	0	1	57	1	0	1	0	2	4	56	0	0	60	140
9:45 AM	14	4	6	0	24	0	47	4	1	52	0	0	0	0	0	5	50	0	0	55	131
Total	66	14	8	0	88	0	218	11	2	231	1	0	1	0	2	18	232	0	0	250	571
Grand Total	228	64	16	0	308	0	702	36	4	742	2	0	1	0	3	66	1027	0	0	1093	2146
Approach %	74.0	20.8	5.2	0.0		0.0	94.6	4.9	0.5		66.7	0.0	33.3	0.0		6.0	94.0	0.0	0.0		
Total %	10.6	3.0	0.7	0.0	14.4	0.0	32.7	1.7	0.2	34.6	0.1	0.0	0.0	0.0	0.1	3.1	47.9	0.0	0.0	50.9	
Exiting Leg Total					0					1049					166					931	2146

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:15 AM	Arcand Drive (North)					Merrimack Street (East)					Worthen Street (South)					Merrimack Street (West)					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
7:15 AM	13	2	0	0	15	0	48	1	0	49	0	0	0	0	0	5	83	0	0	88	152
7:30 AM	28	8	1	0	37	0	42	5	0	47	0	0	0	0	0	10	123	0	0	133	217
7:45 AM	38	8	0	0	46	0	68	5	0	73	0	0	0	0	0	7	98	0	0	105	224
8:00 AM	15	4	0	0	19	0	44	4	0	48	0	0	0	0	0	4	59	0	0	63	130
Total Volume	94	22	1	0	117	0	202	15	0	217	0	0	0	0	0	26	363	0	0	389	723
% Approach Total	80.3	18.8	0.9	0.0		0.0	93.1	6.9	0.0		0.0	0.0	0.0	0.0		6.7	93.3	0.0	0.0		
PHF	0.618	0.688	0.250	0.000	0.636	0.000	0.743	0.750	0.000	0.743	0.000	0.000	0.000	0.000	0.000	0.650	0.738	0.000	0.000	0.731	0.807
Entering Leg	94	22	1	0	117	0	202	15	0	217	0	0	0	0	0	26	363	0	0	389	723
Exiting Leg					0					364					63					296	723
Total					117					581					63					685	1446

PDI File #: **175563 E**
Location: **N: Arcand Drive S: Worthen Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Heavy Vehicles

	Arcand Drive (North)					Merrimack Street (East)					Worthen Street (South)					Merrimack Street (West)					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
6:00 AM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6:15 AM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	3
6:30 AM	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2
6:45 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Total	2	1	0	0	3	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2	7
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
7:15 AM	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2	0	0	2	3
7:30 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	3
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
Total	0	0	0	0	0	0	1	1	0	2	0	0	0	0	0	1	5	0	0	6	8
8:00 AM	1	0	0	0	1	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2	5
8:15 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	2	0	0	3	4
8:30 AM	0	1	0	0	1	0	2	1	0	3	0	0	0	0	0	0	0	0	0	0	4
8:45 AM	0	0	0	0	0	0	2	1	0	3	0	0	0	0	0	0	1	0	0	1	4
Total	1	1	0	0	2	0	7	2	0	9	0	0	0	0	0	1	5	0	0	6	17
9:00 AM	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	3
9:15 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	3
9:30 AM	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	3
9:45 AM	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	4
Total	0	2	0	0	2	0	6	0	0	6	0	0	0	0	0	0	5	0	0	5	13
Grand Total	3	4	0	0	7	0	16	3	0	19	0	0	0	0	0	2	17	0	0	19	45
Approach %	42.9	57.1	0.0	0.0		0.0	84.2	15.8	0.0		0.0	0.0	0.0	0.0		10.5	89.5	0.0	0.0		
Total %	6.7	8.9	0.0	0.0	15.6	0.0	35.6	6.7	0.0	42.2	0.0	0.0	0.0	0.0	0.0	4.4	37.8	0.0	0.0	42.2	
Exiting Leg Total					0					17					9					19	45

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

8:00 AM	Arcand Drive (North)					Merrimack Street (East)					Worthen Street (South)					Merrimack Street (West)					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
8:00 AM	1	0	0	0	1	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2	5
8:15 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	2	0	0	3	4
8:30 AM	0	1	0	0	1	0	2	1	0	3	0	0	0	0	0	0	0	0	0	0	4
8:45 AM	0	0	0	0	0	0	2	1	0	3	0	0	0	0	0	0	1	0	0	1	4
Total Volume	1	1	0	0	2	0	7	2	0	9	0	0	0	0	0	1	5	0	0	6	17
% Approach Total	50.0	50.0	0.0	0.0		0.0	77.8	22.2	0.0		0.0	0.0	0.0	0.0		16.7	83.3	0.0	0.0		
PHF	0.250	0.250	0.000	0.000	0.500	0.000	0.875	0.500	0.000	0.750	0.000	0.000	0.000	0.000	0.000	0.250	0.625	0.000	0.000	0.500	0.850
Entering Leg	1	1	0	0	2	0	7	2	0	9	0	0	0	0	0	1	5	0	0	6	17
Exiting Leg					0					5					4					8	17
Total					2					14					4					14	34

PDI File #: **175563 E**
Location: **N: Arcand Drive S: Worthen Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Buses

	Arcand Drive (North)					Merrimack Street (East)					Worthen Street (South)					Merrimack Street (West)					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
6:00 AM	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	3
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	2
6:45 AM	2	0	0	0	2	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2	6
Total	2	1	0	0	3	0	4	0	0	4	0	0	0	0	0	0	4	0	0	4	11
7:00 AM	2	0	0	0	2	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	4
7:15 AM	2	0	0	0	2	0	4	0	0	4	0	0	0	0	0	0	1	0	0	1	7
7:30 AM	1	0	0	0	1	0	4	0	0	4	0	0	0	0	0	0	3	0	0	3	8
7:45 AM	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	3	0	0	3	7
Total	5	0	0	0	5	0	13	0	0	13	0	0	0	0	0	0	8	0	0	8	26
8:00 AM	4	0	0	0	4	0	2	0	0	2	0	0	0	0	0	0	4	0	0	4	10
8:15 AM	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	5	0	0	5	7
8:30 AM	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	2	0	0	2	6
8:45 AM	2	1	0	0	3	0	2	0	0	2	0	0	0	0	0	0	4	0	0	4	9
Total	7	1	0	0	8	0	9	0	0	9	0	0	0	0	0	0	15	0	0	15	32
9:00 AM	1	0	0	0	1	0	4	0	0	4	0	0	0	0	0	0	2	0	0	2	7
9:15 AM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	5	0	0	5	7
9:30 AM	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	1	0	0	1	4
9:45 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	4
Total	1	0	0	0	1	0	10	0	0	10	0	0	0	0	0	0	11	0	0	11	22
Grand Total	15	2	0	0	17	0	36	0	0	36	0	0	0	0	0	0	38	0	0	38	91
Approach %	88.2	11.8	0.0	0.0		0.0	100.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0		
Total %	16.5	2.2	0.0	0.0	18.7	0.0	39.6	0.0	0.0	39.6	0.0	0.0	0.0	0.0	0.0	0.0	41.8	0.0	0.0	41.8	
Exiting Leg Total					0					38					2					51	91

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:15 AM	Arcand Drive (North)					Merrimack Street (East)					Worthen Street (South)					Merrimack Street (West)					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
7:15 AM	2	0	0	0	2	0	4	0	0	4	0	0	0	0	0	0	1	0	0	1	7
7:30 AM	1	0	0	0	1	0	4	0	0	4	0	0	0	0	0	0	3	0	0	3	8
7:45 AM	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	3	0	0	3	7
8:00 AM	4	0	0	0	4	0	2	0	0	2	0	0	0	0	0	0	4	0	0	4	10
Total Volume	7	0	0	0	7	0	14	0	0	14	0	0	0	0	0	0	11	0	0	11	32
% Approach Total	100.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0		
PHF	0.438	0.000	0.000	0.000	0.438	0.000	0.875	0.000	0.000	0.875	0.000	0.000	0.000	0.000	0.000	0.000	0.688	0.000	0.000	0.688	0.800
Entering Leg	7	0	0	0	7	0	14	0	0	14	0	0	0	0	0	0	11	0	0	11	32
Exiting Leg					0					11					0					21	32
Total					7					25					0					32	64

PDI File #: **175563 E**
Location: **N: Arcand Drive S: Worthen Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Bicycles (on Roadway and Crosswalks)

	Arcand Drive (North)							Merrimack Street (East)							Worthen Street (South)							Merrimack Street (West)							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Total	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
9:00 AM	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	3	4
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	3	4
Grand Total	0	1	1	0	2	0	4	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	1	3	9
Approach %	0.0	25.0	25.0	0.0	50.0	0.0		0.0	100.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	66.7	0.0	0.0	0.0	33.3		
Total %	0.0	11.1	11.1	0.0	22.2	0.0	44.4	0.0	22.2	0.0	0.0	0.0	0.0	22.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.2	0.0	0.0	0.0	11.1	33.3	
Exiting Leg Total							2							3							1							3	9

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

8:15 AM	Arcand Drive (North)							Merrimack Street (East)							Worthen Street (South)							Merrimack Street (West)							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
9:00 AM	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	3	4
Total Volume	0	0	1	0	0	0	1	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	1	3	6
% Approach Total	0.0	0.0	100.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	66.7	0.0	0.0	0.0	33.3		
PHF	0.000	0.000	0.250	0.000	0.000	0.000	0.250	0.000	0.250	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.250	0.250	0.375
Entering Leg	0	0	1	0	0	0	1	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	1	3	6
Exiting Leg							0							3							0							3	6
Total							1							5							0							6	12

PDI File #: **175563 E**
Location: **N: Arcand Drive S: Worthen Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Pedestrians

	Arcand Drive (North)							Merrimack Street (East)							Worthen Street (South)							Merrimack Street (West)							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
6:00 AM	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	3	4	0	0	0	0	1	0	1	6
6:15 AM	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
6:45 AM	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	12	13	0	0	0	0	0	0	0	14
Total	0	0	0	0	1	2	3	0	0	0	0	0	0	0	0	0	0	0	2	15	17	0	0	0	0	1	2	3	23
7:00 AM	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	1	8	9	0	0	0	0	1	0	1	12
7:15 AM	0	0	0	0	20	4	24	0	0	0	0	0	0	0	0	0	0	0	0	5	5	0	0	0	0	1	0	1	30
7:30 AM	0	0	0	0	28	2	30	0	0	0	0	0	1	1	0	0	0	0	2	15	17	0	0	0	0	8	0	8	56
7:45 AM	0	0	0	0	38	3	41	0	0	0	0	0	1	1	0	0	0	0	2	11	13	0	0	0	0	2	0	2	57
Total	0	0	0	0	88	9	97	0	0	0	0	0	2	2	0	0	0	0	5	39	44	0	0	0	0	12	0	12	155
8:00 AM	0	0	0	0	4	1	5	0	0	0	0	0	1	1	0	0	0	0	1	4	5	0	0	0	0	0	0	0	11
8:15 AM	0	0	0	0	6	4	10	0	0	0	0	0	0	0	0	0	0	0	5	8	13	0	0	0	0	3	1	4	27
8:30 AM	0	0	0	0	9	4	13	0	0	0	0	0	0	0	0	0	0	0	2	3	5	0	0	0	0	0	0	0	18
8:45 AM	0	0	0	0	3	7	10	0	0	0	0	0	0	0	0	0	0	0	6	5	11	0	0	0	0	1	1	2	23
Total	0	0	0	0	22	16	38	0	0	0	0	0	1	1	0	0	0	0	14	20	34	0	0	0	0	4	2	6	79
9:00 AM	0	0	0	0	3	5	8	0	0	0	0	0	0	0	0	0	0	0	4	4	8	0	0	0	0	1	0	1	17
9:15 AM	0	0	0	0	3	6	9	0	0	0	0	0	0	0	0	0	0	0	7	5	12	0	0	0	0	1	0	1	22
9:30 AM	0	0	0	0	7	7	14	0	0	0	0	0	0	0	0	0	0	0	7	5	12	0	0	0	0	1	0	1	27
9:45 AM	0	0	0	0	7	6	13	0	0	0	0	0	0	0	0	0	0	0	8	10	18	0	0	0	0	2	0	2	33
Total	0	0	0	0	20	24	44	0	0	0	0	0	0	0	0	0	0	0	26	24	50	0	0	0	0	5	0	5	99
Grand Total	0	0	0	0	131	51	182	0	0	0	0	0	3	3	0	0	0	0	47	98	145	0	0	0	0	22	4	26	356
Approach %	0.0	0.0	0.0	0.0	72.0	28.0		0.0	0.0	0.0	0.0	0.0	100.0		0.0	0.0	0.0	0.0	32.4	67.6		0.0	0.0	0.0	0.0	84.6	15.4		
Total %	0.0	0.0	0.0	0.0	36.8	14.3	51.1	0.0	0.0	0.0	0.0	0.0	0.8	0.8	0.0	0.0	0.0	0.0	13.2	27.5	40.7	0.0	0.0	0.0	0.0	6.2	1.1	7.3	
Exiting Leg Total							182							3							145							26	356

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:00 AM	Arcand Drive (North)							Merrimack Street (East)							Worthen Street (South)							Merrimack Street (West)							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
7:00 AM	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	1	8	9	0	0	0	0	1	0	1	12
7:15 AM	0	0	0	0	20	4	24	0	0	0	0	0	0	0	0	0	0	0	0	5	5	0	0	0	0	1	0	1	30
7:30 AM	0	0	0	0	28	2	30	0	0	0	0	0	1	1	0	0	0	0	2	15	17	0	0	0	0	8	0	8	56
7:45 AM	0	0	0	0	38	3	41	0	0	0	0	0	1	1	0	0	0	0	2	11	13	0	0	0	0	2	0	2	57
Total Volume	0	0	0	0	88	9	97	0	0	0	0	0	2	2	0	0	0	0	5	39	44	0	0	0	0	12	0	12	155
% Approach Total	0.0	0.0	0.0	0.0	90.7	9.3		0.0	0.0	0.0	0.0	0.0	100.0		0.0	0.0	0.0	0.0	11.4	88.6		0.0	0.0	0.0	0.0	100.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.579	0.563	0.591	0.000	0.000	0.000	0.000	0.000	0.500	0.500	0.000	0.000	0.000	0.000	0.625	0.650	0.647	0.000	0.000	0.000	0.000	0.375	0.000	0.375	0.680
Entering Leg	0	0	0	0	88	9	97	0	0	0	0	0	2	2	0	0	0	0	5	39	44	0	0	0	0	12	0	12	155
Exiting Leg							97							2							44							12	155
Total							194							4							88							24	310

PDI File #: **175563 EE**
Location: **N: Arcand Drive S: Worthen Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars, Heavy Vehicles, and Buses (Combined)

	Arcand Drive					Merrimack Street					Worthen Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	19	8	2	0	29	0	58	7	0	65	0	0	0	0	0	8	83	0	0	91	185
2:15 PM	20	3	1	0	24	0	70	9	0	79	0	0	0	0	0	10	81	0	0	91	194
2:30 PM	17	6	1	0	24	0	63	3	0	66	0	0	0	0	0	3	59	0	0	62	152
2:45 PM	18	5	3	0	26	0	78	0	0	78	0	0	0	0	0	9	65	0	0	74	178
Total	74	22	7	0	103	0	269	19	0	288	0	0	0	0	0	30	288	0	0	318	709
3:00 PM	20	7	0	0	27	0	86	1	0	87	0	0	0	3	3	8	59	0	2	69	186
3:15 PM	18	10	2	0	30	0	84	3	0	87	0	0	0	0	0	2	64	0	0	66	183
3:30 PM	10	10	1	0	21	0	88	6	0	94	0	0	0	0	0	10	65	0	0	75	190
3:45 PM	19	6	3	0	28	0	72	3	0	75	0	0	0	0	0	6	62	0	0	68	171
Total	67	33	6	0	106	0	330	13	0	343	0	0	0	3	3	26	250	0	2	278	730
4:00 PM	16	10	0	0	26	1	82	7	0	90	0	0	0	0	0	4	64	0	0	68	184
4:15 PM	23	10	1	0	34	0	76	5	0	81	0	0	0	0	0	4	62	0	0	66	181
4:30 PM	18	11	0	0	29	0	72	2	0	74	1	0	0	0	1	7	70	0	0	77	181
4:45 PM	15	6	2	0	23	0	75	3	0	78	0	0	0	0	0	4	68	0	0	72	173
Total	72	37	3	0	112	1	305	17	0	323	1	0	0	0	1	19	264	0	0	283	719
5:00 PM	15	9	4	0	28	0	76	3	0	79	0	0	0	0	0	5	71	0	0	76	183
5:15 PM	21	3	3	0	27	0	81	1	0	82	0	0	0	0	0	7	68	0	0	75	184
5:30 PM	12	3	1	0	16	0	78	2	0	80	0	0	0	0	0	3	67	0	0	70	166
5:45 PM	15	4	1	0	20	0	84	1	0	85	0	0	0	0	0	4	57	0	0	61	166
Total	63	19	9	0	91	0	319	7	0	326	0	0	0	0	0	19	263	0	0	282	699
Grand Total	276	111	25	0	412	1	1223	56	0	1280	1	0	0	3	4	94	1065	0	2	1161	2857
Approach %	67.0	26.9	6.1	0.0		0.1	95.5	4.4	0.0		25.0	0.0	0.0	75.0		8.1	91.7	0.0	0.2		
Total %	9.7	3.9	0.9	0.0	14.4	0.0	42.8	2.0	0.0	44.8	0.0	0.0	0.0	0.1	0.1	3.3	37.3	0.0	0.1	40.6	
Exiting Leg Total					1					1091					264					1501	2857
Cars	267	108	25	0	400	1	1182	53	0	1236	1	0	0	3	4	93	1013	0	2	1108	2748
% Cars	96.7	97.3	100.0	0.0	97.1	100.0	96.6	94.6	0.0	96.6	100.0	0.0	0.0	100.0	100.0	98.9	95.1	0.0	100.0	95.4	96.2
Exiting Leg Total					1					1039					257					1451	2748
Heavy Vehicles	4	2	0	0	6	0	6	2	0	8	0	0	0	0	0	1	15	0	0	16	30
% Heavy Vehicles	1.4	1.8	0.0	0.0	1.5	0.0	0.5	3.6	0.0	0.6	0.0	0.0	0.0	0.0	0.0	1.1	1.4	0.0	0.0	1.4	1.1
Exiting Leg Total					0					15					5					10	30
Buses	5	1	0	0	6	0	35	1	0	36	0	0	0	0	0	0	37	0	0	37	79
% Buses	1.8	0.9	0.0	0.0	1.5	0.0	2.9	1.8	0.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.0	3.2	2.8
Exiting Leg Total					0					37					2					40	79

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:45 PM	Arcand Drive					Merrimack Street					Worthen Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:45 PM	18	5	3	0	26	0	78	0	0	78	0	0	0	0	0	9	65	0	0	74	178
3:00 PM	20	7	0	0	27	0	86	1	0	87	0	0	0	3	3	8	59	0	2	69	186
3:15 PM	18	10	2	0	30	0	84	3	0	87	0	0	0	0	0	2	64	0	0	66	183
3:30 PM	10	10	1	0	21	0	88	6	0	94	0	0	0	0	0	10	65	0	0	75	190
Total Volume	66	32	6	0	104	0	336	10	0	346	0	0	0	3	3	29	253	0	2	284	737
% Approach Total	63.5	30.8	5.8	0.0		0.0	97.1	2.9	0.0		0.0	0.0	0.0	100.0		10.2	89.1	0.0	0.7		
PHF	0.825	0.800	0.500	0.000	0.867	0.000	0.955	0.417	0.000	0.920	0.000	0.000	0.000	0.250	0.250	0.725	0.973	0.000	0.250	0.947	0.970
Cars	65	31	6	0	102	0	325	10	0	335	0	0	0	3	3	28	243	0	2	273	713
Cars %	98.5	96.9	100.0	0.0	98.1	0.0	96.7	100.0	0.0	96.8	0.0	0.0	0.0	100.0	100.0	96.6	96.0	0.0	100.0	96.1	96.7
Heavy Vehicles	1	1	0	0	2	0	2	0	0	2	0	0	0	0	0	1	3	0	0	4	8
Heavy Vehicles %	1.5	3.1	0.0	0.0	1.9	0.0	0.6	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	3.4	1.2	0.0	0.0	1.4	1.1
Buses	0	0	0	0	0	0	9	0	0	9	0	0	0	0	0	0	7	0	0	7	16
Buses %	0.0	0.0	0.0	0.0	0.0	0.0	2.7	0.0	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0	2.8	0.0	0.0	2.5	2.2

PDI File #: **175563 EE**
Location: **N: Arcand Drive S: Worthen Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Class:

Cars, Heavy Vehicles, and Buses (Combined)

	Arcand Drive (North)					Merrimack Street (East)					Worthen Street (South)					Merrimack Street (West)					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
Cars Enter Leg	65	31	6	0	102	0	325	10	0	335	0	0	0	3	3	28	243	0	2	273	713
Heavy Enter Leg	1	1	0	0	2	0	2	0	0	2	0	0	0	0	0	1	3	0	0	4	8
Bus Enter Leg	0	0	0	0	0	0	9	0	0	9	0	0	0	0	0	0	7	0	0	7	16
Total Entering Leg	66	32	6	0	104	0	336	10	0	346	0	0	0	3	3	29	253	0	2	284	737
Cars Exiting Leg					0					249					72					392	713
Heavy Exiting Leg					0					3					2					3	8
Buses Exiting Leg					0					7					0					9	16
Total Exiting Leg					0					259					74					404	737

PDI File #: **175563 EE**
Location: **N: Arcand Drive S: Worthen Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars

	Arcand Drive					Merrimack Street					Worthen Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	15	7	2	0	24	0	54	5	0	59	0	0	0	0	0	8	79	0	0	87	170
2:15 PM	20	3	1	0	24	0	68	9	0	77	0	0	0	0	0	10	77	0	0	87	188
2:30 PM	17	6	1	0	24	0	61	3	0	64	0	0	0	0	0	3	55	0	0	58	146
2:45 PM	17	4	3	0	24	0	75	0	0	75	0	0	0	0	0	9	61	0	0	70	169
Total	69	20	7	0	96	0	258	17	0	275	0	0	0	0	0	30	272	0	0	302	673
3:00 PM	20	7	0	0	27	0	83	1	0	84	0	0	0	3	3	7	59	0	2	68	182
3:15 PM	18	10	2	0	30	0	83	3	0	86	0	0	0	0	0	2	60	0	0	62	178
3:30 PM	10	10	1	0	21	0	84	6	0	90	0	0	0	0	0	10	63	0	0	73	184
3:45 PM	19	6	3	0	28	0	69	3	0	72	0	0	0	0	0	6	58	0	0	64	164
Total	67	33	6	0	106	0	319	13	0	332	0	0	0	3	3	25	240	0	2	267	708
4:00 PM	16	10	0	0	26	1	79	6	0	86	0	0	0	0	0	4	62	0	0	66	178
4:15 PM	21	9	1	0	31	0	75	5	0	80	0	0	0	0	0	4	60	0	0	64	175
4:30 PM	17	11	0	0	28	0	69	2	0	71	1	0	0	0	1	7	67	0	0	74	174
4:45 PM	15	6	2	0	23	0	73	3	0	76	0	0	0	0	0	4	67	0	0	71	170
Total	69	36	3	0	108	1	296	16	0	313	1	0	0	0	1	19	256	0	0	275	697
5:00 PM	15	9	4	0	28	0	74	3	0	77	0	0	0	0	0	5	67	0	0	72	177
5:15 PM	20	3	3	0	26	0	80	1	0	81	0	0	0	0	0	7	65	0	0	72	179
5:30 PM	12	3	1	0	16	0	74	2	0	76	0	0	0	0	0	3	60	0	0	63	155
5:45 PM	15	4	1	0	20	0	81	1	0	82	0	0	0	0	0	4	53	0	0	57	159
Total	62	19	9	0	90	0	309	7	0	316	0	0	0	0	0	19	245	0	0	264	670
Grand Total	267	108	25	0	400	1	1182	53	0	1236	1	0	0	3	4	93	1013	0	2	1108	2748
Approach %	66.8	27.0	6.3	0.0		0.1	95.6	4.3	0.0		25.0	0.0	0.0	75.0		8.4	91.4	0.0	0.2		
Total %	9.7	3.9	0.9	0.0	14.6	0.0	43.0	1.9	0.0	45.0	0.0	0.0	0.0	0.1	0.1	3.4	36.9	0.0	0.1	40.3	
Exiting Leg Total					1					1039					257					1451	2748

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:45 PM	Arcand Drive					Merrimack Street					Worthen Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:45 PM	17	4	3	0	24	0	75	0	0	75	0	0	0	0	0	9	61	0	0	70	169
3:00 PM	20	7	0	0	27	0	83	1	0	84	0	0	0	3	3	7	59	0	2	68	182
3:15 PM	18	10	2	0	30	0	83	3	0	86	0	0	0	0	0	2	60	0	0	62	178
3:30 PM	10	10	1	0	21	0	84	6	0	90	0	0	0	0	0	10	63	0	0	73	184
Total Volume	65	31	6	0	102	0	325	10	0	335	0	0	0	3	3	28	243	0	2	273	713
% Approach Total	63.7	30.4	5.9	0.0		0.0	97.0	3.0	0.0		0.0	0.0	0.0	100.0		10.3	89.0	0.0	0.7		
PHF	0.813	0.775	0.500	0.000	0.850	0.000	0.967	0.417	0.000	0.931	0.000	0.000	0.000	0.250	0.250	0.700	0.964	0.000	0.250	0.935	0.969
Entering Leg	65	31	6	0	102	0	325	10	0	335	0	0	0	3	3	28	243	0	2	273	713
Exiting Leg					0					249					72					392	713
Total					102					584					75					665	1426

PDI File #: **175563 EE**
Location: **N: Arcand Drive S: Worthen Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Heavy Vehicles

	Arcand Drive					Merrimack Street					Worthen Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	2	0	0	0	2	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	3
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	2
2:45 PM	1	1	0	0	2	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	5
Total	3	1	0	0	4	0	1	1	0	2	0	0	0	0	0	0	5	0	0	5	11
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
3:30 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	1	0	0	2	3
4:00 PM	0	0	0	0	0	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	2
4:15 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Total	0	1	0	0	1	0	2	1	0	3	0	0	0	0	0	0	0	0	0	0	4
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
5:15 PM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	3
5:30 PM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	4	0	0	4	6
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	2
Total	1	0	0	0	1	0	2	0	0	2	0	0	0	0	0	0	9	0	0	9	12
Grand Total	4	2	0	0	6	0	6	2	0	8	0	0	0	0	0	1	15	0	0	16	30
Approach %	66.7	33.3	0.0	0.0		0.0	75.0	25.0	0.0		0.0	0.0	0.0	0.0		6.3	93.8	0.0	0.0		
Total %	13.3	6.7	0.0	0.0	20.0	0.0	20.0	6.7	0.0	26.7	0.0	0.0	0.0	0.0	0.0	3.3	50.0	0.0	0.0	53.3	
Exiting Leg Total					0					15					5					10	30

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:00 PM	Arcand Drive					Merrimack Street					Worthen Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	2	0	0	0	2	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	3
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	2
2:45 PM	1	1	0	0	2	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	5
Total Volume	3	1	0	0	4	0	1	1	0	2	0	0	0	0	0	0	5	0	0	5	11
% Approach Total	75.0	25.0	0.0	0.0		0.0	50.0	50.0	0.0		0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0		
PHF	0.375	0.250	0.000	0.000	0.500	0.000	0.250	0.250	0.000	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.625	0.000	0.000	0.625	0.550
Entering Leg	3	1	0	0	4	0	1	1	0	2	0	0	0	0	0	0	5	0	0	5	11
Exiting Leg					0					5					2					4	11
Total					4					7					2					9	22

PDI File #: **175563 EE**
Location: **N: Arcand Drive S: Worthen Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Buses

	Arcand Drive					Merrimack Street					Worthen Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	2	1	0	0	3	0	4	1	0	5	0	0	0	0	0	0	4	0	0	4	12
2:15 PM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	3	0	0	3	5
2:30 PM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2	4
2:45 PM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2	4
Total	2	1	0	0	3	0	10	1	0	11	0	0	0	0	0	0	11	0	0	11	25
3:00 PM	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	3
3:15 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	4
3:30 PM	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	2	0	0	2	5
3:45 PM	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	4	0	0	4	7
Total	0	0	0	0	0	0	10	0	0	10	0	0	0	0	0	0	9	0	0	9	19
4:00 PM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2	4
4:15 PM	2	0	0	0	2	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	5
4:30 PM	1	0	0	0	1	0	3	0	0	3	0	0	0	0	0	0	3	0	0	3	7
4:45 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	2
Total	3	0	0	0	3	0	7	0	0	7	0	0	0	0	0	0	8	0	0	8	18
5:00 PM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	3	0	0	3	5
5:15 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	2
5:30 PM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	3	0	0	3	5
5:45 PM	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	2	0	0	2	5
Total	0	0	0	0	0	0	8	0	0	8	0	0	0	0	0	0	9	0	0	9	17
Grand Total	5	1	0	0	6	0	35	1	0	36	0	0	0	0	0	0	37	0	0	37	79
Approach %	83.3	16.7	0.0	0.0		0.0	97.2	2.8	0.0		0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0		
Total %	6.3	1.3	0.0	0.0	7.6	0.0	44.3	1.3	0.0	45.6	0.0	0.0	0.0	0.0	0.0	0.0	46.8	0.0	0.0	46.8	
Exiting Leg Total					0					37					2					40	79

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:00 PM	Arcand Drive					Merrimack Street					Worthen Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	2	1	0	0	3	0	4	1	0	5	0	0	0	0	0	0	4	0	0	4	12
2:15 PM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	3	0	0	3	5
2:30 PM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2	4
2:45 PM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2	4
Total Volume	2	1	0	0	3	0	10	1	0	11	0	0	0	0	0	0	11	0	0	11	25
% Approach Total	66.7	33.3	0.0	0.0		0.0	90.9	9.1	0.0		0.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0		
PHF	0.250	0.250	0.000	0.000	0.250	0.000	0.625	0.250	0.000	0.550	0.000	0.000	0.000	0.000	0.000	0.000	0.688	0.000	0.000	0.688	0.521
Entering Leg	2	1	0	0	3	0	10	1	0	11	0	0	0	0	0	0	11	0	0	11	25
Exiting Leg					0					11					2					12	25
Total					3					22					2					23	50

PDI File #: **175563 EE**
Location: **N: Arcand Drive S: Worthen Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Bicycles (on Roadway and Crosswalks)

	Arcand Drive (North)							Merrimack Street (East)							Worthen Street (South)							Merrimack Street (West)							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0	0	0	2
2:15 PM	0	0	0	0	0	2	2	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
2:30 PM	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2:45 PM	0	0	0	0	1	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	2	4
Total	0	0	0	0	1	2	3	0	4	0	0	0	0	4	0	0	0	0	1	1	2	0	1	0	0	1	0	2	11
3:00 PM	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	1	0	0	0	0	1	4
3:15 PM	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3:30 PM	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
Total	0	0	0	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0	2	1	3	0	2	0	0	0	0	2	8
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	2	2
4:15 PM	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
4:45 PM	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Total	0	0	0	0	0	0	0	0	3	0	0	0	0	3	0	0	0	0	0	0	0	0	2	0	0	1	0	3	6
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1
Grand Total	0	0	0	0	4	2	6	0	7	0	0	0	0	7	0	0	0	0	3	2	5	0	6	0	0	2	0	8	26
Approach %	0.0	0.0	0.0	0.0	66.7	33.3		0.0	100.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	60.0	40.0		0.0	75.0	0.0	0.0	25.0	0.0		
Total %	0.0	0.0	0.0	0.0	15.4	7.7	23.1	0.0	26.9	0.0	0.0	0.0	0.0	26.9	0.0	0.0	0.0	0.0	11.5	7.7	19.2	0.0	23.1	0.0	0.0	7.7	0.0	30.8	
Exiting Leg Total							6							6							5							9	26

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:15 PM	Arcand Drive (North)							Merrimack Street (East)							Worthen Street (South)							Merrimack Street (West)							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
2:15 PM	0	0	0	0	0	2	2	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
2:30 PM	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2:45 PM	0	0	0	0	1	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	2	4
3:00 PM	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	1	0	0	0	0	1	4
Total Volume	0	0	0	0	2	2	4	0	4	0	0	0	0	4	0	0	0	0	1	1	2	0	2	0	0	1	0	3	13
% Approach Total	0.0	0.0	0.0	0.0	50.0	50.0		0.0	100.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	50.0	50.0		0.0	66.7	0.0	0.0	33.3	0.0		
PHF	0.000	0.000	0.000	0.000	0.500	0.250	0.500	0.000	0.500	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.000	0.250	0.250	0.250	0.000	0.500	0.000	0.000	0.250	0.000	0.375	0.813
Entering Leg	0	0	0	0	2	2	4	0	4	0	0	0	0	4	0	0	0	0	1	1	2	0	2	0	0	1	0	3	13
Exiting Leg							4							2							2							5	13
Total							8							6							4							8	26

PDI File #: **175563 EE**
Location: **N: Arcand Drive S: Worthen Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Pedestrians

	Arcand Drive (North)							Merrimack Street (East)							Worthen Street (South)							Merrimack Street (West)							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
2:00 PM	0	0	0	0	16	16	32	0	0	0	0	0	0	0	0	0	0	0	9	10	19	0	0	0	0	6	0	6	57
2:15 PM	0	0	0	0	12	8	20	0	0	0	0	0	0	0	0	0	0	0	8	9	17	0	0	0	0	3	1	4	41
2:30 PM	0	0	0	0	12	11	23	0	0	0	0	0	0	0	0	0	0	0	12	8	20	0	0	0	0	8	3	11	54
2:45 PM	0	0	0	0	5	7	12	0	0	0	0	0	0	0	0	0	0	0	4	10	14	0	0	0	0	2	4	6	32
Total	0	0	0	0	45	42	87	0	0	0	0	0	0	0	0	0	0	0	33	37	70	0	0	0	0	19	8	27	184
3:00 PM	0	0	0	0	19	11	30	0	0	0	0	0	0	0	0	0	0	0	11	11	22	0	0	0	0	5	2	7	59
3:15 PM	0	0	0	0	10	6	16	0	0	0	0	0	0	0	0	0	0	0	7	7	14	0	0	0	0	2	0	2	32
3:30 PM	0	0	0	0	17	15	32	0	0	0	0	0	0	0	0	0	0	0	6	14	20	0	0	0	0	6	1	7	59
3:45 PM	0	0	0	0	9	6	15	0	0	0	0	0	0	0	0	0	0	0	8	4	12	0	0	0	0	5	0	5	32
Total	0	0	0	0	55	38	93	0	0	0	0	0	0	0	0	0	0	0	32	36	68	0	0	0	0	18	3	21	182
4:00 PM	0	0	0	0	3	8	11	0	0	0	0	1	0	1	0	0	0	0	2	11	13	0	0	0	0	0	1	1	26
4:15 PM	0	0	0	0	7	20	27	0	0	0	0	0	0	0	0	0	0	0	6	1	7	0	0	0	0	0	3	3	37
4:30 PM	0	0	0	0	12	15	27	0	0	0	0	1	0	1	0	0	0	0	4	8	12	0	0	0	0	0	9	9	49
4:45 PM	0	0	0	0	5	4	9	0	0	0	0	0	0	0	0	0	0	0	4	0	4	0	0	0	0	3	3	6	19
Total	0	0	0	0	27	47	74	0	0	0	0	2	0	2	0	0	0	0	16	20	36	0	0	0	0	3	16	19	131
5:00 PM	0	0	0	0	4	4	8	0	0	0	0	0	0	0	0	0	0	0	6	4	10	0	0	0	0	3	1	4	22
5:15 PM	0	0	0	0	3	4	7	0	0	0	0	0	0	0	0	0	0	0	7	1	8	0	0	0	0	1	0	1	16
5:30 PM	0	0	0	0	1	7	8	0	0	0	0	0	0	0	0	0	0	0	5	3	8	0	0	0	0	4	1	5	21
5:45 PM	0	0	0	0	3	4	7	0	0	0	0	0	0	0	0	0	0	0	10	7	17	0	0	0	0	4	2	6	30
Total	0	0	0	0	11	19	30	0	0	0	0	0	0	0	0	0	0	0	28	15	43	0	0	0	0	12	4	16	89
Grand Total	0	0	0	0	138	146	284	0	0	0	0	2	0	2	0	0	0	0	109	108	217	0	0	0	0	52	31	83	586
Approach %	0.0	0.0	0.0	0.0	48.6	51.4		0.0	0.0	0.0	0.0	100.0	0.0		0.0	0.0	0.0	0.0	50.2	49.8		0.0	0.0	0.0	0.0	62.7	37.3		
Total %	0.0	0.0	0.0	0.0	23.5	24.9	48.5	0.0	0.0	0.0	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0	18.6	18.4	37.0	0.0	0.0	0.0	0.0	8.9	5.3	14.2	
Exiting Leg Total							284							2							217							83	586

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:15 PM	Arcand Drive (North)							Merrimack Street (East)							Worthen Street (South)							Merrimack Street (West)							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
2:15 PM	0	0	0	0	12	8	20	0	0	0	0	0	0	0	0	0	0	0	8	9	17	0	0	0	0	3	1	4	41
2:30 PM	0	0	0	0	12	11	23	0	0	0	0	0	0	0	0	0	0	0	12	8	20	0	0	0	0	8	3	11	54
2:45 PM	0	0	0	0	5	7	12	0	0	0	0	0	0	0	0	0	0	0	4	10	14	0	0	0	0	2	4	6	32
3:00 PM	0	0	0	0	19	11	30	0	0	0	0	0	0	0	0	0	0	0	11	11	22	0	0	0	0	5	2	7	59
Total Volume	0	0	0	0	48	37	85	0	0	0	0	0	0	0	0	0	0	0	35	38	73	0	0	0	0	18	10	28	186
% Approach Total	0.0	0.0	0.0	0.0	56.5	43.5		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	47.9	52.1		0.0	0.0	0.0	0.0	64.3	35.7		
PHF	0.000	0.000	0.000	0.000	0.632	0.841	0.708	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.729	0.864	0.830	0.000	0.000	0.000	0.000	0.563	0.625	0.636	0.788
Entering Leg	0	0	0	0	48	37	85	0	0	0	0	0	0	0	0	0	0	0	35	38	73	0	0	0	0	18	10	28	186
Exiting Leg							85							0							73							28	186
Total							170							0							146							56	372

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

PDI File #: **175563 F**
Location: **N: Dutton Street S: Dutton Street NW: Moody Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

Cars, Heavy Vehicles, and Buses (Combined)

	Dutton Street						Merrimack Street						Dutton Street						Merrimack Street						Moody Street						
	North						East						South						West						Northwest						
	Hard Righ	Right	Thru	Left	U-Turn	Total	Right	Bear Righ	Thru	Left	U-Turn	Total	Right	Thru	Bear Left	Left	U-Turn	Total	Right	Thru	Left	Hard Left	U-Turn	Total	Hard Righ	Bear Right	Bear Left	Hard Left	U-Turn	Total	Total
6:00 AM	0	0	0	0	0	0	0	2	13	17	0	32	2	0	16	1	0	19	7	17	0	0	0	24	0	23	1	0	0	24	99
6:15 AM	0	1	0	0	0	1	1	2	20	20	0	43	7	0	25	3	0	35	5	31	0	0	0	36	0	30	6	0	0	36	151
6:30 AM	0	0	0	0	0	0	1	4	21	20	0	46	12	0	44	6	0	62	19	26	0	1	0	46	0	24	8	0	0	32	186
6:45 AM	0	1	0	0	0	1	0	17	20	16	0	53	7	0	60	6	0	73	28	38	0	0	0	66	0	42	9	0	0	51	244
Total	0	2	0	0	0	2	2	25	74	73	0	174	28	0	145	16	0	189	59	112	0	1	0	172	0	119	24	0	0	143	680
7:00 AM	0	0	0	0	0	0	0	23	30	36	0	89	21	0	90	5	0	116	23	37	0	0	0	60	0	57	6	0	0	63	328
7:15 AM	0	0	0	0	0	0	0	24	43	38	0	105	40	0	138	9	0	187	19	50	0	1	0	70	0	70	18	0	0	88	450
7:30 AM	0	0	0	0	0	0	0	22	46	27	0	95	40	1	145	9	0	195	29	92	0	0	0	121	0	77	17	0	0	94	505
7:45 AM	0	0	1	1	0	2	0	13	64	40	0	117	37	3	92	8	0	140	36	58	0	0	0	94	0	91	22	0	0	113	466
Total	0	0	1	1	0	2	0	82	183	141	0	406	138	4	465	31	0	638	107	237	0	1	0	345	0	295	63	0	0	358	1749
8:00 AM	0	0	0	0	0	0	1	19	40	28	0	88	8	0	71	14	0	93	30	38	0	0	0	68	0	68	23	0	0	91	340
8:15 AM	0	0	0	0	0	0	1	13	40	22	0	76	18	0	62	10	0	90	33	31	0	0	0	64	0	52	15	0	0	67	297
8:30 AM	0	0	0	0	0	0	0	16	47	27	0	90	21	1	81	10	0	113	18	45	0	0	0	63	0	48	6	0	0	54	320
8:45 AM	0	0	0	1	0	1	0	8	45	34	0	87	19	1	74	20	0	114	18	41	0	0	0	59	0	47	11	0	0	58	319
Total	0	0	0	1	0	1	2	56	172	111	0	341	66	2	288	54	0	410	99	155	0	0	0	254	0	215	55	0	0	270	1276
9:00 AM	0	0	0	0	0	0	0	9	46	26	0	81	25	0	56	13	0	94	27	42	0	0	0	69	0	46	5	0	0	51	295
9:15 AM	0	0	0	0	0	0	0	12	56	36	0	104	16	0	70	10	0	96	19	47	0	0	0	66	0	42	9	0	0	51	317
9:30 AM	1	0	0	0	0	1	0	10	44	29	0	83	23	1	64	11	0	99	19	38	0	0	0	57	0	50	9	1	0	60	300
9:45 AM	0	0	0	0	0	0	0	7	44	44	0	95	24	1	69	9	0	103	18	36	0	0	0	54	0	39	7	0	0	46	298
Total	1	0	0	0	0	1	0	38	190	135	0	363	88	2	259	43	0	392	83	163	0	0	0	246	0	177	30	1	0	208	1210
Grand Total	1	2	1	2	0	6	4	201	619	460	0	1284	320	8	1157	144	0	1629	348	667	0	2	0	1017	0	806	172	1	0	979	4915
Approach %	16.7	33.3	16.7	33.3	0.0		0.3	15.7	48.2	35.8	0.0		19.6	0.5	71.0	8.8	0.0		34.2	65.6	0.0	0.2	0.0		0.0	82.3	17.6	0.1	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.1	0.1	4.1	12.6	9.4	0.0	26.1	6.5	0.2	23.5	2.9	0.0	33.1	7.1	13.6	0.0	0.0	0.0	20.7	0.0	16.4	3.5	0.0	0.0	19.9	
Exiting Leg Total						13						1161						1615						765						1361	4915
Cars	1	2	1	2	0	6	4	194	585	432	0	1215	314	8	1097	124	0	1543	320	642	0	2	0	964	0	778	160	1	0	939	4667
% Cars	100.0	100.0	100.0	100.0	0.0	100.0	100.0	96.5	94.5	93.9	0.0	94.6	98.1	100.0	94.8	86.1	0.0	94.7	92.0	96.3	0.0	100.0	0.0	94.8	0.0	96.5	93.0	100.0	0.0	95.9	95.0
Exiting Leg Total						13						1118						1531						711						1294	4667
Heavy Vehicles	0	0	0	0	0	0	0	5	12	8	0	25	5	0	19	6	0	30	9	8	0	0	0	17	0	14	6	0	0	20	92
% Heavy Vehicles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	1.9	1.7	0.0	1.9	1.6	0.0	1.6	4.2	0.0	1.8	2.6	1.2	0.0	0.0	0.0	1.7	0.0	1.7	3.5	0.0	0.0	2.0	1.9
Exiting Leg Total						0						19						31						18						24	92
Buses	0	0	0	0	0	0	0	2	22	20	0	44	1	0	41	14	0	56	19	17	0	0	0	36	0	14	6	0	0	20	156
% Buses	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	3.6	4.3	0.0	3.4	0.3	0.0	3.5	9.7	0.0	3.4	5.5	2.5	0.0	0.0	0.0	3.5	0.0	1.7	3.5	0.0	0.0	2.0	3.2
Exiting Leg Total						0						24						53						36						43	156

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:15 AM	Dutton Street						Merrimack Street						Dutton Street						Merrimack Street						Moody Street						
	North						East						South						West						Northwest						
	Hard Righ	Right	Thru	Left	U-Turn	Total	Right	Bear Righ	Thru	Left	U-Turn	Total	Right	Thru	Bear Left	Left	U-Turn	Total	Right	Thru	Left	Hard Left	U-Turn	Total	Hard Righ	Bear Right	Bear Left	Hard Left	U-Turn	Total	Total
7:15 AM	0	0	0	0	0	0	0	24	43	38	0	105	40	0	138	9	0	187	19	50	0	1	0	70	0	70	18	0	0	88	450
7:30 AM	0	0	0	0	0	0	0	22	46	27	0	95	40	1	145	9	0	195	29	92	0	0	0	121	0	77	17	0	0	94	505
7:45 AM	0	0	1	1	0	2	0	13	64	40	0	117	37	3	92	8	0	140	36	58	0	0	0	94	0	91	22	0	0	113	466
8:00 AM	0	0	0	0	0	0	1	19	40	28	0	88	8	0	71	14	0	93	30	38	0	0	0	68	0	68	23	0	0	91	340
Total Volume	0	0	1	1	0	2	1	78	193	133	0	405	125	4	446	40	0	615	114	238	0	1	0	353	0	306	80	0	0	386	1761
% Approach Total	0.0	0.0	50.0	50.0	0.0		0.2	19.3	47.7	32.8	0.0		20.3	0.7	72.5	6.5	0.0		32.3	67.4	0.0	0.3	0.0		0.0	79.3	20.7	0.0	0.0		
PHF	0.000	0.000	0.250	0.250	0.000	0.250	0.250	0.813	0.754	0.831	0.000	0.865	0.781	0.333	0.769	0.714	0.000	0.788	0.792	0.647	0.000	0.250	0.000	0.729	0.000	0.841	0.870	0.000	0.000	0.854	0.872
Cars	0	0	1	1	0	2	1	77	181	122	0	381	123	4	428	34	0	589	108	229	0	1	0	338	0	298	77	0	0	375	1685
Cars %	0.0	0.0	100.0	100.0	0.0	100.0	100.0	98.7	93.8	91.7	0.0	94.1	98.4	100.0	96.0	85.0	0.0	95.8	94.7	96.2	0.0	100.0	0.0	95.8	0.0	97.4	96.3	0.0	0.0	97.2	95.7
Heavy Vehicles	0	0	0	0	0	0	0	1	2	1	0	4	1	0	6	2	0	9	2	2	0	0	0	4	0	5	2	0	0	7	24
Heavy Vehicles %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.0	0.8	0.0	1.0	0.8	0.0	1.3	5.0	0.0	1.5	1.8	0.8	0.0	0.0	0.0	1.1	0.0	1.6	2.5	0.0	0.0	1.8	1.4
Buses	0	0	0	0	0	0	0	0	10	10	0	20	1	0	12	4	0	17	4	7	0	0	0	11	0	3	1	0	0	4	52
Buses %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2	7.5	0.0	4.9	0.8	0.0	2.7	10.0	0.0	2.8	3.5	2.9	0.0	0.0	0.0	3.1	0.0	1.0	1.3	0.0	0.0	1.0	3.0
Cars Enter Leg	0	0	1	1	0	2	1	77	181	122	0	381	123	4	428	34	0	589	108	229	0	1	0	338	0	298	77	0	0	375	1685
Heavy Enter Leg	0	0	0	0	0	0	0	1	2	1	0	4	1	0	6	2	0	9	2	2	0	0	0	4	0	5	2	0	0	7	24
Bus Enter Leg	0	0	0	0	0	0	0	0	10	10	0	20	1	0	12	4	0	17	4	7	0	0	0	11	0	3	1	0	0	4	52
Total Entering Leg	0	0	1	1	0	2	1	78	193	133	0	405	125	4	446	40	0	615	114	238	0	1	0	353	0	306	80	0	0	386	1761
Cars Exiting Leg						5						430						529						215						506	1685
Heavy Exiting Leg						0						5						8						4						7	24
Buses Exiting Leg						0						9						17						14						12	52
Total Exiting Leg						5						444						554						233						525	1761

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

PDI File #: **175563 F**
Location: **N: Dutton Street S: Dutton Street NW: Moody Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

Cars

	Dutton Street						Merrimack Street						Dutton Street						Merrimack Street						Moody Street						
	North						East						South						West						Northwest						
	Hard Righ	Right	Thru	Left	U-Turn	Total	Right	Bear Righ	Thru	Left	U-Turn	Total	Right	Thru	Bear Left	Left	U-Turn	Total	Right	Thru	Left	Hard Left	U-Turn	Total	Hard Righ	Bear Righ	Bear Left	Hard Left	U-Turn	Total	Total
6:00 AM	0	0	0	0	0	0	0	2	13	16	0	31	2	0	15	0	0	17	5	17	0	0	0	22	0	22	1	0	0	23	93
6:15 AM	0	1	0	0	0	1	1	2	19	19	0	41	7	0	23	3	0	33	4	30	0	0	0	34	0	28	4	0	0	32	141
6:30 AM	0	0	0	0	0	0	1	4	21	19	0	45	12	0	39	5	0	56	18	26	0	1	0	45	0	23	7	0	0	30	176
6:45 AM	0	1	0	0	0	1	0	16	18	15	0	49	7	0	57	5	0	69	26	38	0	0	0	64	0	41	7	0	0	48	231
Total	0	2	0	0	0	2	2	24	71	69	0	166	28	0	134	13	0	175	53	111	0	1	0	165	0	114	19	0	0	133	641
7:00 AM	0	0	0	0	0	0	0	22	30	36	0	88	21	0	85	4	0	110	22	37	0	0	0	59	0	57	6	0	0	63	320
7:15 AM	0	0	0	0	0	0	0	24	40	34	0	98	39	0	133	7	0	179	18	48	0	1	0	67	0	69	15	0	0	84	428
7:30 AM	0	0	0	0	0	0	0	22	42	26	0	90	40	1	140	8	0	189	28	91	0	0	0	119	0	75	17	0	0	92	490
7:45 AM	0	0	1	1	0	2	0	13	61	38	0	112	37	3	90	7	0	137	34	55	0	0	0	89	0	88	22	0	0	110	450
Total	0	0	1	1	0	2	0	81	173	134	0	388	137	4	448	26	0	615	102	231	0	1	0	334	0	289	60	0	0	349	1688
8:00 AM	0	0	0	0	0	0	1	18	38	24	0	81	7	0	65	12	0	84	28	35	0	0	0	63	0	66	23	0	0	89	317
8:15 AM	0	0	0	0	0	0	1	12	39	20	0	72	17	0	59	9	0	85	29	28	0	0	0	57	0	48	14	0	0	62	276
8:30 AM	0	0	0	0	0	0	0	15	42	26	0	83	21	1	80	8	0	110	18	42	0	0	0	60	0	46	5	0	0	51	304
8:45 AM	0	0	0	1	0	1	0	8	41	29	0	78	18	1	68	19	0	106	15	40	0	0	0	55	0	45	10	0	0	55	295
Total	0	0	0	1	0	1	2	53	160	99	0	314	63	2	272	48	0	385	90	145	0	0	0	235	0	205	52	0	0	257	1192
9:00 AM	0	0	0	0	0	0	0	9	43	25	0	77	24	0	54	9	0	87	26	40	0	0	0	66	0	46	5	0	0	51	281
9:15 AM	0	0	0	0	0	0	0	12	53	35	0	100	15	0	64	10	0	89	13	46	0	0	0	59	0	40	8	0	0	48	296
9:30 AM	1	0	0	0	0	1	0	10	42	29	0	81	23	1	62	9	0	95	19	36	0	0	0	55	0	45	9	1	0	55	287
9:45 AM	0	0	0	0	0	0	0	5	43	41	0	89	24	1	63	9	0	97	17	33	0	0	0	50	0	39	7	0	0	46	282
Total	1	0	0	0	0	1	0	36	181	130	0	347	86	2	243	37	0	368	75	155	0	0	0	230	0	170	29	1	0	200	1146
Grand Total	1	2	1	2	0	6	4	194	585	432	0	1215	314	8	1097	124	0	1543	320	642	0	2	0	964	0	778	160	1	0	939	4667
Approach %	16.7	33.3	16.7	33.3	0.0		0.3	16.0	48.1	35.6	0.0		20.3	0.5	71.1	8.0	0.0		33.2	66.6	0.0	0.2	0.0		0.0	82.9	17.0	0.1	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.1	0.1	4.2	12.5	9.3	0.0	26.0	6.7	0.2	23.5	2.7	0.0	33.1	6.9	13.8	0.0	0.0	0.0	20.7	0.0	16.7	3.4	0.0	0.0	20.1	
Exiting Leg Total						13						1118						1531						711						1294	4667

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:00 AM	Dutton Street						Merrimack Street						Dutton Street						Merrimack Street						Moody Street						
	North						East						South						West						Northwest						
	Hard Righ	Right	Thru	Left	U-Turn	Total	Right	Bear Righ	Thru	Left	U-Turn	Total	Right	Thru	Bear Left	Left	U-Turn	Total	Right	Thru	Left	Hard Left	U-Turn	Total	Hard Righ	Bear Righ	Bear Left	Hard Left	U-Turn	Total	Total
7:00 AM	0	0	0	0	0	0	0	22	30	36	0	88	21	0	85	4	0	110	22	37	0	0	0	59	0	57	6	0	0	63	320
7:15 AM	0	0	0	0	0	0	0	24	40	34	0	98	39	0	133	7	0	179	18	48	0	1	0	67	0	69	15	0	0	84	428
7:30 AM	0	0	0	0	0	0	0	22	42	26	0	90	40	1	140	8	0	189	28	91	0	0	0	119	0	75	17	0	0	92	490
7:45 AM	0	0	1	1	0	2	0	13	61	38	0	112	37	3	90	7	0	137	34	55	0	0	0	89	0	88	22	0	0	110	450
Total Volume	0	0	1	1	0	2	0	81	173	134	0	388	137	4	448	26	0	615	102	231	0	1	0	334	0	289	60	0	0	349	1688
% Approach Total	0.0	0.0	50.0	50.0	0.0		0.0	20.9	44.6	34.5	0.0		22.3	0.7	72.8	4.2	0.0		30.5	69.2	0.0	0.3	0.0		0.0	82.8	17.2	0.0	0.0		
PHF	0.000	0.000	0.250	0.250	0.000	0.250	0.000	0.844	0.709	0.882	0.000	0.866	0.856	0.333	0.800	0.813	0.000	0.813	0.750	0.635	0.000	0.250	0.000	0.702	0.000	0.821	0.682	0.000	0.000	0.793	0.861
Entering Leg	0	0	1	1	0	2	0	81	173	134	0	388	137	4	448	26	0	615	102	231	0	1	0	334	0	289	60	0	0	349	1688
Exiting Leg						4						429						526						199						530	1688
Total						6						817						1141						533						879	3376

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
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PDI File #: **175563 F**
Location: **N: Dutton Street S: Dutton Street NW: Moody Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

Heavy Vehicles

	Dutton Street						Merrimack Street						Dutton Street						Merrimack Street						Moody Street						
	North						East						South						West						Northwest						
	Hard Righ	Right	Thru	Left	U-Turn	Total	Right	Bear Righ	Thru	Left	U-Turn	Total	Right	Thru	Bear Left	Left	U-Turn	Total	Right	Thru	Left	Hard Left	U-Turn	Total	Hard Righ	Bear Righ	Bear Left	Hard Left	U-Turn	Total	Total
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0	1	2
6:15 AM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	1	0	0	0	2	0	0	1	0	0	1	4
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	1	0	1	1	0	0	2	4
6:45 AM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	3
Total	0	0	0	0	0	0	0	0	2	0	0	2	0	0	1	0	0	1	3	1	0	0	0	4	0	3	3	0	0	6	13
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	4
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	1	0	4	1	1	0	0	0	2	0	1	2	0	0	3	9
7:30 AM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	3
7:45 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	2	0	0	0	2	4
Total	0	0	0	0	0	0	0	0	1	1	0	2	1	0	7	1	0	9	2	1	0	0	0	3	0	4	2	0	0	6	20
8:00 AM	0	0	0	0	0	0	0	1	1	0	0	2	0	0	3	1	0	4	0	1	0	0	0	1	0	1	0	0	0	1	8
8:15 AM	0	0	0	0	0	0	0	1	0	1	0	2	1	0	0	1	0	2	2	0	0	0	0	2	0	2	0	0	0	2	8
8:30 AM	0	0	0	0	0	0	0	1	3	1	0	5	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0	0	1	7
8:45 AM	0	0	0	0	0	0	0	0	2	3	0	5	1	0	3	1	0	5	0	1	0	0	0	1	0	1	0	0	0	1	12
Total	0	0	0	0	0	0	0	3	6	5	0	14	2	0	6	3	0	11	2	3	0	0	0	5	0	5	0	0	0	5	35
9:00 AM	0	0	0	0	0	0	0	0	1	1	0	2	1	0	0	2	0	3	0	1	0	0	0	1	0	0	0	0	0	0	6
9:15 AM	0	0	0	0	0	0	0	0	1	0	0	1	1	0	2	0	0	3	2	0	0	0	0	2	0	2	1	0	0	3	9
9:30 AM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	2
9:45 AM	0	0	0	0	0	0	0	2	0	1	0	3	0	0	3	0	0	3	0	1	0	0	0	1	0	0	0	0	0	0	7
Total	0	0	0	0	0	0	0	2	3	2	0	7	2	0	5	2	0	9	2	3	0	0	0	5	0	2	1	0	0	3	24
Grand Total	0	0	0	0	0	0	0	5	12	8	0	25	5	0	19	6	0	30	9	8	0	0	0	17	0	14	6	0	0	20	92
Approach %	0.0	0.0	0.0	0.0	0.0		0.0	20.0	48.0	32.0	0.0		16.7	0.0	63.3	20.0	0.0		52.9	47.1	0.0	0.0	0.0		0.0	70.0	30.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4	13.0	8.7	0.0	27.2	5.4	0.0	20.7	6.5	0.0	32.6	9.8	8.7	0.0	0.0	0.0	18.5	0.0	15.2	6.5	0.0	0.0	21.7	
Exiting Leg Total						0						19						31						18						24	92

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

8:00 AM	Dutton Street						Merrimack Street						Dutton Street						Merrimack Street						Moody Street						
	North						East						South						West						Northwest						
	Hard Righ	Right	Thru	Left	U-Turn	Total	Right	Bear Righ	Thru	Left	U-Turn	Total	Right	Thru	Bear Left	Left	U-Turn	Total	Right	Thru	Left	Hard Left	U-Turn	Total	Hard Righ	Bear Righ	Bear Left	Hard Left	U-Turn	Total	Total
8:00 AM	0	0	0	0	0	0	0	1	1	0	0	2	0	0	3	1	0	4	0	1	0	0	0	1	0	1	0	0	0	1	8
8:15 AM	0	0	0	0	0	0	0	1	0	1	0	2	1	0	0	1	0	2	2	0	0	0	0	2	0	2	0	0	0	2	8
8:30 AM	0	0	0	0	0	0	0	1	3	1	0	5	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0	0	1	7
8:45 AM	0	0	0	0	0	0	0	0	2	3	0	5	1	0	3	1	0	5	0	1	0	0	0	1	0	1	0	0	0	1	12
Total Volume	0	0	0	0	0	0	0	3	6	5	0	14	2	0	6	3	0	11	2	3	0	0	0	5	0	5	0	0	0	5	35
% Approach Total	0.0	0.0	0.0	0.0	0.0		0.0	21.4	42.9	35.7	0.0		18.2	0.0	54.5	27.3	0.0		40.0	60.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.750	0.500	0.417	0.000	0.700	0.500	0.000	0.500	0.750	0.000	0.550	0.250	0.750	0.000	0.000	0.000	0.625	0.000	0.625	0.000	0.000	0.000	0.625	0.729
Entering Leg	0	0	0	0	0	0	0	3	6	5	0	14	2	0	6	3	0	11	2	3	0	0	0	5	0	5	0	0	0	5	35
Exiting Leg						0						5						12						9						9	35
Total						0						19						23						14						14	70

PRECISION DATA INDUSTRIES, LLC
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PDI File #: **175563 F**
Location: **N: Dutton Street S: Dutton Street NW: Moody Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class: **Buses**

	Dutton Street						Merrimack Street						Dutton Street						Merrimack Street						Moody Street						
	North						East						South						West						Northwest						
	Hard Righ	Right	Thru	Left	U-Turn	Total	Right	Bear Righ	Thru	Left	U-Turn	Total	Right	Thru	Bear Left	Left	U-Turn	Total	Right	Thru	Left	Hard Left	U-Turn	Total	Hard Righ	Bear Righ	Bear Left	Hard Left	U-Turn	Total	Total
6:00 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	1	0	2	1	0	0	0	0	1	0	0	0	0	0	0	4
6:15 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2	0	0	2	0	0	0	0	0	0	0	2	1	0	0	3	6
6:30 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	4	1	0	5	0	0	0	0	0	0	0	0	0	0	0	0	6
6:45 AM	0	0	0	0	0	0	0	1	1	1	0	3	0	0	3	1	0	4	2	0	0	0	0	2	0	0	1	0	0	1	10
Total	0	0	0	0	0	0	0	1	1	4	0	6	0	0	10	3	0	13	3	0	0	0	0	3	0	2	2	0	0	4	26
7:00 AM	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	1	0	2	1	0	0	0	0	1	0	0	0	0	0	0	4
7:15 AM	0	0	0	0	0	0	0	0	3	4	0	7	0	0	3	1	0	4	0	1	0	0	0	1	0	0	1	0	0	1	13
7:30 AM	0	0	0	0	0	0	0	0	3	1	0	4	0	0	4	1	0	5	1	1	0	0	0	2	0	1	0	0	0	1	12
7:45 AM	0	0	0	0	0	0	0	0	3	1	0	4	0	0	2	1	0	3	1	3	0	0	0	4	0	1	0	0	0	1	12
Total	0	0	0	0	0	0	0	1	9	6	0	16	0	0	10	4	0	14	3	5	0	0	0	8	0	2	1	0	0	3	41
8:00 AM	0	0	0	0	0	0	0	0	1	4	0	5	1	0	3	1	0	5	2	2	0	0	0	4	0	1	0	0	0	1	15
8:15 AM	0	0	0	0	0	0	0	0	1	1	0	2	0	0	3	0	0	3	2	3	0	0	0	5	0	2	1	0	0	3	13
8:30 AM	0	0	0	0	0	0	0	0	2	0	0	2	0	0	1	2	0	3	0	2	0	0	0	2	0	1	1	0	0	2	9
8:45 AM	0	0	0	0	0	0	0	0	2	2	0	4	0	0	3	0	0	3	3	0	0	0	0	3	0	1	1	0	0	2	12
Total	0	0	0	0	0	0	0	0	6	7	0	13	1	0	10	3	0	14	7	7	0	0	0	14	0	5	3	0	0	8	49
9:00 AM	0	0	0	0	0	0	0	0	2	0	0	2	0	0	2	2	0	4	1	1	0	0	0	2	0	0	0	0	0	0	8
9:15 AM	0	0	0	0	0	0	0	0	2	1	0	3	0	0	4	0	0	4	4	1	0	0	0	5	0	0	0	0	0	0	12
9:30 AM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	2	2	0	4	0	1	0	0	0	1	0	5	0	0	0	5	11
9:45 AM	0	0	0	0	0	0	0	0	1	2	0	3	0	0	3	0	0	3	1	2	0	0	0	3	0	0	0	0	0	0	9
Total	0	0	0	0	0	0	0	0	6	3	0	9	0	0	11	4	0	15	6	5	0	0	0	11	0	5	0	0	0	5	40
Grand Total	0	0	0	0	0	0	0	2	22	20	0	44	1	0	41	14	0	56	19	17	0	0	0	36	0	14	6	0	0	20	156
Approach %	0.0	0.0	0.0	0.0	0.0		0.0	4.5	50.0	45.5	0.0		1.8	0.0	73.2	25.0	0.0		52.8	47.2	0.0	0.0	0.0		0.0	70.0	30.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	14.1	12.8	0.0	28.2	0.6	0.0	26.3	9.0	0.0	35.9	12.2	10.9	0.0	0.0	0.0	23.1	0.0	9.0	3.8	0.0	0.0	12.8	
Exiting Leg Total						0						24						53						36						43	156

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:15 AM	Dutton Street						Merrimack Street						Dutton Street						Merrimack Street						Moody Street						
	North						East						South						West						Northwest						
	Hard Righ	Right	Thru	Left	U-Turn	Total	Right	Bear Righ	Thru	Left	U-Turn	Total	Right	Thru	Bear Left	Left	U-Turn	Total	Right	Thru	Left	Hard Left	U-Turn	Total	Hard Righ	Bear Righ	Bear Left	Hard Left	U-Turn	Total	Total
7:15 AM	0	0	0	0	0	0	0	0	3	4	0	7	0	0	3	1	0	4	0	1	0	0	0	1	0	0	1	0	0	1	13
7:30 AM	0	0	0	0	0	0	0	0	3	1	0	4	0	0	4	1	0	5	1	1	0	0	0	2	0	1	0	0	0	1	12
7:45 AM	0	0	0	0	0	0	0	0	3	1	0	4	0	0	2	1	0	3	1	3	0	0	0	4	0	1	0	0	0	1	12
8:00 AM	0	0	0	0	0	0	0	0	1	4	0	5	1	0	3	1	0	5	2	2	0	0	0	4	0	1	0	0	0	1	15
Total Volume	0	0	0	0	0	0	0	0	10	10	0	20	1	0	12	4	0	17	4	7	0	0	0	11	0	3	1	0	0	4	52
% Approach Total	0.0	0.0	0.0	0.0	0.0		0.0	0.0	50.0	50.0	0.0		5.9	0.0	70.6	23.5	0.0		36.4	63.6	0.0	0.0	0.0		0.0	75.0	25.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.833	0.625	0.000	0.714	0.250	0.000	0.750	1.000	0.000	0.850	0.500	0.583	0.000	0.000	0.000	0.688	0.000	0.750	0.250	0.000	0.000	1.000	0.867
Entering Leg	0	0	0	0	0	0	0	0	10	10	0	20	1	0	12	4	0	17	4	7	0	0	0	11	0	3	1	0	0	4	52
Exiting Leg						0						9						17						14						12	52
Total						0						29						34						25						16	104

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

PDI File #: **175563 F**
Location: **N: Dutton Street S: Dutton Street NW: Moody Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

Bicycles (on Roadway and Crosswalks)

	Dutton Street (North)								Merrimack Street (East)								Dutton Street (South)								Merrimack Street (West)								Moody Street (Northwest)								
	Hard Right	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Bear Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Bear Left	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	Hard Left	U-Turn	CW-NB	CW-SB	Total	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	CW-NEB	CW-SWB	Total	Total
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	3
7:45 AM	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	4
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	3	0	0	0	0	0	0	0	0	3
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	3	0	0	0	0	0	0	0	0	3
Grand Total	0	0	0	0	0	2	0	2	0	0	1	1	0	0	0	2	0	1	0	0	0	0	1	2	0	3	0	0	0	0	0	3	0	0	0	0	0	1	0	1	10
Approach %	0.0	0.0	0.0	0.0	0.0	100.0	0.0		0.0	0.0	50.0	50.0	0.0	0.0	0.0		0.0	50.0	0.0	0.0	0.0	0.0	50.0		0.0	100.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	100.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	20.0	0.0	20.0	0.0	0.0	10.0	10.0	0.0	0.0	0.0	20.0	0.0	10.0	0.0	0.0	0.0	0.0	10.0	20.0	0.0	30.0	0.0	0.0	0.0	0.0	0.0	30.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	10.0	
Exiting Leg Total								3								3								2								1								1	10

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:15 AM	Dutton Street (North)								Merrimack Street (East)								Dutton Street (South)								Merrimack Street (West)								Moody Street (Northwest)								
	Hard Right	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Bear Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Bear Left	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	Hard Left	U-Turn	CW-NB	CW-SB	Total	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	CW-NEB	CW-SWB	Total	Total
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	3
7:45 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total Volume	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	5
% Approach Total	0.0	0.0	0.0	0.0	0.0	100.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	50.0	0.0	0.0	0.0	0.0	50.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	100.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.250	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.250	0.417
Entering Leg	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	5
Exiting Leg								3								0								1								0								1	5
Total								5								0								3								0								2	10

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
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PDI File #: **175563 F**
Location: **N: Dutton Street S: Dutton Street NW: Moody Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

Pedestrians

	Dutton Street (North)								Merrimack Street (East)								Dutton Street (South)								Merrimack Street (West)								Moody Street (Northwest)								
	Hard Right	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Bear Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Bear Left	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	Hard Left	U-Turn	CW-NB	CW-SB	Total	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	CW-NEB	CW-SWB	Total	Total
6:00 AM	0	0	0	0	0	1	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	4	3	7	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	12
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
6:45 AM	0	0	0	0	0	5	2	7	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	6	0	6	0	0	0	0	0	11	1	12	26
Total	0	0	0	0	0	6	4	10	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	10	0	0	0	0	0	6	0	6	0	0	0	0	0	12	3	15	41
7:00 AM	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	6
7:15 AM	0	0	0	0	0	12	3	15	0	0	0	0	0	0	3	3	0	0	0	0	0	0	5	5	0	0	0	0	0	2	1	3	0	0	0	0	0	21	4	25	51
7:30 AM	0	0	0	0	0	17	7	24	0	0	0	0	0	0	14	14	0	0	0	0	0	2	21	23	0	0	0	0	0	4	0	4	0	0	0	0	0	34	3	37	102
7:45 AM	0	0	0	0	0	23	2	25	0	0	0	0	0	0	20	20	0	0	0	0	0	0	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	47	3	50	115
Total	0	0	0	0	0	54	12	66	0	0	0	0	0	0	37	37	0	0	0	0	0	2	48	50	0	0	0	0	0	6	1	7	0	0	0	0	0	104	10	114	274
8:00 AM	0	0	0	0	0	4	2	6	0	0	0	0	0	0	2	2	0	0	0	0	0	0	4	4	0	0	0	0	0	1	0	1	0	0	0	0	0	4	0	4	17
8:15 AM	0	0	0	0	0	8	4	12	0	0	0	0	0	1	2	3	0	0	0	0	0	3	5	8	0	0	0	0	0	2	2	4	0	0	0	0	0	7	2	9	36
8:30 AM	0	0	0	0	0	9	8	17	0	0	0	0	0	2	3	5	0	0	0	0	0	1	3	4	0	0	0	0	0	0	1	1	0	0	0	0	0	8	5	13	40
8:45 AM	0	0	0	0	0	3	13	16	0	0	0	0	0	1	4	5	0	0	0	0	0	6	3	9	0	0	0	0	0	0	0	0	0	0	0	0	0	3	9	12	42
Total	0	0	0	0	0	24	27	51	0	0	0	0	0	4	11	15	0	0	0	0	0	10	15	25	0	0	0	0	0	3	3	6	0	0	0	0	0	22	16	38	135
9:00 AM	0	0	0	0	0	3	9	12	0	0	0	0	0	4	2	6	0	0	0	0	0	5	5	10	0	0	0	0	0	1	0	1	0	0	0	0	0	3	5	8	37
9:15 AM	0	0	0	0	0	3	10	13	0	0	0	0	0	1	2	3	0	0	0	0	0	3	7	10	0	0	0	0	0	0	0	0	0	0	0	0	0	3	5	8	34
9:30 AM	0	0	0	0	0	12	5	17	0	0	0	0	0	2	1	3	0	0	0	0	0	6	3	9	0	0	0	0	0	0	1	1	0	0	0	0	0	7	7	14	44
9:45 AM	0	0	0	0	0	9	11	20	0	0	0	0	0	0	0	0	0	0	0	0	0	5	10	15	0	0	0	0	0	1	0	1	0	0	0	0	0	9	9	18	54
Total	0	0	0	0	0	27	35	62	0	0	0	0	0	7	5	12	0	0	0	0	0	19	25	44	0	0	0	0	0	2	1	3	0	0	0	0	0	22	26	48	169
Grand Total	0	0	0	0	0	111	78	189	0	0	0	0	0	11	53	64	0	0	0	0	0	36	93	129	0	0	0	0	0	17	5	22	0	0	0	0	0	160	55	215	619
Approach %	0.0	0.0	0.0	0.0	0.0	58.7	41.3		0.0	0.0	0.0	0.0	0.0	17.2	82.8		0.0	0.0	0.0	0.0	0.0	27.9	72.1		0.0	0.0	0.0	0.0	0.0	77.3	22.7		0.0	0.0	0.0	0.0	0.0	74.4	25.6		
Total %	0.0	0.0	0.0	0.0	0.0	17.9	12.6	30.5	0.0	0.0	0.0	0.0	0.0	1.8	8.6	10.3	0.0	0.0	0.0	0.0	0.0	5.8	15.0	20.8	0.0	0.0	0.0	0.0	0.0	2.7	0.8	3.6	0.0	0.0	0.0	0.0	0.0	25.8	8.9	34.7	
Exiting Leg Total								189								64								129								22								215	619

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:15 AM	Dutton Street (North)								Merrimack Street (East)								Dutton Street (South)								Merrimack Street (West)								Moody Street (Northwest)								
	Hard Right	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Bear Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Bear Left	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	Hard Left	U-Turn	CW-NB	CW-SB	Total	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	CW-NEB	CW-SWB	Total	Total
7:15 AM	0	0	0	0	0	12	3	15	0	0	0	0	0	0	3	3	0	0	0	0	0	0	5	5	0	0	0	0	0	2	1	3	0	0	0	0	0	21	4	25	51
7:30 AM	0	0	0	0	0	17	7	24	0	0	0	0	0	0	14	14	0	0	0	0	0	2	21	23	0	0	0	0	0	4	0	4	0	0	0	0	0	34	3	37	102
7:45 AM	0	0	0	0	0	23	2	25	0	0	0	0	0	0	20	20	0	0	0	0	0	0	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	47	3	50	115
8:00 AM	0	0	0	0	0	4	2	6	0	0	0	0	0	0	2	2	0	0	0	0	0	0	4	4	0	0	0	0	0	1	0	1	0	0	0	0	0	4	0	4	17
Total Volume	0	0	0	0	0	56	14	70	0	0	0	0	0	0	39	39	0	0	0	0	0	2	50	52	0	0	0	0	0	7	1	8	0	0	0	0	0	106	10	116	285
% Approach Total	0.0	0.0	0.0	0.0	0.0	80.0	20.0		0.0	0.0	0.0	0.0	0.0	0.0	100.0		0.0	0.0	0.0	0.0	0.0	3.8	96.2		0.0	0.0	0.0	0.0	0.0	87.5	12.5		0.0	0.0	0.0	0.0	0.0	91.4	8.6		
PHF	0.000	0.000	0.000	0.000	0.000	0.609	0.500	0.700	0.000	0.000	0.000	0.000	0.000	0.000	0.488	0.488	0.000	0.000	0.000	0.000	0.000	0.250	0.595	0.565	0.000	0.000	0.000	0.000	0.000	0.438	0.250	0.500	0.000	0.000	0.000	0.000	0.000	0.564	0.625	0.580	0.620
Entering Leg	0	0	0	0	0	56	14	70	0	0	0	0	0	0	39	39	0	0	0	0	0	2	50	52	0	0	0	0	0	7	1	8	0	0	0	0	0	106	10	116	285
Exiting Leg								70								39								52								8								116	285
Total								140								78								104								16								232	570

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

PDI File #: **175563 FF**
Location: **N: Dutton Street S: Dutton Street NW: Moody Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

Cars, Heavy Vehicles, and Buses (Combined)

	Dutton Street						Merrimack Street						Dutton Street						Merrimack Street						Moody Street						
	North						East						South						West						Northwest						
	Hard Righ	Right	Thru	Left	U-Turn	Total	Right	Bear Righ	Thru	Left	U-Turn	Total	Right	Thru	Bear Left	Left	U-Turn	Total	Right	Thru	Left	Hard Left	U-Turn	Total	Hard Righ	Bear Right	Bear Left	Hard Left	U-Turn	Total	Total
2:00 PM	0	1	1	0	0	2	1	7	51	38	1	98	16	0	60	14	0	90	31	45	0	0	0	76	0	67	15	2	0	84	350
2:15 PM	0	0	1	0	0	1	0	8	57	39	0	104	25	0	56	19	0	100	23	58	0	0	0	81	0	62	9	0	0	71	357
2:30 PM	0	0	0	0	0	0	0	13	45	24	0	82	20	0	56	20	0	96	18	39	0	0	0	57	0	47	9	0	0	56	291
2:45 PM	0	0	1	0	0	1	0	12	68	38	0	118	6	0	74	12	0	92	28	42	0	2	0	72	1	36	10	2	0	49	332
Total	0	1	3	0	0	4	1	40	221	139	1	402	67	0	246	65	0	378	100	184	0	2	0	286	1	212	43	4	0	260	1330
3:00 PM	0	0	0	0	0	0	0	11	69	29	0	109	16	0	90	18	0	124	16	45	0	0	0	61	0	47	7	0	0	54	348
3:15 PM	0	0	0	0	0	0	0	12	64	31	0	107	22	1	88	23	0	134	28	33	0	0	0	61	0	81	9	0	0	90	392
3:30 PM	0	0	0	0	0	0	0	6	78	35	0	119	23	0	87	16	0	126	19	45	1	0	0	65	0	79	14	1	0	94	404
3:45 PM	0	0	1	0	0	1	0	14	43	41	0	98	18	1	89	30	0	138	24	38	0	0	0	62	0	56	7	0	0	63	362
Total	0	0	1	0	0	1	0	43	254	136	0	433	79	2	354	87	0	522	87	161	1	0	0	249	0	263	37	1	0	301	1506
4:00 PM	0	0	0	0	0	0	0	9	72	40	0	121	19	0	91	23	0	133	24	38	0	1	0	63	0	75	13	0	0	88	405
4:15 PM	0	0	1	0	0	1	2	11	59	36	0	108	14	0	108	17	0	139	16	45	0	0	0	61	0	55	11	0	0	66	375
4:30 PM	2	0	0	0	0	2	4	14	54	36	0	108	17	3	78	20	0	118	25	37	0	0	0	62	0	53	12	0	0	65	355
4:45 PM	3	0	1	1	0	5	4	10	48	37	0	99	29	5	115	30	0	179	24	39	0	0	0	63	0	68	10	1	0	79	425
Total	5	0	2	1	0	8	10	44	233	149	0	436	79	8	392	90	0	569	89	159	0	1	0	249	0	251	46	1	0	298	1560
5:00 PM	4	0	3	1	0	8	1	14	61	45	0	121	18	4	114	19	0	155	28	40	0	2	0	70	0	66	11	0	0	77	431
5:15 PM	0	0	1	0	0	1	0	14	60	35	0	109	26	2	103	23	0	154	21	44	0	0	0	65	0	70	7	0	0	77	406
5:30 PM	1	1	0	0	0	2	1	20	60	43	0	124	28	2	89	16	0	135	21	46	0	0	0	67	0	52	5	0	0	57	385
5:45 PM	3	0	0	0	0	3	3	12	59	40	0	114	27	1	137	24	0	189	17	36	0	0	0	53	0	44	7	1	0	52	411
Total	8	1	4	1	0	14	5	60	240	163	0	468	99	9	443	82	0	633	87	166	0	2	0	255	0	232	30	1	0	263	1633
Grand Total	13	2	10	2	0	27	16	187	948	587	1	1739	324	19	1435	324	0	2102	363	670	1	5	0	1039	1	958	156	7	0	1122	6029
Approach %	48.1	7.4	37.0	7.4	0.0		0.9	10.8	54.5	33.8	0.1		15.4	0.9	68.3	15.4	0.0		34.9	64.5	0.1	0.5	0.0		0.1	85.4	13.9	0.6	0.0		
Total %	0.2	0.0	0.2	0.0	0.0	0.4	0.3	3.1	15.7	9.7	0.0	28.8	5.4	0.3	23.8	5.4	0.0	34.9	6.0	11.1	0.0	0.1	0.0	17.2	0.0	15.9	2.6	0.1	0.0	18.6	
Exiting Leg Total						43						1153						1918						1275						1640	6029
Cars	13	2	10	2	0	27	16	179	922	559	1	1677	321	18	1393	305	0	2037	338	645	1	5	0	989	1	945	155	7	0	1108	5838
% Cars	100.0	100.0	100.0	100.0	0.0	100.0	100.0	95.7	97.3	95.2	100.0	96.4	99.1	94.7	97.1	94.1	0.0	96.9	93.1	96.3	100.0	100.0	0.0	95.2	100.0	98.6	99.4	100.0	0.0	98.8	96.8
Exiting Leg Total						42						1124						1852						1230						1590	5838
Heavy Vehicles	0	0	0	0	0	0	0	8	6	8	0	22	2	0	9	4	0	15	7	8	0	0	0	15	0	7	1	0	0	8	60
% Heavy Vehicles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.6	1.4	0.0	1.3	0.6	0.0	0.6	1.2	0.0	0.7	1.9	1.2	0.0	0.0	0.0	1.4	0.0	0.7	0.6	0.0	0.0	0.7	1.0
Exiting Leg Total						0						11						22						10						17	60
Buses	0	0	0	0	0	0	0	0	20	20	0	40	1	1	33	15	0	50	18	17	0	0	0	35	0	6	0	0	0	6	131
% Buses	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	3.4	0.0	2.3	0.3	5.3	2.3	4.6	0.0	2.4	5.0	2.5	0.0	0.0	0.0	3.4	0.0	0.6	0.0	0.0	0.0	0.5	2.2
Exiting Leg Total						1						18						44						35						33	131

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

4:45 PM	Dutton Street						Merrimack Street						Dutton Street						Merrimack Street						Moody Street						
	North						East						South						West						Northwest						
	Hard Righ	Right	Thru	Left	U-Turn	Total	Right	Bear Righ	Thru	Left	U-Turn	Total	Right	Thru	Bear Left	Left	U-Turn	Total	Right	Thru	Left	Hard Left	U-Turn	Total	Hard Righ	Bear Right	Bear Left	Hard Left	U-Turn	Total	Total
4:45 PM	3	0	1	1	0	5	4	10	48	37	0	99	29	5	115	30	0	179	24	39	0	0	0	63	0	68	10	1	0	79	425
5:00 PM	4	0	3	1	0	8	1	14	61	45	0	121	18	4	114	19	0	155	28	40	0	2	0	70	0	66	11	0	0	77	431
5:15 PM	0	0	1	0	0	1	0	14	60	35	0	109	26	2	103	23	0	154	21	44	0	0	0	65	0	70	7	0	0	77	406
5:30 PM	1	1	0	0	0	2	1	20	60	43	0	124	28	2	89	16	0	135	21	46	0	0	0	67	0	52	5	0	0	57	385
Total Volume	8	1	5	2	0	16	6	58	229	160	0	453	101	13	421	88	0	623	94	169	0	2	0	265	0	256	33	1	0	290	1647
% Approach Total	50.0	6.3	31.3	12.5	0.0		1.3	12.8	50.6	35.3	0.0		16.2	2.1	67.6	14.1	0.0		35.5	63.8	0.0	0.8	0.0		0.0	88.3	11.4	0.3	0.0		
PHF	0.500	0.250	0.417	0.500	0.000	0.500	0.375	0.725	0.939	0.889	0.000	0.913	0.871	0.650	0.915	0.733	0.000	0.870	0.839	0.918	0.000	0.250	0.000	0.946	0.000	0.914	0.750	0.250	0.000	0.918	0.955
Cars	8	1	5	2	0	16	6	58	225	154	0	443	101	13	409	83	0	606	87	161	0	2	0	250	0	253	32	1	0	286	1601
Cars %	100.0	100.0	100.0	100.0	0.0	100.0	100.0	100.0	98.3	96.3	0.0	97.8	100.0	100.0	97.1	94.3	0.0	97.3	92.6	95.3	0.0	100.0	0.0	94.3	0.0	98.8	97.0	100.0	0.0	98.6	97.2
Heavy Vehicles	0	0	0	0	0	0	0	0	1	2	0	3	0	0	3	2	0	5	3	5	0	0	0	8	0	0	1	0	0	1	17
Heavy Vehicles %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.3	0.0	0.7	0.0	0.0	0.7	2.3	0.0	0.8	3.2	3.0	0.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	0.3	1.0
Buses	0	0	0	0	0	0	0	0	3	4	0	7	0	0	9	3	0	12	4	3	0	0	0	7	0	3	0	0	0	3	29
Buses %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	2.5	0.0	1.5	0.0	0.0	2.1	3.4	0.0	1.9	4.3	1.8	0.0	0.0	0.0	2.6	0.0	1.2	0.0	0.0	0.0	1.0	1.8
Cars Enter Leg	8	1	5	2	0	16	6	58	225	154	0	443	101	13	409	83	0	606	87	161	0	2	0	250	0	253	32	1	0	286	1601
Heavy Enter Leg	0	0	0	0	0	0	0	0	1	2	0	3	0	0	3	2	0	5	3	5	0	0	0	8	0	0	1	0	0	1	17
Bus Enter Leg	0	0	0	0	0	0	0	0	3	4	0	7	0	0	9	3	0	12	4	3	0	0	0	7	0	3	0	0	0	3	29
Total Entering Leg	8	1	5	2	0	16	6	58	229	160	0	453	101	13	421	88	0	623	94	169	0	2	0	265	0	256	33	1	0	290	1647
Cars Exiting Leg						20						296						499						309						477	1601
Heavy Exiting Leg						0						6						5						3						3	17
Buses Exiting Leg						0						3						11						6						9	29
Total Exiting Leg						20						305						515						318						489	1647

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

PDI File #: **175563 FF**
Location: **N: Dutton Street S: Dutton Street NW: Moody Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

Cars

	Dutton Street						Merrimack Street						Dutton Street						Merrimack Street						Moody Street						
	North						East						South						West						Northwest						
	Hard Righ	Right	Thru	Left	U-Turn	Total	Right	Bear Righ	Thru	Left	U-Turn	Total	Right	Thru	Bear Left	Left	U-Turn	Total	Right	Thru	Left	Hard Left	U-Turn	Total	Hard Righ	Bear Righ	Bear Left	Hard Left	U-Turn	Total	Total
2:00 PM	0	1	1	0	0	2	1	7	46	33	1	88	15	0	56	13	0	84	30	43	0	0	0	73	0	63	15	2	0	80	327
2:15 PM	0	0	1	0	0	1	0	7	56	36	0	99	25	0	54	18	0	97	21	56	0	0	0	77	0	59	9	0	0	68	342
2:30 PM	0	0	0	0	0	0	0	13	44	23	0	80	20	0	52	18	0	90	16	38	0	0	0	54	0	47	9	0	0	56	280
2:45 PM	0	0	1	0	0	1	0	10	66	35	0	111	6	0	72	11	0	89	27	40	0	2	0	69	1	36	10	2	0	49	319
Total	0	1	3	0	0	4	1	37	212	127	1	378	66	0	234	60	0	360	94	177	0	2	0	273	1	205	43	4	0	253	1268
3:00 PM	0	0	0	0	0	0	0	11	67	29	0	107	16	0	89	17	0	122	15	45	0	0	0	60	0	46	7	0	0	53	342
3:15 PM	0	0	0	0	0	0	0	12	63	30	0	105	22	1	86	22	0	131	27	30	0	0	0	57	0	81	9	0	0	90	383
3:30 PM	0	0	0	0	0	0	0	6	76	35	0	117	23	0	86	15	0	124	18	44	1	0	0	63	0	79	14	1	0	94	398
3:45 PM	0	0	1	0	0	1	0	14	42	39	0	95	17	0	84	28	0	129	21	37	0	0	0	58	0	56	7	0	0	63	346
Total	0	0	1	0	0	1	0	43	248	133	0	424	78	1	345	82	0	506	81	156	1	0	0	238	0	262	37	1	0	300	1469
4:00 PM	0	0	0	0	0	0	0	8	69	39	0	116	18	0	90	22	0	130	23	37	0	1	0	61	0	74	13	0	0	87	394
4:15 PM	0	0	1	0	0	1	2	10	58	33	0	103	14	0	106	17	0	137	16	44	0	0	0	60	0	55	11	0	0	66	367
4:30 PM	2	0	0	0	0	2	4	14	53	36	0	107	17	3	77	18	0	115	22	36	0	0	0	58	0	52	12	0	0	64	346
4:45 PM	3	0	1	1	0	5	4	10	47	36	0	97	29	5	108	29	0	171	24	39	0	0	0	63	0	67	10	1	0	78	414
Total	5	0	2	1	0	8	10	42	227	144	0	423	78	8	381	86	0	553	85	156	0	1	0	242	0	248	46	1	0	295	1521
5:00 PM	4	0	3	1	0	8	1	14	60	43	0	118	18	4	112	18	0	152	24	39	0	2	0	65	0	64	10	0	0	74	417
5:15 PM	0	0	1	0	0	1	0	14	60	34	0	108	26	2	101	22	0	151	21	41	0	0	0	62	0	70	7	0	0	77	399
5:30 PM	1	1	0	0	0	2	1	20	58	41	0	120	28	2	88	14	0	132	18	42	0	0	0	60	0	52	5	0	0	57	371
5:45 PM	3	0	0	0	0	3	3	9	57	37	0	106	27	1	132	23	0	183	15	34	0	0	0	49	0	44	7	1	0	52	393
Total	8	1	4	1	0	14	5	57	235	155	0	452	99	9	433	77	0	618	78	156	0	2	0	236	0	230	29	1	0	260	1580
Grand Total	13	2	10	2	0	27	16	179	922	559	1	1677	321	18	1393	305	0	2037	338	645	1	5	0	989	1	945	155	7	0	1108	5838
Approach %	48.1	7.4	37.0	7.4	0.0		1.0	10.7	55.0	33.3	0.1		15.8	0.9	68.4	15.0	0.0		34.2	65.2	0.1	0.5	0.0		0.1	85.3	14.0	0.6	0.0		
Total %	0.2	0.0	0.2	0.0	0.0	0.5	0.3	3.1	15.8	9.6	0.0	28.7	5.5	0.3	23.9	5.2	0.0	34.9	5.8	11.0	0.0	0.1	0.0	16.9	0.0	16.2	2.7	0.1	0.0	19.0	
Exiting Leg Total						42						1124						1852						1230						1590	5838

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

4:45 PM	Dutton Street						Merrimack Street						Dutton Street						Merrimack Street						Moody Street						
	North						East						South						West						Northwest						
	Hard Righ	Right	Thru	Left	U-Turn	Total	Right	Bear Righ	Thru	Left	U-Turn	Total	Right	Thru	Bear Left	Left	U-Turn	Total	Right	Thru	Left	Hard Left	U-Turn	Total	Hard Righ	Bear Righ	Bear Left	Hard Left	U-Turn	Total	Total
4:45 PM	3	0	1	1	0	5	4	10	47	36	0	97	29	5	108	29	0	171	24	39	0	0	0	63	0	67	10	1	0	78	414
5:00 PM	4	0	3	1	0	8	1	14	60	43	0	118	18	4	112	18	0	152	24	39	0	2	0	65	0	64	10	0	0	74	417
5:15 PM	0	0	1	0	0	1	0	14	60	34	0	108	26	2	101	22	0	151	21	41	0	0	0	62	0	70	7	0	0	77	399
5:30 PM	1	1	0	0	0	2	1	20	58	41	0	120	28	2	88	14	0	132	18	42	0	0	0	60	0	52	5	0	0	57	371
Total Volume	8	1	5	2	0	16	6	58	225	154	0	443	101	13	409	83	0	606	87	161	0	2	0	250	0	253	32	1	0	286	1601
% Approach Total	50.0	6.3	31.3	12.5	0.0		1.4	13.1	50.8	34.8	0.0		16.7	2.1	67.5	13.7	0.0		34.8	64.4	0.0	0.8	0.0		0.0	88.5	11.2	0.3	0.0		
PHF	0.500	0.250	0.417	0.500	0.000	0.500	0.375	0.725	0.938	0.895	0.000	0.923	0.871	0.650	0.913	0.716	0.000	0.886	0.906	0.958	0.000	0.250	0.000	0.962	0.000	0.904	0.800	0.250	0.000	0.917	0.960
Entering Leg	8	1	5	2	0	16	6	58	225	154	0	443	101	13	409	83	0	606	87	161	0	2	0	250	0	253	32	1	0	286	1601
Exiting Leg						20						296						499						309						477	1601
Total						36						739						1105						559						763	3202

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

PDI File #: **175563 FF**
Location: **N: Dutton Street S: Dutton Street NW: Moody Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

Heavy Vehicles

	Dutton Street						Merrimack Street						Dutton Street						Merrimack Street						Moody Street						
	North						East						South						West						Northwest						
	Hard Righ	Right	Thru	Left	U-Turn	Total	Right	Bear Righ	Thru	Left	U-Turn	Total	Right	Thru	Bear Left	Left	U-Turn	Total	Right	Thru	Left	Hard Left	U-Turn	Total	Hard Righ	Bear Righ	Bear Left	Hard Left	U-Turn	Total	Total
2:00 PM	0	0	0	0	0	0	0	0	1	2	0	3	0	0	1	0	0	1	0	0	0	0	0	0	0	3	0	0	0	3	7
2:15 PM	0	0	0	0	0	0	0	1	0	1	0	2	0	0	1	0	0	1	1	0	0	0	0	1	0	2	0	0	0	2	6
2:30 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2	1	0	3	1	0	0	0	0	1	0	0	0	0	0	0	5
2:45 PM	0	0	0	0	0	0	0	2	1	0	0	3	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	4
Total	0	0	0	0	0	0	0	3	2	4	0	9	0	0	4	1	0	5	2	1	0	0	0	3	0	5	0	0	0	5	22
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0	1	2
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
3:30 PM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3:45 PM	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	4
Total	0	0	0	0	0	0	0	0	1	1	0	2	1	0	1	1	0	3	1	1	0	0	0	2	0	1	0	0	0	1	8
4:00 PM	0	0	0	0	0	0	0	1	2	0	0	3	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	4
4:15 PM	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
Total	0	0	0	0	0	0	0	2	2	0	0	4	1	0	2	1	0	4	0	0	0	0	0	0	0	1	0	0	0	1	9
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	1	0	0	1	0	0	1	3
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	2
5:30 PM	0	0	0	0	0	0	0	0	1	2	0	3	0	0	0	1	0	1	2	3	0	0	0	5	0	0	0	0	0	0	9
5:45 PM	0	0	0	0	0	0	0	3	0	1	0	4	0	0	1	0	0	1	1	1	0	0	0	2	0	0	0	0	0	0	7
Total	0	0	0	0	0	0	0	3	1	3	0	7	0	0	2	1	0	3	4	6	0	0	0	10	0	0	1	0	0	1	21
Grand Total	0	0	0	0	0	0	0	8	6	8	0	22	2	0	9	4	0	15	7	8	0	0	0	15	0	7	1	0	0	8	60
Approach %	0.0	0.0	0.0	0.0	0.0		0.0	36.4	27.3	36.4	0.0		13.3	0.0	60.0	26.7	0.0		46.7	53.3	0.0	0.0	0.0		0.0	87.5	12.5	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.3	10.0	13.3	0.0	36.7	3.3	0.0	15.0	6.7	0.0	25.0	11.7	13.3	0.0	0.0	0.0	25.0	0.0	11.7	1.7	0.0	0.0	13.3	
Exiting Leg Total						0						11						22						10						17	60

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:00 PM	Dutton Street						Merrimack Street						Dutton Street						Merrimack Street						Moody Street						
	North						East						South						West						Northwest						
	Hard Righ	Right	Thru	Left	U-Turn	Total	Right	Bear Righ	Thru	Left	U-Turn	Total	Right	Thru	Bear Left	Left	U-Turn	Total	Right	Thru	Left	Hard Left	U-Turn	Total	Hard Righ	Bear Righ	Bear Left	Hard Left	U-Turn	Total	Total
2:00 PM	0	0	0	0	0	0	0	0	1	2	0	3	0	0	1	0	0	1	0	0	0	0	0	0	0	3	0	0	0	3	7
2:15 PM	0	0	0	0	0	0	0	1	0	1	0	2	0	0	1	0	0	1	1	0	0	0	0	1	0	2	0	0	0	2	6
2:30 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2	1	0	3	1	0	0	0	0	1	0	0	0	0	0	0	5
2:45 PM	0	0	0	0	0	0	0	2	1	0	0	3	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	4
Total Volume	0	0	0	0	0	0	0	3	2	4	0	9	0	0	4	1	0	5	2	1	0	0	0	3	0	5	0	0	0	5	22
% Approach Total	0.0	0.0	0.0	0.0	0.0		0.0	33.3	22.2	44.4	0.0		0.0	0.0	80.0	20.0	0.0		66.7	33.3	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.375	0.500	0.500	0.000	0.750	0.000	0.000	0.500	0.250	0.000	0.417	0.500	0.250	0.000	0.000	0.000	0.750	0.000	0.417	0.000	0.000	0.000	0.417	0.786
Entering Leg	0	0	0	0	0	0	0	3	2	4	0	9	0	0	4	1	0	5	2	1	0	0	0	3	0	5	0	0	0	5	22
Exiting Leg						0						1						11						3						7	22
Total						0						10						16						6						12	44

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
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PDI File #: **175563 FF**
Location: **N: Dutton Street S: Dutton Street NW: Moody Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

Buses

	Dutton Street						Merrimack Street						Dutton Street						Merrimack Street						Moody Street						
	North						East						South						West						Northwest						
	Hard Righ	Right	Thru	Left	U-Turn	Total	Right	Bear Righ	Thru	Left	U-Turn	Total	Right	Thru	Bear Left	Left	U-Turn	Total	Right	Thru	Left	Hard Left	U-Turn	Total	Hard Righ	Bear Righ	Bear Left	Hard Left	U-Turn	Total	Total
2:00 PM	0	0	0	0	0	0	0	0	4	3	0	7	1	0	3	1	0	5	1	2	0	0	0	3	0	1	0	0	0	1	16
2:15 PM	0	0	0	0	0	0	0	0	1	2	0	3	0	0	1	1	0	2	1	2	0	0	0	3	0	1	0	0	0	1	9
2:30 PM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	2	1	0	3	1	1	0	0	0	2	0	0	0	0	0	0	6
2:45 PM	0	0	0	0	0	0	0	0	1	3	0	4	0	0	2	1	0	3	1	1	0	0	0	2	0	0	0	0	0	0	9
Total	0	0	0	0	0	0	0	0	7	8	0	15	1	0	8	4	0	13	4	6	0	0	0	10	0	2	0	0	0	2	40
3:00 PM	0	0	0	0	0	0	0	0	2	0	0	2	0	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	4
3:15 PM	0	0	0	0	0	0	0	0	1	1	0	2	0	0	2	1	0	3	1	2	0	0	0	3	0	0	0	0	0	0	8
3:30 PM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1	0	2	1	1	0	0	0	2	0	0	0	0	0	0	5
3:45 PM	0	0	0	0	0	0	0	0	1	1	0	2	0	1	4	1	0	6	3	1	0	0	0	4	0	0	0	0	0	0	12
Total	0	0	0	0	0	0	0	0	5	2	0	7	0	1	8	4	0	13	5	4	0	0	0	9	0	0	0	0	0	0	29
4:00 PM	0	0	0	0	0	0	0	0	1	1	0	2	0	0	1	1	0	2	1	1	0	0	0	2	0	1	0	0	0	1	7
4:15 PM	0	0	0	0	0	0	0	0	1	3	0	4	0	0	2	0	0	2	0	1	0	0	0	1	0	0	0	0	0	0	7
4:30 PM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	2	0	3	3	1	0	0	0	4	0	0	0	0	0	0	8
4:45 PM	0	0	0	0	0	0	0	0	1	1	0	2	0	0	5	0	0	5	0	0	0	0	0	0	0	1	0	0	0	1	8
Total	0	0	0	0	0	0	0	0	4	5	0	9	0	0	9	3	0	12	4	3	0	0	0	7	0	2	0	0	0	2	30
5:00 PM	0	0	0	0	0	0	0	0	1	2	0	3	0	0	1	1	0	2	3	1	0	0	0	4	0	2	0	0	0	2	11
5:15 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2	1	0	3	0	1	0	0	0	1	0	0	0	0	0	0	5
5:30 PM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1	0	2	1	1	0	0	0	2	0	0	0	0	0	0	5
5:45 PM	0	0	0	0	0	0	0	0	2	2	0	4	0	0	4	1	0	5	1	1	0	0	0	2	0	0	0	0	0	0	11
Total	0	0	0	0	0	0	0	0	4	5	0	9	0	0	8	4	0	12	5	4	0	0	0	9	0	2	0	0	0	2	32
Grand Total	0	0	0	0	0	0	0	0	20	20	0	40	1	1	33	15	0	50	18	17	0	0	0	35	0	6	0	0	0	6	131
Approach %	0.0	0.0	0.0	0.0	0.0		0.0	0.0	50.0	50.0	0.0		2.0	2.0	66.0	30.0	0.0		51.4	48.6	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.3	15.3	0.0	30.5	0.8	0.8	25.2	11.5	0.0	38.2	13.7	13.0	0.0	0.0	0.0	26.7	0.0	4.6	0.0	0.0	0.0	4.6	
Exiting Leg Total						1						18						44						35						33	131

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:00 PM	Dutton Street						Merrimack Street						Dutton Street						Merrimack Street						Moody Street						
	North						East						South						West						Northwest						
	Hard Righ	Right	Thru	Left	U-Turn	Total	Right	Bear Righ	Thru	Left	U-Turn	Total	Right	Thru	Bear Left	Left	U-Turn	Total	Right	Thru	Left	Hard Left	U-Turn	Total	Hard Righ	Bear Righ	Bear Left	Hard Left	U-Turn	Total	Total
2:00 PM	0	0	0	0	0	0	0	0	4	3	0	7	1	0	3	1	0	5	1	2	0	0	0	3	0	1	0	0	0	1	16
2:15 PM	0	0	0	0	0	0	0	0	1	2	0	3	0	0	1	1	0	2	1	2	0	0	0	3	0	1	0	0	0	1	9
2:30 PM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	2	1	0	3	1	1	0	0	0	2	0	0	0	0	0	0	6
2:45 PM	0	0	0	0	0	0	0	0	1	3	0	4	0	0	2	1	0	3	1	1	0	0	0	2	0	0	0	0	0	0	9
Total Volume	0	0	0	0	0	0	0	0	7	8	0	15	1	0	8	4	0	13	4	6	0	0	0	10	0	2	0	0	0	2	40
% Approach Total	0.0	0.0	0.0	0.0	0.0		0.0	0.0	46.7	53.3	0.0		7.7	0.0	61.5	30.8	0.0		40.0	60.0	0.0	0.0	0.0		0.0	100.0	0.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.438	0.667	0.000	0.536	0.250	0.000	0.667	1.000	0.000	0.650	1.000	0.750	0.000	0.000	0.000	0.833	0.000	0.500	0.000	0.000	0.000	0.500	0.625
Entering Leg	0	0	0	0	0	0	0	0	7	8	0	15	1	0	8	4	0	13	4	6	0	0	0	10	0	2	0	0	0	2	40
Exiting Leg						0						7						14						11						8	40
Total						0						22						27						21						10	80

PRECISION DATA INDUSTRIES, LLC
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PDI File #: **175563 FF**
Location: **N: Dutton Street S: Dutton Street NW: Moody Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

Bicycles (on Roadway and Crosswalks)

	Dutton Street (North)								Merrimack Street (East)								Dutton Street (South)								Merrimack Street (West)								Moody Street (Northwest)								
	Hard Right	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Bear Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Bear Left	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	Hard Left	U-Turn	CW-NB	CW-SB	Total	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	CW-NEB	CW-SWB	Total	Total
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2:15 PM	0	0	0	0	0	1	2	3	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	7
2:30 PM	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	1	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
2:45 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2
Total	0	0	0	0	0	1	3	4	0	0	4	0	0	0	0	4	0	0	0	0	0	2	1	3	0	1	0	0	0	0	0	1	0	0	0	0	0	0	2	2	14
3:00 PM	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	2	0	1	0	0	0	1	0	2	0	0	0	0	0	2	0	2	8
3:15 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2
3:30 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	3
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Total	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	3	0	2	0	0	0	1	0	3	0	0	0	0	0	4	0	4	14
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2
4:30 PM	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
4:45 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2
Total	0	0	0	0	0	0	1	1	0	0	3	0	0	0	0	3	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	6
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2
Grand Total	0	0	0	0	0	5	4	9	0	0	7	0	0	0	0	7	0	1	0	0	0	4	2	7	1	5	0	0	0	1	0	7	0	0	0	0	0	4	2	6	36
Approach %	0.0	0.0	0.0	0.0	0.0	55.6	44.4		0.0	0.0	100.0	0.0	0.0	0.0	0.0		0.0	14.3	0.0	0.0	0.0	57.1	28.6		14.3	71.4	0.0	0.0	0.0	14.3	0.0		0.0	0.0	0.0	0.0	0.0	66.7	33.3		
Total %	0.0	0.0	0.0	0.0	0.0	13.9	11.1	25.0	0.0	0.0	19.4	0.0	0.0	0.0	0.0	19.4	0.0	2.8	0.0	0.0	0.0	11.1	5.6	19.4	2.8	13.9	0.0	0.0	0.0	2.8	0.0	19.4	0.0	0.0	0.0	0.0	0.0	11.1	5.6	16.7	
Exiting Leg Total								10								5								7								8								6	36

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:15 PM	Dutton Street (North)								Merrimack Street (East)								Dutton Street (South)								Merrimack Street (West)								Moody Street (Northwest)								
	Hard Right	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Bear Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Bear Left	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	Hard Left	U-Turn	CW-NB	CW-SB	Total	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	CW-NEB	CW-SWB	Total	Total
2:15 PM	0	0	0	0	0	1	2	3	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	7
2:30 PM	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	1	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
2:45 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2
3:00 PM	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	2	0	1	0	0	0	1	0	2	0	0	0	0	0	2	0	2	8
Total Volume	0	0	0	0	0	3	3	6	0	0	4	0	0	0	0	4	0	1	0	0	0	3	0	4	0	2	0	0	0	1	0	3	0	0	0	0	0	2	2	4	21
% Approach Total	0.0	0.0	0.0	0.0	0.0	50.0	50.0		0.0	0.0	100.0	0.0	0.0	0.0	0.0		0.0	25.0	0.0	0.0	0.0	75.0	0.0		0.0	66.7	0.0	0.0	0.0	33.3	0.0		0.0	0.0	0.0	0.0	0.0	50.0	50.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.375	0.375	0.500	0.000	0.000	0.500	0.000	0.000	0.000	0.000	0.500	0.000	0.250	0.000	0.000	0.000	0.375	0.000	0.500	0.000	0.500	0.000	0.000	0.000	0.250	0.000	0.375	0.000	0.000	0.000	0.000	0.000	0.250	0.250	0.500	0.656
Entering Leg	0	0	0	0	0	3	3	6	0	0	4	0	0	0	0	4	0	1	0	0	0	3	0	4	0	2	0	0	0	1	0	3	0	0	0	0	0	2	2	4	21
Exiting Leg								7								2								3								5								4	21
Total								13								6								7								8								8	42

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

PDI File #: **175563 FF**
Location: **N: Dutton Street S: Dutton Street NW: Moody Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

Pedestrians

	Dutton Street								Merrimack Street								Dutton Street								Merrimack Street								Moody Street								
	North								East								South								West								Northwest								
	Hard Right	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Bear Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Bear Left	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	Hard Left	U-Turn	CW-NB	CW-SB	Total	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	CW-NEB	CW-SWB	Total	Total
2:00 PM	0	0	0	0	0	16	21	37	0	0	0	0	0	1	1	2	0	0	0	0	0	3	7	10	0	0	0	0	0	0	3	3	0	0	0	0	0	14	14	28	80
2:15 PM	0	0	0	0	0	12	15	27	0	0	0	0	0	2	4	6	0	0	0	0	0	9	6	15	0	0	0	0	0	2	0	2	0	0	0	0	0	13	9	22	72
2:30 PM	0	0	0	0	0	9	16	25	0	0	0	0	0	2	10	12	0	0	0	0	0	8	8	16	0	0	0	0	0	0	5	5	0	0	0	0	0	8	12	20	78
2:45 PM	0	0	0	0	0	5	9	14	0	0	0	0	0	1	0	1	0	0	0	0	0	6	9	15	0	0	0	0	0	1	1	2	0	0	0	0	0	4	8	12	44
Total	0	0	0	0	0	42	61	103	0	0	0	0	0	6	15	21	0	0	0	0	0	26	30	56	0	0	0	0	0	3	9	12	0	0	0	0	0	39	43	82	274
3:00 PM	0	0	0	0	0	24	13	37	0	0	0	0	0	11	1	12	0	0	0	0	0	12	9	21	0	0	0	0	0	8	0	8	0	0	0	0	0	19	12	31	109
3:15 PM	0	0	0	0	0	10	7	17	0	0	0	0	0	1	0	1	0	0	0	0	0	7	11	18	0	0	0	0	0	2	0	2	0	0	0	0	0	12	5	17	55
3:30 PM	0	0	0	0	0	19	13	32	0	0	0	0	0	0	0	0	0	0	0	0	0	5	13	18	0	0	0	0	0	0	2	2	0	0	0	0	0	18	13	31	83
3:45 PM	0	0	0	0	0	13	5	18	0	0	0	0	0	1	2	3	0	0	0	0	0	11	3	14	0	0	0	0	0	1	0	1	0	0	0	0	0	6	4	10	46
Total	0	0	0	0	0	66	38	104	0	0	0	0	0	13	3	16	0	0	0	0	0	35	36	71	0	0	0	0	0	11	2	13	0	0	0	0	0	55	34	89	293
4:00 PM	0	0	0	0	0	2	8	10	0	0	0	0	0	1	4	5	0	0	0	0	0	1	13	14	0	0	0	0	0	0	1	1	0	0	0	0	0	2	10	12	42
4:15 PM	0	0	0	0	0	7	20	27	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	6	19	25	57
4:30 PM	0	0	0	0	0	15	17	32	0	0	0	0	0	5	2	7	0	0	0	0	0	8	6	14	0	0	0	0	0	1	1	2	0	0	0	0	0	10	14	24	79
4:45 PM	0	0	0	0	0	8	7	15	0	0	0	0	0	0	3	3	0	0	0	0	0	2	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	7	3	10	31
Total	0	0	0	0	0	32	52	84	0	0	0	0	0	6	9	15	0	0	0	0	0	15	21	36	0	0	0	0	0	1	2	3	0	0	0	0	0	25	46	71	209
5:00 PM	0	0	0	0	0	6	6	12	0	0	0	0	0	1	4	5	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	10	2	12	33
5:15 PM	0	0	0	0	0	3	8	11	0	0	0	0	0	0	1	1	0	0	0	0	0	4	3	7	0	0	0	0	0	1	0	1	0	0	0	0	0	4	6	10	30
5:30 PM	0	0	0	0	0	2	11	13	0	0	0	0	0	0	3	3	0	0	0	0	0	4	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	2	7	9	30
5:45 PM	0	0	0	0	0	7	5	12	0	0	0	0	0	1	0	1	0	0	0	0	0	10	4	14	0	0	0	0	0	3	3	6	0	0	0	0	0	3	4	7	40
Total	0	0	0	0	0	18	30	48	0	0	0	0	0	2	8	10	0	0	0	0	0	22	8	30	0	0	0	0	0	4	3	7	0	0	0	0	0	19	19	38	133
Grand Total	0	0	0	0	0	158	181	339	0	0	0	0	0	27	35	62	0	0	0	0	0	98	95	193	0	0	0	0	0	19	16	35	0	0	0	0	0	138	142	280	909
Approach %	0.0	0.0	0.0	0.0	0.0	46.6	53.4		0.0	0.0	0.0	0.0	0.0	43.5	56.5		0.0	0.0	0.0	0.0	0.0	50.8	49.2		0.0	0.0	0.0	0.0	0.0	54.3	45.7		0.0	0.0	0.0	0.0	0.0	49.3	50.7		
Total %	0.0	0.0	0.0	0.0	0.0	17.4	19.9	37.3	0.0	0.0	0.0	0.0	0.0	3.0	3.9	6.8	0.0	0.0	0.0	0.0	0.0	10.8	10.5	21.2	0.0	0.0	0.0	0.0	0.0	2.1	1.8	3.9	0.0	0.0	0.0	0.0	0.0	15.2	15.6	30.8	
Exiting Leg Total								339								62								193								35								280	909

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:15 PM	Dutton Street								Merrimack Street								Dutton Street								Merrimack Street								Moody Street								
	North								East								South								West								Northwest								
	Hard Right	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Bear Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Bear Left	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	Hard Left	U-Turn	CW-NB	CW-SB	Total	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	CW-NEB	CW-SWB	Total	Total
2:15 PM	0	0	0	0	0	12	15	27	0	0	0	0	0	2	4	6	0	0	0	0	0	9	6	15	0	0	0	0	0	2	0	2	0	0	0	0	0	13	9	22	72
2:30 PM	0	0	0	0	0	9	16	25	0	0	0	0	0	2	10	12	0	0	0	0	0	8	8	16	0	0	0	0	0	0	5	5	0	0	0	0	0	8	12	20	78
2:45 PM	0	0	0	0	0	5	9	14	0	0	0	0	0	1	0	1	0	0	0	0	0	6	9	15	0	0	0	0	0	1	1	2	0	0	0	0	0	4	8	12	44
3:00 PM	0	0	0	0	0	24	13	37	0	0	0	0	0	11	1	12	0	0	0	0	0	12	9	21	0	0	0	0	0	8	0	8	0	0	0	0	0	19	12	31	109
Total Volume	0	0	0	0	0	50	53	103	0	0	0	0	0	16	15	31	0	0	0	0	0	35	32	67	0	0	0	0	0	11	6	17	0	0	0	0	0	44	41	85	303
% Approach Total	0.0	0.0	0.0	0.0	0.0	48.5	51.5		0.0	0.0	0.0	0.0	0.0	51.6	48.4		0.0	0.0	0.0	0.0	0.0	52.2	47.8		0.0	0.0	0.0	0.0	0.0	64.7	35.3		0.0	0.0	0.0	0.0	0.0	51.8	48.2		
PHF	0.000	0.000	0.000	0.000	0.000	0.521	0.828	0.696	0.000	0.000	0.000	0.000	0.000	0.364	0.375	0.646	0.000	0.000	0.000	0.000	0.000	0.729	0.889	0.798	0.000	0.000	0.000	0.000	0.000	0.344	0.300	0.531	0.000	0.000	0.000	0.000	0.000	0.579	0.854	0.685	0.695
Entering Leg	0	0	0	0	0	50	53	103	0	0	0	0	0	16	15	31	0	0	0	0	0	35	32	67	0	0	0	0	0	11	6	17	0	0	0	0	0	44	41	85	303
Exiting Leg								103								31								67								17								85	303
Total								206								62								134								34								170	606

PDI File #: **175563 G**
Location: **S: Central Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Class: **Cars, Heavy Vehicles, and Buses (Combined)**

	Merrimack Street East				Central Street South				Merrimack Street West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
6:00 AM	33	116	0	149	0	7	0	7	15	8	0	23	179
6:15 AM	35	103	0	138	2	10	0	12	21	33	0	54	204
6:30 AM	38	115	0	153	0	14	0	14	20	25	0	45	212
6:45 AM	44	103	0	147	1	31	0	32	30	34	0	64	243
Total	150	437	0	587	3	62	0	65	86	100	0	186	838
7:00 AM	87	126	0	213	2	27	0	29	26	30	0	56	298
7:15 AM	87	102	0	189	1	71	0	72	43	41	0	84	345
7:30 AM	61	95	0	156	3	77	0	80	59	49	0	108	344
7:45 AM	81	98	0	179	2	66	0	68	58	33	0	91	338
Total	316	421	0	737	8	241	0	249	186	153	0	339	1325
8:00 AM	81	111	0	192	1	50	0	51	36	29	0	65	308
8:15 AM	82	123	0	205	1	52	0	53	25	22	0	47	305
8:30 AM	92	105	0	197	1	51	0	52	35	38	0	73	322
8:45 AM	81	111	0	192	2	54	0	56	27	32	0	59	307
Total	336	450	0	786	5	207	0	212	123	121	0	244	1242
9:00 AM	83	96	0	179	1	43	0	44	37	30	0	67	290
9:15 AM	87	88	0	175	4	40	0	44	38	36	0	74	293
9:30 AM	81	100	0	181	2	59	0	61	33	37	0	70	312
9:45 AM	78	86	0	164	5	47	0	52	28	32	0	60	276
Total	329	370	0	699	12	189	0	201	136	135	0	271	1171
Grand Total	1131	1678	0	2809	28	699	0	727	531	509	0	1040	4576
Approach %	40.3	59.7	0.0		3.9	96.1	0.0		51.1	48.9	0.0		
Total %	24.7	36.7	0.0	61.4	0.6	15.3	0.0	15.9	11.6	11.1	0.0	22.7	
Exiting Leg Total				537				2209				1830	4576
Cars	1078	1637	0	2715	27	669	0	696	512	488	0	1000	4411
% Cars	95.3	97.6	0.0	96.7	96.4	95.7	0.0	95.7	96.4	95.9	0.0	96.2	96.4
Exiting Leg Total				515				2149				1747	4411
Heavy Vehicles	22	25	0	47	1	11	0	12	5	12	0	17	76
% Heavy Vehicles	1.9	1.5	0.0	1.7	3.6	1.6	0.0	1.7	0.9	2.4	0.0	1.6	1.7
Exiting Leg Total				13				30				33	76
Buses	31	16	0	47	0	19	0	19	14	9	0	23	89
% Buses	2.7	1.0	0.0	1.7	0.0	2.7	0.0	2.6	2.6	1.8	0.0	2.2	1.9
Exiting Leg Total				9				30				50	89

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:15 AM	Merrimack Street East				Central Street South				Merrimack Street West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
7:15 AM	87	102	0	189	1	71	0	72	43	41	0	84	345
7:30 AM	61	95	0	156	3	77	0	80	59	49	0	108	344
7:45 AM	81	98	0	179	2	66	0	68	58	33	0	91	338
8:00 AM	81	111	0	192	1	50	0	51	36	29	0	65	308
Total Volume	310	406	0	716	7	264	0	271	196	152	0	348	1335
% Approach Total	43.3	56.7	0.0		2.6	97.4	0.0		56.3	43.7	0.0		
PHF	0.891	0.914	0.000	0.932	0.583	0.857	0.000	0.847	0.831	0.776	0.000	0.806	0.967
Cars	298	396	0	694	6	253	0	259	191	143	0	334	1287
Cars %	96.1	97.5	0.0	96.9	85.7	95.8	0.0	95.6	97.4	94.1	0.0	96.0	96.4
Heavy Vehicles	2	5	0	7	1	1	0	2	1	5	0	6	15
Heavy Vehicles %	0.6	1.2	0.0	1.0	14.3	0.4	0.0	0.7	0.5	3.3	0.0	1.7	1.1
Buses	10	5	0	15	0	10	0	10	4	4	0	8	33
Buses %	3.2	1.2	0.0	2.1	0.0	3.8	0.0	3.7	2.0	2.6	0.0	2.3	2.5

PDI File #: **175563 G**
Location: **S: Central Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars, Heavy Vehicles, and Buses (Combined)

	Merrimack Street East				Central Street South				Merrimack Street West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
Cars Enter Leg	298	396	0	694	6	253	0	259	191	143	0	334	1287
Heavy Enter Leg	2	5	0	7	1	1	0	2	1	5	0	6	15
Bus Enter Leg	10	5	0	15	0	10	0	10	4	4	0	8	33
Total Entering Leg	310	406	0	716	7	264	0	271	196	152	0	348	1335
Cars Exiting Leg				149				587				551	1287
Heavy Exiting Leg				6				6				3	15
Buses Exiting Leg				4				9				20	33
Total Exiting Leg				159				602				574	1335

PDI File #: **175563 G**
Location: **S: Central Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars

	Merrimack Street				Central Street				Merrimack Street				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
6:00 AM	33	115	0	148	0	7	0	7	15	8	0	23	178
6:15 AM	32	102	0	134	2	10	0	12	20	31	0	51	197
6:30 AM	37	111	0	148	0	14	0	14	20	25	0	45	207
6:45 AM	40	101	0	141	1	29	0	30	29	32	0	61	232
Total	142	429	0	571	3	60	0	63	84	96	0	180	814
7:00 AM	85	122	0	207	2	26	0	28	25	30	0	55	290
7:15 AM	83	100	0	183	1	68	0	69	42	36	0	78	330
7:30 AM	60	93	0	153	2	74	0	76	58	49	0	107	336
7:45 AM	80	94	0	174	2	62	0	64	56	30	0	86	324
Total	308	409	0	717	7	230	0	237	181	145	0	326	1280
8:00 AM	75	109	0	184	1	49	0	50	35	28	0	63	297
8:15 AM	79	120	0	199	1	50	0	51	23	21	0	44	294
8:30 AM	86	99	0	185	1	46	0	47	32	36	0	68	300
8:45 AM	74	108	0	182	2	53	0	55	25	31	0	56	293
Total	314	436	0	750	5	198	0	203	115	116	0	231	1184
9:00 AM	80	91	0	171	1	42	0	43	36	29	0	65	279
9:15 AM	82	88	0	170	4	39	0	43	36	34	0	70	283
9:30 AM	80	99	0	179	2	56	0	58	33	36	0	69	306
9:45 AM	72	85	0	157	5	44	0	49	27	32	0	59	265
Total	314	363	0	677	12	181	0	193	132	131	0	263	1133
Grand Total	1078	1637	0	2715	27	669	0	696	512	488	0	1000	4411
Approach %	39.7	60.3	0.0		3.9	96.1	0.0		51.2	48.8	0.0		
Total %	24.4	37.1	0.0	61.6	0.6	15.2	0.0	15.8	11.6	11.1	0.0	22.7	
Exiting Leg Total				515				2149				1747	4411

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:15 AM	Merrimack Street				Central Street				Merrimack Street				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
7:15 AM	83	100	0	183	1	68	0	69	42	36	0	78	330
7:30 AM	60	93	0	153	2	74	0	76	58	49	0	107	336
7:45 AM	80	94	0	174	2	62	0	64	56	30	0	86	324
8:00 AM	75	109	0	184	1	49	0	50	35	28	0	63	297
Total Volume	298	396	0	694	6	253	0	259	191	143	0	334	1287
% Approach Total	42.9	57.1	0.0		2.3	97.7	0.0		57.2	42.8	0.0		
PHF	0.898	0.908	0.000	0.943	0.750	0.855	0.000	0.852	0.823	0.730	0.000	0.780	0.958
Entering Leg	298	396	0	694	6	253	0	259	191	143	0	334	1287
Exiting Leg				149				587				551	1287
Total				843				846				885	2574

PDI File #: **175563 G**
Location: **S: Central Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Heavy Vehicles

	Merrimack Street				Central Street				Merrimack Street				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
6:00 AM	0	1	0	1	0	0	0	0	0	0	0	0	1
6:15 AM	1	1	0	2	0	0	0	0	1	1	0	2	4
6:30 AM	0	3	0	3	0	0	0	0	0	0	0	0	3
6:45 AM	0	2	0	2	0	1	0	1	1	1	0	2	5
Total	1	7	0	8	0	1	0	1	2	2	0	4	13
7:00 AM	1	1	0	2	0	1	0	1	1	0	0	1	4
7:15 AM	0	1	0	1	0	0	0	0	1	2	0	3	4
7:30 AM	0	2	0	2	1	1	0	2	0	0	0	0	4
7:45 AM	0	1	0	1	0	0	0	0	0	2	0	2	3
Total	1	5	0	6	1	2	0	3	2	4	0	6	15
8:00 AM	2	1	0	3	0	0	0	0	0	1	0	1	4
8:15 AM	2	2	0	4	0	1	0	1	0	1	0	1	6
8:30 AM	4	4	0	8	0	3	0	3	0	0	0	0	11
8:45 AM	4	1	0	5	0	0	0	0	1	1	0	2	7
Total	12	8	0	20	0	4	0	4	1	3	0	4	28
9:00 AM	3	3	0	6	0	0	0	0	0	0	0	0	6
9:15 AM	2	0	0	2	0	0	0	0	0	2	0	2	4
9:30 AM	0	1	0	1	0	2	0	2	0	1	0	1	4
9:45 AM	3	1	0	4	0	2	0	2	0	0	0	0	6
Total	8	5	0	13	0	4	0	4	0	3	0	3	20
Grand Total	22	25	0	47	1	11	0	12	5	12	0	17	76
Approach %	46.8	53.2	0.0		8.3	91.7	0.0		29.4	70.6	0.0		
Total %	28.9	32.9	0.0	61.8	1.3	14.5	0.0	15.8	6.6	15.8	0.0	22.4	
Exiting Leg Total				13				30				33	76

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

8:15 AM	Merrimack Street				Central Street				Merrimack Street				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
8:15 AM	2	2	0	4	0	1	0	1	0	1	0	1	6
8:30 AM	4	4	0	8	0	3	0	3	0	0	0	0	11
8:45 AM	4	1	0	5	0	0	0	0	1	1	0	2	7
9:00 AM	3	3	0	6	0	0	0	0	0	0	0	0	6
Total Volume	13	10	0	23	0	4	0	4	1	2	0	3	30
% Approach Total	56.5	43.5	0.0		0.0	100.0	0.0		33.3	66.7	0.0		
PHF	0.813	0.625	0.000	0.719	0.000	0.333	0.000	0.333	0.250	0.500	0.000	0.375	0.682
Entering Leg	13	10	0	23	0	4	0	4	1	2	0	3	30
Exiting Leg				2				11				17	30
Total				25				15				20	60

PDI File #: **175563 G**
Location: **S: Central Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Buses

	Merrimack Street				Central Street				Merrimack Street				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	2	0	0	2	0	0	0	0	0	1	0	1	3
6:30 AM	1	1	0	2	0	0	0	0	0	0	0	0	2
6:45 AM	4	0	0	4	0	1	0	1	0	1	0	1	6
Total	7	1	0	8	0	1	0	1	0	2	0	2	11
7:00 AM	1	3	0	4	0	0	0	0	0	0	0	0	4
7:15 AM	4	1	0	5	0	3	0	3	0	3	0	3	11
7:30 AM	1	0	0	1	0	2	0	2	1	0	0	1	4
7:45 AM	1	3	0	4	0	4	0	4	2	1	0	3	11
Total	7	7	0	14	0	9	0	9	3	4	0	7	30
8:00 AM	4	1	0	5	0	1	0	1	1	0	0	1	7
8:15 AM	1	1	0	2	0	1	0	1	2	0	0	2	5
8:30 AM	2	2	0	4	0	2	0	2	3	2	0	5	11
8:45 AM	3	2	0	5	0	1	0	1	1	0	0	1	7
Total	10	6	0	16	0	5	0	5	7	2	0	9	30
9:00 AM	0	2	0	2	0	1	0	1	1	1	0	2	5
9:15 AM	3	0	0	3	0	1	0	1	2	0	0	2	6
9:30 AM	1	0	0	1	0	1	0	1	0	0	0	0	2
9:45 AM	3	0	0	3	0	1	0	1	1	0	0	1	5
Total	7	2	0	9	0	4	0	4	4	1	0	5	18
Grand Total	31	16	0	47	0	19	0	19	14	9	0	23	89
Approach %	66.0	34.0	0.0		0.0	100.0	0.0		60.9	39.1	0.0		
Total %	34.8	18.0	0.0	52.8	0.0	21.3	0.0	21.3	15.7	10.1	0.0	25.8	
Exiting Leg Total				9				30				50	89

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:45 AM	Merrimack Street				Central Street				Merrimack Street				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
7:45 AM	1	3	0	4	0	4	0	4	2	1	0	3	11
8:00 AM	4	1	0	5	0	1	0	1	1	0	0	1	7
8:15 AM	1	1	0	2	0	1	0	1	2	0	0	2	5
8:30 AM	2	2	0	4	0	2	0	2	3	2	0	5	11
Total Volume	8	7	0	15	0	8	0	8	8	3	0	11	34
% Approach Total	53.3	46.7	0.0		0.0	100.0	0.0		72.7	27.3	0.0		
PHF	0.500	0.583	0.000	0.750	0.000	0.500	0.000	0.500	0.667	0.375	0.000	0.550	0.773
Entering Leg	8	7	0	15	0	8	0	8	8	3	0	11	34
Exiting Leg				3				15				16	34
Total				18				23				27	68

PDI File #: **175563 G**
Location: **S: Central Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Bicycles (on Roadway and Crosswalks)

	Merrimack Street East						Central Street South						Merrimack Street West						
	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	U-Turn	CW-NB	CW-SB	Total	Total
6:00 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	2
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	3	0	3	0	1	0	0	0	1	4
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
Total	0	0	0	0	0	0	0	1	0	3	0	4	0	1	0	0	0	1	5
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1
8:30 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	2
9:00 AM	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1
9:15 AM	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	2
Grand Total	0	1	0	0	0	1	0	1	0	6	2	9	0	1	0	0	0	1	11
Approach %	0.0	100.0	0.0	0.0	0.0		0.0	11.1	0.0	66.7	22.2		0.0	100.0	0.0	0.0	0.0		
Total %	0.0	9.1	0.0	0.0	0.0	9.1	0.0	9.1	0.0	54.5	18.2	81.8	0.0	9.1	0.0	0.0	0.0	9.1	
Exiting Leg Total						1						9						1	11

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

6:30 AM	Merrimack Street East						Central Street South						Merrimack Street West						
	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	U-Turn	CW-NB	CW-SB	Total	Total
6:30 AM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	3	0	3	0	1	0	0	0	1	4
Total Volume	0	1	0	0	0	1	0	0	0	3	0	3	0	1	0	0	0	1	5
% Approach Total	0.0	100.0	0.0	0.0	0.0		0.0	0.0	0.0	100.0	0.0		0.0	100.0	0.0	0.0	0.0		
PHF	0.000	0.250	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.250	0.000	0.250	0.000	0.250	0.000	0.000	0.000	0.250	0.313
Entering Leg	0	1	0	0	0	1	0	0	0	3	0	3	0	1	0	0	0	1	5
Exiting Leg						1						4						0	5
Total						2						7						1	10

PDI File #: **175563 G**
Location: **S: Central Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Pedestrians

	Merrimack Street						Central Street						Merrimack Street						
	East						South						West						
	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	U-Turn	CW-NB	CW-SB	Total	Total
6:00 AM	0	0	0	0	3	3	0	0	0	3	1	4	0	0	0	1	0	1	8
6:15 AM	0	0	0	0	4	4	0	0	0	2	3	5	0	0	0	1	1	2	11
6:30 AM	0	0	0	1	3	4	0	0	0	1	2	3	0	0	0	3	1	4	11
6:45 AM	0	0	0	7	7	14	0	0	0	2	5	7	0	0	0	1	1	2	23
Total	0	0	0	8	17	25	0	0	0	8	11	19	0	0	0	6	3	9	53
7:00 AM	0	0	0	11	14	25	0	0	0	0	5	5	0	0	0	8	1	9	39
7:15 AM	0	0	0	22	23	45	0	0	0	3	8	11	0	0	0	20	2	22	78
7:30 AM	0	0	0	21	58	79	0	0	0	10	5	15	0	0	0	11	4	15	109
7:45 AM	0	0	0	9	50	59	0	0	0	6	5	11	0	0	0	8	4	12	82
Total	0	0	0	63	145	208	0	0	0	19	23	42	0	0	0	47	11	58	308
8:00 AM	0	0	0	12	5	17	0	0	0	8	8	16	0	0	0	1	1	2	35
8:15 AM	0	0	0	16	10	26	0	0	0	9	12	21	0	0	0	4	3	7	54
8:30 AM	0	0	0	17	15	32	0	0	0	8	7	15	0	0	0	6	1	7	54
8:45 AM	0	0	0	25	18	43	0	0	0	8	14	22	0	0	0	1	1	2	67
Total	0	0	0	70	48	118	0	0	0	33	41	74	0	0	0	12	6	18	210
9:00 AM	0	0	0	13	6	19	0	0	0	17	14	31	0	0	0	10	7	17	67
9:15 AM	0	0	0	17	12	29	0	0	0	12	9	21	0	0	0	6	3	9	59
9:30 AM	0	0	0	10	6	16	0	0	0	9	7	16	0	0	0	8	6	14	46
9:45 AM	0	0	0	12	11	23	0	0	0	13	9	22	0	0	0	5	3	8	53
Total	0	0	0	52	35	87	0	0	0	51	39	90	0	0	0	29	19	48	225
Grand Total	0	0	0	193	245	438	0	0	0	111	114	225	0	0	0	94	39	133	796
Approach %	0.0	0.0	0.0	44.1	55.9		0.0	0.0	0.0	49.3	50.7		0.0	0.0	0.0	70.7	29.3		
Total %	0.0	0.0	0.0	24.2	30.8	55.0	0.0	0.0	0.0	13.9	14.3	28.3	0.0	0.0	0.0	11.8	4.9	16.7	
Exiting Leg Total						438						225						133	796

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:00 AM	Merrimack Street						Central Street						Merrimack Street						
	East						South						West						
	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	U-Turn	CW-NB	CW-SB	Total	Total
7:00 AM	0	0	0	11	14	25	0	0	0	0	5	5	0	0	0	8	1	9	39
7:15 AM	0	0	0	22	23	45	0	0	0	3	8	11	0	0	0	20	2	22	78
7:30 AM	0	0	0	21	58	79	0	0	0	10	5	15	0	0	0	11	4	15	109
7:45 AM	0	0	0	9	50	59	0	0	0	6	5	11	0	0	0	8	4	12	82
Total Volume	0	0	0	63	145	208	0	0	0	19	23	42	0	0	0	47	11	58	308
% Approach Total	0.0	0.0	0.0	30.3	69.7		0.0	0.0	0.0	45.2	54.8		0.0	0.0	0.0	81.0	19.0		
PHF	0.000	0.000	0.000	0.716	0.625	0.658	0.000	0.000	0.000	0.475	0.719	0.700	0.000	0.000	0.000	0.588	0.688	0.659	0.706
Entering Leg	0	0	0	63	145	208	0	0	0	19	23	42	0	0	0	47	11	58	308
Exiting Leg						208						42						58	308
Total						416						84						116	616

PDI File #: **175563 GG**
Location: **S: Central Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Class:

Cars, Heavy Vehicles, and Buses (Combined)

	Merrimack Street				Central Street				Merrimack Street				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
2:00 PM	89	88	0	177	2	50	0	52	27	44	0	71	300
2:15 PM	64	80	0	144	5	52	0	57	43	40	0	83	284
2:30 PM	72	92	0	164	3	57	0	60	33	43	0	76	300
2:45 PM	83	83	0	166	1	57	0	58	29	43	0	72	296
Total	308	343	0	651	11	216	0	227	132	170	0	302	1180
3:00 PM	82	90	0	172	3	52	0	55	38	35	0	73	300
3:15 PM	78	90	0	168	4	61	0	65	33	36	0	69	302
3:30 PM	79	84	0	163	4	51	0	55	45	49	0	94	312
3:45 PM	69	91	0	160	8	57	0	65	25	34	0	59	284
Total	308	355	0	663	19	221	0	240	141	154	0	295	1198
4:00 PM	79	74	0	153	13	62	0	75	33	44	0	77	305
4:15 PM	85	105	0	190	3	54	0	57	25	32	0	57	304
4:30 PM	80	104	0	184	5	65	0	70	37	38	0	75	329
4:45 PM	91	97	0	188	7	54	0	61	41	38	0	79	328
Total	335	380	0	715	28	235	0	263	136	152	0	288	1266
5:00 PM	82	82	0	164	6	62	0	68	32	50	0	82	314
5:15 PM	91	92	0	183	3	49	0	52	50	41	0	91	326
5:30 PM	90	96	0	186	3	61	0	64	38	45	0	83	333
5:45 PM	88	102	0	190	10	65	0	75	35	32	0	67	332
Total	351	372	0	723	22	237	0	259	155	168	0	323	1305
Grand Total	1302	1450	0	2752	80	909	0	989	564	644	0	1208	4949
Approach %	47.3	52.7	0.0		8.1	91.9	0.0		46.7	53.3	0.0		
Total %	26.3	29.3	0.0	55.6	1.6	18.4	0.0	20.0	11.4	13.0	0.0	24.4	
Exiting Leg Total				724				2014				2211	4949
Cars	1260	1436	0	2696	80	885	0	965	546	636	0	1182	4843
% Cars	96.8	99.0	0.0	98.0	100.0	97.4	0.0	97.6	96.8	98.8	0.0	97.8	97.9
Exiting Leg Total				716				1982				2145	4843
Heavy Vehicles	15	12	0	27	0	4	0	4	6	5	0	11	42
% Heavy Vehicles	1.2	0.8	0.0	1.0	0.0	0.4	0.0	0.4	1.1	0.8	0.0	0.9	0.8
Exiting Leg Total				5				18				19	42
Buses	27	2	0	29	0	20	0	20	12	3	0	15	64
% Buses	2.1	0.1	0.0	1.1	0.0	2.2	0.0	2.0	2.1	0.5	0.0	1.2	1.3
Exiting Leg Total				3				14				47	64

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

5:00 PM	Merrimack Street				Central Street				Merrimack Street				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
5:00 PM	82	82	0	164	6	62	0	68	32	50	0	82	314
5:15 PM	91	92	0	183	3	49	0	52	50	41	0	91	326
5:30 PM	90	96	0	186	3	61	0	64	38	45	0	83	333
5:45 PM	88	102	0	190	10	65	0	75	35	32	0	67	332
Total Volume	351	372	0	723	22	237	0	259	155	168	0	323	1305
% Approach Total	48.5	51.5	0.0		8.5	91.5	0.0		48.0	52.0	0.0		
PHF	0.964	0.912	0.000	0.951	0.550	0.912	0.000	0.863	0.775	0.840	0.000	0.887	0.980
Cars	339	369	0	708	22	234	0	256	146	166	0	312	1276
Cars %	96.6	99.2	0.0	97.9	100.0	98.7	0.0	98.8	94.2	98.8	0.0	96.6	97.8
Heavy Vehicles	5	3	0	8	0	0	0	0	5	2	0	7	15
Heavy Vehicles %	1.4	0.8	0.0	1.1	0.0	0.0	0.0	0.0	3.2	1.2	0.0	2.2	1.1
Buses	7	0	0	7	0	3	0	3	4	0	0	4	14
Buses %	2.0	0.0	0.0	1.0	0.0	1.3	0.0	1.2	2.6	0.0	0.0	1.2	1.1

PDI File #: **175563 GG**
Location: **S: Central Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars, Heavy Vehicles, and Buses (Combined)

	Merrimack Street East				Central Street South				Merrimack Street West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
Cars Enter Leg	339	369	0	708	22	234	0	256	146	166	0	312	1276
Heavy Enter Leg	5	3	0	8	0	0	0	0	5	2	0	7	15
Bus Enter Leg	7	0	0	7	0	3	0	3	4	0	0	4	14
Total Entering Leg	351	372	0	723	22	237	0	259	155	168	0	323	1305
Cars Exiting Leg				188				515				573	1276
Heavy Exiting Leg				2				8				5	15
Buses Exiting Leg				0				4				10	14
Total Exiting Leg				190				527				588	1305

PDI File #: **175563 GG**
Location: **S: Central Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
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Cars

	Merrimack Street				Central Street				Merrimack Street				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
2:00 PM	82	87	0	169	2	47	0	49	27	43	0	70	288
2:15 PM	61	79	0	140	5	48	0	53	42	39	0	81	274
2:30 PM	70	91	0	161	3	54	0	57	31	42	0	73	291
2:45 PM	80	82	0	162	1	55	0	56	29	42	0	71	289
Total	293	339	0	632	11	204	0	215	129	166	0	295	1142
3:00 PM	82	90	0	172	3	51	0	54	37	35	0	72	298
3:15 PM	76	90	0	166	4	60	0	64	32	35	0	67	297
3:30 PM	77	83	0	160	4	51	0	55	44	49	0	93	308
3:45 PM	67	87	0	154	8	56	0	64	24	33	0	57	275
Total	302	350	0	652	19	218	0	237	137	152	0	289	1178
4:00 PM	76	74	0	150	13	60	0	73	33	44	0	77	300
4:15 PM	81	105	0	186	3	53	0	56	24	32	0	56	298
4:30 PM	80	102	0	182	5	63	0	68	36	38	0	74	324
4:45 PM	89	97	0	186	7	53	0	60	41	38	0	79	325
Total	326	378	0	704	28	229	0	257	134	152	0	286	1247
5:00 PM	80	82	0	162	6	61	0	67	31	49	0	80	309
5:15 PM	89	90	0	179	3	49	0	52	46	41	0	87	318
5:30 PM	88	95	0	183	3	60	0	63	37	44	0	81	327
5:45 PM	82	102	0	184	10	64	0	74	32	32	0	64	322
Total	339	369	0	708	22	234	0	256	146	166	0	312	1276
Grand Total	1260	1436	0	2696	80	885	0	965	546	636	0	1182	4843
Approach %	46.7	53.3	0.0		8.3	91.7	0.0		46.2	53.8	0.0		
Total %	26.0	29.7	0.0	55.7	1.7	18.3	0.0	19.9	11.3	13.1	0.0	24.4	
Exiting Leg Total				716				1982				2145	4843

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

4:45 PM	Merrimack Street				Central Street				Merrimack Street				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
4:45 PM	89	97	0	186	7	53	0	60	41	38	0	79	325
5:00 PM	80	82	0	162	6	61	0	67	31	49	0	80	309
5:15 PM	89	90	0	179	3	49	0	52	46	41	0	87	318
5:30 PM	88	95	0	183	3	60	0	63	37	44	0	81	327
Total Volume	346	364	0	710	19	223	0	242	155	172	0	327	1279
% Approach Total	48.7	51.3	0.0		7.9	92.1	0.0		47.4	52.6	0.0		
PHF	0.972	0.938	0.000	0.954	0.679	0.914	0.000	0.903	0.842	0.878	0.000	0.940	0.978
Entering Leg	346	364	0	710	19	223	0	242	155	172	0	327	1279
Exiting Leg				191				519				569	1279
Total				901				761				896	2558

PDI File #: **175563 GG**
Location: **S: Central Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Heavy Vehicles

	Merrimack Street East				Central Street South				Merrimack Street West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
2:00 PM	2	1	0	3	0	1	0	1	0	0	0	0	4
2:15 PM	2	1	0	3	0	1	0	1	0	0	0	0	4
2:30 PM	1	1	0	2	0	1	0	1	1	1	0	2	5
2:45 PM	1	1	0	2	0	0	0	0	0	1	0	1	3
Total	6	4	0	10	0	3	0	3	1	2	0	3	16
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	1	1	0	2	0	0	0	0	0	0	0	0	2
3:45 PM	0	3	0	3	0	0	0	0	0	1	0	1	4
Total	1	4	0	5	0	0	0	0	0	1	0	1	6
4:00 PM	2	0	0	2	0	1	0	1	0	0	0	0	3
4:15 PM	1	0	0	1	0	0	0	0	0	0	0	0	1
4:30 PM	0	1	0	1	0	0	0	0	0	0	0	0	1
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3	1	0	4	0	1	0	1	0	0	0	0	5
5:00 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
5:15 PM	0	2	0	2	0	0	0	0	3	0	0	3	5
5:30 PM	2	1	0	3	0	0	0	0	0	1	0	1	4
5:45 PM	3	0	0	3	0	0	0	0	2	0	0	2	5
Total	5	3	0	8	0	0	0	0	5	2	0	7	15
Grand Total	15	12	0	27	0	4	0	4	6	5	0	11	42
Approach %	55.6	44.4	0.0		0.0	100.0	0.0		54.5	45.5	0.0		
Total %	35.7	28.6	0.0	64.3	0.0	9.5	0.0	9.5	14.3	11.9	0.0	26.2	
Exiting Leg Total				5				18				19	42

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:00 PM	Merrimack Street East				Central Street South				Merrimack Street West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
2:00 PM	2	1	0	3	0	1	0	1	0	0	0	0	4
2:15 PM	2	1	0	3	0	1	0	1	0	0	0	0	4
2:30 PM	1	1	0	2	0	1	0	1	1	1	0	2	5
2:45 PM	1	1	0	2	0	0	0	0	0	1	0	1	3
Total Volume	6	4	0	10	0	3	0	3	1	2	0	3	16
% Approach Total	60.0	40.0	0.0		0.0	100.0	0.0		33.3	66.7	0.0		
PHF	0.750	1.000	0.000	0.833	0.000	0.750	0.000	0.750	0.250	0.500	0.000	0.375	0.800
Entering Leg	6	4	0	10	0	3	0	3	1	2	0	3	16
Exiting Leg				2				5				9	16
Total				12				8				12	32

PDI File #: **175563 GG**
Location: **S: Central Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

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Buses

	Merrimack Street				Central Street				Merrimack Street				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
2:00 PM	5	0	0	5	0	2	0	2	0	1	0	1	8
2:15 PM	1	0	0	1	0	3	0	3	1	1	0	2	6
2:30 PM	1	0	0	1	0	2	0	2	1	0	0	1	4
2:45 PM	2	0	0	2	0	2	0	2	0	0	0	0	4
Total	9	0	0	9	0	9	0	9	2	2	0	4	22
3:00 PM	0	0	0	0	0	1	0	1	1	0	0	1	2
3:15 PM	2	0	0	2	0	1	0	1	1	1	0	2	5
3:30 PM	1	0	0	1	0	0	0	0	1	0	0	1	2
3:45 PM	2	1	0	3	0	1	0	1	1	0	0	1	5
Total	5	1	0	6	0	3	0	3	4	1	0	5	14
4:00 PM	1	0	0	1	0	1	0	1	0	0	0	0	2
4:15 PM	3	0	0	3	0	1	0	1	1	0	0	1	5
4:30 PM	0	1	0	1	0	2	0	2	1	0	0	1	4
4:45 PM	2	0	0	2	0	1	0	1	0	0	0	0	3
Total	6	1	0	7	0	5	0	5	2	0	0	2	14
5:00 PM	2	0	0	2	0	1	0	1	1	0	0	1	4
5:15 PM	2	0	0	2	0	0	0	0	1	0	0	1	3
5:30 PM	0	0	0	0	0	1	0	1	1	0	0	1	2
5:45 PM	3	0	0	3	0	1	0	1	1	0	0	1	5
Total	7	0	0	7	0	3	0	3	4	0	0	4	14
Grand Total	27	2	0	29	0	20	0	20	12	3	0	15	64
Approach %	93.1	6.9	0.0		0.0	100.0	0.0		80.0	20.0	0.0		
Total %	42.2	3.1	0.0	45.3	0.0	31.3	0.0	31.3	18.8	4.7	0.0	23.4	
Exiting Leg Total				3				14				47	64

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:00 PM	Merrimack Street				Central Street				Merrimack Street				
	East				South				West				
	Thru	Left	U-Turn	Total	Right	Left	U-Turn	Total	Right	Thru	U-Turn	Total	Total
2:00 PM	5	0	0	5	0	2	0	2	0	1	0	1	8
2:15 PM	1	0	0	1	0	3	0	3	1	1	0	2	6
2:30 PM	1	0	0	1	0	2	0	2	1	0	0	1	4
2:45 PM	2	0	0	2	0	2	0	2	0	0	0	0	4
Total Volume	9	0	0	9	0	9	0	9	2	2	0	4	22
% Approach Total	100.0	0.0	0.0		0.0	100.0	0.0		50.0	50.0	0.0		
PHF	0.450	0.000	0.000	0.450	0.000	0.750	0.000	0.750	0.500	0.500	0.000	0.500	0.688
Entering Leg	9	0	0	9	0	9	0	9	2	2	0	4	22
Exiting Leg				2				2				18	22
Total				11				11				22	44

PDI File #: **175563 GG**
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City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
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Bicycles (on Roadway and Crosswalks)

	Merrimack Street						Central Street						Merrimack Street						
	East						South						West						
	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	U-Turn	CW-NB	CW-SB	Total	Total
2:00 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1
2:15 PM	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	0	0	0	2
2:30 PM	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
2:45 PM	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1
Total	1	0	0	0	1	2	0	0	0	1	2	3	0	0	0	0	0	0	5
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2	2
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	1	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	2
Total	0	1	0	0	0	1	1	0	0	0	0	1	0	1	0	1	0	2	4
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	2
4:30 PM	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
4:45 PM	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	2
Total	1	0	0	0	0	1	0	1	0	0	0	1	0	2	0	1	0	3	5
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	2	1	0	0	1	4	1	1	0	1	2	5	0	3	0	2	0	5	14
Approach %	50.0	25.0	0.0	0.0	25.0		20.0	20.0	0.0	20.0	40.0		0.0	60.0	0.0	40.0	0.0		
Total %	14.3	7.1	0.0	0.0	7.1	28.6	7.1	7.1	0.0	7.1	14.3	35.7	0.0	21.4	0.0	14.3	0.0	35.7	
Exiting Leg Total						5						4						5	14

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:00 PM	Merrimack Street						Central Street						Merrimack Street						
	East						South						West						
	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	U-Turn	CW-NB	CW-SB	Total	Total
2:00 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1
2:15 PM	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	0	0	0	2
2:30 PM	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
2:45 PM	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1
Total Volume	1	0	0	0	1	2	0	0	0	1	2	3	0	0	0	0	0	0	5
% Approach Total	50.0	0.0	0.0	0.0	50.0		0.0	0.0	0.0	33.3	66.7		0.0	0.0	0.0	0.0	0.0		
PHF	0.250	0.000	0.000	0.000	0.250	0.500	0.000	0.000	0.000	0.250	0.500	0.750	0.000	0.000	0.000	0.000	0.000	0.000	0.625
Entering Leg	1	0	0	0	1	2	0	0	0	1	2	3	0	0	0	0	0	0	5
Exiting Leg						1						3						1	5
Total						3						6						1	10

PDI File #: **175563 GG**
Location: **S: Central Street**
Location: **E: Merrimack Street W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Pedestrians

	Merrimack Street						Central Street						Merrimack Street						
	East						South						West						
	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	U-Turn	CW-NB	CW-SB	Total	Total
2:00 PM	0	0	0	12	18	30	0	0	0	7	9	16	0	0	0	8	3	11	57
2:15 PM	0	0	0	18	6	24	0	0	0	12	28	40	0	0	0	15	9	24	88
2:30 PM	0	0	0	13	13	26	0	0	0	8	19	27	0	0	0	13	11	24	77
2:45 PM	0	0	0	13	23	36	0	0	0	12	9	21	0	0	0	14	9	23	80
Total	0	0	0	56	60	116	0	0	0	39	65	104	0	0	0	50	32	82	302
3:00 PM	0	0	0	8	17	25	0	0	0	8	14	22	0	0	0	12	7	19	66
3:15 PM	0	0	0	12	11	23	0	0	0	10	14	24	0	0	0	4	3	7	54
3:30 PM	0	0	0	9	21	30	0	0	0	9	14	23	0	0	0	9	10	19	72
3:45 PM	0	0	0	8	7	15	0	0	0	10	9	19	0	0	0	3	8	11	45
Total	0	0	0	37	56	93	0	0	0	37	51	88	0	0	0	28	28	56	237
4:00 PM	0	0	0	35	31	66	0	0	0	11	11	22	0	0	0	9	6	15	103
4:15 PM	0	0	0	12	14	26	0	0	0	7	14	21	0	0	0	2	7	9	56
4:30 PM	0	0	0	8	13	21	0	0	0	11	12	23	0	0	0	7	2	9	53
4:45 PM	0	0	0	16	10	26	0	0	0	14	7	21	0	0	0	9	5	14	61
Total	0	0	0	71	68	139	0	0	0	43	44	87	0	0	0	27	20	47	273
5:00 PM	0	0	0	15	19	34	0	0	0	13	14	27	0	0	0	5	4	9	70
5:15 PM	0	0	0	5	9	14	0	0	0	8	9	17	0	0	0	11	5	16	47
5:30 PM	0	0	0	4	14	18	0	0	0	12	9	21	0	0	0	12	5	17	56
5:45 PM	0	0	0	8	8	16	0	0	0	7	8	15	0	0	0	9	2	11	42
Total	0	0	0	32	50	82	0	0	0	40	40	80	0	0	0	37	16	53	215
Grand Total	0	0	0	196	234	430	0	0	0	159	200	359	0	0	0	142	96	238	1027
Approach %	0.0	0.0	0.0	45.6	54.4		0.0	0.0	0.0	44.3	55.7		0.0	0.0	0.0	59.7	40.3		
Total %	0.0	0.0	0.0	19.1	22.8	41.9	0.0	0.0	0.0	15.5	19.5	35.0	0.0	0.0	0.0	13.8	9.3	23.2	
Exiting Leg Total						430						359						238	1027

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:15 PM	Merrimack Street						Central Street						Merrimack Street						
	East						South						West						
	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	U-Turn	CW-NB	CW-SB	Total	Total
2:15 PM	0	0	0	18	6	24	0	0	0	12	28	40	0	0	0	15	9	24	88
2:30 PM	0	0	0	13	13	26	0	0	0	8	19	27	0	0	0	13	11	24	77
2:45 PM	0	0	0	13	23	36	0	0	0	12	9	21	0	0	0	14	9	23	80
3:00 PM	0	0	0	8	17	25	0	0	0	8	14	22	0	0	0	12	7	19	66
Total Volume	0	0	0	52	59	111	0	0	0	40	70	110	0	0	0	54	36	90	311
% Approach Total	0.0	0.0	0.0	46.8	53.2		0.0	0.0	0.0	36.4	63.6		0.0	0.0	0.0	60.0	40.0		
PHF	0.000	0.000	0.000	0.722	0.641	0.771	0.000	0.000	0.000	0.833	0.625	0.688	0.000	0.000	0.000	0.900	0.818	0.938	0.884
Entering Leg	0	0	0	52	59	111	0	0	0	40	70	110	0	0	0	54	36	90	311
Exiting Leg						111						110						90	311
Total						222						220						180	622

PDI File #: **175563 H**
Location: **N: Bridge Street S: Prescott Street**
Location: **E: Kearney Square W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars, Heavy Vehicles, and Buses (Combined)

	Bridge Street					Kearney Square					Prescott Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
6:00 AM	136	0	10	0	146	10	16	0	0	26	2	20	1	0	23	0	9	0	0	9	204
6:15 AM	116	0	31	0	147	10	20	0	0	30	9	50	1	0	60	0	36	0	1	37	274
6:30 AM	127	0	26	0	153	11	25	0	0	36	10	45	1	0	56	0	22	0	0	22	267
6:45 AM	113	0	31	0	144	24	37	0	0	61	19	73	0	0	92	0	37	0	0	37	334
Total	492	0	98	0	590	55	98	0	0	153	40	188	3	0	231	0	104	0	1	105	1079
7:00 AM	137	0	28	0	165	23	78	0	0	101	13	84	2	0	99	0	32	0	0	32	397
7:15 AM	89	0	51	0	140	46	101	0	0	147	22	74	3	0	99	0	44	0	0	44	430
7:30 AM	78	0	63	0	141	63	69	0	0	132	32	67	6	0	105	0	49	0	1	50	428
7:45 AM	76	0	67	0	143	41	94	0	0	135	38	97	10	0	145	0	32	0	0	32	455
Total	380	0	209	0	589	173	342	0	0	515	105	322	21	0	448	0	157	0	1	158	1710
8:00 AM	107	0	54	0	161	24	82	0	0	106	25	69	3	0	97	0	28	1	0	29	393
8:15 AM	125	0	37	0	162	45	81	0	0	126	26	61	1	0	88	0	21	1	0	22	398
8:30 AM	106	0	42	0	148	38	85	0	0	123	34	79	0	0	113	0	37	0	0	37	421
8:45 AM	119	0	45	0	164	37	76	0	0	113	39	83	3	0	125	0	34	1	0	35	437
Total	457	0	178	0	635	144	324	0	0	468	124	292	7	0	423	0	120	3	0	123	1649
9:00 AM	97	0	42	0	139	36	78	0	0	114	37	69	2	0	108	0	28	0	0	28	389
9:15 AM	100	0	33	0	133	38	76	0	0	114	51	90	3	0	144	0	41	1	0	42	433
9:30 AM	118	0	46	0	164	27	65	0	0	92	29	94	2	0	125	0	33	1	0	34	415
9:45 AM	100	0	23	0	123	22	57	0	0	79	24	86	3	0	113	0	38	2	0	40	355
Total	415	0	144	0	559	123	276	0	0	399	141	339	10	0	490	0	140	4	0	144	1592
Grand Total	1744	0	629	0	2373	495	1040	0	0	1535	410	1141	41	0	1592	0	521	7	2	530	6030
Approach %	73.5	0.0	26.5	0.0		32.2	67.8	0.0	0.0		25.8	71.7	2.6	0.0		0.0	98.3	1.3	0.4		
Total %	28.9	0.0	10.4	0.0	39.4	8.2	17.2	0.0	0.0	25.5	6.8	18.9	0.7	0.0	26.4	0.0	8.6	0.1	0.0	8.8	
Exiting Leg Total					1643					1560					0					2827	6030
Cars	1680	0	615	0	2295	489	1007	0	0	1496	404	1059	40	0	1503	0	504	6	1	511	5805
% Cars	96.3	0.0	97.8	0.0	96.7	98.8	96.8	0.0	0.0	97.5	98.5	92.8	97.6	0.0	94.4	0.0	96.7	85.7	50.0	96.4	96.3
Exiting Leg Total					1554					1523					0					2728	5805
Heavy Vehicles	36	0	10	0	46	3	12	0	0	15	0	55	1	0	56	0	11	1	1	13	130
% Heavy Vehicles	2.1	0.0	1.6	0.0	1.9	0.6	1.2	0.0	0.0	1.0	0.0	4.8	2.4	0.0	3.5	0.0	2.1	14.3	50.0	2.5	2.2
Exiting Leg Total					59					21					0					50	130
Buses	28	0	4	0	32	3	21	0	0	24	6	27	0	0	33	0	6	0	0	6	95
% Buses	1.6	0.0	0.6	0.0	1.3	0.6	2.0	0.0	0.0	1.6	1.5	2.4	0.0	0.0	2.1	0.0	1.2	0.0	0.0	1.1	1.6
Exiting Leg Total					30					16					0					49	95

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:00 AM	Bridge Street					Kearney Square					Prescott Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
7:00 AM	137	0	28	0	165	23	78	0	0	101	13	84	2	0	99	0	32	0	0	32	397
7:15 AM	89	0	51	0	140	46	101	0	0	147	22	74	3	0	99	0	44	0	0	44	430
7:30 AM	78	0	63	0	141	63	69	0	0	132	32	67	6	0	105	0	49	0	1	50	428
7:45 AM	76	0	67	0	143	41	94	0	0	135	38	97	10	0	145	0	32	0	0	32	455
Total Volume	380	0	209	0	589	173	342	0	0	515	105	322	21	0	448	0	157	0	1	158	1710
% Approach Total	64.5	0.0	35.5	0.0		33.6	66.4	0.0	0.0		23.4	71.9	4.7	0.0		0.0	99.4	0.0	0.6		
PHF	0.693	0.000	0.780	0.000	0.892	0.687	0.847	0.000	0.000	0.876	0.691	0.830	0.525	0.000	0.772	0.000	0.801	0.000	0.250	0.790	0.940
Cars	370	0	205	0	575	171	332	0	0	503	103	298	21	0	422	0	150	0	0	150	1650
Cars %	97.4	0.0	98.1	0.0	97.6	98.8	97.1	0.0	0.0	97.7	98.1	92.5	100.0	0.0	94.2	0.0	95.5	0.0	0.0	94.9	96.5
Heavy Vehicles	5	0	1	0	6	1	1	0	0	2	0	16	0	0	16	0	3	0	1	4	28
Heavy Vehicles %	1.3	0.0	0.5	0.0	1.0	0.6	0.3	0.0	0.0	0.4	0.0	5.0	0.0	0.0	3.6	0.0	1.9	0.0	100.0	2.5	1.6
Buses	5	0	3	0	8	1	9	0	0	10	2	8	0	0	10	0	4	0	0	4	32
Buses %	1.3	0.0	1.4	0.0	1.4	0.6	2.6	0.0	0.0	1.9	1.9	2.5	0.0	0.0	2.2	0.0	2.5	0.0	0.0	2.5	1.9

PDI File #: **175563 H**
Location: **N: Bridge Street S: Prescott Street**
Location: **E: Kearney Square W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars, Heavy Vehicles, and Buses (Combined)

	Bridge Street					Kearney Square					Prescott Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
Cars Enter Leg	370	0	205	0	575	171	332	0	0	503	103	298	21	0	422	0	150	0	0	150	1650
Heavy Enter Leg	5	0	1	0	6	1	1	0	0	2	0	16	0	0	16	0	3	0	1	4	28
Bus Enter Leg	5	0	3	0	8	1	9	0	0	10	2	8	0	0	10	0	4	0	0	4	32
Total Entering Leg	380	0	209	0	589	173	342	0	0	515	105	322	21	0	448	0	157	0	1	158	1710
Cars Exiting Leg					469					458					0					723	1650
Heavy Exiting Leg					17					4					0					7	28
Buses Exiting Leg					9					9					0					14	32
Total Exiting Leg					495					471					0					744	1710

PDI File #: **175563 H**
Location: **N: Bridge Street S: Prescott Street**
Location: **E: Kearney Square W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars

	Bridge Street					Kearney Square					Prescott Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
6:00 AM	133	0	10	0	143	10	16	0	0	26	2	17	1	0	20	0	9	0	0	9	198
6:15 AM	112	0	31	0	143	10	19	0	0	29	9	48	1	0	58	0	34	0	1	35	265
6:30 AM	122	0	26	0	148	11	24	0	0	35	10	43	1	0	54	0	22	0	0	22	259
6:45 AM	110	0	30	0	140	23	34	0	0	57	19	68	0	0	87	0	35	0	0	35	319
Total	477	0	97	0	574	54	93	0	0	147	40	176	3	0	219	0	100	0	1	101	1041
7:00 AM	133	0	27	0	160	22	76	0	0	98	12	75	2	0	89	0	32	0	0	32	379
7:15 AM	88	0	50	0	138	46	96	0	0	142	22	66	3	0	91	0	39	0	0	39	410
7:30 AM	77	0	61	0	138	63	67	0	0	130	31	65	6	0	102	0	49	0	0	49	419
7:45 AM	72	0	67	0	139	40	93	0	0	133	38	92	10	0	140	0	30	0	0	30	442
Total	370	0	205	0	575	171	332	0	0	503	103	298	21	0	422	0	150	0	0	150	1650
8:00 AM	101	0	53	0	154	23	80	0	0	103	25	60	3	0	88	0	27	0	0	27	372
8:15 AM	117	0	35	0	152	45	81	0	0	126	25	57	1	0	83	0	20	1	0	21	382
8:30 AM	100	0	42	0	142	37	77	0	0	114	33	77	0	0	110	0	35	0	0	35	401
8:45 AM	115	0	44	0	159	37	73	0	0	110	39	74	3	0	116	0	34	1	0	35	420
Total	433	0	174	0	607	142	311	0	0	453	122	268	7	0	397	0	116	2	0	118	1575
9:00 AM	92	0	41	0	133	36	76	0	0	112	37	67	1	0	105	0	27	0	0	27	377
9:15 AM	98	0	33	0	131	38	73	0	0	111	51	84	3	0	138	0	40	1	0	41	421
9:30 AM	115	0	43	0	158	26	65	0	0	91	28	85	2	0	115	0	33	1	0	34	398
9:45 AM	95	0	22	0	117	22	57	0	0	79	23	81	3	0	107	0	38	2	0	40	343
Total	400	0	139	0	539	122	271	0	0	393	139	317	9	0	465	0	138	4	0	142	1539
Grand Total	1680	0	615	0	2295	489	1007	0	0	1496	404	1059	40	0	1503	0	504	6	1	511	5805
Approach %	73.2	0.0	26.8	0.0		32.7	67.3	0.0	0.0		26.9	70.5	2.7	0.0		0.0	98.6	1.2	0.2		
Total %	28.9	0.0	10.6	0.0	39.5	8.4	17.3	0.0	0.0	25.8	7.0	18.2	0.7	0.0	25.9	0.0	8.7	0.1	0.0	8.8	
Exiting Leg Total					1554					1523					0					2728	5805

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

7:00 AM	Bridge Street					Kearney Square					Prescott Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
7:00 AM	133	0	27	0	160	22	76	0	0	98	12	75	2	0	89	0	32	0	0	32	379
7:15 AM	88	0	50	0	138	46	96	0	0	142	22	66	3	0	91	0	39	0	0	39	410
7:30 AM	77	0	61	0	138	63	67	0	0	130	31	65	6	0	102	0	49	0	0	49	419
7:45 AM	72	0	67	0	139	40	93	0	0	133	38	92	10	0	140	0	30	0	0	30	442
Total Volume	370	0	205	0	575	171	332	0	0	503	103	298	21	0	422	0	150	0	0	150	1650
% Approach Total	64.3	0.0	35.7	0.0		34.0	66.0	0.0	0.0		24.4	70.6	5.0	0.0		0.0	100.0	0.0	0.0		
PHF	0.695	0.000	0.765	0.000	0.898	0.679	0.865	0.000	0.000	0.886	0.678	0.810	0.525	0.000	0.754	0.000	0.765	0.000	0.000	0.765	0.933
Entering Leg	370	0	205	0	575	171	332	0	0	503	103	298	21	0	422	0	150	0	0	150	1650
Exiting Leg					469					458					0					723	1650
Total					1044					961					422					873	3300

PDI File #: **175563 H**
Location: **N: Bridge Street S: Prescott Street**
Location: **E: Kearney Square W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Heavy Vehicles

	Bridge Street					Kearney Square					Prescott Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
6:00 AM	2	0	0	0	2	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	5
6:15 AM	3	0	0	0	3	0	0	0	0	0	0	2	0	0	2	0	1	0	0	1	6
6:30 AM	3	0	0	0	3	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	4
6:45 AM	2	0	1	0	3	0	0	0	0	0	0	3	0	0	3	0	1	0	0	1	7
Total	10	0	1	0	11	0	0	0	0	0	0	9	0	0	9	0	2	0	0	2	22
7:00 AM	2	0	0	0	2	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	7
7:15 AM	1	0	0	0	1	0	0	0	0	0	0	7	0	0	7	0	2	0	0	2	10
7:30 AM	1	0	1	0	2	0	1	0	0	1	0	1	0	0	1	0	0	0	1	1	5
7:45 AM	1	0	0	0	1	1	0	0	0	1	0	3	0	0	3	0	1	0	0	1	6
Total	5	0	1	0	6	1	1	0	0	2	0	16	0	0	16	0	3	0	1	4	28
8:00 AM	2	0	1	0	3	1	1	0	0	2	0	8	0	0	8	0	1	1	0	2	15
8:15 AM	5	0	2	0	7	0	0	0	0	0	0	3	0	0	3	0	1	0	0	1	11
8:30 AM	6	0	0	0	6	1	5	0	0	6	0	0	0	0	0	0	2	0	0	2	14
8:45 AM	0	0	1	0	1	0	2	0	0	2	0	7	0	0	7	0	0	0	0	0	10
Total	13	0	4	0	17	2	8	0	0	10	0	18	0	0	18	0	4	1	0	5	50
9:00 AM	3	0	1	0	4	0	2	0	0	2	0	0	1	0	1	0	1	0	0	1	8
9:15 AM	1	0	0	0	1	0	1	0	0	1	0	4	0	0	4	0	1	0	0	1	7
9:30 AM	2	0	2	0	4	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	8
9:45 AM	2	0	1	0	3	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	7
Total	8	0	4	0	12	0	3	0	0	3	0	12	1	0	13	0	2	0	0	2	30
Grand Total	36	0	10	0	46	3	12	0	0	15	0	55	1	0	56	0	11	1	1	13	130
Approach %	78.3	0.0	21.7	0.0		20.0	80.0	0.0	0.0		0.0	98.2	1.8	0.0		0.0	84.6	7.7	7.7		
Total %	27.7	0.0	7.7	0.0	35.4	2.3	9.2	0.0	0.0	11.5	0.0	42.3	0.8	0.0	43.1	0.0	8.5	0.8	0.8	10.0	
Exiting Leg Total					59					21					0					50	130

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

8:00 AM	Bridge Street					Kearney Square					Prescott Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
8:00 AM	2	0	1	0	3	1	1	0	0	2	0	8	0	0	8	0	1	1	0	2	15
8:15 AM	5	0	2	0	7	0	0	0	0	0	0	3	0	0	3	0	1	0	0	1	11
8:30 AM	6	0	0	0	6	1	5	0	0	6	0	0	0	0	0	0	2	0	0	2	14
8:45 AM	0	0	1	0	1	0	2	0	0	2	0	7	0	0	7	0	0	0	0	0	10
Total Volume	13	0	4	0	17	2	8	0	0	10	0	18	0	0	18	0	4	1	0	5	50
% Approach Total	76.5	0.0	23.5	0.0		20.0	80.0	0.0	0.0		0.0	100.0	0.0	0.0		0.0	80.0	20.0	0.0		
PHF	0.542	0.000	0.500	0.000	0.607	0.500	0.400	0.000	0.000	0.417	0.000	0.563	0.000	0.000	0.563	0.000	0.500	0.250	0.000	0.625	0.833
Entering Leg	13	0	4	0	17	2	8	0	0	10	0	18	0	0	18	0	4	1	0	5	50
Exiting Leg					21					8					0					21	50
Total					38					18					18					26	100

PDI File #: **175563 H**
Location: **N: Bridge Street S: Prescott Street**
Location: **E: Kearney Square W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Buses

	Bridge Street					Kearney Square					Prescott Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
6:00 AM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6:15 AM	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	3
6:30 AM	2	0	0	0	2	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	4
6:45 AM	1	0	0	0	1	1	3	0	0	4	0	2	0	0	2	0	1	0	0	1	8
Total	5	0	0	0	5	1	5	0	0	6	0	3	0	0	3	0	2	0	0	2	16
7:00 AM	2	0	1	0	3	1	2	0	0	3	1	4	0	0	5	0	0	0	0	0	11
7:15 AM	0	0	1	0	1	0	5	0	0	5	0	1	0	0	1	0	3	0	0	3	10
7:30 AM	0	0	1	0	1	0	1	0	0	1	1	1	0	0	2	0	0	0	0	0	4
7:45 AM	3	0	0	0	3	0	1	0	0	1	0	2	0	0	2	0	1	0	0	1	7
Total	5	0	3	0	8	1	9	0	0	10	2	8	0	0	10	0	4	0	0	4	32
8:00 AM	4	0	0	0	4	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	6
8:15 AM	3	0	0	0	3	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	5
8:30 AM	0	0	0	0	0	0	3	0	0	3	1	2	0	0	3	0	0	0	0	0	6
8:45 AM	4	0	0	0	4	0	1	0	0	1	0	2	0	0	2	0	0	0	0	0	7
Total	11	0	0	0	11	0	5	0	0	5	2	6	0	0	8	0	0	0	0	0	24
9:00 AM	2	0	0	0	2	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	4
9:15 AM	1	0	0	0	1	0	2	0	0	2	0	2	0	0	2	0	0	0	0	0	5
9:30 AM	1	0	1	0	2	1	0	0	0	1	1	5	0	0	6	0	0	0	0	0	9
9:45 AM	3	0	0	0	3	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	5
Total	7	0	1	0	8	1	2	0	0	3	2	10	0	0	12	0	0	0	0	0	23
Grand Total	28	0	4	0	32	3	21	0	0	24	6	27	0	0	33	0	6	0	0	6	95
Approach %	87.5	0.0	12.5	0.0		12.5	87.5	0.0	0.0		18.2	81.8	0.0	0.0		0.0	100.0	0.0	0.0		
Total %	29.5	0.0	4.2	0.0	33.7	3.2	22.1	0.0	0.0	25.3	6.3	28.4	0.0	0.0	34.7	0.0	6.3	0.0	0.0	6.3	
Exiting Leg Total					30					16					0					49	95

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

6:30 AM	Bridge Street					Kearney Square					Prescott Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
6:30 AM	2	0	0	0	2	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	4
6:45 AM	1	0	0	0	1	1	3	0	0	4	0	2	0	0	2	0	1	0	0	1	8
7:00 AM	2	0	1	0	3	1	2	0	0	3	1	4	0	0	5	0	0	0	0	0	11
7:15 AM	0	0	1	0	1	0	5	0	0	5	0	1	0	0	1	0	3	0	0	3	10
Total Volume	5	0	2	0	7	2	11	0	0	13	1	8	0	0	9	0	4	0	0	4	33
% Approach Total	71.4	0.0	28.6	0.0		15.4	84.6	0.0	0.0		11.1	88.9	0.0	0.0		0.0	100.0	0.0	0.0		
PHF	0.625	0.000	0.500	0.000	0.583	0.500	0.550	0.000	0.000	0.650	0.250	0.500	0.000	0.000	0.450	0.000	0.333	0.000	0.000	0.333	0.750
Entering Leg	5	0	2	0	7	2	11	0	0	13	1	8	0	0	9	0	4	0	0	4	33
Exiting Leg					10					7					0					16	33
Total					17					20					9					20	66

PDI File #: **175563 H**
Location: **N: Bridge Street S: Prescott Street**
Location: **E: Kearney Square W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Bicycles (on Roadway and Crosswalks)

	Bridge Street							Kearney Square							Prescott Street							Merrimack Street							
	North							East							South							West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	2
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	0	0	0	0	0	0	0	2
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0	0	0	2	0	0	0	0	0	0	0	3
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0	0	0	0	0	2
Grand Total	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	4	1	0	0	0	5	0	0	0	0	0	0	0	7
Approach %	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	100.0	0.0		0.0	80.0	20.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.6	0.0	28.6	0.0	57.1	14.3	0.0	0.0	0.0	71.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Exiting Leg Total							4							2							0							1	7

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

6:30 AM	Bridge Street							Kearney Square							Prescott Street							Merrimack Street							
	North							East							South							West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	0	0	0	0	0	0	0	2
Total Volume	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0	0	0	2	0	0	0	0	0	0	0	3
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	100.0	0.0		0.0	50.0	50.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.250	0.000	0.250	0.250	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.375
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0	0	0	2	0	0	0	0	0	0	0	3
Exiting Leg							1							1							0							1	3
Total							1							2							2							1	6

PDI File #: **175563 H**
Location: **N: Bridge Street S: Prescott Street**
Location: **E: Kearney Square W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **6:00 AM**
End Time: **10:00 AM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Pedestrians

	Bridge Street							Kearney Square							Prescott Street							Merrimack Street							
	North							East							South							West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
6:00 AM	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	6	7
6:15 AM	0	0	0	0	2	0	2	0	0	0	0	1	0	1	0	0	0	0	2	0	2	0	0	0	0	1	4	5	10
6:30 AM	0	0	0	0	1	3	4	0	0	0	0	0	0	0	0	0	0	0	2	1	3	0	0	0	0	2	2	4	11
6:45 AM	0	0	0	0	1	2	3	0	0	0	0	2	0	2	0	0	0	0	1	2	3	0	0	0	0	5	4	9	17
Total	0	0	0	0	4	6	10	0	0	0	0	3	0	3	0	0	0	0	5	3	8	0	0	0	0	12	12	24	45
7:00 AM	0	0	0	0	4	2	6	0	0	0	0	3	2	5	0	0	0	0	1	2	3	0	0	0	0	4	2	6	20
7:15 AM	0	0	0	0	6	8	14	0	0	0	0	2	0	2	0	0	0	0	6	2	8	0	0	0	0	6	3	9	33
7:30 AM	0	0	0	0	10	10	20	0	0	0	0	1	1	2	0	0	0	0	4	2	6	0	0	0	0	7	6	13	41
7:45 AM	0	0	0	0	29	9	38	0	0	0	0	3	2	5	0	0	0	0	7	7	14	0	0	0	0	1	0	1	58
Total	0	0	0	0	49	29	78	0	0	0	0	9	5	14	0	0	0	0	18	13	31	0	0	0	0	18	11	29	152
8:00 AM	0	0	0	0	19	6	25	0	0	0	0	2	3	5	0	0	0	0	6	3	9	0	0	0	0	3	0	3	42
8:15 AM	0	0	0	0	11	0	11	0	0	0	0	2	0	2	0	0	0	0	4	6	10	0	0	0	0	6	7	13	36
8:30 AM	0	0	0	0	7	1	8	0	0	0	0	4	3	7	0	0	0	0	5	5	10	0	0	0	0	3	8	11	36
8:45 AM	0	0	0	0	17	3	20	0	0	0	0	1	1	2	0	0	0	0	3	9	12	0	0	0	0	5	3	8	42
Total	0	0	0	0	54	10	64	0	0	0	0	9	7	16	0	0	0	0	18	23	41	0	0	0	0	17	18	35	156
9:00 AM	0	0	0	0	18	8	26	0	0	0	0	3	2	5	0	0	0	0	8	5	13	0	0	0	0	8	9	17	61
9:15 AM	0	0	0	0	29	12	41	0	0	0	0	4	2	6	0	0	0	0	19	12	31	0	0	0	0	5	6	11	89
9:30 AM	0	0	0	0	12	4	16	0	0	0	0	2	2	4	0	0	0	0	16	3	19	0	0	0	0	7	2	9	48
9:45 AM	0	0	0	0	13	9	22	0	0	0	0	7	5	12	0	0	0	0	13	8	21	0	0	0	0	4	6	10	65
Total	0	0	0	0	72	33	105	0	0	0	0	16	11	27	0	0	0	0	56	28	84	0	0	0	0	24	23	47	263
Grand Total	0	0	0	0	179	78	257	0	0	0	0	37	23	60	0	0	0	0	97	67	164	0	0	0	0	71	64	135	616
Approach %	0.0	0.0	0.0	0.0	69.6	30.4		0.0	0.0	0.0	0.0	61.7	38.3		0.0	0.0	0.0	0.0	59.1	40.9		0.0	0.0	0.0	0.0	52.6	47.4		
Total %	0.0	0.0	0.0	0.0	29.1	12.7	41.7	0.0	0.0	0.0	0.0	6.0	3.7	9.7	0.0	0.0	0.0	0.0	15.7	10.9	26.6	0.0	0.0	0.0	0.0	11.5	10.4	21.9	
Exiting Leg Total							257							60							164							135	616

Peak Hour Analysis from 06:00 AM to 10:00 AM begins at:

9:00 AM	Bridge Street							Kearney Square							Prescott Street							Merrimack Street							
	North							East							South							West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
9:00 AM	0	0	0	0	18	8	26	0	0	0	0	3	2	5	0	0	0	0	8	5	13	0	0	0	0	8	9	17	61
9:15 AM	0	0	0	0	29	12	41	0	0	0	0	4	2	6	0	0	0	0	19	12	31	0	0	0	0	5	6	11	89
9:30 AM	0	0	0	0	12	4	16	0	0	0	0	2	2	4	0	0	0	0	16	3	19	0	0	0	0	7	2	9	48
9:45 AM	0	0	0	0	13	9	22	0	0	0	0	7	5	12	0	0	0	0	13	8	21	0	0	0	0	4	6	10	65
Total Volume	0	0	0	0	72	33	105	0	0	0	0	16	11	27	0	0	0	0	56	28	84	0	0	0	0	24	23	47	263
% Approach Total	0.0	0.0	0.0	0.0	68.6	31.4		0.0	0.0	0.0	0.0	59.3	40.7		0.0	0.0	0.0	0.0	66.7	33.3		0.0	0.0	0.0	0.0	51.1	48.9		
PHF	0.000	0.000	0.000	0.000	0.621	0.688	0.640	0.000	0.000	0.000	0.000	0.571	0.550	0.563	0.000	0.000	0.000	0.000	0.737	0.583	0.677	0.000	0.000	0.000	0.000	0.750	0.639	0.691	0.739
Entering Leg	0	0	0	0	72	33	105	0	0	0	0	16	11	27	0	0	0	0	56	28	84	0	0	0	0	24	23	47	263
Exiting Leg							105							27							84							47	263
Total							210							54							168							94	526

PDI File #: **175563 HH**
Location: **N: Bridge Street S: Prescott Street**
Location: **E: Kearney Square W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars, Heavy Vehicles, and Buses (Combined)

	Bridge Street					Kearney Square					Prescott Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	105	0	55	0	160	43	68	0	0	111	43	108	4	0	155	0	43	1	0	44	470
2:15 PM	86	0	46	0	132	14	50	0	0	64	34	109	2	0	145	0	42	1	0	43	384
2:30 PM	99	0	40	0	139	20	62	0	0	82	31	134	3	0	168	0	49	0	0	49	438
2:45 PM	97	0	50	0	147	30	64	0	0	94	26	97	3	1	127	0	44	2	0	46	414
Total	387	0	191	0	578	107	244	0	0	351	134	448	12	1	595	0	178	4	0	182	1706
3:00 PM	98	0	47	0	145	29	67	0	0	96	35	148	7	0	190	0	35	1	0	36	467
3:15 PM	87	0	45	0	132	35	77	0	0	112	25	121	4	0	150	0	39	1	0	40	434
3:30 PM	102	0	78	0	180	36	67	0	0	103	34	130	3	0	167	0	52	1	0	53	503
3:45 PM	95	0	75	0	170	35	55	0	0	90	26	128	5	0	159	0	36	2	0	38	457
Total	382	0	245	0	627	135	266	0	0	401	120	527	19	0	666	0	162	5	0	167	1861
4:00 PM	76	0	51	0	127	32	72	0	0	104	41	127	5	0	173	0	61	0	0	61	465
4:15 PM	105	0	54	0	159	30	74	0	0	104	41	117	2	0	160	0	32	1	0	33	456
4:30 PM	117	0	71	0	188	24	47	0	0	71	37	137	1	0	175	0	46	1	0	47	481
4:45 PM	95	0	47	0	142	25	81	0	0	106	42	130	3	0	175	0	40	1	0	41	464
Total	393	0	223	0	616	111	274	0	0	385	161	511	11	0	683	0	179	3	0	182	1866
5:00 PM	99	0	72	0	171	33	68	0	0	101	32	131	0	0	163	0	60	0	0	60	495
5:15 PM	110	0	58	0	168	25	63	0	0	88	34	136	6	0	176	0	41	0	0	41	473
5:30 PM	103	0	56	0	159	36	76	0	0	112	44	141	5	0	190	0	43	0	0	43	504
5:45 PM	105	1	50	0	156	36	82	0	0	118	31	99	3	0	133	0	46	2	0	48	455
Total	417	1	236	0	654	130	289	0	0	419	141	507	14	0	662	0	190	2	0	192	1927
Grand Total	1579	1	895	0	2475	483	1073	0	0	1556	556	1993	56	1	2606	0	709	14	0	723	7360
Approach %	63.8	0.0	36.2	0.0		31.0	69.0	0.0	0.0		21.3	76.5	2.1	0.0		0.0	98.1	1.9	0.0		
Total %	21.5	0.0	12.2	0.0	33.6	6.6	14.6	0.0	0.0	21.1	7.6	27.1	0.8	0.0	35.4	0.0	9.6	0.2	0.0	9.8	
Exiting Leg Total					2490					2160					2					2708	7360
Cars	1548	1	888	0	2437	480	1051	0	0	1531	552	1957	54	1	2564	0	701	14	0	715	7247
% Cars	98.0	100.0	99.2	0.0	98.5	99.4	97.9	0.0	0.0	98.4	99.3	98.2	96.4	100.0	98.4	0.0	98.9	100.0	0.0	98.9	98.5
Exiting Leg Total					2451					2141					2					2653	7247
Heavy Vehicles	17	0	3	0	20	0	9	0	0	9	2	33	1	0	36	0	5	0	0	5	70
% Heavy Vehicles	1.1	0.0	0.3	0.0	0.8	0.0	0.8	0.0	0.0	0.6	0.4	1.7	1.8	0.0	1.4	0.0	0.7	0.0	0.0	0.7	1.0
Exiting Leg Total					33					10					0					27	70
Buses	14	0	4	0	18	3	13	0	0	16	2	3	1	0	6	0	3	0	0	3	43
% Buses	0.9	0.0	0.4	0.0	0.7	0.6	1.2	0.0	0.0	1.0	0.4	0.2	1.8	0.0	0.2	0.0	0.4	0.0	0.0	0.4	0.6
Exiting Leg Total					6					9					0					28	43

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

4:45 PM	Bridge Street					Kearney Square					Prescott Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
4:45 PM	95	0	47	0	142	25	81	0	0	106	42	130	3	0	175	0	40	1	0	41	464
5:00 PM	99	0	72	0	171	33	68	0	0	101	32	131	0	0	163	0	60	0	0	60	495
5:15 PM	110	0	58	0	168	25	63	0	0	88	34	136	6	0	176	0	41	0	0	41	473
5:30 PM	103	0	56	0	159	36	76	0	0	112	44	141	5	0	190	0	43	0	0	43	504
Total Volume	407	0	233	0	640	119	288	0	0	407	152	538	14	0	704	0	184	1	0	185	1936
% Approach Total	63.6	0.0	36.4	0.0		29.2	70.8	0.0	0.0		21.6	76.4	2.0	0.0		0.0	99.5	0.5	0.0		
PHF	0.925	0.000	0.809	0.000	0.936	0.826	0.889	0.000	0.000	0.908	0.864	0.954	0.583	0.000	0.926	0.000	0.767	0.250	0.000	0.771	0.960
Cars	400	0	233	0	633	119	285	0	0	404	152	529	14	0	695	0	183	1	0	184	1916
Cars %	98.3	0.0	100.0	0.0	98.9	100.0	99.0	0.0	0.0	99.3	100.0	98.3	100.0	0.0	98.7	0.0	99.5	100.0	0.0	99.5	99.0
Heavy Vehicles	5	0	0	0	5	0	1	0	0	1	0	9	0	0	9	0	1	0	0	1	16
Heavy Vehicles %	1.2	0.0	0.0	0.0	0.8	0.0	0.3	0.0	0.0	0.2	0.0	1.7	0.0	0.0	1.3	0.0	0.5	0.0	0.0	0.5	0.8
Buses	2	0	0	0	2	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	4
Buses %	0.5	0.0	0.0	0.0	0.3	0.0	0.7	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2

PDI File #: **175563 HH**
Location: **N: Bridge Street S: Prescott Street**
Location: **E: Kearney Square W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars, Heavy Vehicles, and Buses (Combined)

	Bridge Street					Kearney Square					Prescott Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
Cars Enter Leg	400	0	233	0	633	119	285	0	0	404	152	529	14	0	695	0	183	1	0	184	1916
Heavy Enter Leg	5	0	0	0	5	0	1	0	0	1	0	9	0	0	9	0	1	0	0	1	16
Bus Enter Leg	2	0	0	0	2	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	4
Total Entering Leg	407	0	233	0	640	119	288	0	0	407	152	538	14	0	704	0	184	1	0	185	1936
Cars Exiting Leg					649					568					0					699	1916
Heavy Exiting Leg					9					1					0					6	16
Buses Exiting Leg					0					0					0					4	4
Total Exiting Leg					658					569					0					709	1936

PDI File #: **175563 HH**
Location: **N: Bridge Street S: Prescott Street**
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City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
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Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Cars

	Bridge Street					Kearney Square					Prescott Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	98	0	54	0	152	42	66	0	0	108	43	107	4	0	154	0	42	1	0	43	457
2:15 PM	85	0	45	0	130	14	48	0	0	62	34	103	2	0	139	0	41	1	0	42	373
2:30 PM	97	0	37	0	134	20	61	0	0	81	31	131	3	0	165	0	48	0	0	48	428
2:45 PM	95	0	50	0	145	30	63	0	0	93	26	95	3	1	125	0	42	2	0	44	407
Total	375	0	186	0	561	106	238	0	0	344	134	436	12	1	583	0	173	4	0	177	1665
3:00 PM	98	0	47	0	145	28	66	0	0	94	34	146	7	0	187	0	35	1	0	36	462
3:15 PM	86	0	45	0	131	35	76	0	0	111	25	119	4	0	148	0	38	1	0	39	429
3:30 PM	101	0	78	0	179	36	65	0	0	101	33	129	3	0	165	0	52	1	0	53	498
3:45 PM	91	0	75	0	166	34	54	0	0	88	26	124	5	0	155	0	35	2	0	37	446
Total	376	0	245	0	621	133	261	0	0	394	118	518	19	0	655	0	160	5	0	165	1835
4:00 PM	76	0	51	0	127	32	67	0	0	99	39	124	5	0	168	0	61	0	0	61	455
4:15 PM	104	0	52	0	156	30	72	0	0	102	41	116	2	0	159	0	32	1	0	33	450
4:30 PM	115	0	71	0	186	24	47	0	0	71	37	136	1	0	174	0	46	1	0	47	478
4:45 PM	95	0	47	0	142	25	80	0	0	105	42	128	3	0	173	0	40	1	0	41	461
Total	390	0	221	0	611	111	266	0	0	377	159	504	11	0	674	0	179	3	0	182	1844
5:00 PM	98	0	72	0	170	33	68	0	0	101	32	128	0	0	160	0	60	0	0	60	491
5:15 PM	107	0	58	0	165	25	62	0	0	87	34	133	6	0	173	0	41	0	0	41	466
5:30 PM	100	0	56	0	156	36	75	0	0	111	44	140	5	0	189	0	42	0	0	42	498
5:45 PM	102	1	50	0	153	36	81	0	0	117	31	98	1	0	130	0	46	2	0	48	448
Total	407	1	236	0	644	130	286	0	0	416	141	499	12	0	652	0	189	2	0	191	1903
Grand Total	1548	1	888	0	2437	480	1051	0	0	1531	552	1957	54	1	2564	0	701	14	0	715	7247
Approach %	63.5	0.0	36.4	0.0		31.4	68.6	0.0	0.0		21.5	76.3	2.1	0.0		0.0	98.0	2.0	0.0		
Total %	21.4	0.0	12.3	0.0	33.6	6.6	14.5	0.0	0.0	21.1	7.6	27.0	0.7	0.0	35.4	0.0	9.7	0.2	0.0	9.9	
Exiting Leg Total					2451					2141					2					2653	7247

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

4:45 PM	Bridge Street					Kearney Square					Prescott Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
4:45 PM	95	0	47	0	142	25	80	0	0	105	42	128	3	0	173	0	40	1	0	41	461
5:00 PM	98	0	72	0	170	33	68	0	0	101	32	128	0	0	160	0	60	0	0	60	491
5:15 PM	107	0	58	0	165	25	62	0	0	87	34	133	6	0	173	0	41	0	0	41	466
5:30 PM	100	0	56	0	156	36	75	0	0	111	44	140	5	0	189	0	42	0	0	42	498
Total Volume	400	0	233	0	633	119	285	0	0	404	152	529	14	0	695	0	183	1	0	184	1916
% Approach Total	63.2	0.0	36.8	0.0		29.5	70.5	0.0	0.0		21.9	76.1	2.0	0.0		0.0	99.5	0.5	0.0		
PHF	0.935	0.000	0.809	0.000	0.931	0.826	0.891	0.000	0.000	0.910	0.864	0.945	0.583	0.000	0.919	0.000	0.763	0.250	0.000	0.767	0.962
Entering Leg	400	0	233	0	633	119	285	0	0	404	152	529	14	0	695	0	183	1	0	184	1916
Exiting Leg					649					568					0					699	1916
Total					1282					972					695					883	3832

PDI File #: **175563 HH**
Location: **N: Bridge Street S: Prescott Street**
Location: **E: Kearney Square W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Heavy Vehicles

	Bridge Street					Kearney Square					Prescott Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	4	0	1	0	5	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	7
2:15 PM	1	0	0	0	1	0	1	0	0	1	0	6	0	0	6	0	0	0	0	0	8
2:30 PM	2	0	2	0	4	0	0	0	0	0	0	3	0	0	3	0	1	0	0	1	8
2:45 PM	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	0	2	0	0	2	4
Total	7	0	3	0	10	0	3	0	0	3	0	11	0	0	11	0	3	0	0	3	27
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
3:30 PM	1	0	0	0	1	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	3
3:45 PM	2	0	0	0	2	0	0	0	0	0	0	3	0	0	3	0	1	0	0	1	6
Total	3	0	0	0	3	0	1	0	0	1	0	7	0	0	7	0	1	0	0	1	12
4:00 PM	0	0	0	0	0	0	3	0	0	3	2	3	0	0	5	0	0	0	0	0	8
4:15 PM	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	2
4:30 PM	1	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
Total	1	0	0	0	1	0	4	0	0	4	2	7	0	0	9	0	0	0	0	0	14
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	3
5:15 PM	2	0	0	0	2	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	5
5:30 PM	3	0	0	0	3	0	1	0	0	1	0	1	0	0	1	0	1	0	0	1	6
5:45 PM	1	0	0	0	1	0	0	0	0	0	0	1	1	0	2	0	0	0	0	0	3
Total	6	0	0	0	6	0	1	0	0	1	0	8	1	0	9	0	1	0	0	1	17
Grand Total	17	0	3	0	20	0	9	0	0	9	2	33	1	0	36	0	5	0	0	5	70
Approach %	85.0	0.0	15.0	0.0		0.0	100.0	0.0	0.0		5.6	91.7	2.8	0.0		0.0	100.0	0.0	0.0		
Total %	24.3	0.0	4.3	0.0	28.6	0.0	12.9	0.0	0.0	12.9	2.9	47.1	1.4	0.0	51.4	0.0	7.1	0.0	0.0	7.1	
Exiting Leg Total					33					10					0					27	70

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:00 PM	Bridge Street					Kearney Square					Prescott Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	4	0	1	0	5	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	7
2:15 PM	1	0	0	0	1	0	1	0	0	1	0	6	0	0	6	0	0	0	0	0	8
2:30 PM	2	0	2	0	4	0	0	0	0	0	0	3	0	0	3	0	1	0	0	1	8
2:45 PM	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	0	2	0	0	2	4
Total Volume	7	0	3	0	10	0	3	0	0	3	0	11	0	0	11	0	3	0	0	3	27
% Approach Total	70.0	0.0	30.0	0.0		0.0	100.0	0.0	0.0		0.0	100.0	0.0	0.0		0.0	100.0	0.0	0.0		
PHF	0.438	0.000	0.375	0.000	0.500	0.000	0.750	0.000	0.000	0.750	0.000	0.458	0.000	0.000	0.458	0.000	0.375	0.000	0.000	0.375	0.844
Entering Leg	7	0	3	0	10	0	3	0	0	3	0	11	0	0	11	0	3	0	0	3	27
Exiting Leg					11					6					0					10	27
Total					21					9					11					13	54

PDI File #: **175563 HH**
Location: **N: Bridge Street S: Prescott Street**
Location: **E: Kearney Square W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Buses

	Bridge Street					Kearney Square					Prescott Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	3	0	0	0	3	1	1	0	0	2	0	0	0	0	0	0	1	0	0	1	6
2:15 PM	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	3
2:30 PM	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2
2:45 PM	2	0	0	0	2	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	3
Total	5	0	2	0	7	1	3	0	0	4	0	1	0	0	1	0	2	0	0	2	14
3:00 PM	0	0	0	0	0	1	1	0	0	2	1	0	0	0	1	0	0	0	0	0	3
3:15 PM	1	0	0	0	1	0	1	0	0	1	0	1	0	0	1	0	1	0	0	1	4
3:30 PM	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0	0	0	0	0	2
3:45 PM	2	0	0	0	2	1	1	0	0	2	0	1	0	0	1	0	0	0	0	0	5
Total	3	0	0	0	3	2	4	0	0	6	2	2	0	0	4	0	1	0	0	1	14
4:00 PM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	2
4:15 PM	1	0	2	0	3	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	4
4:30 PM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4:45 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Total	2	0	2	0	4	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	8
5:00 PM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:15 PM	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	2	0	0	0	2	0	1	0	0	1	0	0	1	0	1	0	0	0	0	0	4
Total	4	0	0	0	4	0	2	0	0	2	0	0	1	0	1	0	0	0	0	0	7
Grand Total	14	0	4	0	18	3	13	0	0	16	2	3	1	0	6	0	3	0	0	3	43
Approach %	77.8	0.0	22.2	0.0		18.8	81.3	0.0	0.0		33.3	50.0	16.7	0.0		0.0	100.0	0.0	0.0		
Total %	32.6	0.0	9.3	0.0	41.9	7.0	30.2	0.0	0.0	37.2	4.7	7.0	2.3	0.0	14.0	0.0	7.0	0.0	0.0	7.0	
Exiting Leg Total					6					9					0					28	43

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:00 PM	Bridge Street					Kearney Square					Prescott Street					Merrimack Street					
	North					East					South					West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Total
2:00 PM	3	0	0	0	3	1	1	0	0	2	0	0	0	0	0	0	1	0	0	1	6
2:15 PM	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	3
2:30 PM	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2
2:45 PM	2	0	0	0	2	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	3
Total Volume	5	0	2	0	7	1	3	0	0	4	0	1	0	0	1	0	2	0	0	2	14
% Approach Total	71.4	0.0	28.6	0.0		25.0	75.0	0.0	0.0		0.0	100.0	0.0	0.0		0.0	100.0	0.0	0.0		
PHF	0.417	0.000	0.500	0.000	0.583	0.250	0.750	0.000	0.000	0.500	0.000	0.250	0.000	0.000	0.250	0.000	0.500	0.000	0.000	0.500	0.583
Entering Leg	5	0	2	0	7	1	3	0	0	4	0	1	0	0	1	0	2	0	0	2	14
Exiting Leg					2					4					0					8	14
Total					9					8					1					10	28

PDI File #: **175563 HH**
Location: **N: Bridge Street S: Prescott Street**
Location: **E: Kearney Square W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Bicycles (on Roadway and Crosswalks)

	Bridge Street							Kearney Square							Prescott Street							Merrimack Street							
	North							East							South							West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:15 PM	2	0	0	0	1	0	3	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	2	4	8
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Total	2	0	0	0	1	0	3	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	2	5	9
3:00 PM	0	0	0	0	0	0	0	0	1	0	0	0	1	2	0	0	0	0	0	0	0	0	0	1	0	0	0	1	3
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	1	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3
Total	1	0	0	0	0	0	1	0	1	0	0	1	2	4	0	0	0	0	0	0	0	0	0	1	0	0	1	2	7
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	1	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3
Total	0	0	0	0	0	0	0	1	1	0	0	0	2	4	0	0	0	0	0	0	0	0	2	0	0	0	1	3	7
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	1	0	1	3
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	1	0	1	3
Grand Total	3	0	0	0	1	0	4	1	3	0	0	1	6	11	0	0	0	0	0	0	0	0	2	1	0	4	4	11	26
Approach %	75.0	0.0	0.0	0.0	25.0	0.0		9.1	27.3	0.0	0.0	9.1	54.5		0.0	0.0	0.0	0.0	0.0	0.0		0.0	18.2	9.1	0.0	36.4	36.4		
Total %	11.5	0.0	0.0	0.0	3.8	0.0	15.4	3.8	11.5	0.0	0.0	3.8	23.1	42.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7	3.8	0.0	15.4	15.4	42.3	
Exiting Leg Total							3							9							0							14	26

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:15 PM	Bridge Street							Kearney Square							Prescott Street							Merrimack Street							
	North							East							South							West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
2:15 PM	2	0	0	0	1	0	3	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	2	4	8
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
3:00 PM	0	0	0	0	0	0	0	0	1	0	0	0	1	2	0	0	0	0	0	0	0	0	0	1	0	0	0	1	3
Total Volume	2	0	0	0	1	0	3	0	2	0	0	0	1	3	0	0	0	0	0	0	0	0	0	1	0	3	2	6	12
% Approach Total	66.7	0.0	0.0	0.0	33.3	0.0		0.0	66.7	0.0	0.0	0.0	33.3		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	16.7	0.0	50.0	33.3		
PHF	0.250	0.000	0.000	0.000	0.250	0.000	0.250	0.000	0.500	0.000	0.000	0.000	0.250	0.375	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.375	0.250	0.375	0.375
Entering Leg	2	0	0	0	1	0	3	0	2	0	0	0	1	3	0	0	0	0	0	0	0	0	0	1	0	3	2	6	12
Exiting Leg							2							1							0							9	12
Total							5							4							0							15	24

PDI File #: **175563 HH**
Location: **N: Bridge Street S: Prescott Street**
Location: **E: Kearney Square W: Merrimack Street**
City, State: **Lowell, MA**
Client: **Bryant Associates/ T. Brayton**
Site Code: **216092**
Count Date: **Wednesday, March 29, 2017**
Start Time: **2:00 PM**
End Time: **6:00 PM**
Class:

PRECISION DATA INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Pedestrians

	Bridge Street							Kearney Square							Prescott Street							Merrimack Street							
	North							East							South							West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
2:00 PM	0	0	0	0	12	8	20	0	0	0	0	2	4	6	0	0	0	0	7	3	10	0	0	0	0	5	4	9	45
2:15 PM	0	0	0	0	12	21	33	0	0	0	0	4	2	6	0	0	0	0	11	11	22	0	0	0	0	6	10	16	77
2:30 PM	0	0	0	0	13	13	26	0	0	0	0	8	3	11	0	0	0	0	5	1	6	0	0	0	0	3	7	10	53
2:45 PM	0	0	0	0	4	12	16	0	0	0	0	2	2	4	0	0	0	0	21	2	23	0	0	0	0	11	11	22	65
Total	0	0	0	0	41	54	95	0	0	0	0	16	11	27	0	0	0	0	44	17	61	0	0	0	0	25	32	57	240
3:00 PM	0	0	0	0	16	10	26	0	0	0	0	4	9	13	0	0	0	0	9	7	16	0	0	0	0	11	10	21	76
3:15 PM	0	0	0	0	10	25	35	0	0	0	0	1	5	6	0	0	0	0	10	8	18	0	0	0	0	11	9	20	79
3:30 PM	0	0	0	0	14	15	29	0	0	0	0	7	14	21	0	0	0	0	10	12	22	0	0	0	0	1	3	4	76
3:45 PM	0	0	0	0	18	10	28	0	0	0	0	4	2	6	0	0	0	0	6	6	12	0	0	0	0	6	5	11	57
Total	0	0	0	0	58	60	118	0	0	0	0	16	30	46	0	0	0	0	35	33	68	0	0	0	0	29	27	56	288
4:00 PM	0	0	0	0	8	18	26	0	0	0	0	0	3	3	0	0	0	0	5	8	13	0	0	0	0	5	6	11	53
4:15 PM	0	0	0	0	1	9	10	0	0	0	0	5	9	14	0	0	0	0	7	4	11	0	0	0	0	14	7	21	56
4:30 PM	0	0	0	0	5	11	16	0	0	0	0	1	5	6	0	0	0	0	9	4	13	0	0	0	0	4	4	8	43
4:45 PM	0	0	0	0	4	7	11	0	0	0	0	9	3	12	0	0	0	0	10	6	16	0	0	0	0	7	12	19	58
Total	0	0	0	0	18	45	63	0	0	0	0	15	20	35	0	0	0	0	31	22	53	0	0	0	0	30	29	59	210
5:00 PM	0	0	0	0	4	10	14	0	0	0	0	4	2	6	0	0	0	0	2	5	7	0	0	0	0	7	10	17	44
5:15 PM	0	0	0	0	7	13	20	0	0	0	0	3	1	4	0	0	0	0	9	5	14	0	0	0	0	9	6	15	53
5:30 PM	0	0	0	0	5	10	15	0	0	0	0	7	4	11	0	0	0	0	9	3	12	0	0	0	0	7	3	10	48
5:45 PM	0	0	0	0	5	7	12	0	0	0	0	3	1	4	0	0	0	0	4	9	13	0	0	0	0	8	8	16	45
Total	0	0	0	0	21	40	61	0	0	0	0	17	8	25	0	0	0	0	24	22	46	0	0	0	0	31	27	58	190
Grand Total	0	0	0	0	138	199	337	0	0	0	0	64	69	133	0	0	0	0	134	94	228	0	0	0	0	115	115	230	928
Approach %	0.0	0.0	0.0	0.0	40.9	59.1		0.0	0.0	0.0	0.0	48.1	51.9		0.0	0.0	0.0	0.0	58.8	41.2		0.0	0.0	0.0	0.0	50.0	50.0		
Total %	0.0	0.0	0.0	0.0	14.9	21.4	36.3	0.0	0.0	0.0	0.0	6.9	7.4	14.3	0.0	0.0	0.0	0.0	14.4	10.1	24.6	0.0	0.0	0.0	0.0	12.4	12.4	24.8	
Exiting Leg Total							337							133							228							230	928

Peak Hour Analysis from 02:00 PM to 06:00 PM begins at:

2:45 PM	Bridge Street							Kearney Square							Prescott Street							Merrimack Street							
	North							East							South							West							
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total	Total
2:45 PM	0	0	0	0	4	12	16	0	0	0	0	2	2	4	0	0	0	0	21	2	23	0	0	0	0	11	11	22	65
3:00 PM	0	0	0	0	16	10	26	0	0	0	0	4	9	13	0	0	0	0	9	7	16	0	0	0	0	11	10	21	76
3:15 PM	0	0	0	0	10	25	35	0	0	0	0	1	5	6	0	0	0	0	10	8	18	0	0	0	0	11	9	20	79
3:30 PM	0	0	0	0	14	15	29	0	0	0	0	7	14	21	0	0	0	0	10	12	22	0	0	0	0	1	3	4	76
Total Volume	0	0	0	0	44	62	106	0	0	0	0	14	30	44	0	0	0	0	50	29	79	0	0	0	0	34	33	67	296
% Approach Total	0.0	0.0	0.0	0.0	41.5	58.5		0.0	0.0	0.0	0.0	31.8	68.2		0.0	0.0	0.0	0.0	63.3	36.7		0.0	0.0	0.0	0.0	50.7	49.3		
PHF	0.000	0.000	0.000	0.000	0.688	0.620	0.757	0.000	0.000	0.000	0.000	0.500	0.536	0.524	0.000	0.000	0.000	0.000	0.595	0.604	0.859	0.000	0.000	0.000	0.000	0.773	0.750	0.761	0.937
Entering Leg	0	0	0	0	44	62	106	0	0	0	0	14	30	44	0	0	0	0	50	29	79	0	0	0	0	34	33	67	296
Exiting Leg							106							44							79							67	296
Total							212							88							158							134	592

APPENDIX B

Trip Generation

This sheet is for double sided printing purposes

Student/Staff Populations

The basis of trip generation has been established from the existing and proposed student and staff populations. Table B1 lists the student and staff populations used in this analysis.

Table B1
Student and Staff Populations

Population	No Build Volume	Build Volume	Net Increase	% Increase
Students	3,255	3,520	265	8%
Daytime Employees	440	500	60	14%

Site Area

Student Modes of Transportation

Student surveys were conducted in January 2017 and April 2017 to identify how students were traveling to and from the high school in the Downtown area. The results of these surveys can be found in Appendix G. Table B2 lists the estimated student modes of transportation for the existing Downtown site based on these student surveys.

Table B2
Percent of Students Utilizing Different Modes of Transportation
Downtown Site

Mode	Morning Arrival	Afternoon Departure
Drive	10%	10%
LRTA Bus	20%	30%
Ride from family/friend	43%	23%
Special Education Bus	2%	2%
Walk	25%	35%

The April 2017 survey also gathered additional information for students that rode with family or friend whether they carpooled with a fellow student or if they were dropped-off/picked-up within our study area. There is a reduction of anticipated trips for the carpooling students, since the carpooling students are accounted for under self driving students. For the purposes of this traffic analysis, the students that were dropped-off/picked-up outside our study area would be considered a 'walk' student. The further breakdown of the 'ride from family/friend' students is shown in Table B3.

Table B3
Breakdown of Students that Ride To and From School Site

Students that Ride with family/friend	Morning Arrival	Afternoon Departure
Carpool with others	13%	24%
Drop-off/Pick-up Inside Study Area	77.4%	53.1%
Drop-off/Pick-up Outside Study Area	9.6%	22.8%

Table B4 shows the anticipated number of students participating in each mode of transportation under no build and build conditions.

Table B4
Anticipated Number of Students Using Each Mode
Under No Build and Build Conditions

Mode	School A.M. Peak			School P.M. Peak		
	No Build (3,255)	Build (3,520)	Differ-ence	No Build (3,255)	Build (3,520)	Differ-ence
Drive	325	352	+27	325	352	+27
LRTA Bus	651	704	+53	977	1,056	+79
Ride - Carpool with others	182	197	+15	180	194	+14
Ride - Drop-off/Pick-up Inside Study Area	1,084	1,172	+88	398	431	+33
Ride - Drop-off/Pick-up Outside Study Area	134	145	+11	171	185	+14
Special Education Bus	65	70	+5	65	70	+5
Walk	814	880	+66	1,139	1,232	+93
Total	3,255	3,520	265	3,255	3,520	265

Currently, there are approximately 10 vehicles used to transport special education students to and from school. There are approximately 11 LRTA buses that transport students during school dismissal.

Staff Modes of Transportation

A staff survey was conducted in April 2017 to identify how staff was traveling to and from the high school in the Downtown area. The results of this survey can be found in Appendix G. Table B5 lists the anticipated staff modes of transportation for the Downtown site based on this staff survey.

Table B5
Percent of Staff Utilizing Different Modes of Transportation
Downtown Site

Mode	Morning Arrival	Afternoon Departure
Drive	89%	89%
LRTA Bus	1%	1%
Ride - Carpool	3%	2%
Ride - Drop-off/Pick-up Inside Study Area	1%	0.5%
Ride - Drop-off/Pick-up Outside Study Area	0%	0.5%
Walk	6%	7%

The April 2017 survey also gathered additional information about when staff arrived and departed from the school. The survey indicated that approximately 75% of the staff (330 employees) arrived within the school A.M. peak hour of 7:15 to 8:15. Approximately 70% of the staff (308 employees) departed during the school P.M. peak hour of 2:30 to 3:30.

Table B6
Anticipated Number of Staff Using Each Mode
Under No Build and Build Conditions

Mode	School A.M. Peak			School P.M. Peak		
	No Build (330)	Build (375)	Differ-ence	No Build (308)	Build (350)	Differ-ence
Drive	294	334	+40	274	311	+37
LRTA Bus	3	4	+1	3	3	0
Ride - Carpool	10	11	+1	6	7	+1
Ride - Drop-off/Pick-up Inside Study Area	3	4	+1	2	2	0
Ride - Drop-off/Pick-up Outside Study Area	0	0	0	2	2	0
Walk	20	23	+2	21	25	+4
Total	330	376	45	308	350	42

School Peak Hour Vehicle Trip Generation

Based on the estimated number of additional students that will be using the Lowell Regional Transit Authority (LRTA) buses and special education buses during the school A.M. and P.M. peak hours, to be conservative, one additional LRTA bus and one additional special education bus has been added to both peak hours, as shown in Table B7. It is assumed that vehicle trips attributed to the students that carpool have already been accounted for under the self-driving student vehicle trips.

Table B7
Anticipated New Vehicle Trips under Build Conditions
During the School A.M. and P.M. Peak Hours

Mode	School A.M. Peak					School P.M. Peak				
	Add. Std.	Add. Staff	Total Trips	Ent. Trips	Ext. Trips	Add. Std.	Add. Staff	Total Trips	Ent. Trips	Ext. Trips
Drive	27	40	67	67	0	27	37	64	0	64
LRTA Bus	1	N/A	2	1	1	1	N/A	2	1	1
Ride - Carpool	N/A	1	1	1	0	N/A	1	1	0	1
Ride - Drop-off/ Pick-up Inside Study Area	88	1	178	89	89	33	0	66	33	33
Special Education Bus	1	N/A	2	1	1	1	N/A	2	1	1
TOTAL			250	159	91	TOTAL		135	35	100

During the school A.M. peak hour, it is anticipated that there would be 159 new trips entering and 91 new trips exiting the study area for the Lowell High School. During the school P.M. peak hour, it is anticipated that there would be 35 new trips entering and 100 new trips exiting the study area for the Lowell High School. These vehicle trips include students, staff, buses, and rides from others (e.g. parents).

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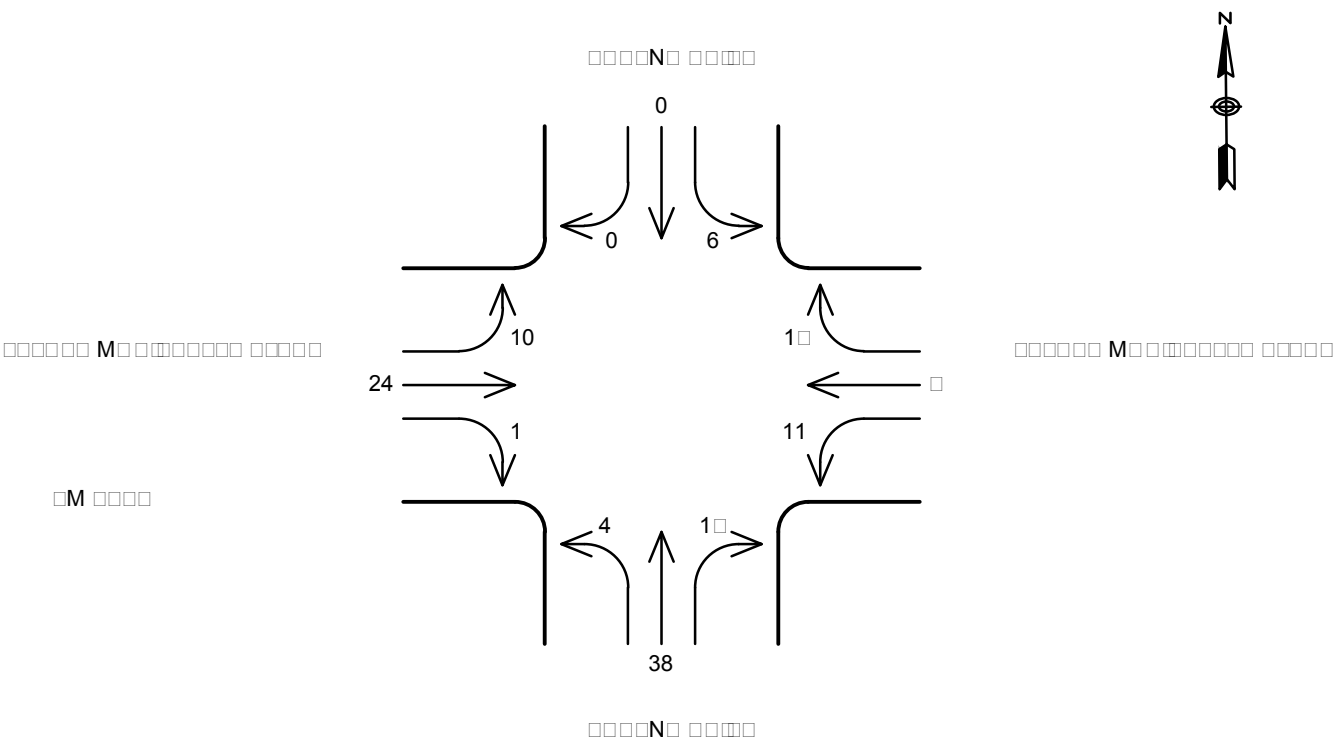

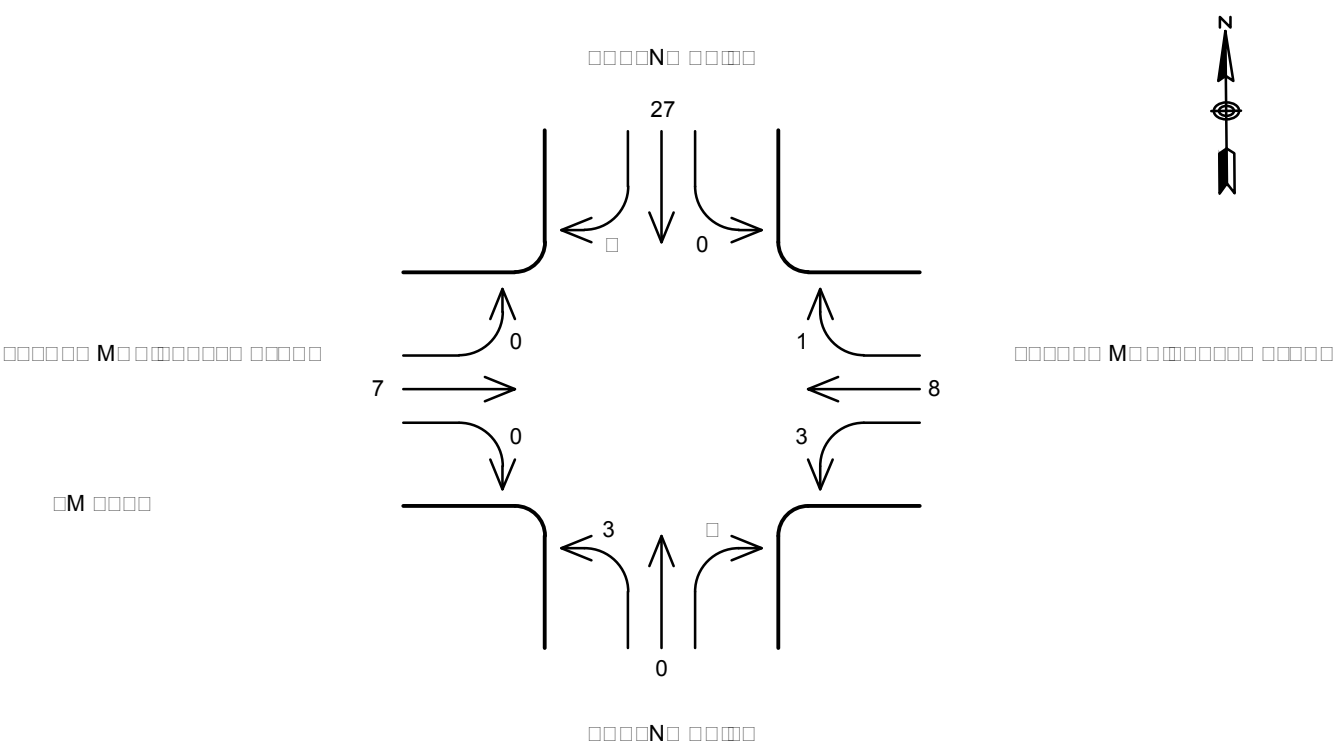

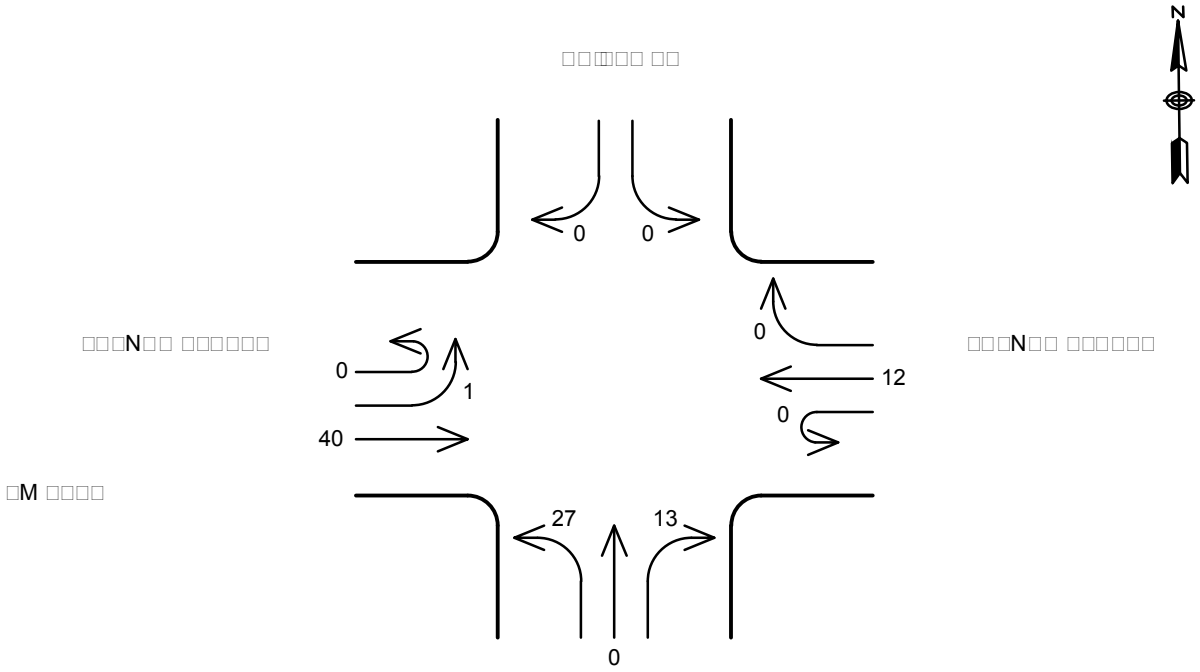
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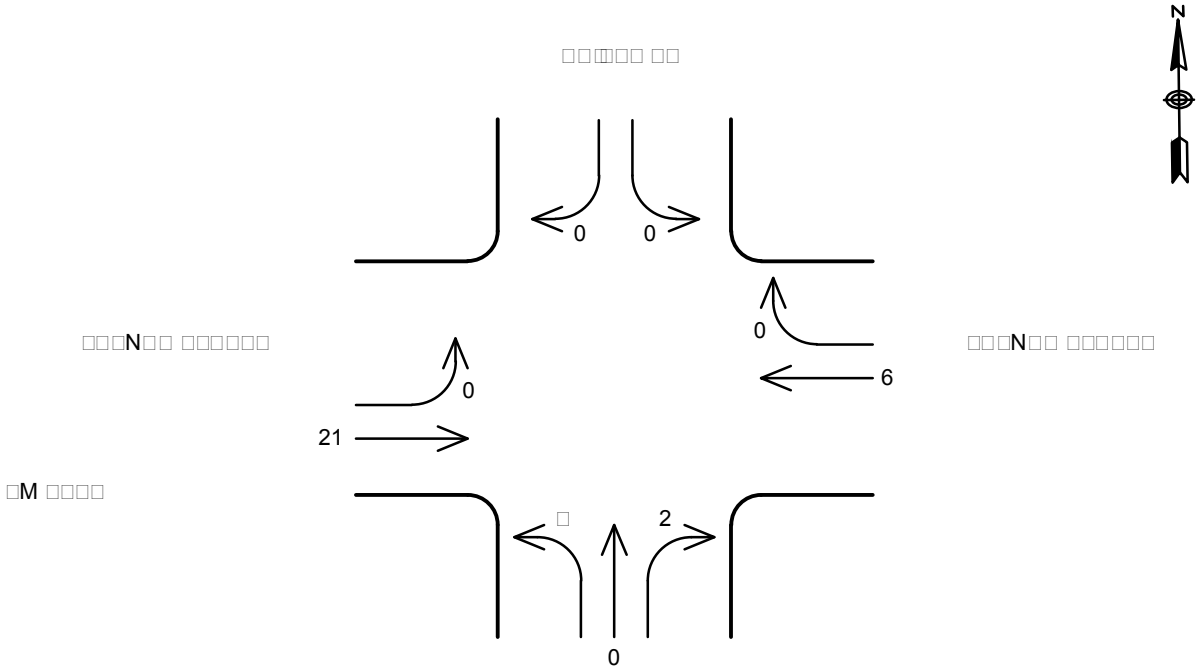
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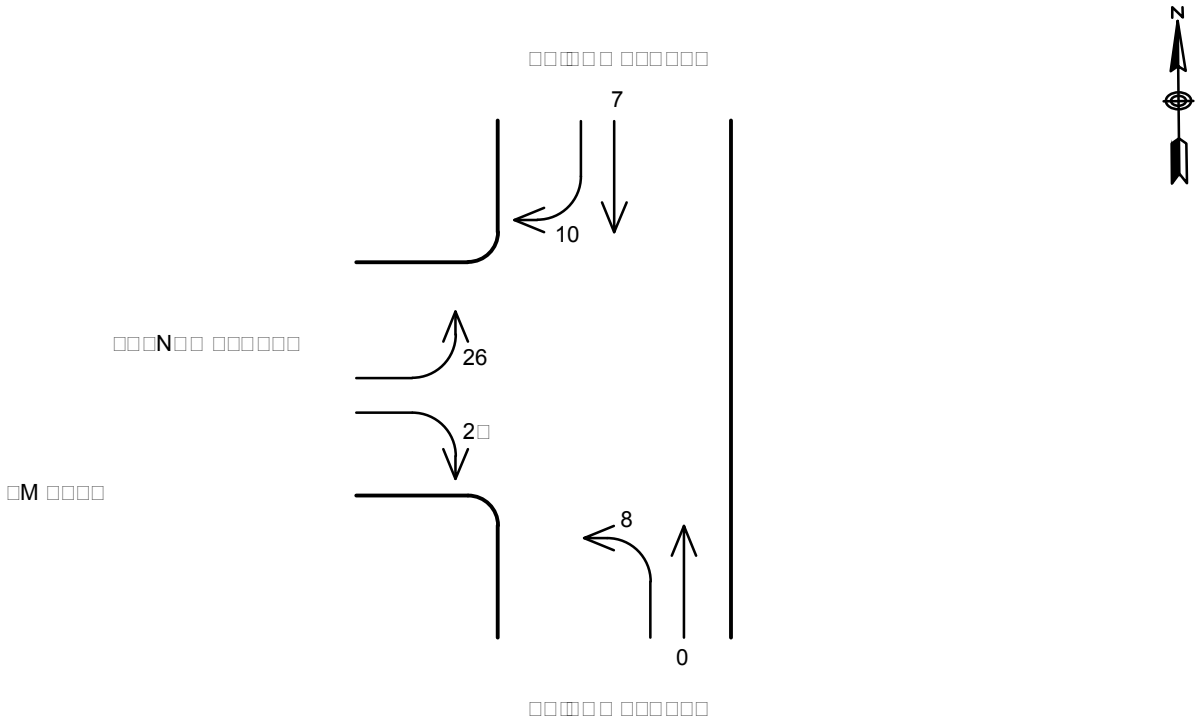
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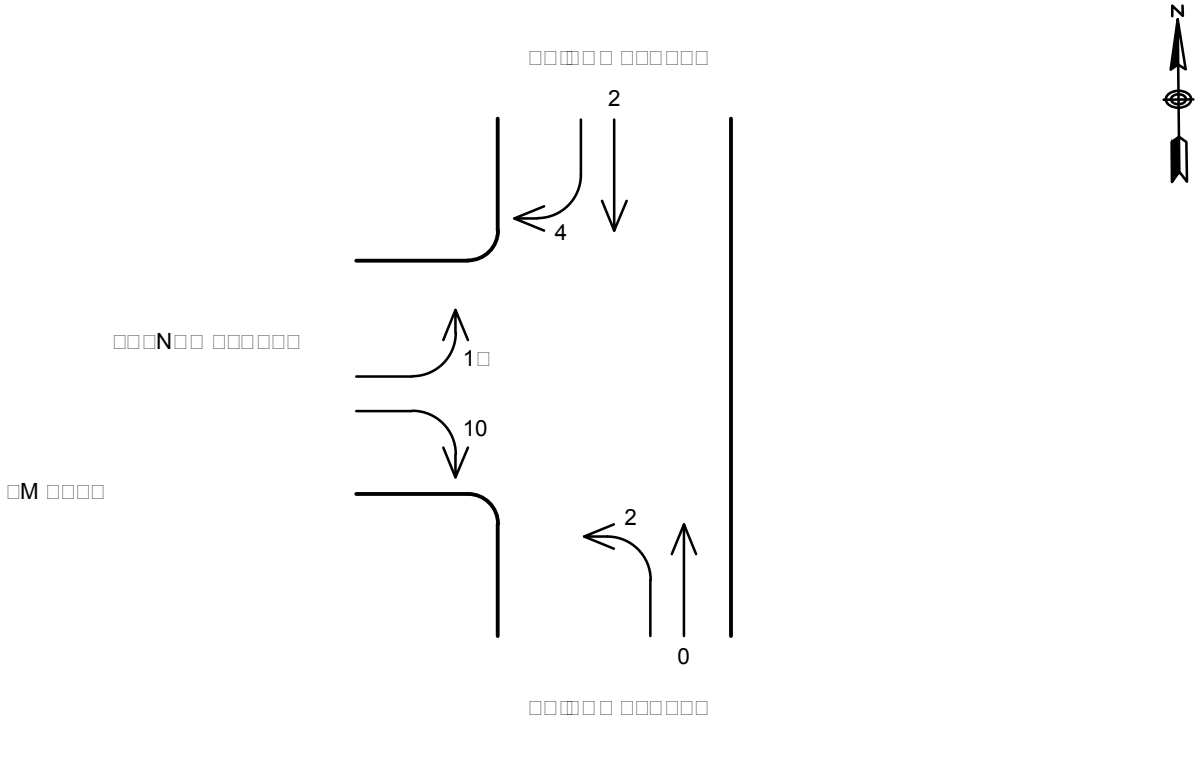
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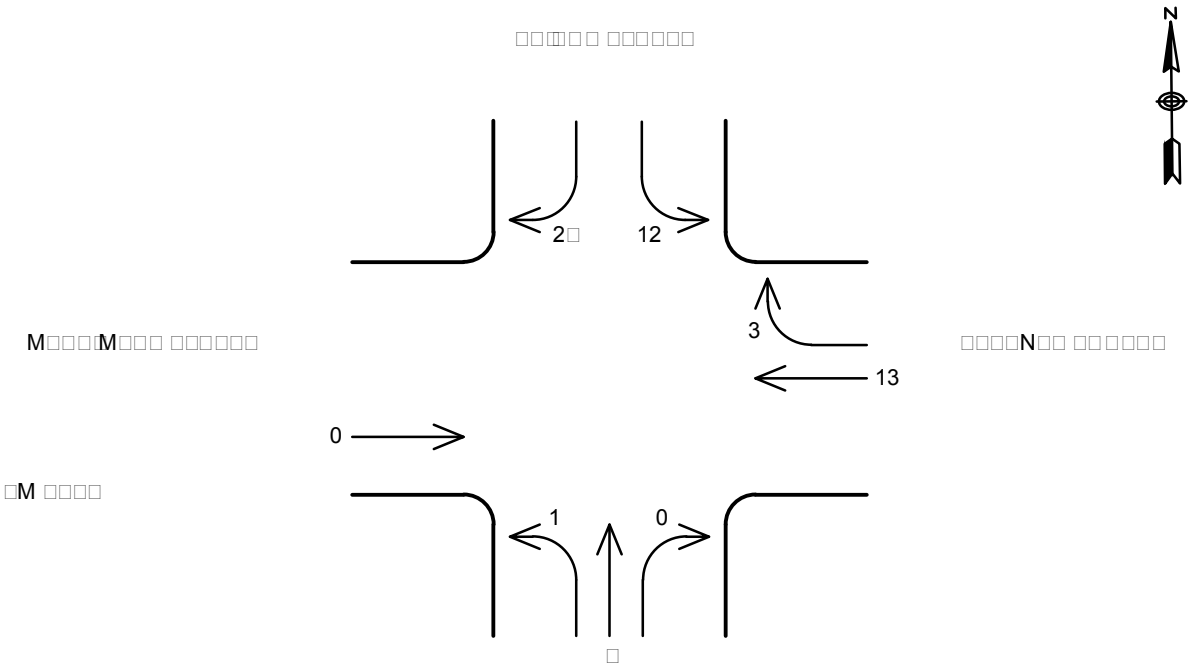

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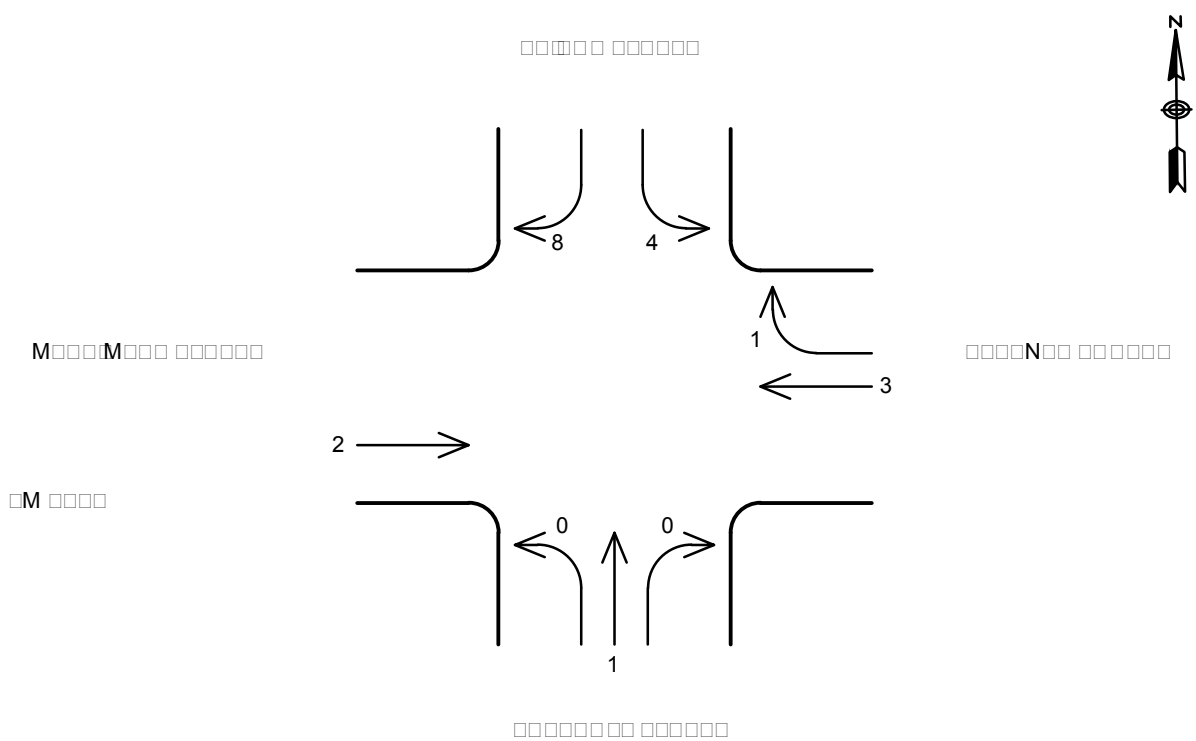

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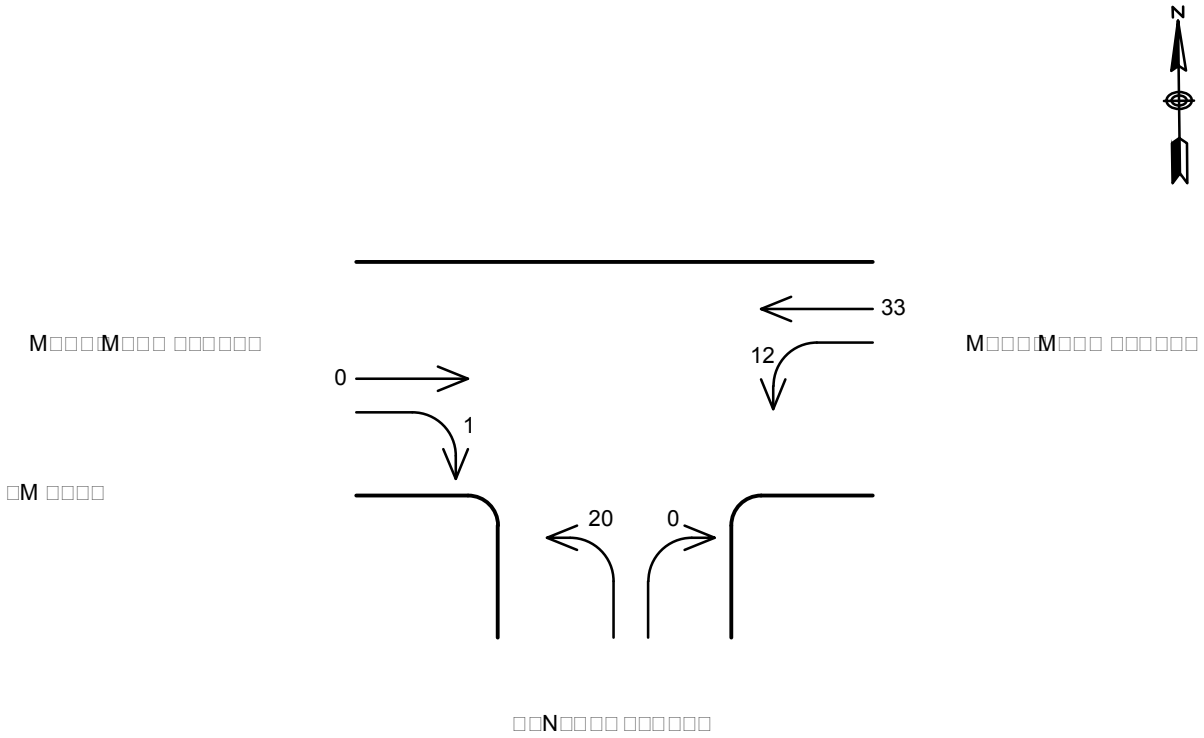
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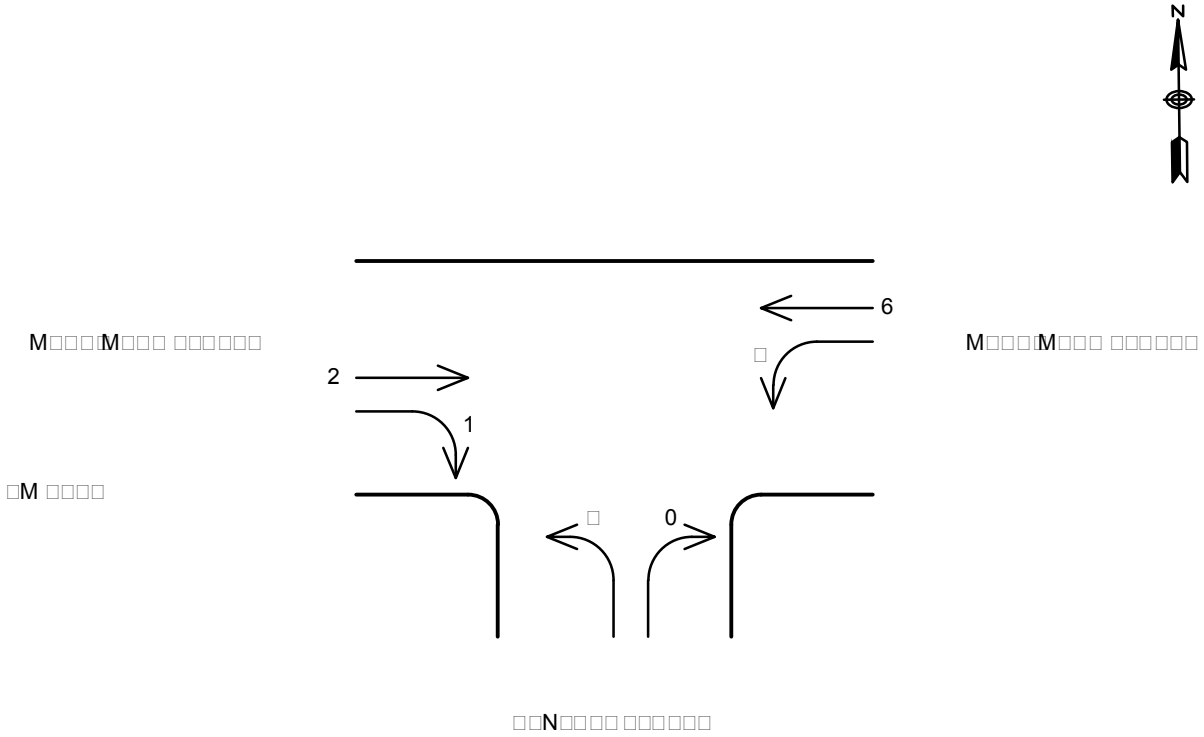
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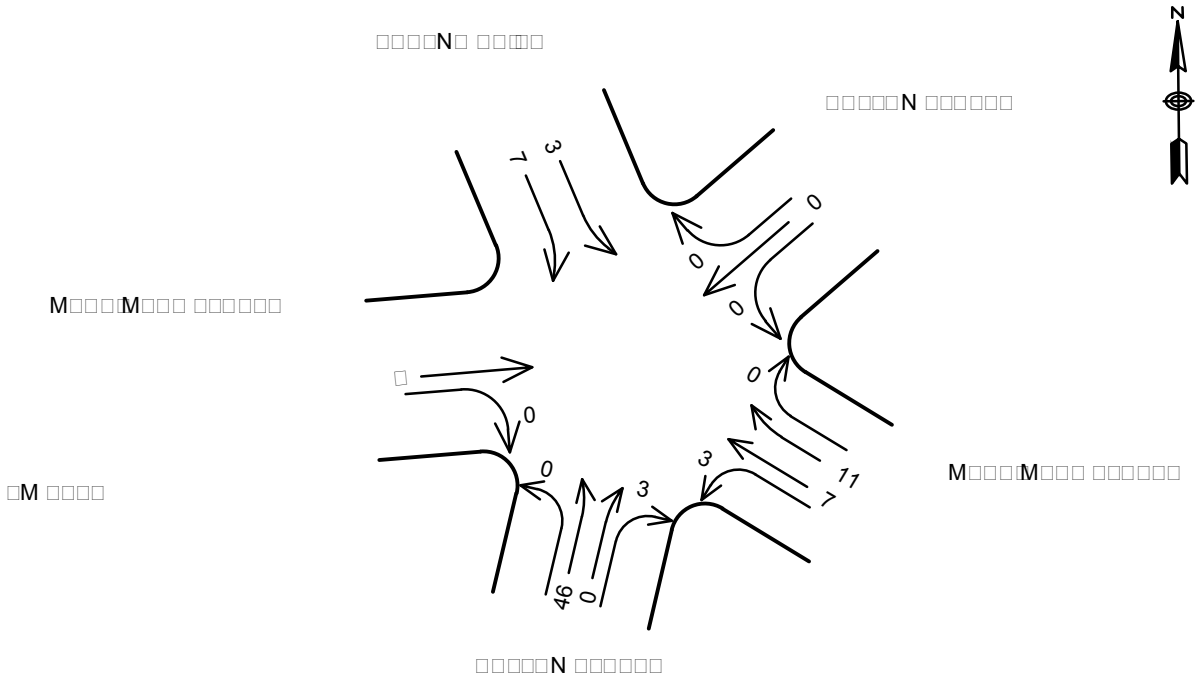

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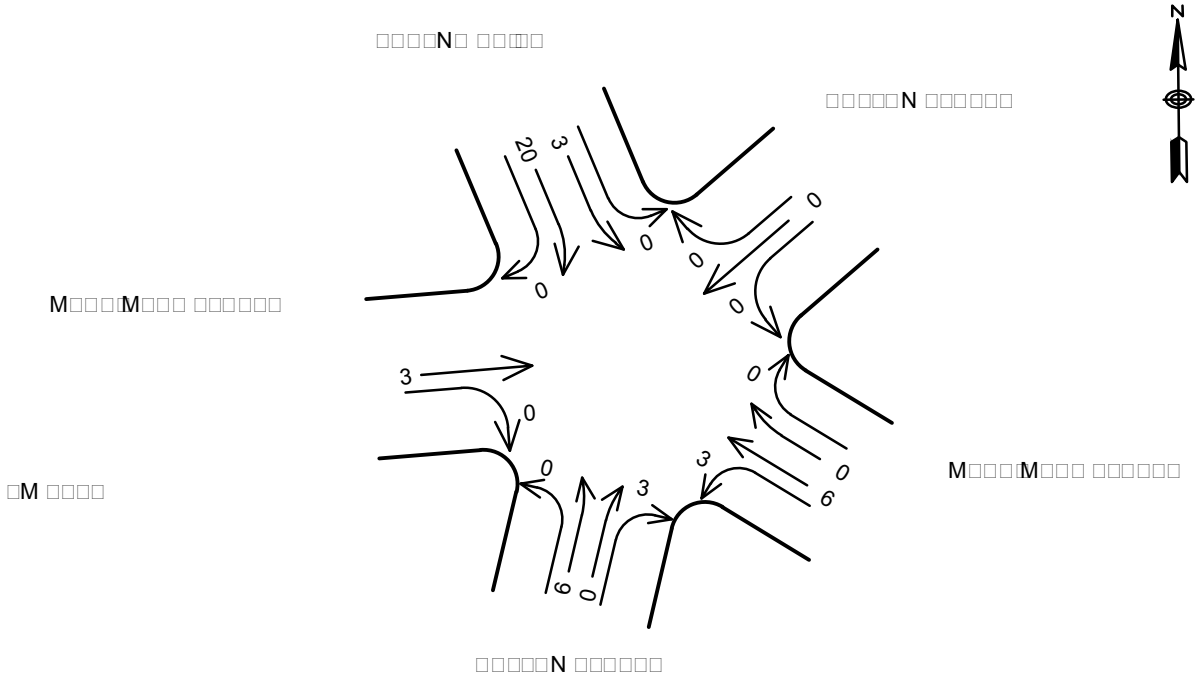

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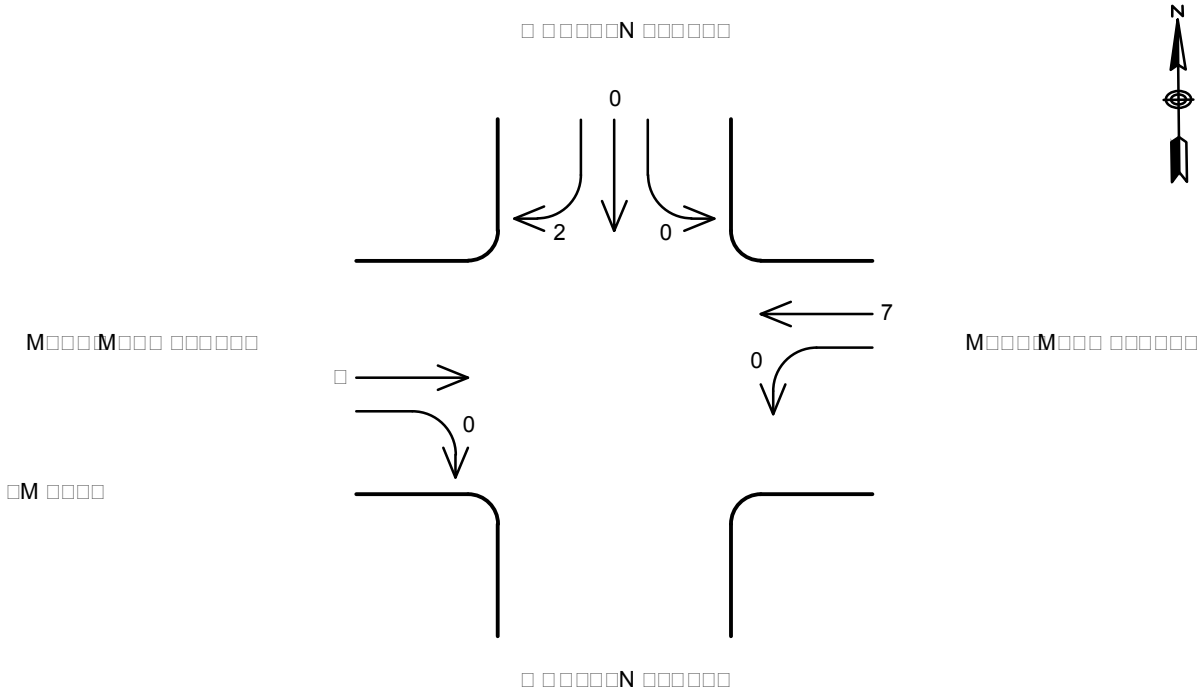

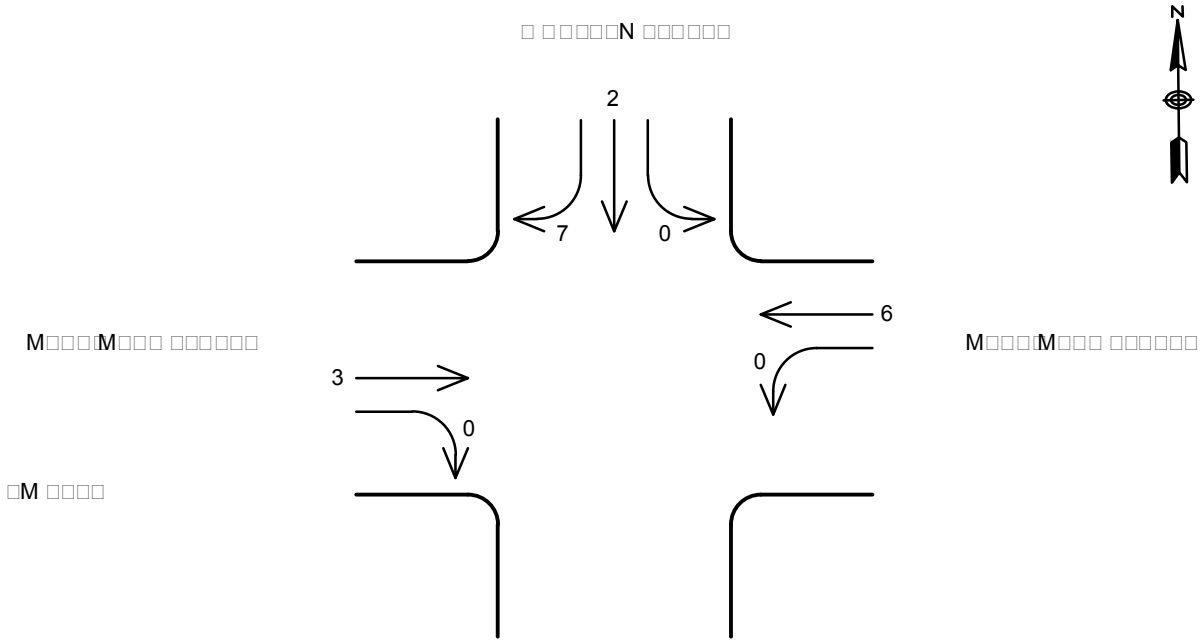

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APPENDIX C

Intersection Capacity Analysis Computations

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Capacity Analysis

Unsignalized Intersection

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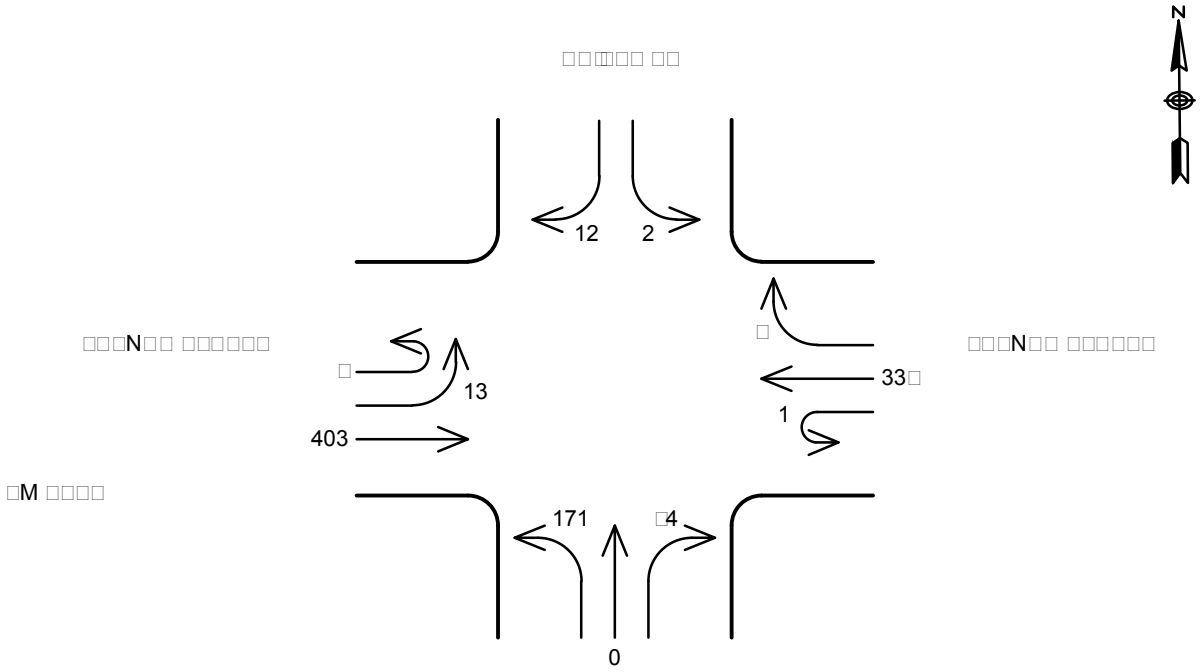

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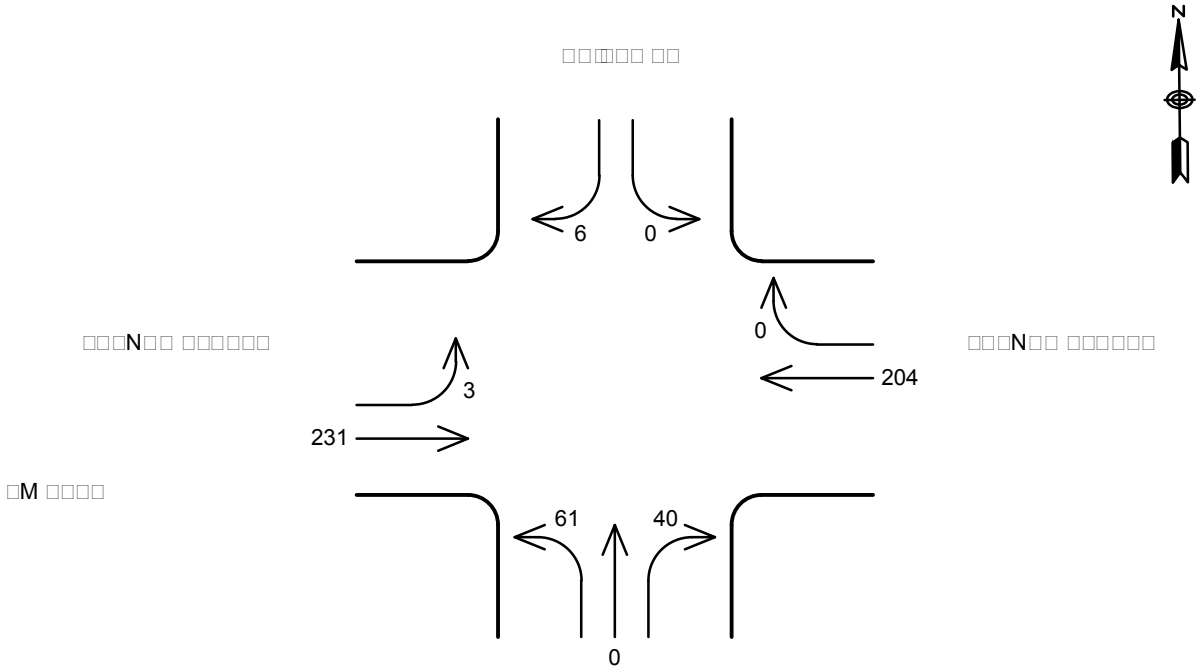

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Intersection	
Int Delay, s/veh	58.9

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	5	13	403	0	1	0	339	5	171	0	94	2	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	-	None	-	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	-	0	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-	0	-	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	63	46	85	25	25	92	80	42	70	92	69	25	92	38
Heavy Vehicles, %	0	8	1	0	0	0	1	20	0	0	1	0	0	17
Mvmt Flow	8	28	474	0	4	0	424	12	244	0	136	8	0	32

Major/Minor	Major1				Major2				Minor1			Minor2		
Conflicting Flow All	467	436	0	0	610	474	0	0	976	991	478	1029	985	438
Stage 1	-	-	-	-	-	-	-	-	531	547	-	430	438	-
Stage 2	-	-	-	-	-	-	-	-	445	444	-	599	547	-
Critical Hdwy	-	4.18	-	-	-	4.1	-	-	7.1	6.5	6.21	7.1	6.5	6.37
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	-	2.272	-	-	-	2.2	-	-	3.5	4	3.309	3.5	4	3.453
Pot Cap-1 Maneuver	-	1092	-	-	-	1099	-	-	~ 232	248	589	214	250	588
Stage 1	-	-	-	-	-	-	-	-	536	521	-	607	582	-
Stage 2	-	-	-	-	-	-	-	-	596	579	-	492	521	-
Platoon blocked, %			-	-			-	-						
Mov Cap-1 Maneuver	~ -5	~ -5	-	-	-	-	-	-	~ 220	248	589	165	250	588
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	~ 220	248	-	165	250	-
Stage 1	-	-	-	-	-	-	-	-	536	521	-	607	582	-
Stage 2	-	-	-	-	-	-	-	-	564	579	-	378	521	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			210.3	15.4
HCM LOS			F	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	284	+	-	-	-	-	-	387
HCM Lane V/C Ratio	1.34	-	-	-	-	-	-	0.102
HCM Control Delay (s)	210.3	-	-	-	-	-	-	15.4
HCM Lane LOS	F	-	-	-	-	-	-	C
HCM 95th %tile Q(veh)	19.4	-	-	-	-	-	-	0.3

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

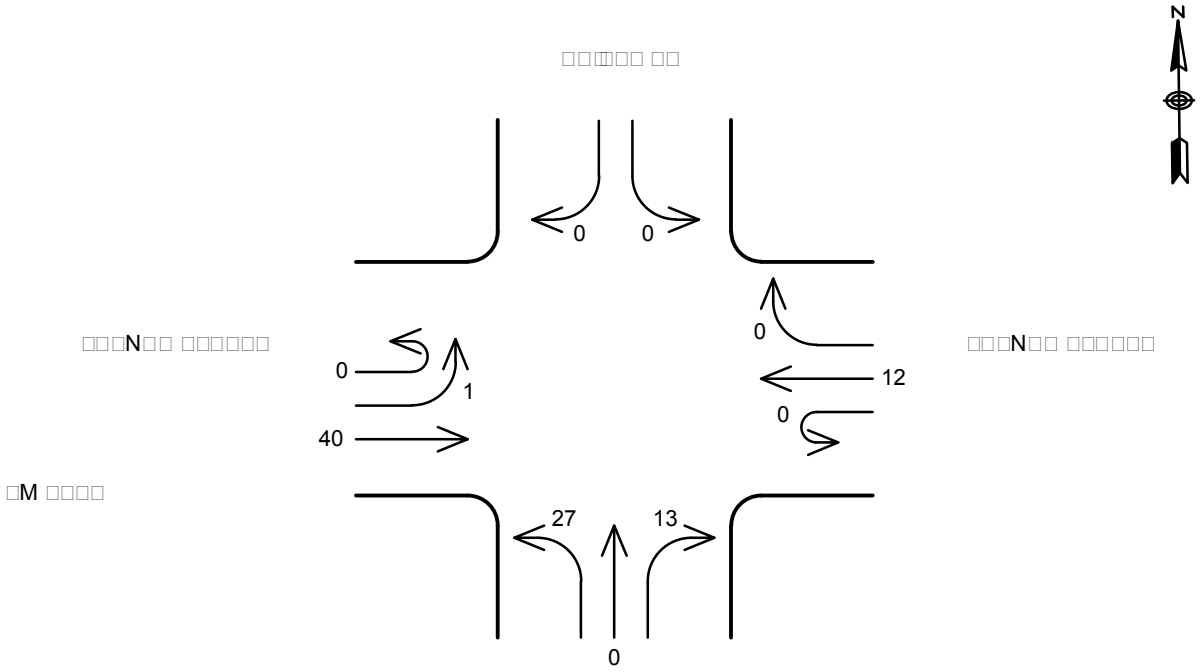
Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	3	231	0	0	204	0	61	0	40	0	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	89	92	92	76	92	67	92	71	92	92	50
Heavy Vehicles, %	0	3	0	0	1	0	3	0	0	0	0	0
Mvmt Flow	4	260	0	0	268	0	91	0	56	0	0	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	268	0	0	260	0	0	542	536	260	564	536	268
Stage 1	-	-	-	-	-	-	268	268	-	268	268	-
Stage 2	-	-	-	-	-	-	274	268	-	296	268	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.13	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.13	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.13	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.527	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1307	-	-	1316	-	-	450	454	784	439	454	776
Stage 1	-	-	-	-	-	-	735	691	-	742	691	-
Stage 2	-	-	-	-	-	-	730	691	-	717	691	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1307	-	-	1316	-	-	442	452	784	406	452	776
Mov Cap-2 Maneuver	-	-	-	-	-	-	442	452	-	406	452	-
Stage 1	-	-	-	-	-	-	732	688	-	739	691	-
Stage 2	-	-	-	-	-	-	719	691	-	663	688	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	14.4	9.7
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	530	1307	-	-	1316	-	-	776
HCM Lane V/C Ratio	0.278	0.003	-	-	-	-	-	0.015
HCM Control Delay (s)	14.4	7.8	0	-	0	-	-	9.7
HCM Lane LOS	B	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	1.1	0	-	-	0	-	-	0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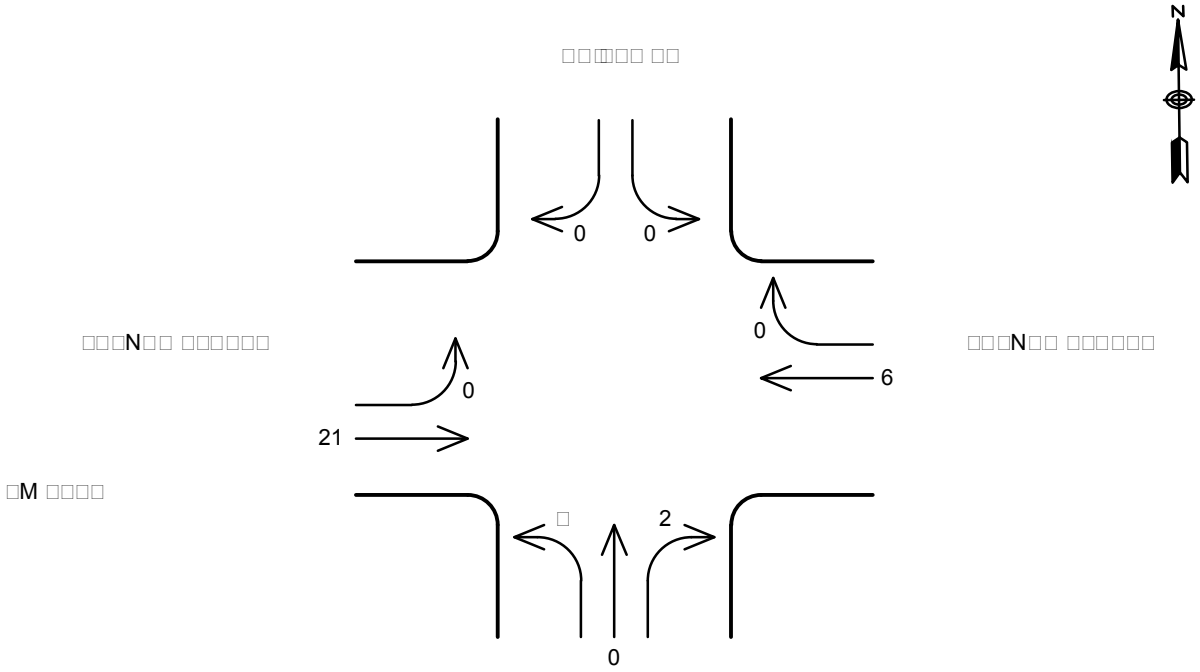
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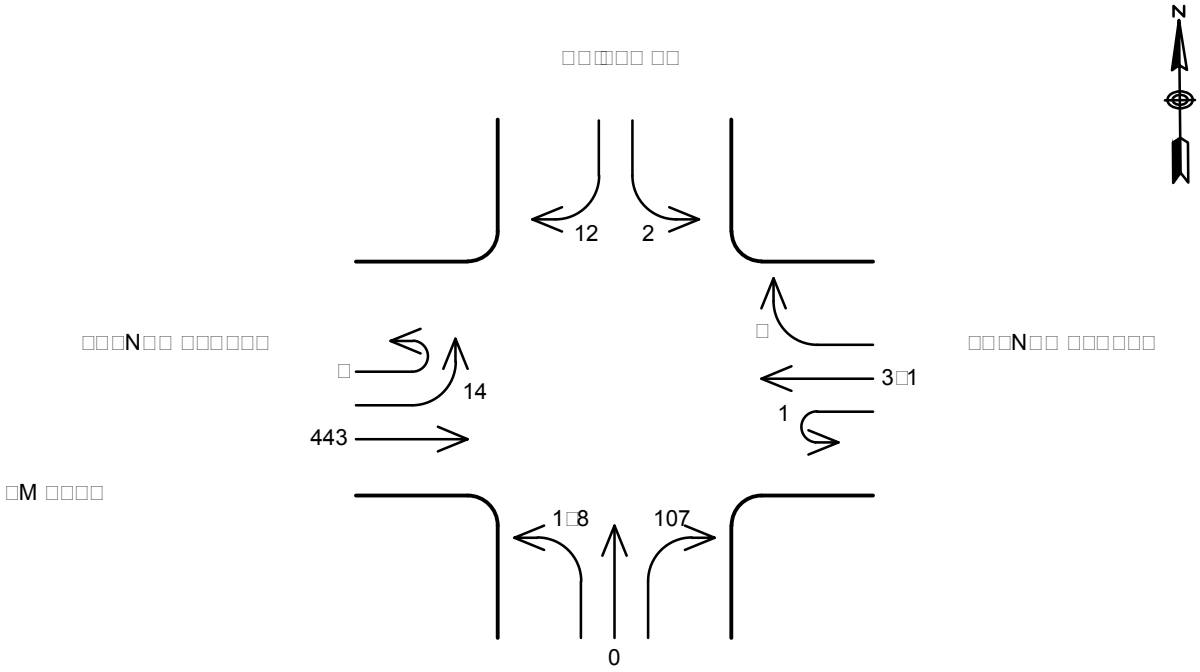
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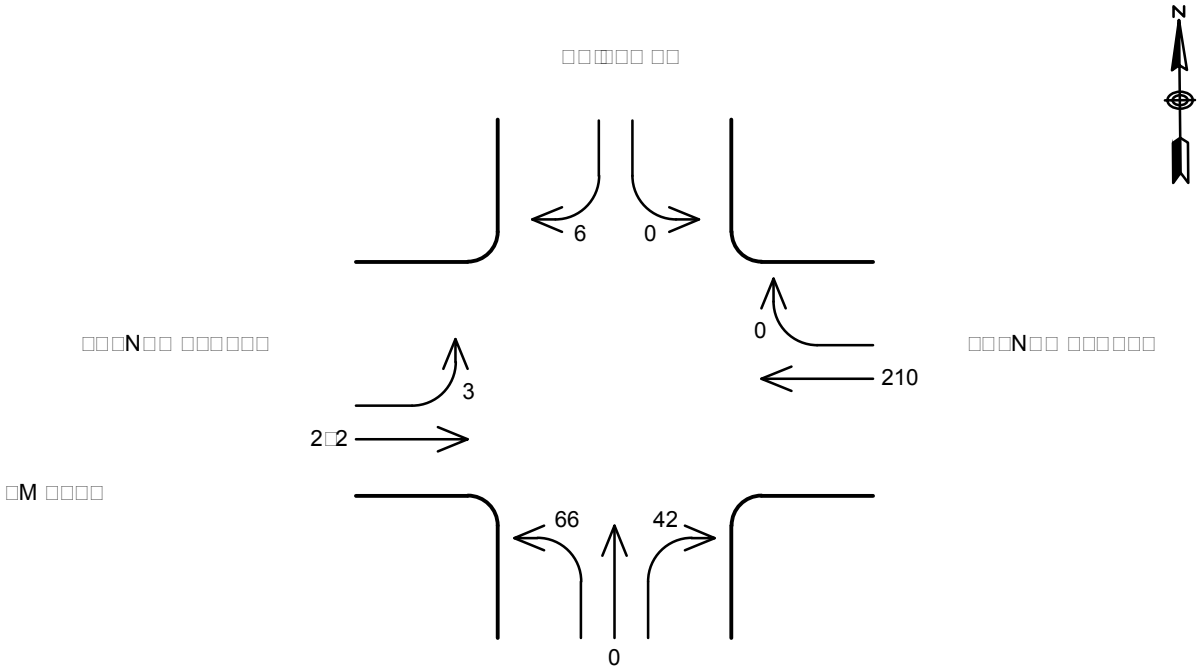
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Intersection	
Int Delay, s/veh	108.1

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	5	14	443	0	1	0	351	5	198	0	107	2	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	-	None	-	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	-	0	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-	0	-	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	63	46	85	25	25	92	80	42	70	92	69	25	92	38
Heavy Vehicles, %	0	8	1	0	0	0	1	20	0	0	1	0	0	17
Mvmt Flow	8	30	521	0	4	0	439	12	283	0	155	8	0	32

Major/Minor	Major1				Major2				Minor1			Minor2		
Conflicting Flow All	482	451	0	0	676	521	0	0	1042	1057	525	1105	1051	453
Stage 1	-	-	-	-	-	-	-	-	582	598	-	445	453	-
Stage 2	-	-	-	-	-	-	-	-	460	459	-	660	598	-
Critical Hdwy	-	4.18	-	-	-	4.1	-	-	7.1	6.5	6.21	7.1	6.5	6.37
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	-	2.272	-	-	-	2.2	-	-	3.5	4	3.309	3.5	4	3.453
Pot Cap-1 Maneuver	-	1078	-	-	-	1056	-	-	~ 210	227	554	190	229	577
Stage 1	-	-	-	-	-	-	-	-	502	494	-	596	573	-
Stage 2	-	-	-	-	-	-	-	-	585	570	-	455	494	-
Platoon blocked, %			-	-			-	-						
Mov Cap-1 Maneuver	~ -5	~ -5	-	-	-	-	-	-	~ 199	227	554	137	229	577
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	~ 199	227	-	137	229	-
Stage 1	-	-	-	-	-	-	-	-	502	494	-	596	573	-
Stage 2	-	-	-	-	-	-	-	-	553	570	-	328	494	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			$ 366.7	16.6
HCM LOS			F	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	257	+	-	-	-	-	-	350
HCM Lane V/C Ratio	1.704	-	-	-	-	-	-	0.113
HCM Control Delay (s)	$ 366.7	-	-	-	-	-	-	16.6
HCM Lane LOS	F	-	-	-	-	-	-	C
HCM 95th %tile Q(veh)	28.4	-	-	-	-	-	-	0.4

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	3	252	0	0	210	0	66	0	42	0	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	89	92	92	76	92	67	92	71	92	92	50
Heavy Vehicles, %	0	3	0	0	0	0	3	0	0	0	0	0
Mvmt Flow	4	283	0	0	276	0	99	0	59	0	0	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	276	0	0	283	0	0	573	567	283	597	567	276
Stage 1	-	-	-	-	-	-	291	291	-	276	276	-
Stage 2	-	-	-	-	-	-	282	276	-	321	291	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.13	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.13	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.13	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.527	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1299	-	-	1291	-	-	429	436	761	418	436	768
Stage 1	-	-	-	-	-	-	715	675	-	735	685	-
Stage 2	-	-	-	-	-	-	723	685	-	695	675	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1299	-	-	1291	-	-	421	434	761	384	434	768
Mov Cap-2 Maneuver	-	-	-	-	-	-	421	434	-	384	434	-
Stage 1	-	-	-	-	-	-	712	672	-	732	685	-
Stage 2	-	-	-	-	-	-	712	685	-	638	672	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	15.3	9.8
HCM LOS			C	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	506	1299	-	-	1291	-	-	768
HCM Lane V/C Ratio	0.312	0.003	-	-	-	-	-	0.016
HCM Control Delay (s)	15.3	7.8	0	-	0	-	-	9.8
HCM Lane LOS	C	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	1.3	0	-	-	0	-	-	0

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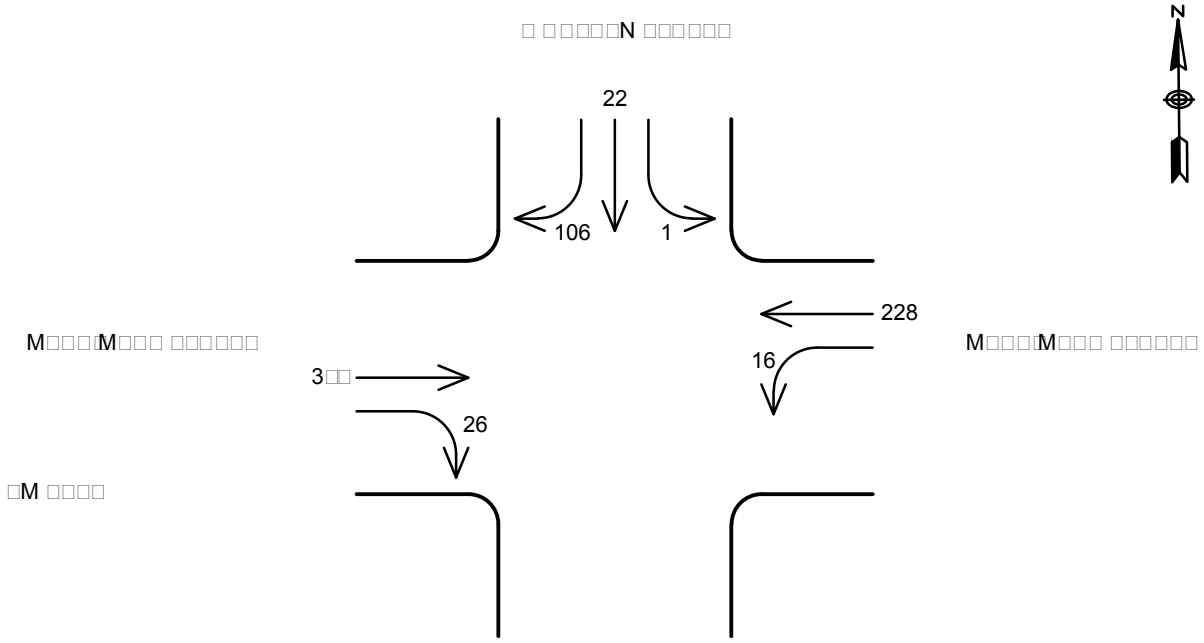

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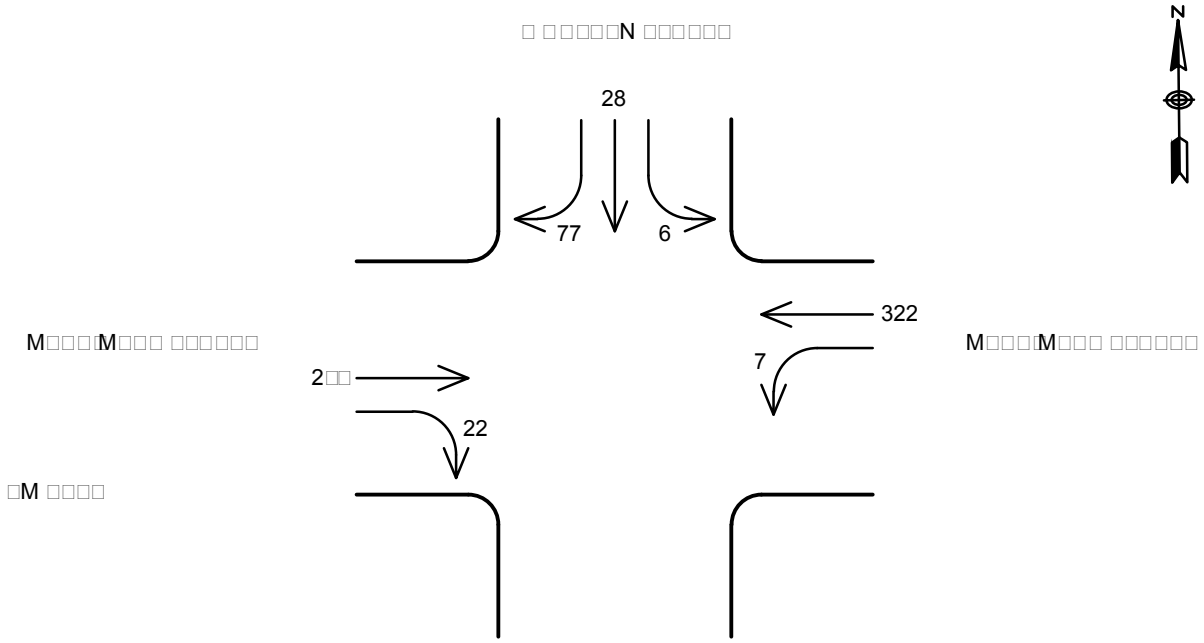

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Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	395	26	16	228	0	0	0	0	1	22	106
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	0	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	74	65	80	76	92	92	92	92	25	69	67
Heavy Vehicles, %	0	2	0	6	1	0	0	0	0	0	0	1
Mvmt Flow	0	534	40	20	300	0	0	0	0	4	32	158

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	300	0	0	574	0	0	894	914	300
Stage 1	-	-	-	-	-	-	340	340	-
Stage 2	-	-	-	-	-	-	554	574	-
Critical Hdwy	4.1	-	-	4.16	-	-	6.4	6.5	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	5.4	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.4	5.5	-
Follow-up Hdwy	2.2	-	-	2.254	-	-	3.5	4	3.309
Pot Cap-1 Maneuver	1273	-	-	979	-	-	314	275	742
Stage 1	-	-	-	-	-	-	725	643	-
Stage 2	-	-	-	-	-	-	580	506	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1273	-	-	979	-	-	306	0	742
Mov Cap-2 Maneuver	-	-	-	-	-	-	306	0	-
Stage 1	-	-	-	-	-	-	707	0	-
Stage 2	-	-	-	-	-	-	580	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0.5	11.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1273	-	-	979	-	-	306	742
HCM Lane V/C Ratio	-	-	-	0.02	-	-	0.013	0.213
HCM Control Delay (s)	0	-	-	8.8	0	-	16.9	11.2
HCM Lane LOS	A	-	-	A	A	-	C	B
HCM 95th %tile Q(veh)	0	-	-	0.1	-	-	0	0.8

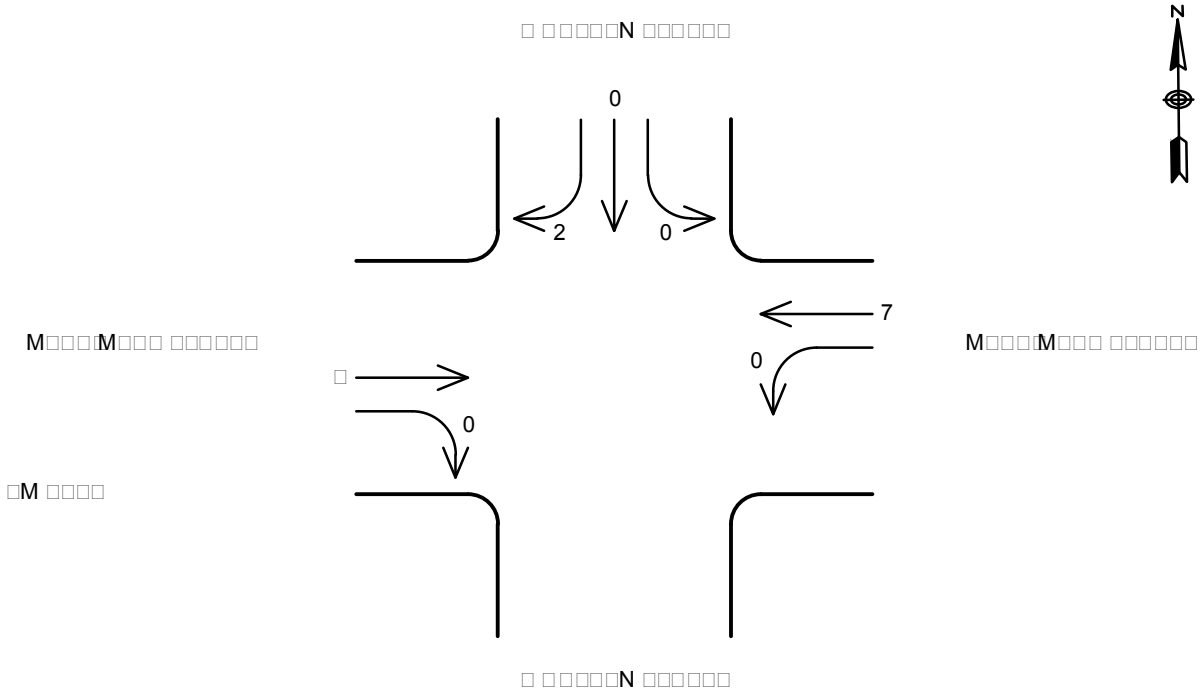
Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	255	22	7	322	0	0	0	0	6	28	77
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	0	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	95	61	58	90	92	92	92	92	50	70	91
Heavy Vehicles, %	2	5	5	0	3	2	0	0	0	0	4	1
Mvmt Flow	0	268	36	12	358	0	0	0	0	12	40	85

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	358	0	0	304	0	0	668	686	358
Stage 1	-	-	-	-	-	-	382	382	-
Stage 2	-	-	-	-	-	-	286	304	-
Critical Hdwy	4.12	-	-	4.1	-	-	6.4	6.54	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	5.4	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.4	5.54	-
Follow-up Hdwy	2.218	-	-	2.2	-	-	3.5	4.036	3.309
Pot Cap-1 Maneuver	1201	-	-	1268	-	-	426	368	689
Stage 1	-	-	-	-	-	-	694	609	-
Stage 2	-	-	-	-	-	-	767	659	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1201	-	-	1268	-	-	421	0	689
Mov Cap-2 Maneuver	-	-	-	-	-	-	421	0	-
Stage 1	-	-	-	-	-	-	686	0	-
Stage 2	-	-	-	-	-	-	767	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0.3	11.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1201	-	-	1268	-	-	421	689
HCM Lane V/C Ratio	-	-	-	0.01	-	-	0.029	0.123
HCM Control Delay (s)	0	-	-	7.9	0	-	13.8	11
HCM Lane LOS	A	-	-	A	A	-	B	B
HCM 95th %tile Q(veh)	0	-	-	0	-	-	0.1	0.4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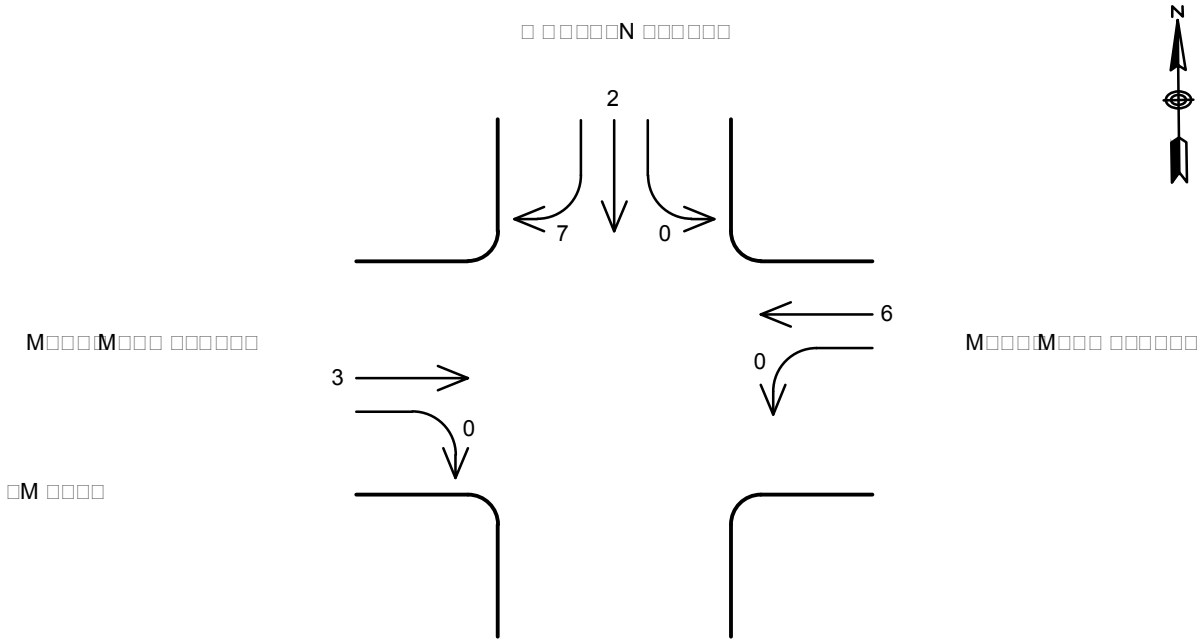
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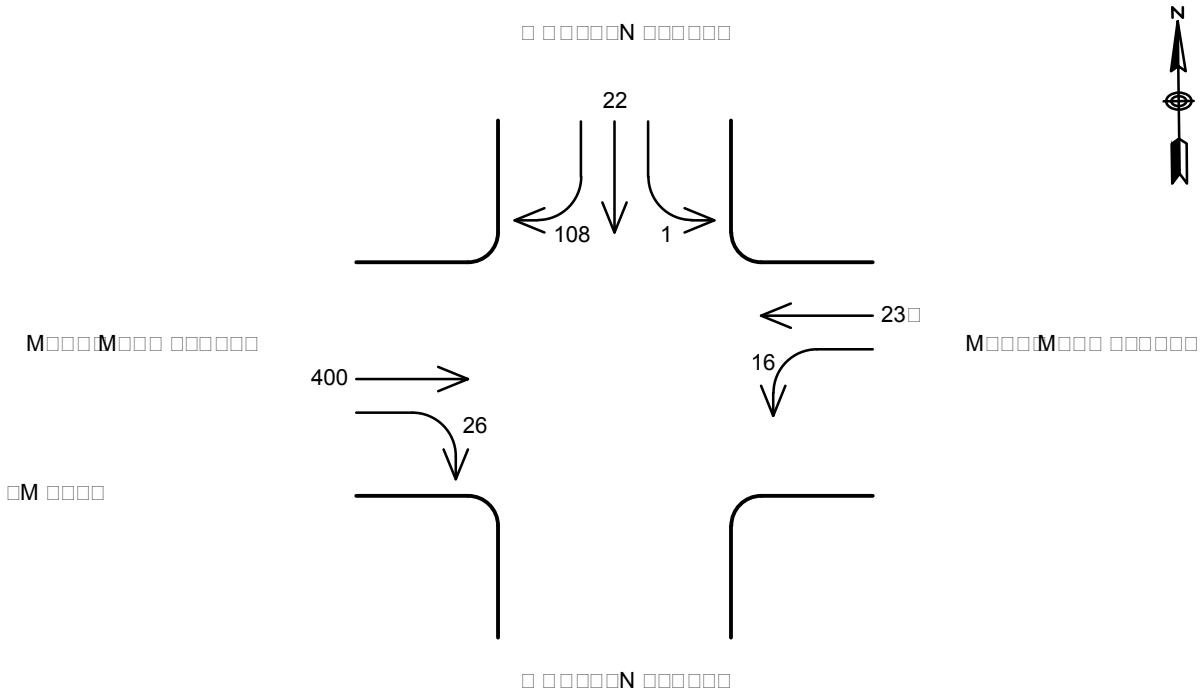
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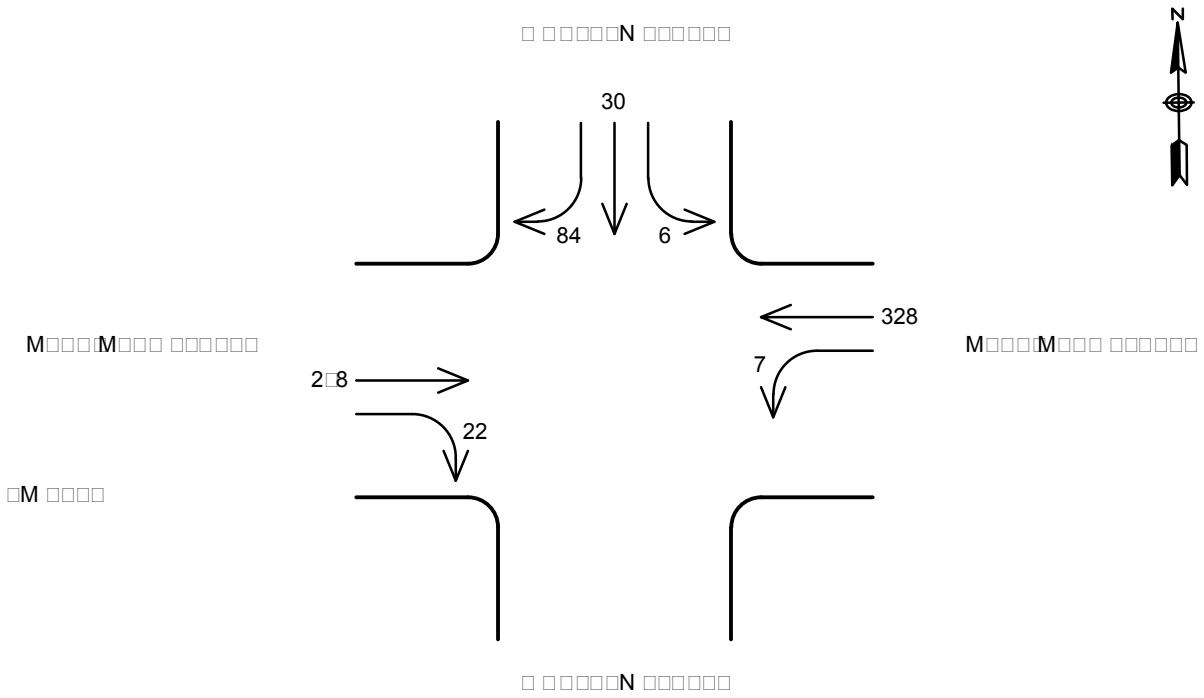
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Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	400	26	16	235	0	0	0	0	1	22	108
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	0	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	74	65	80	76	92	92	92	92	25	69	67
Heavy Vehicles, %	0	2	0	6	1	0	0	0	0	0	0	1
Mvmt Flow	0	541	40	20	309	0	0	0	0	4	32	161

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	309	0	0	581	0	0	910	930	309
Stage 1	-	-	-	-	-	-	349	349	-
Stage 2	-	-	-	-	-	-	561	581	-
Critical Hdwy	4.1	-	-	4.16	-	-	6.4	6.5	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	5.4	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.4	5.5	-
Follow-up Hdwy	2.2	-	-	2.254	-	-	3.5	4	3.309
Pot Cap-1 Maneuver	1263	-	-	974	-	-	307	269	733
Stage 1	-	-	-	-	-	-	719	637	-
Stage 2	-	-	-	-	-	-	575	503	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1263	-	-	974	-	-	299	0	733
Mov Cap-2 Maneuver	-	-	-	-	-	-	299	0	-
Stage 1	-	-	-	-	-	-	701	0	-
Stage 2	-	-	-	-	-	-	575	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0.5	11.4
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1263	-	-	974	-	-	299	733
HCM Lane V/C Ratio	-	-	-	0.021	-	-	0.013	0.22
HCM Control Delay (s)	0	-	-	8.8	0	-	17.2	11.3
HCM Lane LOS	A	-	-	A	A	-	C	B
HCM 95th %tile Q(veh)	0	-	-	0.1	-	-	0	0.8

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	258	22	7	328	0	0	0	0	6	30	84
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	0	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	95	61	58	90	92	92	92	92	50	70	91
Heavy Vehicles, %	0	5	5	0	3	0	0	0	0	0	4	1
Mvmt Flow	0	272	36	12	364	0	0	0	0	12	43	92

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	364	0	0	308	0	0	679	697	364
Stage 1	-	-	-	-	-	-	389	389	-
Stage 2	-	-	-	-	-	-	290	308	-
Critical Hdwy	4.1	-	-	4.1	-	-	6.4	6.54	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	5.4	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.4	5.54	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4.036	3.309
Pot Cap-1 Maneuver	1206	-	-	1264	-	-	420	362	683
Stage 1	-	-	-	-	-	-	689	605	-
Stage 2	-	-	-	-	-	-	764	657	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1206	-	-	1264	-	-	415	0	683
Mov Cap-2 Maneuver	-	-	-	-	-	-	415	0	-
Stage 1	-	-	-	-	-	-	681	0	-
Stage 2	-	-	-	-	-	-	764	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0.3	11.4
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1206	-	-	1264	-	-	415	683
HCM Lane V/C Ratio	-	-	-	0.01	-	-	0.029	0.135
HCM Control Delay (s)	0	-	-	7.9	0	-	13.9	11.1
HCM Lane LOS	A	-	-	A	A	-	B	B
HCM 95th %tile Q(veh)	0	-	-	0	-	-	0.1	0.5

Capacity Analysis

Signalized Intersection

This sheet is for double sided printing purposes

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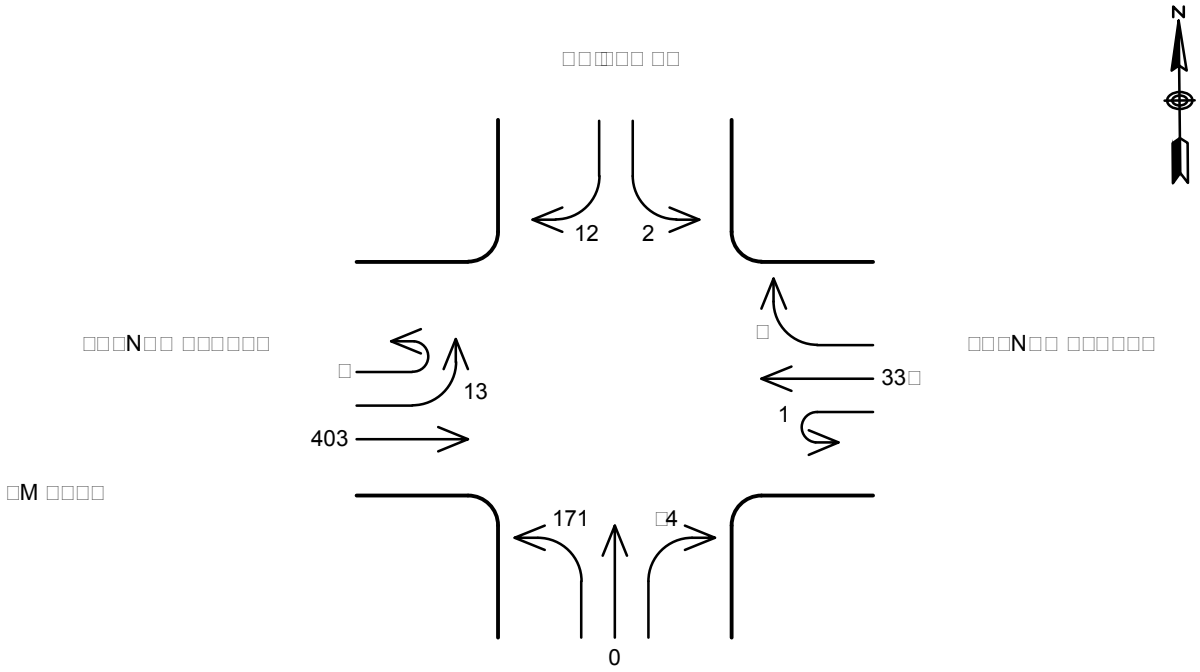

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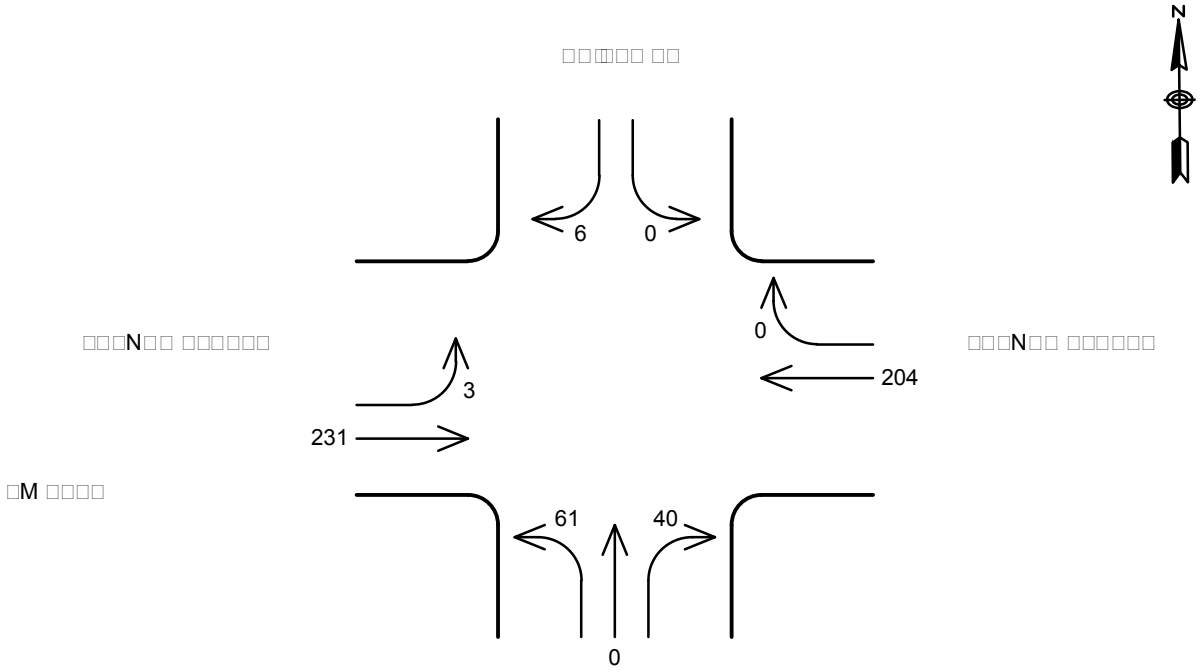

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Intersection	
Int Delay, s/veh	58.9

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	5	13	403	0	1	0	339	5	171	0	94	2	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	-	None	-	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	-	0	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-	0	-	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	63	46	85	25	25	92	80	42	70	92	69	25	92	38
Heavy Vehicles, %	0	8	1	0	0	0	1	20	0	0	1	0	0	17
Mvmt Flow	8	28	474	0	4	0	424	12	244	0	136	8	0	32

Major/Minor	Major1				Major2				Minor1			Minor2		
Conflicting Flow All	467	436	0	0	610	474	0	0	976	991	478	1029	985	438
Stage 1	-	-	-	-	-	-	-	-	531	547	-	430	438	-
Stage 2	-	-	-	-	-	-	-	-	445	444	-	599	547	-
Critical Hdwy	-	4.18	-	-	-	4.1	-	-	7.1	6.5	6.21	7.1	6.5	6.37
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	-	2.272	-	-	-	2.2	-	-	3.5	4	3.309	3.5	4	3.453
Pot Cap-1 Maneuver	-	1092	-	-	-	1099	-	-	~ 232	248	589	214	250	588
Stage 1	-	-	-	-	-	-	-	-	536	521	-	607	582	-
Stage 2	-	-	-	-	-	-	-	-	596	579	-	492	521	-
Platoon blocked, %			-	-			-	-						
Mov Cap-1 Maneuver	~ -5	~ -5	-	-	-	-	-	-	~ 220	248	589	165	250	588
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	~ 220	248	-	165	250	-
Stage 1	-	-	-	-	-	-	-	-	536	521	-	607	582	-
Stage 2	-	-	-	-	-	-	-	-	564	579	-	378	521	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			210.3	15.4
HCM LOS			F	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	284	+	-	-	-	-	-	387
HCM Lane V/C Ratio	1.34	-	-	-	-	-	-	0.102
HCM Control Delay (s)	210.3	-	-	-	-	-	-	15.4
HCM Lane LOS	F	-	-	-	-	-	-	C
HCM 95th %tile Q(veh)	19.4	-	-	-	-	-	-	0.3

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

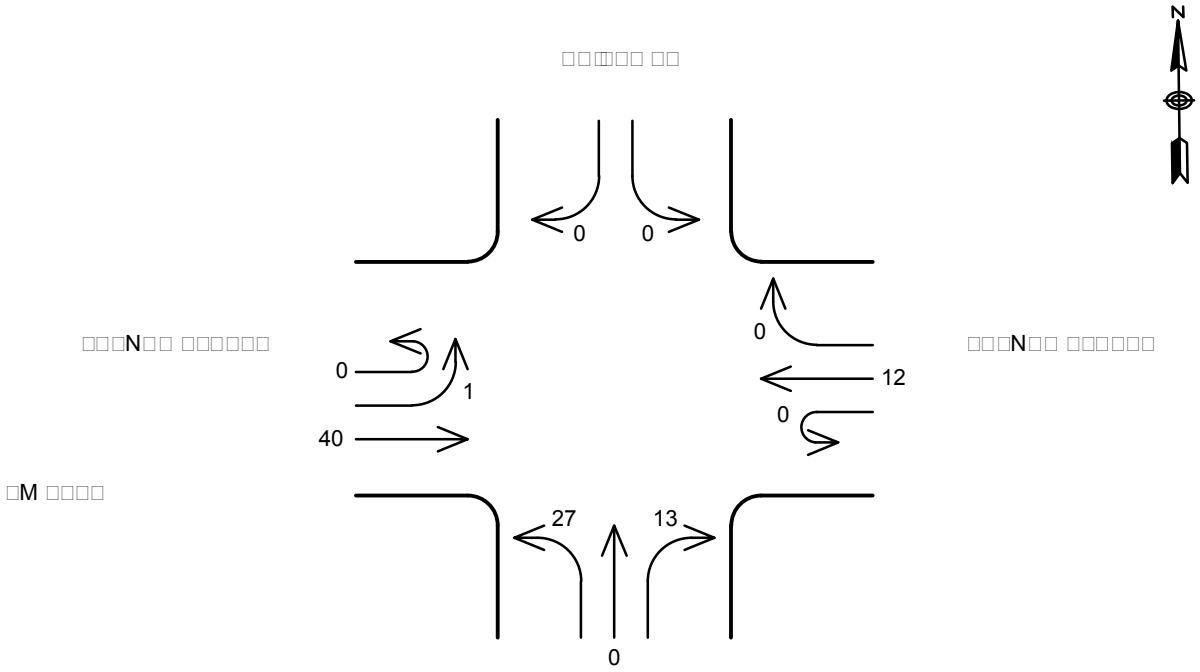
Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	3	231	0	0	204	0	61	0	40	0	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	89	92	92	76	92	67	92	71	92	92	50
Heavy Vehicles, %	0	3	0	0	1	0	3	0	0	0	0	0
Mvmt Flow	4	260	0	0	268	0	91	0	56	0	0	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	268	0	0	260	0	0	542	536	260	564	536	268
Stage 1	-	-	-	-	-	-	268	268	-	268	268	-
Stage 2	-	-	-	-	-	-	274	268	-	296	268	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.13	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.13	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.13	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.527	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1307	-	-	1316	-	-	450	454	784	439	454	776
Stage 1	-	-	-	-	-	-	735	691	-	742	691	-
Stage 2	-	-	-	-	-	-	730	691	-	717	691	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1307	-	-	1316	-	-	442	452	784	406	452	776
Mov Cap-2 Maneuver	-	-	-	-	-	-	442	452	-	406	452	-
Stage 1	-	-	-	-	-	-	732	688	-	739	691	-
Stage 2	-	-	-	-	-	-	719	691	-	663	688	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	14.4	9.7
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	530	1307	-	-	1316	-	-	776
HCM Lane V/C Ratio	0.278	0.003	-	-	-	-	-	0.015
HCM Control Delay (s)	14.4	7.8	0	-	0	-	-	9.7
HCM Lane LOS	B	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	1.1	0	-	-	0	-	-	0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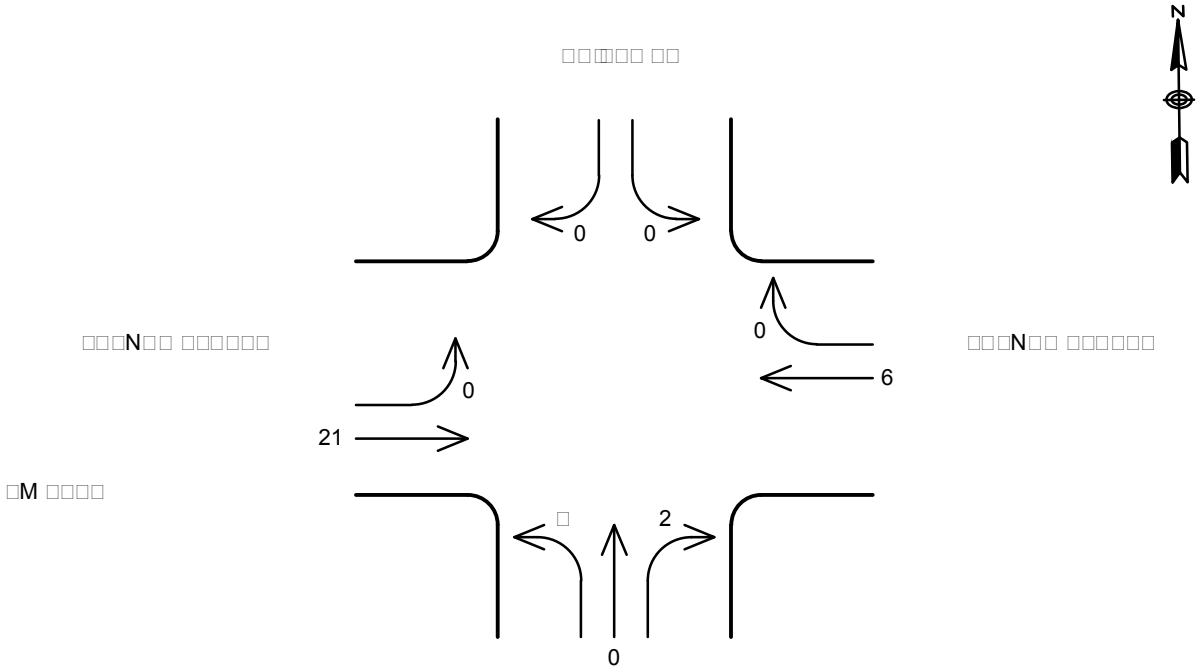
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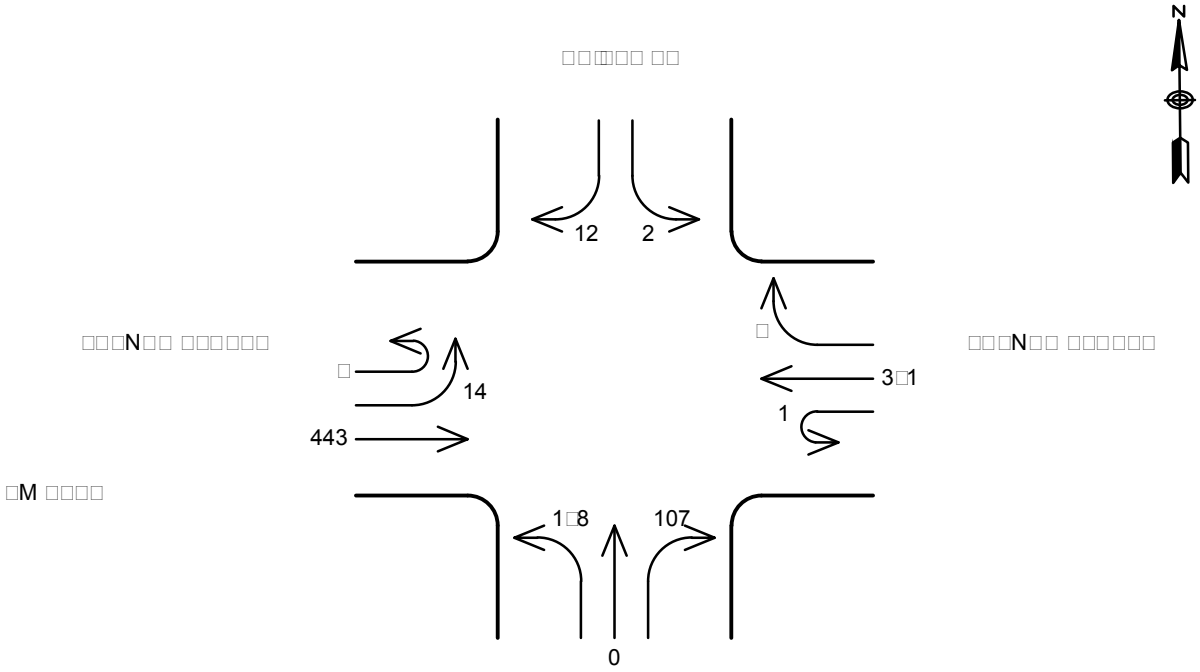
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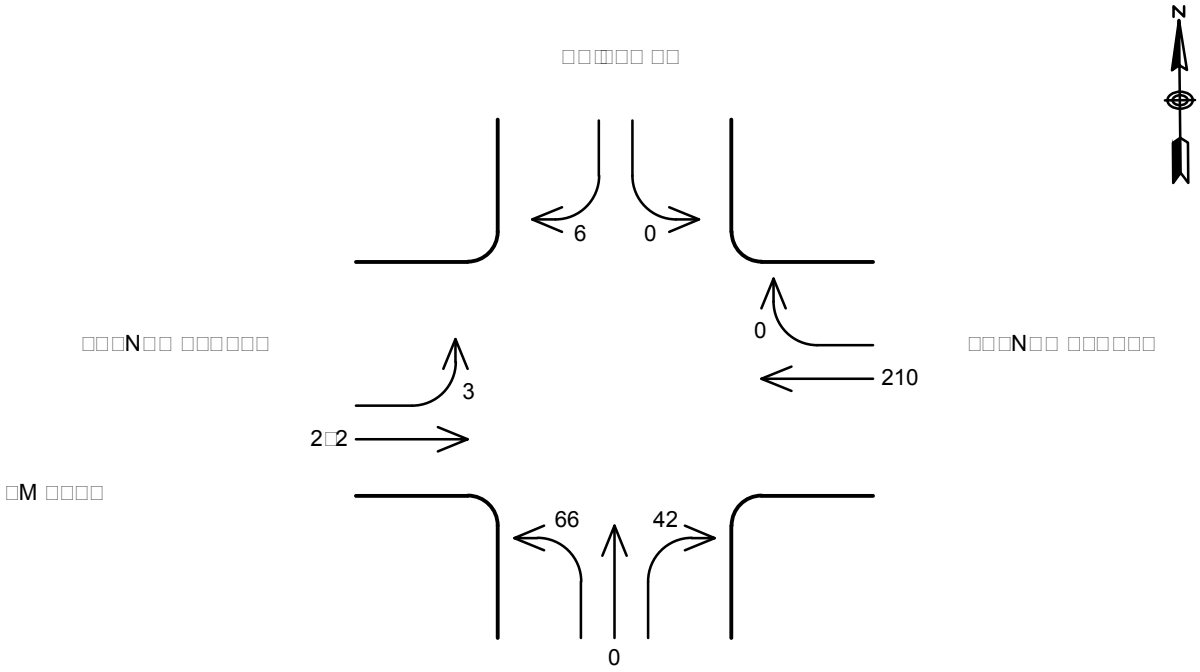
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Intersection	
Int Delay, s/veh	108.1

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	5	14	443	0	1	0	351	5	198	0	107	2	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	-	None	-	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	-	0	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-	0	-	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	63	46	85	25	25	92	80	42	70	92	69	25	92	38
Heavy Vehicles, %	0	8	1	0	0	0	1	20	0	0	1	0	0	17
Mvmt Flow	8	30	521	0	4	0	439	12	283	0	155	8	0	32

Major/Minor	Major1				Major2				Minor1			Minor2		
Conflicting Flow All	482	451	0	0	676	521	0	0	1042	1057	525	1105	1051	453
Stage 1	-	-	-	-	-	-	-	-	582	598	-	445	453	-
Stage 2	-	-	-	-	-	-	-	-	460	459	-	660	598	-
Critical Hdwy	-	4.18	-	-	-	4.1	-	-	7.1	6.5	6.21	7.1	6.5	6.37
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	-	2.272	-	-	-	2.2	-	-	3.5	4	3.309	3.5	4	3.453
Pot Cap-1 Maneuver	-	1078	-	-	-	1056	-	-	~ 210	227	554	190	229	577
Stage 1	-	-	-	-	-	-	-	-	502	494	-	596	573	-
Stage 2	-	-	-	-	-	-	-	-	585	570	-	455	494	-
Platoon blocked, %			-	-			-	-						
Mov Cap-1 Maneuver	~ -5	~ -5	-	-	-	-	-	-	~ 199	227	554	137	229	577
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	~ 199	227	-	137	229	-
Stage 1	-	-	-	-	-	-	-	-	502	494	-	596	573	-
Stage 2	-	-	-	-	-	-	-	-	553	570	-	328	494	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			$ 366.7	16.6
HCM LOS			F	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	257	+	-	-	-	-	-	350
HCM Lane V/C Ratio	1.704	-	-	-	-	-	-	0.113
HCM Control Delay (s)	$ 366.7	-	-	-	-	-	-	16.6
HCM Lane LOS	F	-	-	-	-	-	-	C
HCM 95th %tile Q(veh)	28.4	-	-	-	-	-	-	0.4

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	3	252	0	0	210	0	66	0	42	0	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	89	92	92	76	92	67	92	71	92	92	50
Heavy Vehicles, %	0	3	0	0	0	0	3	0	0	0	0	0
Mvmt Flow	4	283	0	0	276	0	99	0	59	0	0	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	276	0	0	283	0	0	573	567	283	597	567	276
Stage 1	-	-	-	-	-	-	291	291	-	276	276	-
Stage 2	-	-	-	-	-	-	282	276	-	321	291	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.13	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.13	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.13	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.527	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1299	-	-	1291	-	-	429	436	761	418	436	768
Stage 1	-	-	-	-	-	-	715	675	-	735	685	-
Stage 2	-	-	-	-	-	-	723	685	-	695	675	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1299	-	-	1291	-	-	421	434	761	384	434	768
Mov Cap-2 Maneuver	-	-	-	-	-	-	421	434	-	384	434	-
Stage 1	-	-	-	-	-	-	712	672	-	732	685	-
Stage 2	-	-	-	-	-	-	712	685	-	638	672	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	15.3	9.8
HCM LOS			C	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	506	1299	-	-	1291	-	-	768
HCM Lane V/C Ratio	0.312	0.003	-	-	-	-	-	0.016
HCM Control Delay (s)	15.3	7.8	0	-	0	-	-	9.8
HCM Lane LOS	C	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	1.3	0	-	-	0	-	-	0

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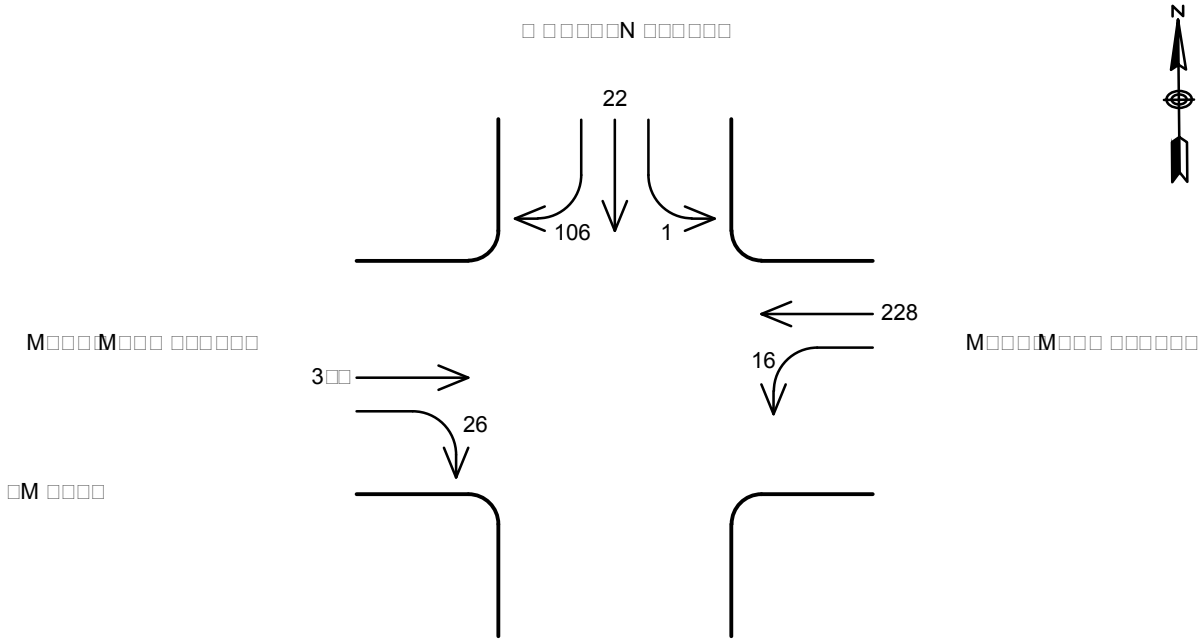

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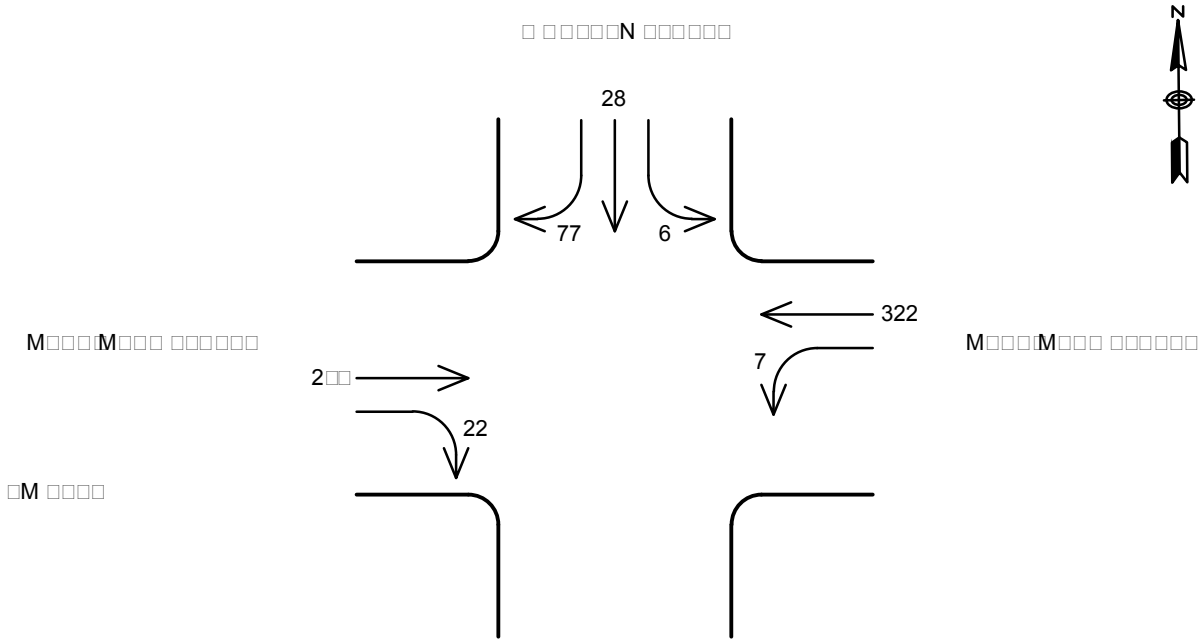

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Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	395	26	16	228	0	0	0	0	1	22	106
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	0	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	74	65	80	76	92	92	92	92	25	69	67
Heavy Vehicles, %	0	2	0	6	1	0	0	0	0	0	0	1
Mvmt Flow	0	534	40	20	300	0	0	0	0	4	32	158

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	300	0	0	574	0	0	894	914	300
Stage 1	-	-	-	-	-	-	340	340	-
Stage 2	-	-	-	-	-	-	554	574	-
Critical Hdwy	4.1	-	-	4.16	-	-	6.4	6.5	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	5.4	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.4	5.5	-
Follow-up Hdwy	2.2	-	-	2.254	-	-	3.5	4	3.309
Pot Cap-1 Maneuver	1273	-	-	979	-	-	314	275	742
Stage 1	-	-	-	-	-	-	725	643	-
Stage 2	-	-	-	-	-	-	580	506	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1273	-	-	979	-	-	306	0	742
Mov Cap-2 Maneuver	-	-	-	-	-	-	306	0	-
Stage 1	-	-	-	-	-	-	707	0	-
Stage 2	-	-	-	-	-	-	580	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0.5	11.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1273	-	-	979	-	-	306	742
HCM Lane V/C Ratio	-	-	-	0.02	-	-	0.013	0.213
HCM Control Delay (s)	0	-	-	8.8	0	-	16.9	11.2
HCM Lane LOS	A	-	-	A	A	-	C	B
HCM 95th %tile Q(veh)	0	-	-	0.1	-	-	0	0.8

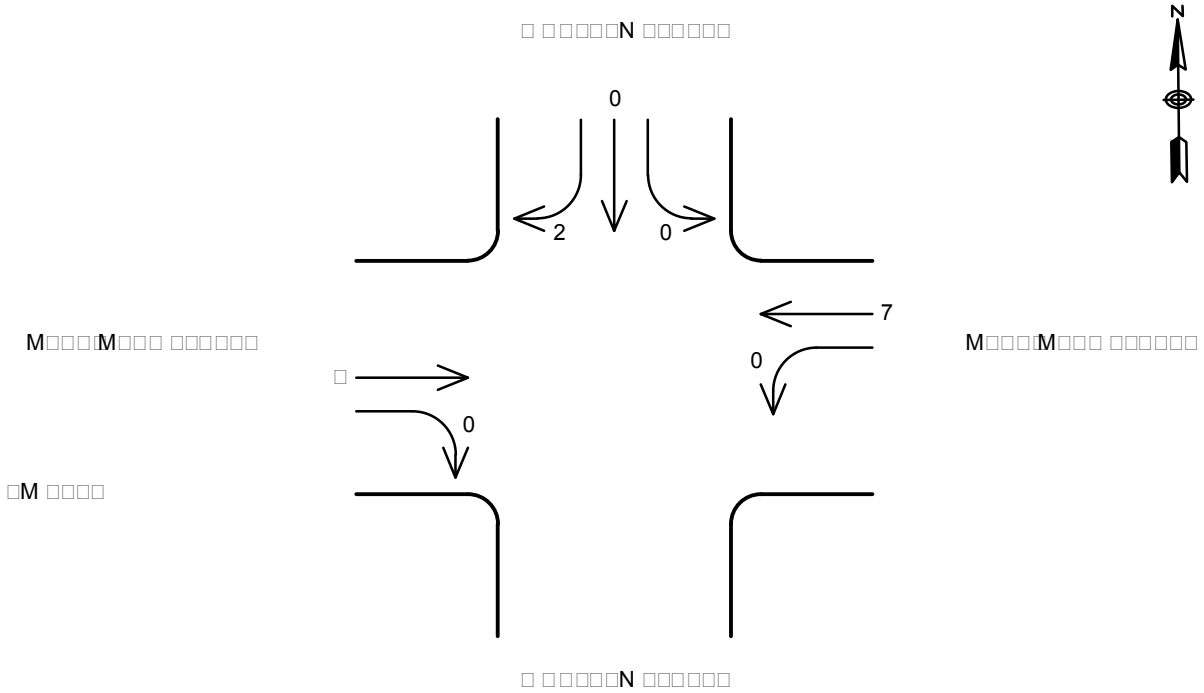
Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	255	22	7	322	0	0	0	0	6	28	77
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	0	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	95	61	58	90	92	92	92	92	50	70	91
Heavy Vehicles, %	2	5	5	0	3	2	0	0	0	0	4	1
Mvmt Flow	0	268	36	12	358	0	0	0	0	12	40	85

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	358	0	0	304	0	0	668	686	358
Stage 1	-	-	-	-	-	-	382	382	-
Stage 2	-	-	-	-	-	-	286	304	-
Critical Hdwy	4.12	-	-	4.1	-	-	6.4	6.54	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	5.4	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.4	5.54	-
Follow-up Hdwy	2.218	-	-	2.2	-	-	3.5	4.036	3.309
Pot Cap-1 Maneuver	1201	-	-	1268	-	-	426	368	689
Stage 1	-	-	-	-	-	-	694	609	-
Stage 2	-	-	-	-	-	-	767	659	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1201	-	-	1268	-	-	421	0	689
Mov Cap-2 Maneuver	-	-	-	-	-	-	421	0	-
Stage 1	-	-	-	-	-	-	686	0	-
Stage 2	-	-	-	-	-	-	767	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0.3	11.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1201	-	-	1268	-	-	421	689
HCM Lane V/C Ratio	-	-	-	0.01	-	-	0.029	0.123
HCM Control Delay (s)	0	-	-	7.9	0	-	13.8	11
HCM Lane LOS	A	-	-	A	A	-	B	B
HCM 95th %tile Q(veh)	0	-	-	0	-	-	0.1	0.4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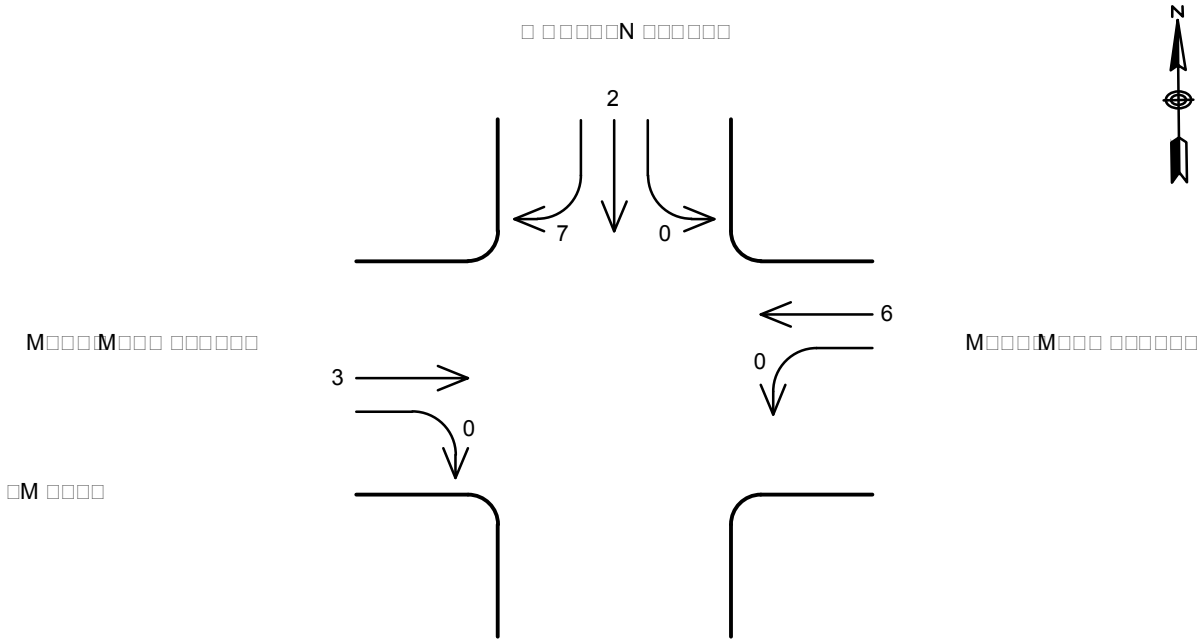
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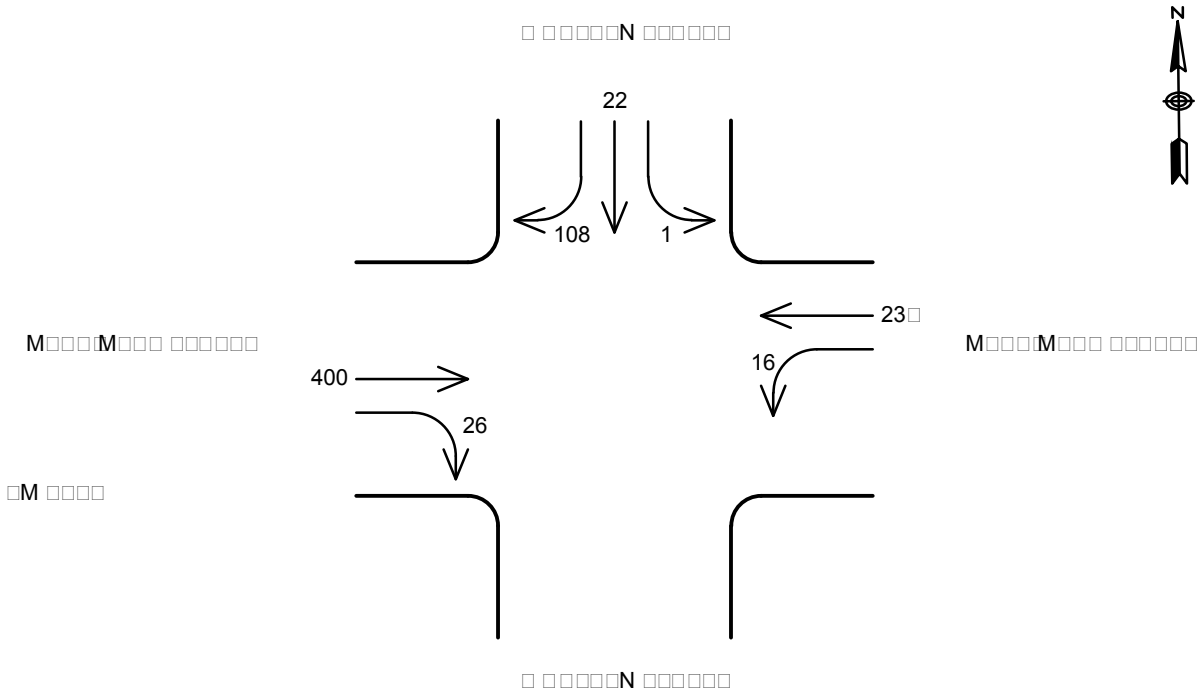
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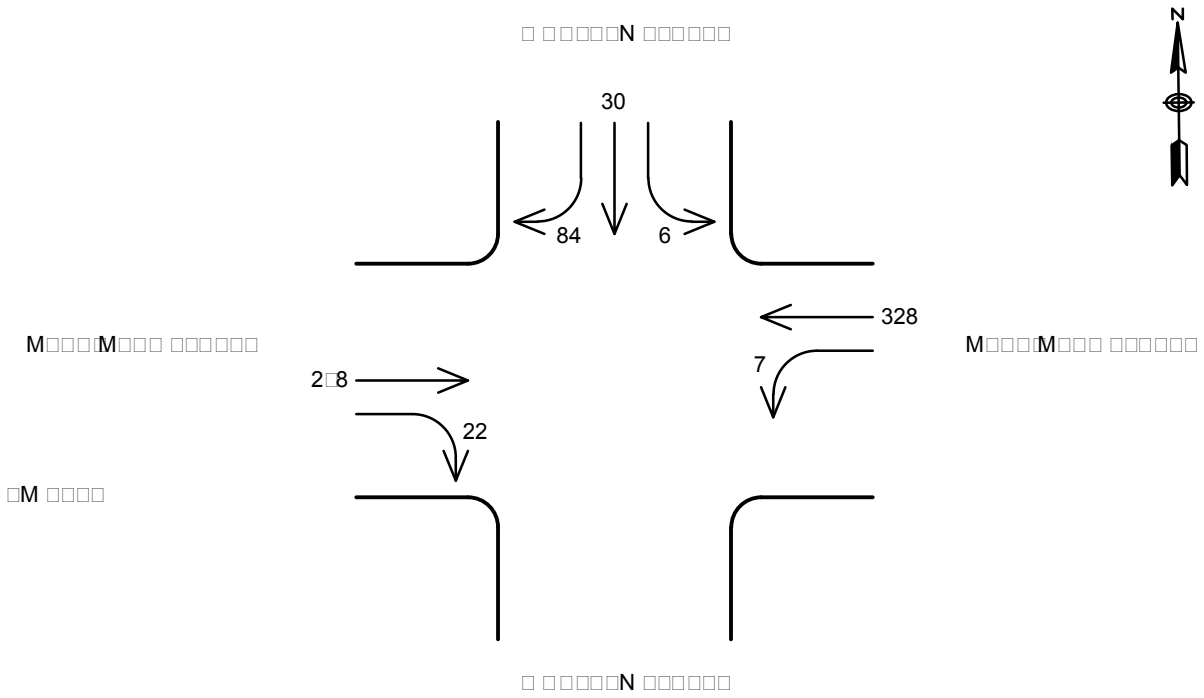
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6
328
7
22

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	400	26	16	235	0	0	0	0	1	22	108
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	0	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	74	65	80	76	92	92	92	92	25	69	67
Heavy Vehicles, %	0	2	0	6	1	0	0	0	0	0	0	1
Mvmt Flow	0	541	40	20	309	0	0	0	0	4	32	161

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	309	0	0	581	0	0	910	930	309
Stage 1	-	-	-	-	-	-	349	349	-
Stage 2	-	-	-	-	-	-	561	581	-
Critical Hdwy	4.1	-	-	4.16	-	-	6.4	6.5	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	5.4	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.4	5.5	-
Follow-up Hdwy	2.2	-	-	2.254	-	-	3.5	4	3.309
Pot Cap-1 Maneuver	1263	-	-	974	-	-	307	269	733
Stage 1	-	-	-	-	-	-	719	637	-
Stage 2	-	-	-	-	-	-	575	503	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1263	-	-	974	-	-	299	0	733
Mov Cap-2 Maneuver	-	-	-	-	-	-	299	0	-
Stage 1	-	-	-	-	-	-	701	0	-
Stage 2	-	-	-	-	-	-	575	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0.5	11.4
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1263	-	-	974	-	-	299	733
HCM Lane V/C Ratio	-	-	-	0.021	-	-	0.013	0.22
HCM Control Delay (s)	0	-	-	8.8	0	-	17.2	11.3
HCM Lane LOS	A	-	-	A	A	-	C	B
HCM 95th %tile Q(veh)	0	-	-	0.1	-	-	0	0.8

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	258	22	7	328	0	0	0	0	6	30	84
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	0	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	95	61	58	90	92	92	92	92	50	70	91
Heavy Vehicles, %	0	5	5	0	3	0	0	0	0	0	4	1
Mvmt Flow	0	272	36	12	364	0	0	0	0	12	43	92

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	364	0	0	308	0	0	679	697	364
Stage 1	-	-	-	-	-	-	389	389	-
Stage 2	-	-	-	-	-	-	290	308	-
Critical Hdwy	4.1	-	-	4.1	-	-	6.4	6.54	6.21
Critical Hdwy Stg 1	-	-	-	-	-	-	5.4	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.4	5.54	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4.036	3.309
Pot Cap-1 Maneuver	1206	-	-	1264	-	-	420	362	683
Stage 1	-	-	-	-	-	-	689	605	-
Stage 2	-	-	-	-	-	-	764	657	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1206	-	-	1264	-	-	415	0	683
Mov Cap-2 Maneuver	-	-	-	-	-	-	415	0	-
Stage 1	-	-	-	-	-	-	681	0	-
Stage 2	-	-	-	-	-	-	764	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0.3	11.4
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1206	-	-	1264	-	-	415	683
HCM Lane V/C Ratio	-	-	-	0.01	-	-	0.029	0.135
HCM Control Delay (s)	0	-	-	7.9	0	-	13.9	11.1
HCM Lane LOS	A	-	-	A	A	-	B	B
HCM 95th %tile Q(veh)	0	-	-	0	-	-	0.1	0.5

APPENDIX D

Crash Data Summary

This sheet is for double sided printing purposes

Project: Traffic Impact Analysis
Proposed Lowell High School Alternatives

Lowell, Massachusetts

BAI Project No. 216092

Person No.	
O	Operator
P	Passenger
NA	Not Applicable

Crash Type	
A	Angle
BIKE	Bicyclist
DEER	Deer
HO	Head On
OBJ	Object
PED	Pedestrian
RE	Rear-End
RTR	Rear to Rear
SW	Sideswipe
UNK	Unknown

Project: Traffic Impact Analysis
Proposed Lowell High School Alternatives
Downtown Lowell Site

Lowell, Massachusetts

BAI Project No. 216092

Crash Data for the Years 2014, 2015, 2016, 2017

Year	Property Damage Only	Injury	Fatal	Total
2014	30	1	0	31
2015	34	4	0	38
2016	36	6	0	42
2017	12	3	0	15

Project: Traffic Impact Analysis
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Downtown Lowell Site

Lowell, Massachusetts

BAI Project No. 216092

Crash Data for the Years 2014, 2015, 2016, 2017

Crash No.	Report No.	Vehicle No.	Date	Direction of Travel*	Intersection/Crash Location	Person No.	No. of Injuries	Fatalities	Accident Type	Pavement Condition	Weather	Lighting	Military Time	Day
1		1	1/6/2014	SOUTH	INTERSECTION OF MERRIMACK STREET AND WORTHEN STREET	O	0	0	SW		RAIN	DUSK	1455	MONDAY
		2		SOUTH		O	0							
2	14-457	1	1/10/2014	WEST	MERRIMACK STREET BETWEEN CARDINAL O'CONNELL PARKWAY AND WORTHEN STREET	O	0	0	RE		SNOW	DAYLIGHT	0930	FRIDAY
		2		NA		NA	0							
3		1	1/23/2014	SOUTH	INTERSECTION OF PAIGE STREET AND BRIDGE STREET	O	0	0	A		CLEAR	DAYLIGHT	1500	THURSDAY
		2		EAST		O	0							
4	2014-1418	1	1/24/2014	WEST	FRENCH STREET BETWEEN JOHN STREET AND BROOKINGS STREET	O	1	0	PED		CLEAR	DAYLIGHT	1341	FRIDAY
5	14-1713	1	1/27/2014	NA	INTERSECTION OF FATHER MORISSETTE BOULEVARD AND ARCAND DRIVE	NA	0	0	A		CLEAR	DAYLIGHT	UNK	MONDAY
		2		SOUTH		O	0							
6	14-2073	1	2/6/2014	NORTH	INTERSECTION OF MERRIMACK STREET, ARCAND DRIVE, AND DUTTON STREET	O	0	0	A		CLEAR	DARK-LIGHTED	2015	THURSDAY
		2		NORTH		O	0							
7	2014-2355	1	2/11/2014	SOUTH	INTERSECTION OF MERRIMACK STREET, ARCAND DRIVE, AND DUTTON STREET	O	0	0	A		CLEAR	DARK-LIGHTED	0535	TUESDAY
		2		SOUTH		O	0							
8	14-2688	1	2/15/2014	EAST	ARCAND DRIVE BETWEEN FATHER MORISSETTE BOULEVARD AND MERRIMACK STREET	O	0	0	RTR		SNOW	DARK-LIGHTED	1150	SATURDAY
		2		SOUTH		O	0							
9	14-200802	1	2/17/2014	NORTH	INTERSECTION OF FRENCH STREET AND JOHN STREET	O	0	0	A		CLEAR	DAYLIGHT	1400	MONDAY
		2		EAST		O	0							
10		1	3/25/2014	UNK	WITHIN AYOTTE PARKING GARAGE STRUCTURE	O	0	0	RE		UNK	UNK	UNK	TUESDAY
		2		UNK		O	0							
11	14-5361	1	4/1/2014	WEST	WITHIN AYOTTE PARKING GARAGE STRUCTURE	O	0	0	SW		CLEAR	DARK-LIGHTED	2130	TUESDAY
		2		WEST		O	0							
12	14-5420	1	4/2/2014	NORTH	INTERSECTION OF FRENCH STREET AND JOHN STREET	O	0	0	RE		CLEAR	DAYLIGHT	2150	WEDNESDAY
		2		NORTH		O	0							
13	14-6380	1	4/18/2014	SOUTH	INTERSECTION OF PAIGE STREET AND BRIDGE STREET	O	0	0	HO		CLOUDY	DAYLIGHT	1205	FRIDAY
		2		EAST		O	0							
14	14-6952	1	4/28/2014	WEST	JOHN STREET AT 75 JOHN STREET PARKING GARAGE ENTRANCE	O	0	0	A		CLEAR	DAYLIGHT	1030	MONDAY
		2		EAST		O	0							
15	14-6963	1	4/28/2014	NA	MERRIMACK STREET BETWEEN PALMER STREET AND JOHN STREET	NA	0	0	RE		CLEAR	DAYLIGHT	1400	MONDAY
		2		WEST		O	0							
16	14-7437	1	5/6/2014	SOUTH	INTERSECTION OF PAIGE STREET AND BRIDGE STREET	O	0	0	A		CLEAR	DAYLIGHT	0945	TUESDAY
		2		EAST		O	0							
17	14-7648	1	5/9/2014	NORTH	INTERSECTION OF FATHER MORISSETTE BOULEVARD AND ARCAND DRIVE	O	0	0	SW		CLOUDY	DAYLIGHT	1726	FRIDAY
		2		NORTH		O	0							

Project: Traffic Impact Analysis
Proposed Lowell High School Alternatives
Downtown Lowell Site

Lowell, Massachusetts

BAI Project No. 216092

Crash Data for the Years 2014, 2015, 2016, 2017

Crash No.	Report No.	Vehicle No.	Date	Direction of Travel*	Intersection/Crash Location	Person No.	No. of Injuries	Fatalities	Accident Type	Pavement Condition	Weather	Lighting	Military Time	Day
18	2014-7865	1	5/13/2014	NORTH	INTERSECTION OF MERRIMACK STREET AND BRIDGE STREET	O	0	0	SW		CLEAR	DAYLIGHT	0730	TUESDAY
		2		NORTH		O	0							
19		1	5/19/2014	SOUTH	INTERSECTION OF MERRIMACK STREET, ARCAND DRIVE, AND DUTTON STREET	O	0	0	A		RAIN	DARK-LIGHTED	2031	MONDAY
		2		NORTH		O	0							
20		1	5/28/2014	SOUTH	INTERSECTION OF MERRIMACK STREET, ARCAND DRIVE, AND DUTTON STREET	O	0	0	A		RAIN	DAYLIGHT	1450	WEDNESDAY
		2		NORTH		O	0							
21		1	6/26/2014	WEST	INTERSECTION OF MERRIMACK STREET AND PALMER STREET	O	0	0	RE		CLOUDY	DAYLIGHT	1400	THURSDAY
		2		WEST		O	0							
22		1	7/26/2014	EAST	INTERSECTION OF FRENCH STREET AND KIRK STREET	O	0	0	RE		CLOUDY	DAYLIGHT	0900	SATURDAY
		2		EAST		O	0							
23	14-13057	1	8/1/2014	EAST	MERRIMACK STREET BETWEEN PALMER STREET AND JOHN STREET	O	0	0	RE		RAIN	DAYLIGHT	1430	FRIDAY
		2		NA		NA	0							
24		1	8/25/2014	EAST	INTERSECTION OF FRENCH STREET AND JOHN STREET	O	0	0	RE		CLEAR	DAYLIGHT	1130	MONDAY
				EAST		O	0							
25		1	8/26/2014	NA	KIRK STREET BETWEEN MERRIMACK STREET AND LEE STREET	NA	0	0	SW		CLEAR	DAYLIGHT	1847	TUESDAY
		2		NORTH		O	0							
26		1	9/11/2014	NORTH	INTERSECTION OF FRENCH STREET AND JOHN STREET	O	0	0	SW		CLEAR	DARK-LIGHTED	2310	THURSDAY
		2		NORTH		O	0							
27		1	10/20/2014	EAST	INTERSECTION OF FRENCH STREET AND JOHN STREET	O	0	0	A		CLEAR	DARK-LIGHTED	2140	MONDAY
		2		WEST		O	0							
28		1	10/22/2014	SOUTH	INTERSECTION OF FATHER MORISSETTE BOULEVARD AND ARCAND DRIVE	O	0	0	RE		RAIN	DARK-LIGHTED	0739	WEDNESDAY
		2		SOUTH		O	0							
29		1	10/22/2014	SOUTH	INTERSECTION OF MERRIMACK STREET, ARCAND DRIVE, AND DUTTON STREET	O	0	0	RE		CLOUDY	DAYLIGHT	1345	WEDNESDAY
		2		SOUTH		O	0							
30		1	11/17/2014	NORTH	INTERSECTION OF FRENCH STREET AND JOHN STREET	O	0	0	RE		RAIN	DARK-LIGHTED	1737	MONDAY
		2		NORTH		O	0							
31		1	11/20/2014	EAST	INTERSECTION OF MERRIMACK STREET AND CENTRAL STREET	O	0	0	SW		CLEAR	DAYLIGHT	1319	THURSDAY
		2		WEST		O	0							
32		1	1/8/2015	EAST	INTERSECTION OF JOHN STREET AND PAIGE STREET	O	1	0	PED		CLEAR	DAYLIGHT	1300	THURSDAY
33		1	1/8/2015	WEST	INTERSECTION OF MERRIMACK STREET AND PALMER STREET	O	0	0	SW		CLEAR	DARK-LIGHTED	2340	THURSDAY
		2		WEST		O	0							
34		1	1/31/2015	EAST	INTERSECTION OF FATHER MORISSETTE BOULEVARD AND ARCAND DRIVE	O	0	0	OBJ		RAIN	DARK-LIGHTED	0245	SATURDAY
35		1	2/12/2015	SOUTH	INTERSECTION OF FATHER MORISSETTE BOULEVARD AND ARCAND DRIVE	O	0	0	RE		SNOW	DAYLIGHT	1605	THURSDAY
		2		SOUTH		O	0							

Project: Traffic Impact Analysis
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Downtown Lowell Site

Lowell, Massachusetts

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36		1	2/12/2015	EAST	FATHER MORISSETTE BOULEVARD BETWEEN ARCAND DRIVE AND POST OFFICE SQUARE	O	0	0	RE		CLOUDY	DARK-LIGHTED	1851	THURSDAY
		2		EAST		O	0							
37		1	2/17/2015	WEST	INTERSECTION OF MERRIMACK STREET AND JOHN STREET	O	0	0	RE		CLOUDY	DAYLIGHT	1335	TUESDAY
		2		WEST		O	0							
38		1	2/26/2015	WEST	MERRIMACK STREET BETWEEN JOHN STREET AND CENTRAL STREET	O	0	0	SW			DARK-LIGHTED	2345	THURSDAY
		2		WEST		O	0							
39	15-4811	1	3/18/2015	SOUTH	INTERSECTION OF FRENCH STREET AND JOHN STREET	O	0	0	UNK		CLEAR	DARK-LIGHTED	0130	WEDNESDAY
40		1	3/23/2015	EAST	FRENCH STREET BETWEEN KIRK STREET AND JOHN STREET	O	0	0	SW		CLEAR	DAYLIGHT	1440	MONDAY
		2		EAST		O	0							
41		1	4/9/2015	NA	MERRIMACK STREET BETWEEN ARCAND DRIVE AND SHATTUCK STREET	NA	0	0	SW		RAIN	DAYLIGHT	1755	THURSDAY
		2		EAST		O	0							
42		1	4/10/2015	NA	INTERSECTION OF MERRIMACK STREET AND WORTHEN STREET	NA	0	0	SW		RAIN	DARK-UNLIT	UNK	FRIDAY
		2		SOUTH		O	0							
43		1	4/29/2015	WEST	MERRIMACK STREET BETWEEN PALMER STREET AND JOHN STREET	O	0	0	A		CLEAR	DARK-LIGHTED	1940	WEDNESDAY
		2		WEST		O	0							
44	15-8671	1	5/19/2015	EAST	INTERSECTION OF FATHER MORISSETTE BOULEVARD AND POST OFFICE SQUARE	O	0	0	SW		CLEAR	DAYLIGHT	1430	TUESDAY
		2		EAST		O	0							
45	15-9602	1	6/3/2015	WEST	MERRIMACK STREET BETWEEN PALMER STREET AND JOHN STREET	O	1	0	RE		CLEAR	DAYLIGHT	0930	WEDNESDAY
		2		WEST		O	0							
46		1	6/20/2015	NORTH	INTERSECTION OF FRENCH STREET AND BRIDGE STREET	O	0	0	A		CLEAR	DAYLIGHT	0900	SATURDAY
		2		SOUTH		O	0							
47		1	6/29/2015	SOUTH	INTERSECTION OF FATHER MORISSETTE BOULEVARD AND POST OFFICE SQUARE	O	0	0	A		CLEAR	DARK-LIGHTED	2233	MONDAY
		2		WEST		O	0							
48		1	7/11/2015	NA	PAIGE STREET BETWEEN JOHN STREET AND BRIDGE STREET	NA	0	0	RE		CLEAR	DARK-UNK LIGHT	UNK	SATURDAY
		2		WEST		O	0							
49		1	7/26/2016	NA	ARCAND DRIVE BETWEEN FATHER MORISSETTE BOULEVARD AND MERRIMACK STREET	O	0	0	A		CLEAR	DAYLIGHT	1109	TUESDAY
		2		NORTH		O	0							
50		1	8/2/2015	SOUTH	INTERSECTION OF MERRIMACK STREET AND BRIDGE STREET	O	0	0	A		CLEAR	DAYLIGHT	1820	SUNDAY
		2		SOUTH		O	0							
51		1	8/16/2015	WEST	INTERSECTION OF MERRIMACK STREET AND PALMER STREET	O	0	0	RE		CLEAR	DARK-LIGHTED	0115	SUNDAY
		2		WEST		O	0							
52		1	8/24/2015	EAST	PAIGE STREET BETWEEN KIRK STREET AND JOHN STREET	O	0	0	A		CLOUDY	DAYLIGHT	1120	MONDAY
		2		NA		NA	0							

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Crash No.	Report No.	Vehicle No.	Date	Direction of Travel*	Intersection/Crash Location	Person No.	No. of Injuries	Fatalities	Accident Type	Pavement Condition	Weather	Lighting	Military Time	Day
53		1	8/28/2015	SOUTH	INTERSECTION OF JOHN STREET AND PAIGE STREET	O	0	0	RE		CLEAR	DARK-LIGHTED	0005	FRIDAY
		2		NA		NA	0							
54		1	9/6/2015	WEST	INTERSECTION OF MERRIMACK STREET AND KIRK STREET	O	0	0	SW		CLEAR	DAYLIGHT	1643	SUNDAY
		2		WEST		O	0							
55	15-16535	1	9/13/2015	SOUTH	INTERSECTION OF FRENCH STREET AND BRIDGE STREET	O	0	0	HO		UNK	UNK	1145	SUNDAY
		2		EAST		O	0							
56		1	9/21/2015	WEST	FRENCH STREET BETWEEN KIRK STREET AND JOHN STREET	O	1	0	PED		CLEAR	DAYLIGHT	0829	MONDAY
57	15-17751	1	9/30/2015	EAST	INTERSECTION OF FATHER MORISSETTE BOULEVARD AND POST OFFICE SQUARE	O	0	0	SW		RAIN	DAYLIGHT	0815	WEDNESDAY
		2		EAST		O	0							
58	15-18136	1	10/6/2015	SOUTH	INTERSECTION OF MERRIMACK STREET, ARCAND DRIVE, AND DUTTON STREET	O	0	0	SW		CLEAR	DAYLIGHT	0800	TUESDAY
		2		SOUTH		O	0							
59		1	10/19/2015	NORTH	JOHN STREET AT 75 JOHN STREET PARKING GARAGE ENTRANCE	O	0	0	A		CLEAR	DAYLIGHT	1205	MONDAY
		2		NORTH		O	0							
60		1	10/23/2015	UNK	WITHIN AYOTTE PARKING GARAGE STRUCTURE	O	0	0	A		CLEAR	DAYLIGHT	0740	FRIDAY
		2		UNK		O	0							
61		1	10/23/2015	SOUTH	ARCAND DRIVE BETWEEN FATHER MORISSETTE BOULEVARD AND MERRIMACK STREET	O	0	0	SW		CLOUDY	DAYLIGHT	0845	FRIDAY
		2		SOUTH		O	0							
62		1	10/29/2015	WEST	INTERSECTION OF MERRIMACK STREET, ARCAND DRIVE, AND DUTTON STREET	O	0	0	RE		CLEAR	DAYLIGHT	1115	THURSDAY
		2		WEST		O	0							
63		1	11/6/2015	NA	WITHIN AYOTTE PARKING GARAGE STRUCTURE	NA	0	0	SW		CLEAR	DAYLIGHT	0730	FRIDAY
		2		UNK		O	0							
64	15-20322	1	11/9/2015	EAST	FATHER MORISSETTE BOULEVARD BETWEEN ARCAND DRIVE AND POST OFFICE SQUARE	O	0	0	RE		CLEAR	DARK-UNLIT	1725	MONDAY
		2		EAST		O	0							
		3		EAST		O	0							
65	2015-0021096A	1	11/20/2015	SOUTH	INTERSECTION OF FRENCH STREET AND BRIDGE STREET	O	0	0	BIKE		UNK	UNK	1652	FRIDAY
66	15-21713	1	12/1/2015	WEST	INTERSECTION OF FRENCH STREET AND JOHN STREET	O	1	0	RE		CLEAR	DAYLIGHT	0830	TUESDAY
		2		WEST		O	1							
67	15-21750	1	12/1/2015	NORTH	JOHN STREET AT 75 JOHN STREET PARKING GARAGE ENTRANCE	O	0	0	A		RAIN	DAYLIGHT	1400	TUESDAY
		2		WEST		O	0							
68		1	12/10/2015	EAST	INTERSECTION OF FRENCH STREET AND JOHN STREET	O	0	0	A		CLEAR	DARK-LIGHTED	1750	THURSDAY
		2		EAST		O	0							
69		1	12/19/2015	SOUTH	INTERSECTION OF FATHER MORISSETTE BOULEVARD AND ARCAND DRIVE	O	0	0	SW		CLEAR	DARK-LIGHTED	1800	SATURDAY
		2		SOUTH		O	0							

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70		1	1/11/2016	UNK	WITHIN AYOTTE PARKING GARAGE STRUCTURE	O	0	0	A		CLEAR	DARK-LIGHTED	1445	MONDAY
		2		UNK		O	0							
71		1	1/19/2016	WEST	INTERSECTION OF MERRIMACK STREET AND BRIDGE STREET	O	0	0	A			DARK-LIGHTED	1726	TUESDAY
		2		WEST		O	0							
72		1	1/14/2016	EAST	INTERSECTION OF FRENCH STREET AND JOHN STREET	O	0	0	SW		CLEAR	DAYLIGHT	1200	THURSDAY
		2		EAST		O	0							
73		1	1/22/2016	WEST	INTERSECTION OF MERRIMACK STREET AND CENTRAL STREET	O	0	0	SW		CLEAR	DAYLIGHT	0930	FRIDAY
		2		EAST		O	0							
74		1	1/26/2016	WEST	INTERSECTION OF MERRIMACK STREET AND PALMER STREET	O	0	0	RE		CLOUDY	DAYLIGHT	1315	TUESDAY
		2		WEST		O	0							
75		1	1/26/2016	WEST	INTERSECTION OF MERRIMACK STREET AND KIRK STREET	O	0	0	RE		CLOUDY	DAYLIGHT	1615	TUESDAY
		2		WEST		O	0							
76		1	2/10/2016	NA	ARCAND DRIVE BETWEEN FATHER MORISSETTE BOULEVARD AND MERRIMACK STREET	NA	0	0	SW		CLOUDY	DAYLIGHT	UNK	WEDNESDAY
		2		NORTH		O	0							
77		1	2/17/2016	SOUTH	ARCAND DRIVE BETWEEN FATHER MORISSETTE BOULEVARD AND MERRIMACK STREET	O	0	0	A		CLEAR	DAYLIGHT	1635	WEDNESDAY
		2		NA		NA	0							
78		1	2/24/2016	WEST	INTERSECTION OF MERRIMACK STREET AND CENTRAL STREET	O	1	0	SW		RAIN	DARK-LIGHTED	UNK	WEDNESDAY
		2		WEST		O	0							
79		1	2/26/2016	WEST	INTERSECTION OF MERRIMACK STREET AND PALMER STREET	O	0	0	SW		CLEAR	DAYLIGHT	1050	FRIDAY
		2		WEST		O	0							
80		1	3/6/2016	WEST	MERRIMACK STREET BETWEEN PALMER STREET AND JOHN STREET	O	0	0	SW		CLEAR	DARK-LIGHTED	0145	SUNDAY
		2		NA		NA	0							
81		1	3/7/2016	EAST	MERRIMACK STREET BETWEEN CENTRAL STREET AND BRIDGE STREET	O	0	0	A		CLOUDY	DAYLIGHT	1554	MONDAY
		2		NA		NA	0							
82		1	3/10/2016	EAST	INTERSECTION OF JOHN STREET AND LEE STREET	O	0	0	A		CLOUDY	DAYLIGHT	1050	THURSDAY
		2		NORTH		O	0							
83		1	3/29/2016	NORTH	INTERSECTION OF FRENCH STREET AND BRIDGE STREET	O	0	0	A		CLEAR	DAYLIGHT	1315	TUESDAY
		2		SOUTH		O	0							
84		1	4/15/2016	NA	WITHIN AYOTTE PARKING GARAGE STRUCTURE	NA	0	0	UNK		UNK	DARK-UNK LIGHT	UNK	FRIDAY
		2		UNK		O	0							
85		1	5/25/2016	NORTH	INTERSECTION OF FRENCH STREET AND KIRK STREET	O	0	0	SW		CLEAR	DAYLIGHT	1650	WEDNESDAY
		2		EAST		O	0							
86		1	6/1/2016	NORTH	KIRK STREET BETWEEN MERRIMACK STREET AND LEE STREET	O	0	0	SW		CLEAR	DAYLIGHT	1430	WEDNESDAY
		2		NORTH		O	0							

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87		1	7/19/2016	EAST	INTERSECTION OF MERRIMACK STREET AND WORTHEN STREET	O	0	0	SW		UNK	UNK	1800	TUESDAY
		2		EAST		O	0							
		3		EAST		O	0							
88		1	8/24/2016	WEST	INTERSECTION OF FRENCH STREET AND JOHN STREET	O	0	0	SW		CLEAR	DAYLIGHT	1045	WEDNESDAY
		2		WEST		O	0							
89		1	8/26/2016	NORTH	ARCAND DRIVE BETWEEN FATHER MORISSETTE BOULEVARD AND MERRIMACK STREET	O	0	0	SW		CLEAR	DAYLIGHT	1510	FRIDAY
		2		NORTH		O	0							
90		1	8/31/2016	SOUTH	INTERSECTION OF MERRIMACK STREET, ARCAND DRIVE, AND DUTTON STREET	O	1	0	BIKE		CLOUDY	DAYLIGHT	1045	WEDNESDAY
91		1	9/8/2016	EAST	INTERSECTION OF FRENCH STREET AND BRIDGE STREET	O	1	0	PED		CLEAR	DAYLIGHT	1010	THURSDAY
92		1	9/9/2016	WEST	INTERSECTION OF FATHER MORISSETTE BOULEVARD AND ARCAND DRIVE	O	0	0	A		CLEAR	DAYLIGHT	1145	FRIDAY
		2		SOUTH		O	0							
93		1	9/21/2016	EAST	INTERSECTION OF MERRIMACK STREET AND CENTRAL STREET	O	0	0	RE		CLEAR	DAYLIGHT	1310	WEDNESDAY
		2		EAST		O	0							
94		1	10/13/2016	NORTH	WITHIN AYOTTE PARKING GARAGE STRUCTURE	O	0	0	A		CLEAR	DAYLIGHT	1450	THURSDAY
		2		NA		NA	0							
95		1	10/13/2016	WEST	INTERSECTION OF MERRIMACK STREET AND BRIDGE STREET	O	0	0	SW		CLOUDY	DARK-LIGHTED	1749	THURSDAY
		2		WEST		O	0							
96		1	10/17/2016	EAST	MERRIMACK STREET BETWEEN PALMER STREET AND JOHN STREET	O	0	0	RE		UNK	DAYLIGHT	1130	MONDAY
		2		EAST		O	0							
97		1	10/24/2016	EAST	INTERSECTION OF FATHER MORISSETTE BOULEVARD AND ARCAND DRIVE	O	0	0	BIKE		CLEAR	DAYLIGHT	0720	MONDAY
98		1	10/26/2016	WEST	MERRIMACK STREET BETWEEN PALMER STREET AND JOHN STREET	O	0	0	UNK		UNK	UNK	1730	WEDNESDAY
		2		NA		NA	0							
99		1	11/11/2016	SOUTH	INTERSECTION OF MERRIMACK STREET, ARCAND DRIVE, AND WORTHEN STREET	O	0	0	OBJ		CLEAR	DAYLIGHT	0815	FRIDAY
100		1	11/21/2016	EAST	PAIGE STREET BETWEEN JOHN STREET AND BRIDGE STREET	O	0	0	RE		CLOUDY	DAYLIGHT	1000	MONDAY
		2		EAST		O	0							
101		1	11/29/2016	EAST	INTERSECTION OF FRENCH STREET AND BROOKINGS STREET	O	1	0	RE		RAIN	DARK-NOT LIT	1650	TUESDAY
		2		EAST		O	0							
102		1	11/30/2016	EAST	MERRIMACK STREET BETWEEN KIRK STREET AND PALMER STREET	O	0	0	A		CLEAR	DAYLIGHT	1131	WEDNESDAY
		2		EAST		O	0							
103		1	11/30/2016	WEST	INTERSECTION OF FRENCH STREET AND KIRK STREET	O	0	0	RE		CLOUDY	DAYLIGHT	1440	WEDNESDAY
		2		WEST		O	0							
104		1	12/5/2016	NORTH	INTERSECTION OF KIRK STREET AND LEE STREET	O	0	0	SW		SNOW	DAYLIGHT	0800	MONDAY
		2		NORTH		O	0							

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105		1	12/5/2016	NA	WITHIN AYOTTE PARKING GARAGE STRUCTURE	NA	0	0	UNK		UNK	UNK	UNK	MONDAY
		2		UNK		O	0							
106		1	12/8/2016	EAST	INTERSECTION OF FRENCH STREET AND JOHN STREET	O	0	0	A		CLEAR	DARK-LIGHTED	1828	THURSDAY
		2		EAST		O	0							
107		1	12/9/2016	NORTH	ARCAND DRIVE BETWEEN FATHER MORISSETTE BOULEVARD AND MERRIMACK STREET	O	0	0	SW		CLEAR	DARK-LIGHTED	1917	FRIDAY
		2		NORTH		O	0							
108		1	12/13/2016	WEST	INTERSECTION OF MERRIMACK STREET AND WORTHEN STREET	O	0	0	SW		CLEAR	DARK-LIGHTED	2020	TUESDAY
		2		WEST		O	0							
109		1	12/14/2016	WEST	MERRIMACK STREET BETWEEN JOHN STREET AND CENTRAL STREET	O	1	0	OBJ		CLEAR	DARK-LIGHTED	1909	WEDNESDAY
110		1	12/20/2016	SOUTH	INTERSECTION OF FATHER MORISSETTE BOULEVARD AND ARCAND DRIVE	O	1	0	PED		CLEAR	DAYLIGHT	1353	TUESDAY
111		1	12/21/2016	WEST	INTERSECTION OF MERRIMACK STREET, ARCAND DRIVE, AND DUTTON STREET	O	0	0	SW		CLEAR	DAYLIGHT	1148	WEDNESDAY
		2		WEST		O	0							
112		1	1/9/2017	EAST	INTERSECTION OF FATHER MORISSETTE BOULEVARD AND ARCAND DRIVE	O	0	0	SW		CLEAR	DAYLIGHT	0740	MONDAY
		2		EAST		O	0							
113		1	1/28/2017	UNK	ARCAND DRIVE BETWEEN FATHER MORISSETTE BOULEVARD AND MERRIMACK STREET	O	0	0	HO		CLEAR	DARK-LIGHTED	0352	SATURDAY
		2		NORTH		O	0							
		3		NORTH		O	0							
114		1	1/10/2017	SOUTH	JOHN STREET AT 75 JOHN STREET PARKING GARAGE ENTRANCE	O	0	0	PED		CLOUDY	DUSK	1627	TUESDAY
115		1	1/11/2017	EAST	MERRIMACK STREET BETWEEN KIRK STREET AND PALMER STREET	O	0	0	RE		CLEAR	DAYLIGHT	1510	WEDNESDAY
		2		EAST		O	0							
116		1	1/14/2017	WEST	INTERSECTION OF MERRIMACK STREET AND KIRK STREET	O	1	0	RE		CLOUDY	DAYLIGHT	1545	SATURDAY
		2		WEST		O	0							
117		1	1/30/2017	NORTH	INTERSECTION OF MERRIMACK STREET, ARCAND DRIVE, AND DUTTON STREET	O	0	0	RE		CLEAR	DAYLIGHT	1547	MONDAY
		2		NORTH		O	0							
118		1	2/6/2017	SOUTH	INTERSECTION OF FRENCH STREET AND BRIDGE STREET	O	0	0	HO		CLEAR	DAYLIGHT	1206	MONDAY
		2		NORTH		O	0							
		3		WEST		O	0							
119		1	2/11/2017	EAST	MERRIMACK STREET BETWEEN ARCAND DRIVE AND SHATTUCK STREET	O	0	0	SW		SNOW	DAYLIGHT	1330	SATURDAY
		2		NA		NA	0							
120		1	2/12/2017	EAST	INTERSECTION OF FRENCH STREET AND JOHN STREET	O	0	0	RE		SNOW	DAYLIGHT	1230	SUNDAY
		2		EAST		O	0							
121		1	3/4/2017	EAST	MERRIMACK STREET BETWEEN PALMER STREET AND JOHN STREET	O	1	0	PED		CLEAR	DUSK	1857	SATURDAY
122		1	3/5/2017	EAST	INTERSECTION OF MERRIMACK STREET AND CENTRAL STREET	O	1	0	PED		CLEAR	DARK-LIGHTED	0146	SUNDAY

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123		1	3/8/2017	SOUTH	INTERSECTION OF MERRIMACK STREET, ARCAND DRIVE, AND DUTTON STREET	O	0	0	SW		CLEAR	DAYLIGHT	1215	WEDNESDAY
		2		SOUTH		O	0							
124		1	3/10/2017	EAST	INTERSECTION OF FRENCH STREET AND JOHN STREET	O	0	0	A		SNOW	DAYLIGHT	1630	FRIDAY
		2		NORTH		O	0							
125		1	3/19/2017	NORTH	ARCAND DRIVE BETWEEN FATHER MORISSETTE BOULEVARD AND MERRIMACK STREET	O	0	0	OBJ		CLEAR	DARK-LIGHTED	0710	SUNDAY
126	017-0005022	1	3/19/2017	UNK	MERRIMACK STREET BETWEEN PALMER STREET AND JOHN STREET	O	UNK	0	UNK		UNK	UNK	1404	SUNDAY
		2		UNK		O	UNK							
						TOTAL	15	0						

APPENDIX E

Speed Data

This sheet is for double sided printing purposes

PDI File# 175563 B-NB
Arcard Drive (NB) south of Father Morrissette Boulevard
City, State: Lowell, MA

Date	Starting Hr:min	0 to <5	5 to <10	10 to <15	15 to <20	20 to <25	25 to <30	30 to <35	35 to <40	40 to <45	45 to <50	50 to <55	55 to <60	60 to <65	65 to <70	70 to <75	75 to <80	80 to <85	85 to <90	90 to <95	95 to >100	Total Counts	Ave Speed	85pct Speed	10mph Pace
3/29/2017	0:00	0	0	0	0	0	5	7	0	0	0	0	0	0	0	0	0	0	0	0	0	12	26.3	28.0	19 to 29
3/29/2017	0:15	0	0	0	0	0	4	5	0	0	0	0	0	0	0	0	0	0	0	0	0	9	25.8	29.5	20 to 30
3/29/2017	0:30	0	0	0	1	2	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	7	22.9	28.0	19 to 29
3/29/2017	0:45	0	0	0	1	3	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	11	22.6	26.0	18 to 28
3/29/2017	1:00	0	0	0	0	0	3	6	1	0	0	0	0	0	0	0	0	0	0	0	0	10	26.8	29.0	21 to 31
3/29/2017	1:15	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	26.3	32.0	22 to 32
3/29/2017	1:30	0	0	0	0	1	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	8	25.0	29.7	20 to 30
3/29/2017	1:45	0	0	0	1	0	3	6	0	0	0	0	0	0	0	0	0	0	0	0	0	10	24.6	27.5	19 to 29
3/29/2017	2:00	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	29.0	29.0	19 to 29
3/29/2017	2:15	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	6	25.8	27.0	19 to 29
3/29/2017	2:30	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	30.0	30.0	20 to 30
3/29/2017	2:45	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	4	27.3	26.0	21 to 31
3/29/2017	3:00	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	28.7	36.0	15 to 25
3/29/2017	3:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	*
3/29/2017	3:30	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	3	25.7	30.0	20 to 30
3/29/2017	3:45	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4	23.8	29.0	8 to 18
3/29/2017	4:00	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4	27.0	27.0	18 to 28
3/29/2017	4:15	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	27.0	28.0	18 to 28
3/29/2017	4:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	*
3/29/2017	4:45	0	0	0	0	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	4	23.8	25.0	15 to 25
3/29/2017	5:00	0	0	0	0	0	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	6	27.7	32.0	22 to 32
3/29/2017	5:15	0	0	0	0	1	2	5	0	0	0	0	0	0	0	0	0	0	0	0	0	8	25.6	28.0	19 to 29
3/29/2017	5:30	0	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4	24.3	27.0	18 to 28
3/29/2017	5:45	0	0	0	0	1	4	9	3	1	1	0	0	0	0	0	0	0	0	0	0	19	28.4	31.0	21 to 31
3/29/2017	6:00	0	0	0	0	0	4	7	3	0	1	0	0	0	0	0	0	0	0	0	0	15	28.5	32.0	22 to 32
3/29/2017	6:15	0	0	0	2	2	11	12	2	0	0	0	0	0	0	0	0	0	0	0	0	29	24.7	29.3	22 to 32
3/29/2017	6:30	0	0	0	1	5	14	21	8	0	0	0	0	0	0	0	0	0	0	0	0	49	26.1	30.3	22 to 32
3/29/2017	6:45	0	0	1	1	5	27	28	6	1	0	0	0	0	0	0	0	0	0	0	0	69	25.1	29.0	21 to 31
3/29/2017	7:00	0	0	2	1	7	32	31	11	0	1	0	0	0	0	0	0	0	0	0	0	85	25.7	29.9	20 to 30
3/29/2017	7:15	0	0	0	1	21	31	33	10	0	0	0	0	0	0	0	0	0	0	0	0	96	24.6	29.3	18 to 28
3/29/2017	7:30	0	1	0	6	13	48	22	4	0	0	0	0	0	0	0	0	0	0	0	0	94	23.2	27.8	20 to 30
3/29/2017	7:45	0	0	1	0	22	26	16	7	0	0	0	0	0	0	0	0	0	0	0	0	72	23.5	28.7	17 to 27
3/29/2017	8:00	0	0	0	0	3	21	27	9	2	0	0	0	0	0	0	0	0	0	0	0	62	26.6	30.5	21 to 31
3/29/2017	8:15	0	0	1	1	4	20	32	7	0	0	0	0	0	0	0	0	0	0	0	0	65	25.9	29.0	22 to 32
3/29/2017	8:30	0	0	0	2	8	17	31	10	1	0	0	0	0	0	0	0	0	0	0	0	69	25.9	30.3	22 to 32
3/29/2017	8:45	0	0	0	0	11	24	22	6	1	0	0	0	0	0	0	0	0	0	0	0	64	25.0	29.0	18 to 28
3/29/2017	9:00	0	0	2	0	1	15	21	9	1	0	0	0	0	0	0	0	0	0	0	0	49	26.3	31.0	22 to 32
3/29/2017	9:15	0	0	0	3	5	19	27	9	0	0	0	0	0	0	0	0	0	0	0	0	63	25.7	30.0	22 to 32
3/29/2017	9:30	0	0	1	2	2	33	24	8	0	0	0	0	0	0	0	0	0	0	0	0	70	25.2	29.6	21 to 31
3/29/2017	9:45	0	0	0	0	4	16	34	13	0	0	0	0	0	0	0	0	0	0	0	0	67	26.7	30.5	22 to 32
3/29/2017	10:00	0	0	0	1	6	14	20	8	0	0	0	0	0	0	0	0	0	0	0	0	49	25.9	30.3	22 to 32
3/29/2017	10:15	0	0	0	1	6	26	23	6	0	0	0	0	0	0	0	0	0	0	0	0	62	25.3	29.4	21 to 31
3/29/2017	10:30	0	0	0	3	5	8	22	8	0	0	0	0	0	0	0	0	0	0	0	0	46	25.7	30.2	22 to 32
3/29/2017	10:45	0	0	0	1	1	12	24	11	4	0	0	0	0	0	0	0	0	0	0	0	53	27.8	31.8	23 to 33
3/29/2017	11:00	0	0	0	1	3	11	15	11	2	0	0	0	0	0	0	0	0	0	0	0	43	27.1	32.7	21 to 31
3/29/2017	11:15	0	0	0	0	3	18	31	7	0	0	0	0	0	0	0	0	0	0	0	0	59	26.6	29.6	22 to 32
3/29/2017	11:30	0	0	0	0	7	25	30	7	0	0	0	0	0	0	0	0	0	0	0	0	69	25.7	29.0	20 to 30
3/29/2017	11:45	0	0	0	0	13	21	15	8	1	0	0	0	0	0	0	0	0	0	0	0	58	25.1	30.0	18 to 28
3/29/2017	12:00	0	0	0	2	5	29	35	10	2	0	0	0	0	0	0	0	0	0	0	0	83	26.0	30.0	21 to 31
3/29/2017	12:15	0	0	0	2	5	14	18	7	0	0	0	0	0	0	0	0	0	0	0	0	46	25.1	30.0	20 to 30
3/29/2017	12:30	0	0	0	0	2	15	21	10	0	0	0	0	0	0	0	0	0	0	0	0	48	27.1	30.8	22 to 32
3/29/2017	12:45	0	0	0	1	4	10	16	17	0	0	0	0	0	0	0	0	0	0	0	0	48	27.4	31.3	24 to 34
3/29/2017	13:00	0	0	0	3	2	23	20	6	1	0	0	0	0	0	0	0	0	0	0	0	55	25.4	29.7	21 to 31
3/29/2017	13:15	0	0	0	0	4	11	27	6	3	0	0	0	0	0	0	0	0	0	0	0	51	27.5	30.5	22 to 32
3/29/2017	13:30	0	0	0	1	2	19	30	15	0	1	0	0	0	0	0	0	0	0	0	0	68	27.3	30.8	22 to 32
3/29/2017	13:45	0	0	0	0	4	13	31	5	0	0	0	0	0	0	0	0	0	0	0	0	53	26.5	28.9	24 to 34
3/29/2017	14:00	0	0	0	4	6	20	28	5	0	0	0	0	0	0	0	0	0	0	0	0	63	25.4	29.3	22 to 32
3/29/2017	14:15	0	0	1	1	3	11	27	10	3	0	0	0	0	0	0	0	0	0	0	0	56	27.1	32.0	22 to 32
3/29/2017	14:30	0	0	0	3	3	10	27	5	1	0	0	0	0	0	0	0	0	0	0	0	49	26.4	29.8	23 to 33
3/29/2017	14:45	0	0	0	1	2	20	32	14	1	0	0	0	0	0	0	0	0	0	0	0	70	27.5	31.0	22 to 32
3/29/2017	15:00	0	0	0	0	5	22	27	13	0	0	0	0	0	0	0	0	0	0	0	0	67	26.8	30.8	22 to 32
3/29/2017	15:15	0	0	0	0	12	21	31	11	3	0	0	0	0	0	0	0	0	0	0	0	78	26.1	30.5	23 to 33
3/29/2017	15:30	0	0	1	1	7	11	31	20	1	0	0	0	0	0	0	0	0	0	0	0	72	27.0	31.7	23 to 33
3/29/2017	15:45	0	0	2	0	7	16	40	8	1	0	0	0	0	0	0	0	0	0	0	0	74	25.9	29.7	22 to 32
3/29/2017	16:00	0	0	0	3	10	24	39	8	0	0	0	0	0	0	0	0	0	0	0	0	84	25.2	29.0	21 to 31
3/29/2017	16:15	0	0	0	0	9	29	35	11	3	0	0	0	0	0	0	0	0	0	0	0	87	26.0	30.2	21 to 31

3/29/2017	16:30	0	0	0	2	18	24	23	8	2	0	0	0	0	0	0	0	0	0	0	0	77	24.4	29.0	19 to 29
3/29/2017	16:45	0	0	1	1	27	23	32	6	1	0	0	0	0	0	0	0	0	0	0	0	91	23.6	27.9	18 to 28
3/29/2017	17:00	0	0	0	2	16	25	43	12	1	0	0	0	0	0	0	0	0	0	0	0	99	25.8	29.8	20 to 30
3/29/2017	17:15	0	0	1	1	5	18	33	29	1	0	0	0	0	0	0	0	0	0	0	0	88	27.8	31.3	24 to 34
3/29/2017	17:30	0	0	0	0	8	17	40	21	0	1	0	0	0	0	0	0	0	0	0	0	87	27.4	32.0	25 to 35
3/29/2017	17:45	0	0	0	1	9	37	44	14	0	0	0	0	0	0	0	0	0	0	0	0	105	26.0	29.8	21 to 31
3/29/2017	18:00	0	0	0	0	5	26	45	11	0	2	0	0	0	0	0	0	0	0	0	0	89	27.1	30.0	22 to 32
3/29/2017	18:15	0	0	0	0	3	17	38	18	0	0	0	0	0	0	0	0	0	0	0	0	76	27.8	31.0	23 to 33
3/29/2017	18:30	0	0	2	2	2	16	30	13	1	0	0	0	0	0	0	0	0	0	0	0	66	26.3	30.6	22 to 32
3/29/2017	18:45	0	0	0	2	5	20	28	9	1	0	0	0	0	0	0	0	0	0	0	0	65	26.1	30.0	22 to 32
3/29/2017	19:00	0	1	0	0	3	13	34	10	1	0	0	0	0	0	0	0	0	0	0	0	62	27.0	30.4	21 to 31
3/29/2017	19:15	0	0	0	0	4	17	25	7	3	0	0	0	0	0	0	0	0	0	0	0	56	26.8	31.0	22 to 32
3/29/2017	19:30	0	0	0	0	6	5	16	4	0	0	0	0	0	0	0	0	0	0	0	0	31	26.2	29.7	20 to 30
3/29/2017	19:45	0	0	0	2	4	14	27	3	0	0	0	0	0	0	0	0	0	0	0	0	50	25.6	29.0	21 to 31
3/29/2017	20:00	0	0	0	0	1	16	21	8	0	0	0	0	0	0	0	0	0	0	0	0	46	26.7	30.3	21 to 31
3/29/2017	20:15	0	0	1	0	2	12	23	7	1	0	0	0	0	0	0	0	0	0	0	0	46	27.0	30.2	21 to 31
3/29/2017	20:30	0	0	0	0	4	14	22	5	0	0	0	0	0	0	0	0	0	0	0	0	45	26.3	28.9	20 to 30
3/29/2017	20:45	0	0	0	0	1	8	14	10	1	0	0	0	0	0	0	0	0	0	0	0	34	28.2	33.0	23 to 33
3/29/2017	21:00	0	0	0	1	0	7	12	4	1	0	0	0	0	0	0	0	0	0	0	0	25	27.0	31.0	22 to 32
3/29/2017	21:15	0	0	0	1	1	6	12	7	0	0	0	0	0	0	0	0	0	0	0	0	27	27.0	31.0	25 to 35
3/29/2017	21:30	0	0	0	0	3	9	21	5	1	0	0	0	0	0	0	0	0	0	0	0	39	27.1	30.0	21 to 31
3/29/2017	21:45	0	0	0	0	1	5	9	3	0	0	0	0	0	0	0	0	0	0	0	0	18	27.2	30.0	22 to 32
3/29/2017	22:00	0	0	0	1	4	1	12	3	0	0	0	0	0	0	0	0	0	0	0	0	21	26.3	30.0	24 to 34
3/29/2017	22:15	0	0	0	0	2	2	11	7	0	0	0	0	0	0	0	0	0	0	0	0	22	28.5	31.8	22 to 32
3/29/2017	22:30	0	0	0	0	2	3	8	6	0	0	0	0	0	0	0	0	0	0	0	0	19	27.7	31.0	22 to 32
3/29/2017	22:45	0	0	0	0	1	3	7	4	2	0	0	0	0	0	0	0	0	0	0	0	17	29.0	32.0	22 to 32
3/29/2017	23:00	0	0	0	0	1	8	6	3	0	0	0	0	0	0	0	0	0	0	0	0	18	26.2	28.0	18 to 28
3/29/2017	23:15	0	0	0	0	4	5	12	0	0	0	0	0	0	0	0	0	0	0	0	0	21	25.5	29.0	20 to 30
3/29/2017	23:30	0	0	0	1	2	5	9	4	1	0	0	0	0	0	0	0	0	0	0	0	22	26.5	30.7	22 to 32
3/29/2017	23:45	0	0	0	1	0	5	10	4	0	0	0	0	0	0	0	0	0	0	0	0	20	26.3	30.3	21 to 31
24 Hr Summary		**0**	**2**	**17**	**70**	**407**	**1232**	**1820**	**623**	**52**	**7**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4230**	**26.1**	**31.0**	**22 to 32**
		0.00%	**0.05%**	**0.40%**	**1.65%**	**9.62%**	**29.13%**	**43.03%**	**14.73%**	**1.23%**	**0.17%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**				

PDI File# 175563 B-SB
Arcard Drive (SB) south of Father Morrissette Boulevard
City, State: Lowell, MA

Date	Starting Hr:min	0 to <5	5 to <10	10 to <15	15 to <20	20 to <25	25 to <30	30 to <35	35 to <40	40 to <45	45 to <50	50 to <55	55 to <60	60 to <65	65 to <70	70 to <75	75 to <80	80 to <85	85 to <90	90 to <95	95 to >100	Total Counts	Ave Speed	85pct Speed	10mph Pace
3/29/2017	0:00	0	0	0	0	5	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	12	26.3	28.5	19 to 29
3/29/2017	0:15	0	0	0	0	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	26.4	29.5	20 to 30
3/29/2017	0:30	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	28.0	33.0	23 to 33
3/29/2017	0:45	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	21.0	30.0	10 to 20
3/29/2017	1:00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	24.0	24.0	14 to 24
3/29/2017	1:15	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	11.0	11.0	1 to 11
3/29/2017	1:30	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	31.0	31.0	21 to 31
3/29/2017	1:45	0	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	23.8	26.0	17 to 27
3/29/2017	2:00	0	0	1	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	23.8	26.0	17 to 27
3/29/2017	2:15	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	21.0	21.0	11 to 21
3/29/2017	2:30	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	27.0	27.0	17 to 27
3/29/2017	2:45	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	25.0	25.0	15 to 25
3/29/2017	3:00	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	24.3	25.0	17 to 27
3/29/2017	3:15	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	24.5	25.0	20 to 30
3/29/2017	3:30	0	0	0	0	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	26.5	29.0	20 to 30
3/29/2017	3:45	0	0	0	1	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4	25.8	27.0	17 to 27
3/29/2017	4:00	0	0	0	0	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	5	28.0	31.5	22 to 32
3/29/2017	4:15	0	0	0	0	1	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	27.1	29.0	20 to 30
3/29/2017	4:30	0	0	0	1	0	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	6	28.5	29.0	19 to 29
3/29/2017	4:45	0	0	0	0	2	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	7	28.7	32.0	22 to 32
3/29/2017	5:00	0	0	1	0	5	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	13	25.3	29.0	21 to 31
3/29/2017	5:15	0	0	0	1	3	15	4	0	0	0	0	0	0	0	0	0	0	0	0	0	23	27.7	30.3	21 to 31
3/29/2017	5:30	0	0	1	0	3	12	8	0	0	0	0	0	0	0	0	0	0	0	0	0	24	28.3	31.5	24 to 34
3/29/2017	5:45	0	0	0	0	8	16	8	1	0	0	0	0	0	0	0	0	0	0	0	0	33	28.4	31.3	22 to 32
3/29/2017	6:00	0	0	0	1	12	20	5	1	0	0	0	1	0	0	0	0	0	0	0	0	40	27.6	30.3	21 to 31
3/29/2017	6:15	0	1	0	0	17	14	14	2	0	0	0	0	0	0	0	0	0	0	0	0	48	27.4	32.0	22 to 32
3/29/2017	6:30	0	0	1	2	10	24	7	0	0	0	0	0	0	0	0	0	0	0	0	0	44	27.0	30.0	22 to 32
3/29/2017	6:45	0	0	0	1	20	33	10	2	0	0	0	0	0	0	0	0	0	0	0	0	66	27.3	30.5	21 to 31
3/29/2017	7:00	0	0	0	4	25	43	6	1	0	0	0	0	0	0	0	0	0	0	0	0	79	26.2	29.2	20 to 30
3/29/2017	7:15	0	0	0	11	30	36	9	1	0	0	0	0	0	0	0	0	0	0	0	0	87	25.7	29.7	20 to 30
3/29/2017	7:30	0	0	2	14	29	38	16	0	0	0	0	0	0	0	0	0	0	0	0	0	99	25.7	30.1	22 to 32
3/29/2017	7:45	0	0	2	13	45	50	6	0	0	0	0	0	0	0	0	0	0	0	0	0	116	25.0	28.6	20 to 30
3/29/2017	8:00	0	0	0	10	20	47	5	1	0	0	0	0	0	0	0	0	0	0	0	0	83	26.1	29.3	21 to 31
3/29/2017	8:15	0	0	1	1	24	33	11	1	0	0	0	0	0	0	0	0	0	0	0	0	71	26.7	30.2	22 to 32
3/29/2017	8:30	0	0	0	6	23	35	5	0	0	0	0	0	0	0	0	0	0	0	0	0	69	25.7	29.0	20 to 30
3/29/2017	8:45	0	0	1	7	32	18	5	0	0	0	0	0	0	0	0	0	0	0	0	0	63	24.7	27.7	18 to 28
3/29/2017	9:00	0	0	1	5	15	31	8	3	0	0	0	0	0	0	0	0	0	0	0	0	63	26.7	31.0	22 to 32
3/29/2017	9:15	0	0	1	4	28	26	10	0	0	0	0	0	0	0	0	0	0	0	0	0	69	25.8	30.0	22 to 32
3/29/2017	9:30	0	0	4	9	34	28	7	0	0	0	0	0	0	0	0	0	0	0	0	0	82	24.9	28.9	20 to 30
3/29/2017	9:45	0	0	1	6	13	31	13	1	0	0	0	0	0	0	0	0	0	0	0	0	65	26.8	30.6	22 to 32
3/29/2017	10:00	0	0	0	2	21	33	6	0	0	0	0	0	0	0	0	0	0	0	0	0	62	26.0	29.4	21 to 31
3/29/2017	10:15	0	0	0	7	20	32	7	0	0	0	0	0	0	0	0	0	0	0	0	0	66	26.0	29.5	21 to 31
3/29/2017	10:30	0	0	1	2	23	31	11	1	0	0	0	0	0	0	0	0	0	0	0	0	69	26.7	30.5	22 to 32
3/29/2017	10:45	0	0	0	7	17	37	8	2	0	0	0	0	0	0	0	0	0	0	0	0	71	26.5	29.8	21 to 31
3/29/2017	11:00	0	0	2	3	26	25	10	0	0	0	0	0	0	0	0	0	0	0	0	0	66	26.0	30.0	21 to 31
3/29/2017	11:15	0	0	2	5	16	36	13	1	1	0	0	0	0	0	0	0	0	0	0	0	74	26.6	30.6	21 to 31
3/29/2017	11:30	0	0	1	5	27	15	11	0	0	0	0	0	0	0	0	0	0	0	0	0	59	25.7	30.7	20 to 30
3/29/2017	11:45	0	2	4	30	40	39	4	0	0	0	0	0	0	0	0	0	0	0	0	0	119	23.0	27.4	18 to 28
3/29/2017	12:00	0	0	0	10	36	40	8	0	0	0	0	0	0	0	0	0	0	0	0	0	94	25.6	29.3	21 to 31
3/29/2017	12:15	0	0	1	8	18	43	16	3	0	0	0	0	0	0	0	0	0	0	0	0	89	27.1	31.0	23 to 33
3/29/2017	12:30	0	0	0	5	26	47	7	1	0	0	0	0	0	0	0	0	0	0	0	0	86	26.5	29.3	20 to 30
3/29/2017	12:45	0	0	0	0	17	37	6	0	0	0	0	0	0	0	0	0	0	0	0	0	60	27.3	29.0	21 to 31
3/29/2017	13:00	0	2	1	9	23	15	3	0	0	0	0	0	0	0	0	0	0	0	0	0	53	23.2	27.3	18 to 28
3/29/2017	13:15	0	1	0	8	29	34	7	2	0	0	0	0	0	0	0	0	0	0	0	0	81	25.5	29.4	21 to 31
3/29/2017	13:30	0	0	1	8	17	30	8	0	0	0	0	0	0	0	0	0	0	0	0	0	64	25.8	29.6	20 to 30
3/29/2017	13:45	0	0	0	9	17	40	7	1	0	0	0	0	0	0	0	0	0	0	0	0	74	26.2	29.4	21 to 31
3/29/2017	14:00	0	0	3	7	35	36	14	1	1	0	0	0	0	0	0	0	0	0	0	0	97	26.0	30.2	21 to 31
3/29/2017	14:15	0	0	0	2	22	53	12	3	0	0	0	0	0	0	0	0	0	0	0	0	92	27.5	30.3	21 to 31
3/29/2017	14:30	0	0	1	4	11	36	11	3	0	0	0	0	0	0	0	0	0	0	0	0	66	27.9	30.8	23 to 33
3/29/2017	14:45	0	0	0	2	27	26	19	0	0	0	0	0	0	0	0	0	0	0	0	0	74	26.9	30.8	22 to 32
3/29/2017	15:00	0	0	0	5	27	35	7	0	0	0	0	0	0	0	0	0	0	0	0	0	74	26.3	29.0	22 to 32
3/29/2017	15:15	0	0	1	6	29	48	12	1	2	0	0	0	0	0	0	0	0	0	0	0	99	26.7	30.0	20 to 30
3/29/2017	15:30	0	0	1	3	28	53	13	1	0	0	0	0	0	0	0	0	0	0	0	0	99	26.7	29.9	21 to 31
3/29/2017	15:45	0	1	4	6	29	32	10	1	0	0	0	0	0	0	0	0	0	0	0	0	83	25.5	29.8	21 to 31
3/29/2017	16:00	0	0	6	16	28	39	12	0	0	0	0	0	0	0	0	0	0	0	0	0	101	24.8	29.4	20 to 30
3/29/2017	16:15	0	0	2	8	35	41	6	1	0	0	0	0	0	0	0	0	0	0	0	0	93	25.4	28.6	20 to 30

3/29/2017	16:30	0	0	2	3	31	35	14	2	0	0	0	0	0	0	0	0	0	0	0	0	87	26.5	30.8	21 to 31
3/29/2017	16:45	0	0	4	9	33	28	7	0	1	0	0	0	0	0	0	0	0	0	0	0	82	24.8	28.4	19 to 29
3/29/2017	17:00	0	0	0	0	26	60	17	1	0	0	0	0	0	0	0	0	0	0	0	0	104	27.6	30.4	23 to 33
3/29/2017	17:15	0	0	1	3	33	48	13	1	0	0	0	0	0	0	0	0	0	0	0	0	99	26.8	29.9	22 to 32
3/29/2017	17:30	0	0	2	2	18	43	9	2	0	0	0	0	0	0	0	0	0	0	0	0	76	26.9	30.0	21 to 31
3/29/2017	17:45	0	0	1	2	23	26	9	1	0	0	0	0	0	0	0	0	0	0	0	0	62	26.9	30.5	22 to 32
3/29/2017	18:00	0	0	0	3	7	36	11	2	0	0	0	0	0	0	0	0	0	0	0	0	59	28.3	30.8	23 to 33
3/29/2017	18:15	0	0	1	3	10	41	16	0	0	0	0	0	0	0	0	0	0	0	0	0	71	27.5	30.6	23 to 33
3/29/2017	18:30	0	0	2	3	11	37	13	0	0	0	0	0	0	0	0	0	0	0	0	0	66	27.2	30.5	23 to 33
3/29/2017	18:45	0	0	0	2	7	22	4	0	0	0	0	0	0	0	0	0	0	0	0	0	35	26.9	29.8	23 to 33
3/29/2017	19:00	0	0	1	0	9	27	8	1	1	0	0	0	0	0	0	0	0	0	0	0	47	27.9	31.0	23 to 33
3/29/2017	19:15	0	0	0	1	13	27	7	1	0	0	0	0	0	0	0	0	0	0	0	0	49	27.3	30.3	22 to 32
3/29/2017	19:30	0	0	0	1	11	24	8	0	0	0	0	0	0	0	0	0	0	0	0	0	44	27.5	30.3	23 to 33
3/29/2017	19:45	0	0	0	1	6	20	6	0	0	0	0	0	0	0	0	0	0	0	0	0	33	27.6	30.5	23 to 33
3/29/2017	20:00	0	0	0	0	9	18	11	0	0	0	0	0	0	0	0	0	0	0	0	0	38	27.5	30.8	21 to 31
3/29/2017	20:15	0	0	0	5	12	24	8	0	0	0	0	0	0	0	0	0	0	0	0	0	49	26.8	30.3	22 to 32
3/29/2017	20:30	0	0	2	4	24	36	7	1	0	0	0	0	0	0	0	0	0	0	0	0	74	26.1	29.0	20 to 30
3/29/2017	20:45	0	0	1	3	10	14	2	0	0	0	0	0	0	0	0	0	0	0	0	0	30	25.3	29.0	21 to 31
3/29/2017	21:00	0	0	0	0	7	11	4	1	0	0	0	0	0	0	0	0	0	0	0	0	23	28.0	31.0	22 to 32
3/29/2017	21:15	0	0	0	3	5	9	2	0	0	0	0	0	0	0	0	0	0	0	0	0	19	25.5	29.0	19 to 29
3/29/2017	21:30	0	0	0	2	7	8	5	1	0	0	0	0	0	0	0	0	0	0	0	0	23	26.7	31.0	21 to 31
3/29/2017	21:45	0	0	0	1	2	10	2	0	0	0	0	0	0	0	0	0	0	0	0	0	15	27.4	30.0	20 to 30
3/29/2017	22:00	0	0	0	2	12	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	20	24.9	28.0	19 to 29
3/29/2017	22:15	0	0	0	0	1	6	4	0	0	0	0	0	0	0	0	0	0	0	0	0	11	29.3	32.5	25 to 35
3/29/2017	22:30	0	0	0	0	3	13	2	0	0	0	0	0	0	0	0	0	0	0	0	0	18	27.9	29.7	22 to 32
3/29/2017	22:45	0	0	0	0	7	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	11	26.2	29.0	20 to 30
3/29/2017	23:00	0	0	1	0	4	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	25.7	28.0	20 to 30
3/29/2017	23:15	0	0	0	3	8	11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	23	25.3	29.3	20 to 30
3/29/2017	23:30	0	0	3	1	4	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	15	23.7	30.5	21 to 31
3/29/2017	23:45	0	0	1	1	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	22.4	25.5	16 to 26
24 Hr Summary		**0**	**7**	**72**	**335**	**1423**	**2186**	**609**	**52**	**6**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4691**	**26.3**	**30.0**	**21 to 31**
		0.00%	**0.15%**	**1.53%**	**7.14%**	**30.33%**	**46.60%**	**12.98%**	**1.11%**	**0.13%**	**0.00%**	**0.00%**	**0.02%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**				

Father Morissette Boulevard (EB)
just west of High School School Crosswalk
City, State: Lowell, MA
Client: Bryant Associates/ T. Brayton

PRECISION
D A T A
INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

175563 A-EB Volume
Site Code: 216092

Start Time	A.M.	EB	P.M.													Wed 03/29/17
12:00	4		63													
12:15	5		75													
12:30	1		49													
12:45	6	16	43	230												
01:00	4		43													
01:15	2		50													
01:30	4		47													
01:45	8	18	57	197												
02:00	4		53													
02:15	4		39													
02:30	1		48													
02:45	1	10	56	196												
03:00	0		59													
03:15	0		48													
03:30	0		79													
03:45	1	1	63	249												
04:00	3		68													
04:15	0		70													
04:30	1		64													
04:45	6	10	73	275												
05:00	4		92													
05:15	9		73													
05:30	7		69													
05:45	17	37	60	294												
06:00	9		65													
06:15	20		44													
06:30	30		48													
06:45	47	106	44	201												
07:00	65		39													
07:15	109		37													
07:30	146		18													
07:45	124	444	33	127												
08:00	66		41													
08:15	52		39													
08:30	54		47													
08:45	52	224	41	168												
09:00	57		27													
09:15	38		17													
09:30	40		21													
09:45	38	173	5	70												
10:00	47		14													
10:15	49		19													
10:30	65		14													
10:45	46	207	12	59												
11:00	61		1													
11:15	61		9													
11:30	72		20													
11:45	98	292	8	38												
Total	1538		2104													
Percent			100.0 %		0.0%		0.0%									
Day Total		3642														
Peak	07:15	-	04:45	-	-	-	-	-	-	-	-	-	-	-	-	
Vol.	445	-	307	-	-	-	-	-	-	-	-	-	-	-	-	
P.H.F.	0.762		0.834													

Father Morissette Boulevard (EB)
just west of High School School Crosswalk
City, State: Lowell, MA
Client: Bryant Associates/ T. Brayton

PRECISION
D A T A
INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

175563 A-EB CLASS
Site Code: 216092

EB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
03/29/1														
7	0	6	10	0	0	0	0	0	0	0	0	0	0	16
01:00	0	11	3	0	4	0	0	0	0	0	0	0	0	18
02:00	0	8	2	0	0	0	0	0	0	0	0	0	0	10
03:00	0	0	1	0	0	0	0	0	0	0	0	0	0	1
04:00	1	5	2	2	0	0	0	0	0	0	0	0	0	10
05:00	0	14	12	0	11	0	0	0	0	0	0	0	0	37
06:00	0	58	25	1	22	0	0	0	0	0	0	0	0	106
07:00	13	341	68	1	19	2	0	0	0	0	0	0	0	444
08:00	0	155	41	4	22	0	1	1	0	0	0	0	0	224
09:00	2	105	37	3	22	3	0	1	0	0	0	0	0	173
10:00	0	129	50	1	26	1	0	0	0	0	0	0	0	207
11:00	4	207	51	8	19	1	0	2	0	0	0	0	0	292
12 PM	1	142	56	4	23	1	1	1	1	0	0	0	0	230
13:00	1	112	52	6	25	0	1	0	0	0	0	0	0	197
14:00	0	122	49	7	17	1	0	0	0	0	0	0	0	196
15:00	0	167	60	3	16	0	0	3	0	0	0	0	0	249
16:00	0	174	72	2	24	0	0	3	0	0	0	0	0	275
17:00	0	207	64	2	20	0	0	1	0	0	0	0	0	294
18:00	2	139	45	3	12	0	0	0	0	0	0	0	0	201
19:00	0	83	28	2	13	0	0	1	0	0	0	0	0	127
20:00	0	109	48	1	8	0	0	2	0	0	0	0	0	168
21:00	0	38	25	0	7	0	0	0	0	0	0	0	0	70
22:00	0	39	17	0	3	0	0	0	0	0	0	0	0	59
23:00	0	32	6	0	0	0	0	0	0	0	0	0	0	38
Total	24	2403	824	50	313	9	3	15	1	0	0	0	0	3642
Percent	0.7%	66.0%	22.6%	1.4%	8.6%	0.2%	0.1%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	07:00	07:00	07:00	11:00	10:00	09:00	08:00	11:00						07:00
Vol.	13	341	68	8	26	3	1	2						444
PM Peak	18:00	17:00	16:00	14:00	13:00	12:00	12:00	15:00	12:00					17:00
Vol.	2	207	72	7	25	1	1	3	1					294

Father Morissette Boulevard (EB)
just west of High School School Crosswalk
City, State: Lowell, MA
Client: Bryant Associates/ T. Brayton

PRECISION
D A T A
INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

175563 A-EB SPEED
Site Code: 216092

EB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
03/29/ 17	0	0	5	9	2	0	0	0	0	0	0	0	0	16	28	26
01:00	0	4	6	4	3	1	0	0	0	0	0	0	0	18	31	24
02:00	0	1	7	2	0	0	0	0	0	0	0	0	0	10	25	23
03:00	0	0	1	0	0	0	0	0	0	0	0	0	0	1	23	22
04:00	1	0	0	6	3	0	0	0	0	0	0	0	0	10	31	27
05:00	0	6	12	11	5	**2**	**1**	0	0	0	0	0	0	37	31	25
06:00	2	23	55	22	4	0	0	0	0	0	0	0	0	106	26	22
07:00	**146**	**110**	**178**	10	0	0	0	0	0	0	0	0	0	**444**	22	16
08:00	1	43	111	65	4	0	0	0	0	0	0	0	0	224	26	23
09:00	9	34	72	50	8	0	0	0	0	0	0	0	0	173	27	22
10:00	6	27	89	**77**	8	0	0	0	0	0	0	0	0	207	27	23
11:00	42	65	125	48	**12**	0	0	0	0	0	0	0	0	292	25	20
12 PM	11	49	93	68	9	0	0	0	0	0	0	0	0	230	27	22
13:00	6	25	89	62	15	0	0	0	0	0	0	0	0	197	27	23
14:00	3	23	89	64	15	2	0	0	0	0	0	0	0	196	28	24
15:00	2	36	111	87	13	0	0	0	0	0	0	0	0	249	27	23
16:00	3	31	98	**109**	**33**	1	0	0	0	0	0	0	0	275	28	25
17:00	**12**	**50**	**141**	78	12	1	0	0	0	0	0	0	0	**294**	27	22
18:00	11	31	74	71	11	3	0	0	0	0	0	0	0	201	27	23
19:00	2	15	50	44	11	4	1	0	0	0	0	0	0	127	28	24
20:00	4	30	67	60	7	0	0	0	0	0	0	0	0	168	27	23
21:00	0	6	15	27	16	4	**2**	0	0	0	0	0	0	70	32	27
22:00	0	4	17	22	9	**6**	1	0	0	0	0	0	0	59	32	27
23:00	0	2	12	16	8	0	0	0	0	0	0	0	0	38	30	26
Total	261	615	1517	1012	208	24	5	0	0	0	0	0	0	3642		
%	7.2%	16.9%	41.7%	27.8%	5.7%	0.7%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	07:00	07:00	07:00	10:00	11:00	05:00	05:00							07:00		
Vol.	146	110	178	77	12	2	1							444		
PM Peak	17:00	17:00	17:00	16:00	16:00	22:00	21:00							17:00		
Vol.	12	50	141	109	33	6	2							294		

Stats

15th Percentile :	16 MPH
50th Percentile :	22 MPH
85th Percentile :	27 MPH
95th Percentile :	30 MPH
Mean Speed(Average) :	22 MPH
10 MPH Pace Speed :	20-29 MPH
Number in Pace :	2529
Percent in Pace :	69.4%
Number of Vehicles > 25 MPH :	1047
Percent of Vehicles > 25 MPH :	28.7%

Father Morissette Boulevard (WB)
just east of High School Crosswalk
City, State: Lowell, MA
Client: Bryant Associates/ T. Brayton

PRECISION
D A T A
INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

175563 A-WB Volume
Site Code: 216092

Start Time	A.M.	WB	P.M.												
															Wed 03/29/17
12:00	8		98												
12:15	10		59												
12:30	3		91												
12:45	5	26	67	315											
01:00	2		61												
01:15	1		73												
01:30	1		72												
01:45	3	7	81	287											
02:00	1		81												
02:15	1		60												
02:30	0		57												
02:45	4	6	62	260											
03:00	1		58												
03:15	3		70												
03:30	5		65												
03:45	6	15	62	255											
04:00	1		75												
04:15	5		51												
04:30	5		68												
04:45	6	17	79	273											
05:00	10		78												
05:15	14		74												
05:30	16		99												
05:45	25	65	86	337											
06:00	36		70												
06:15	43		55												
06:30	43		37												
06:45	76	198	37	199											
07:00	72		33												
07:15	115		41												
07:30	126		31												
07:45	135	448	38	143											
08:00	68		31												
08:15	71		24												
08:30	64		39												
08:45	71	274	35	129											
09:00	71		29												
09:15	73		25												
09:30	69		23												
09:45	68	281	19	96											
10:00	61		10												
10:15	66		11												
10:30	74		6												
10:45	81	282	14	41											
11:00	79		8												
11:15	90		9												
11:30	77		13												
11:45	118	364	9	39											
Total	1983		2374												
Percent			100.0 %		0.0%		0.0%								
Day Total		4357													
Peak	07:00	-	05:00	-	-	-	-	-	-	-	-	-	-	-	-
Vol.	448	-	337	-	-	-	-	-	-	-	-	-	-	-	-
P.H.F.	0.830		0.851												

Father Morissette Boulevard (WB)
just east of High School Crosswalk
City, State: Lowell, MA
Client: Bryant Associates/ T. Brayton

PRECISION
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INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

175563 A-WB Class
Site Code: 216092

WB

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Total
03/29/1														
7	0	23	3	0	0	0	0	0	0	0	0	0	0	26
01:00	0	7	0	0	0	0	0	0	0	0	0	0	0	7
02:00	0	5	0	0	1	0	0	0	0	0	0	0	0	6
03:00	0	12	3	0	0	0	0	0	0	0	0	0	0	15
04:00	0	15	2	0	0	0	0	0	0	0	0	0	0	17
05:00	0	48	11	2	3	1	0	0	0	0	0	0	0	65
06:00	2	137	38	1	17	3	0	0	0	0	0	0	0	198
07:00	28	363	45	3	4	1	0	2	1	0	1	0	0	448
08:00	0	217	34	3	18	0	0	2	0	0	0	0	0	274
09:00	0	233	29	6	12	0	0	1	0	0	0	0	0	281
10:00	9	215	49	0	7	2	0	0	0	0	0	0	0	282
11:00	12	293	44	0	11	1	1	2	0	0	0	0	0	364
12 PM	6	243	38	2	22	2	0	2	0	0	0	0	0	315
13:00	1	220	42	6	15	2	0	1	0	0	0	0	0	287
14:00	3	217	30	0	9	1	0	0	0	0	0	0	0	260
15:00	0	220	30	0	4	0	0	1	0	0	0	0	0	255
16:00	0	230	37	1	4	0	0	1	0	0	0	0	0	273
17:00	6	291	36	0	3	1	0	0	0	0	0	0	0	337
18:00	2	170	24	1	2	0	0	0	0	0	0	0	0	199
19:00	5	121	14	0	3	0	0	0	0	0	0	0	0	143
20:00	1	109	16	0	2	1	0	0	0	0	0	0	0	129
21:00	0	82	11	0	3	0	0	0	0	0	0	0	0	96
22:00	0	34	7	0	0	0	0	0	0	0	0	0	0	41
23:00	0	31	8	0	0	0	0	0	0	0	0	0	0	39
Total	75	3536	551	25	140	15	1	12	1	0	1	0	0	4357
Percent	1.7%	81.2%	12.6%	0.6%	3.2%	0.3%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	07:00	07:00	10:00	09:00	08:00	06:00	11:00	07:00	07:00		07:00			07:00
Vol.	28	363	49	6	18	3	1	2	1		1			448
PM Peak	12:00	17:00	13:00	13:00	12:00	12:00		12:00						17:00
Vol.	6	291	42	6	22	2		2						337

PRECISION
D A T A
INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

Father Morissette Boulevard (WB)
just east of High School Crosswalk
City, State: Lowell, MA
Client: Bryant Associates/ T. Brayton

175563 A-WB Speed
Site Code: 216092

WB

Start Time	1 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59	60 64	65 69	70 9999	Total	85th % ile	Ave Speed
03/29/ 17	0	0	6	9	8	3	0	0	0	0	0	0	0	26	33	29
01:00	0	1	2	2	2	0	0	0	0	0	0	0	0	7	31	26
02:00	0	0	3	2	0	1	0	0	0	0	0	0	0	6	34	26
03:00	0	0	4	8	2	1	0	0	0	0	0	0	0	15	30	27
04:00	0	0	4	4	9	0	0	0	0	0	0	0	0	17	32	28
05:00	0	0	17	32	12	**4**	0	0	0	0	0	0	0	65	31	27
06:00	31	30	51	59	25	1	**1**	0	0	0	0	0	0	198	28	22
07:00	**190**	**50**	**186**	19	2	1	0	0	0	0	0	0	0	**448**	22	16
08:00	13	28	100	104	26	3	0	0	0	0	0	0	0	274	28	24
09:00	8	10	87	**135**	**38**	3	0	0	0	0	0	0	0	281	28	25
10:00	16	22	108	110	25	1	0	0	0	0	0	0	0	282	28	24
11:00	81	48	164	55	16	0	0	0	0	0	0	0	0	364	25	19
12 PM	6	19	**107**	138	37	**8**	0	0	0	0	0	0	0	315	28	25
13:00	7	19	94	138	26	3	0	0	0	0	0	0	0	287	28	25
14:00	6	17	77	118	36	6	0	0	0	0	0	0	0	260	29	25
15:00	18	21	83	100	30	3	0	0	0	0	0	0	0	255	28	24
16:00	7	6	89	125	**42**	4	0	0	0	0	0	0	0	273	29	26
17:00	18	**29**	98	**156**	35	0	0	**1**	0	0	0	0	0	**337**	28	24
18:00	**21**	14	63	61	38	2	0	0	0	0	0	0	0	199	30	24
19:00	1	3	35	81	22	0	**1**	0	0	0	0	0	0	143	29	26
20:00	10	7	58	45	9	0	0	0	0	0	0	0	0	129	27	23
21:00	0	4	20	57	15	0	0	0	0	0	0	0	0	96	29	26
22:00	0	1	17	16	5	1	1	0	0	0	0	0	0	41	29	26
23:00	0	0	9	13	10	6	0	1	0	0	0	0	0	39	34	29
Total	433	329	1482	1587	470	51	3	2	0	0	0	0	0	4357		
%	9.9%	7.6%	34.0%	36.4%	10.8%	1.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	07:00	07:00	07:00	09:00	09:00	05:00	06:00							07:00		
Vol.	190	50	186	135	38	4	1							448		
PM Peak	18:00	17:00	12:00	17:00	16:00	12:00	19:00	17:00						17:00		
Vol.	21	29	107	156	42	8	1	1						337		

Stats

15th Percentile :	17 MPH
50th Percentile :	23 MPH
85th Percentile :	28 MPH
95th Percentile :	32 MPH
Mean Speed(Average) :	23 MPH
10 MPH Pace Speed :	20-29 MPH
Number in Pace :	3069
Percent in Pace :	70.4%
Number of Vehicles > 25 MPH :	1796
Percent of Vehicles > 25 MPH :	41.2%

Park Garage Access
east of River Place
City, State: Lowell, MA
Client: Bryant Assocaites/ T. Brayton

PRECISION
D A T A
INDUSTRIES, LLC
46 Morton Street, Framingham, MA 01702
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdillc.com

175563 C Volume
Site Code: 216092

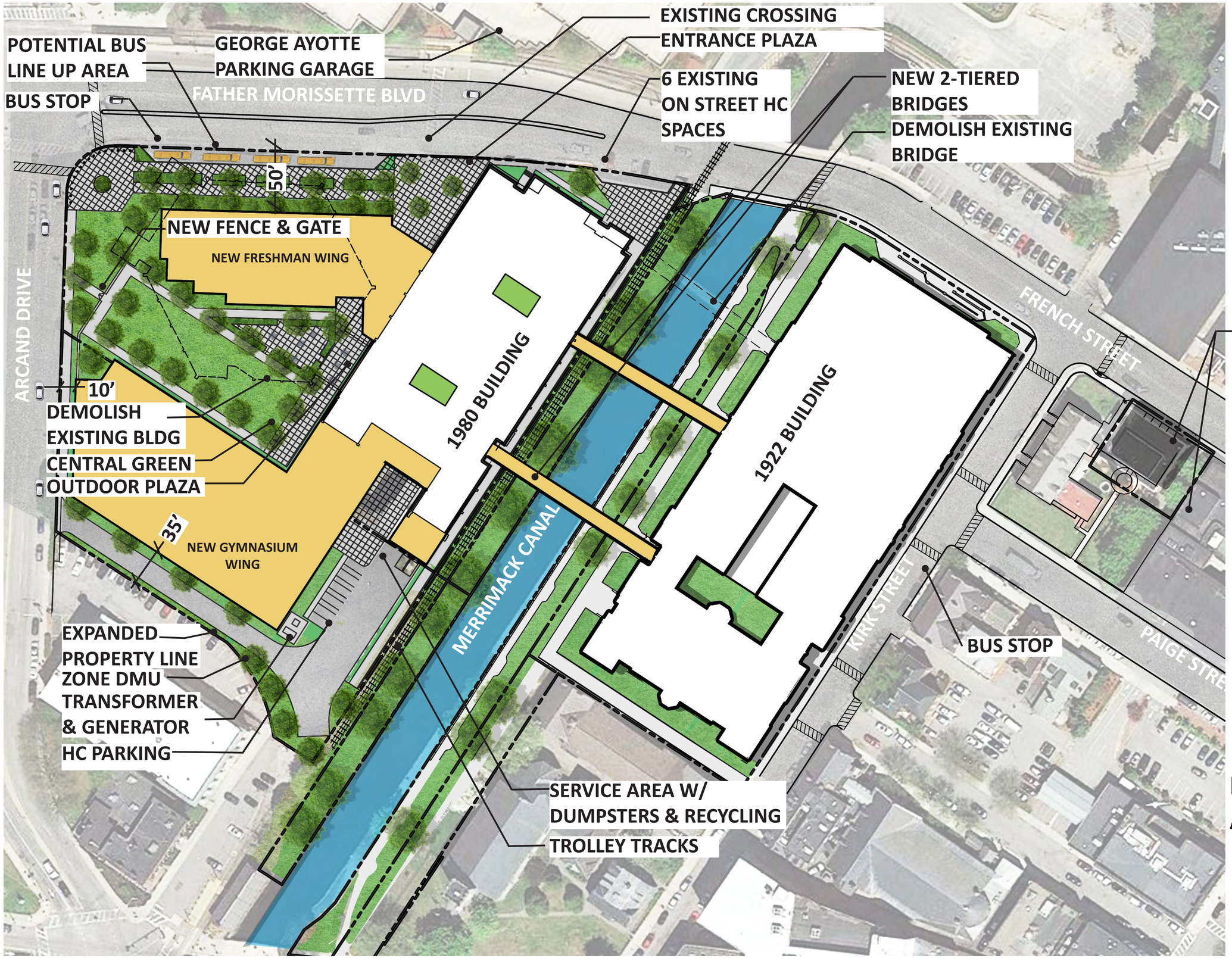
Start	EB (Enter)				WB (Exit)				Combined				03/29/17
Time	A.M.		P.M.		A.M.		P.M.		A.M.		P.M.		Wed
12:00	1		5		0		35		1		40		
12:15	0		5		0		25		0		30		
12:30	0		3		1		22		1		25		
12:45	0	1	5	18	0	1	6	88	0	2	11	106	
01:00	2		2		0		16		2		18		
01:15	0		6		0		25		0		31		
01:30	0		6		1		11		1		17		
01:45	0	2	1	15	0	1	9	61	0	3	10	76	
02:00	0		1		0		40		0		41		
02:15	0		0		0		39		0		39		
02:30	1		2		0		29		1		31		
02:45	0	1	7	10	0	0	28	136	0	1	35	146	
03:00	0		3		0		39		0		42		
03:15	0		9		0		74		0		83		
03:30	0		8		0		124		0		132		
03:45	0	0	3	23	0	0	51	288	0	0	54	311	
04:00	0		1		0		49		0		50		
04:15	0		4		0		25		0		29		
04:30	1		6		0		33		1		39		
04:45	3	4	6	17	0	0	24	131	3	4	30	148	
05:00	1		17		0		37		1		54		
05:15	5		14		2		32		7		46		
05:30	15		31		0		21		15		52		
05:45	22	43	28	90	0	2	15	105	22	45	43	195	
06:00	30		12		3		27		33		39		
06:15	43		5		3		14		46		19		
06:30	78		4		3		20		81		24		
06:45	130	281	3	24	4	13	11	72	134	294	14	96	
07:00	170		4		3		12		173		16		
07:15	174		2		2		12		176		14		
07:30	95		1		2		14		97		15		
07:45	54	493	0	7	3	10	8	46	57	503	8	53	
08:00	58		3		3		14		61		17		
08:15	60		2		1		25		61		27		
08:30	46		0		6		68		52		68		
08:45	31	195	1	6	8	18	24	131	39	213	25	137	
09:00	31		1		2		4		33		5		
09:15	38		1		2		3		40		4		
09:30	18		3		3		2		21		5		
09:45	11	98	2	7	9	16	1	10	20	114	3	17	
10:00	17		1		10		4		27		5		
10:15	8		1		7		1		15		2		
10:30	9		0		8		0		17		0		
10:45	9	43	1	3	6	31	1	6	15	74	2	9	
11:00	8		1		15		1		23		2		
11:15	7		2		37		1		44		3		
11:30	9		3		23		1		32		4		
11:45	3	27	0	6	179	254	1	4	182	281	1	10	
Total	1188		226		346		1078		1534		1304		
Percent	77.4%		17.3%		22.6%		82.7%						
Day Total		1414				1424				2838			
Peak	06:45	-	05:00	-	11:00	-	03:15	-	06:45	-	03:15	-	- -
Vol.	569	-	90	-	254	-	298	-	580	-	319	-	- -
P.H.F.	0.818		0.726		0.355		0.601		0.824		0.604		

This sheet is for double sided printing purposes

APPENDIX F

Supplemental Plans

This sheet is for double sided printing purposes



PARKING SPACES
- GEORGE AYOTTE GARAGE (1200 SPACE CAPACITY)
- 6 HC SPACES ON SITE

BUS DROP OFF: CLOSEST STOPS NOTED ON PLANS
POTENTIAL PULL OFF FOR 4 BUSES
SITE ACREAGE= 7.4

NOTES:
1. SITE IS IN ZONE DMU THERE ARE NO DIMENSIONAL SETBACK REQUIREMENTS
2.LOWELL LANDSCAPE REQ. 5% LANDSCAPE IN PARKING AREAS + ONE SHADE TREE FOR EVERY 2,000SF OF PAVING.

TURN OVER EXISTING FRESHMAN ACADEMY AND STEAM PLANT TO THE CITY

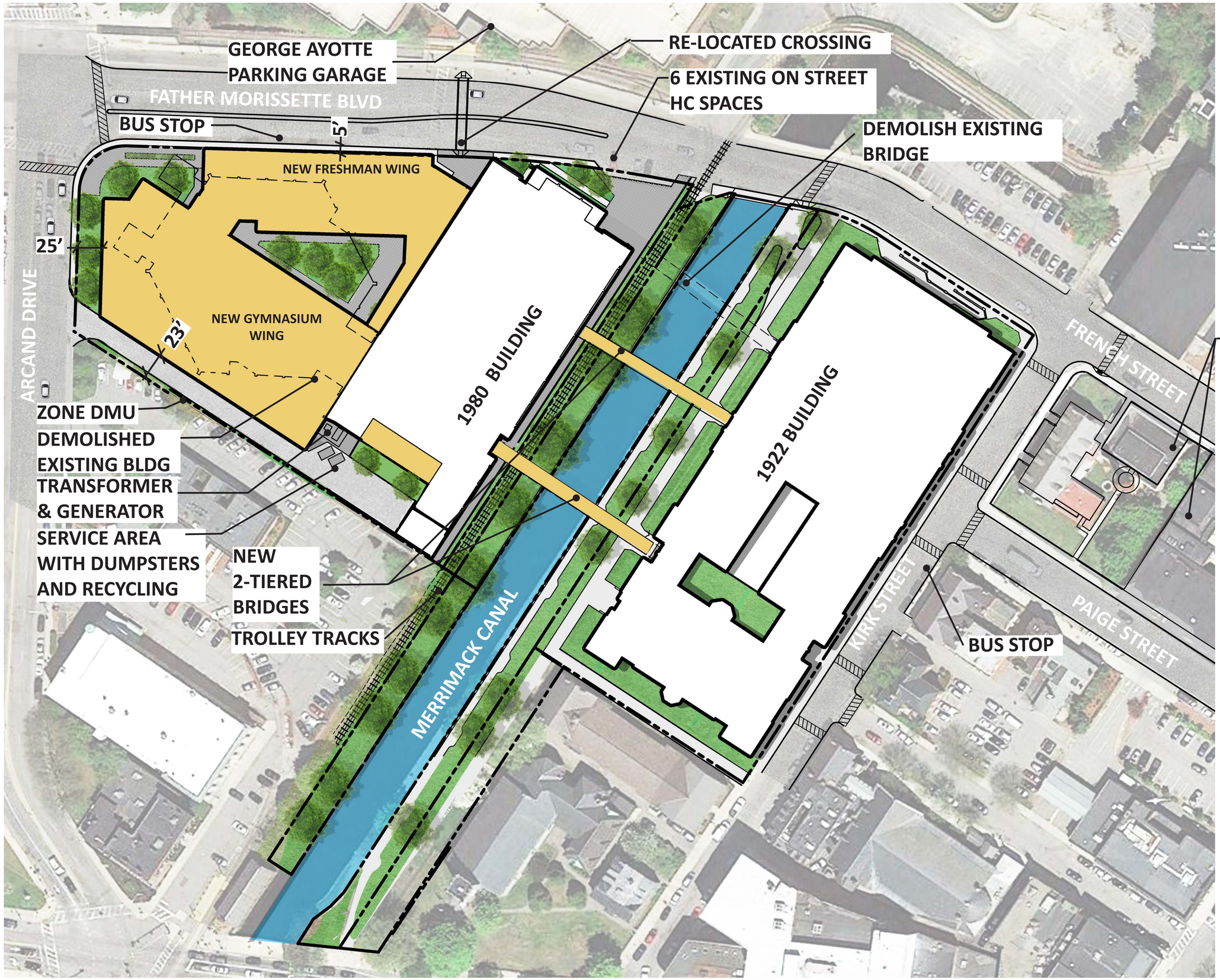
LOWELL HIGH SCHOOL ADD/ RENO OPTION 3A

MARCH 29TH, 2018

SCALE IN FEET

0 20 80 160

SCALE:1"= 40'-0



PARKING SPACES
- GEORGE AYOTTE GARAGE (1200 SPACE CAPACITY)
- NO ON SITE PARKING SPACES

BUS DROP OFF: CLOSEST STOPS NOTED ON PLANS
SITE ACREAGE=6

NOTES:
1. SITE IS IN ZONE DMU THERE ARE NO DIMENSIONAL SETBACK REQUIREMENTS
2.LOWELL LANDSCAPE REQ. 5% LANDSCAPE IN PARKING AREAS + ONE SHADE TREE FOR EVERY 2,000SF OF PAVING.

LOWELL HIGH SCHOOL ADD/ RENO OPTION 2A

MARCH 29TH, 2018

SCALE IN FEET
0 20 80 160
SCALE:1"= 40'-0



PARKING SPACES
- GEORGE AYOTTE GARAGE (1200 SPACE CAPACITY)
- 6 HC SPACES ON SITE

BUS DROP OFF: CLOSEST STOPS NOTED ON PLANS
SITE ACREAGE=4.7

NOTES:
1. SITE IS IN ZONE DMU THERE ARE NO DIMENSIONAL SETBACK REQUIREMENTS
2.LOWELL LANDSCAPE REQ. 5% LANDSCAPE IN PARKING AREAS + ONE SHADE TREE FOR EVERY 2,000SF OF PAVING.

TURN OVER EXISTING FRESHMAN ACADEMY, 1922 BUILDING AND STEAM PLANT TO THE CITY

LOWELL HIGH SCHOOL
NEW OPTION A

MARCH 29TH, 2018

SCALE IN FEET

0 20 80 160

SCALE:1"= 40'-0

This sheet is for double sided printing purposes

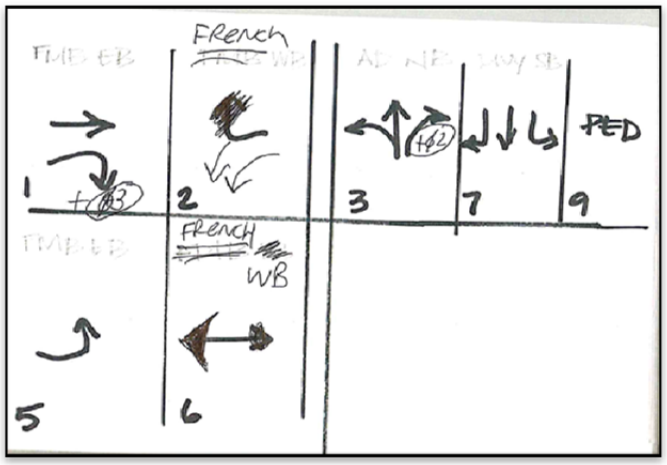
Father Morissette Boulevard\Arcand Drive

Signal Timing Information

Email on April 3, 2017 by Nicolas Bosonetto (nbosonetto@lowellma.gov), City Transportation Engineer

The signal at French/F. Morisette/Arcand has the following phases:

- Ø1 – F. Morrisette EB through & protected right onto Arcand
- Ø2 – French St. WB right onto Arcand
- Ø3 – Arcand NB through and left & protected right onto Arcand
- Ø5 – F. Morrisette EB left turn into tsongas arena (detection only)
- Ø6 – French St EB through.
- Ø7 – Tsongas Arena driveway
- Ø9 – exclusive pedestrian phase (on detection only)



Phase	Min green	Pass/10	Yel/10	Red/10	Max 1	Max 2	Ped Walk	Ped Clr
1	10	40	30	20	35	25		
2	4	40	30	20	12	12		
3	4	40	30	20	35	35		
5	4	40	30	20	30	30		
6	4	40	30	20	12	12		
7	4	40	30	20	35	35		
9							7	17

Father Morrisette Boulevard\Mid-Block Crossing

Signal Timing Information

Email on April 3, 2017 by Nicolas Bosonetto (nbosonetto@lowellma.gov), City Transportation Engineer

The crosswalk signal at F. Morisette at the LHS is just a basic green light. When the ped button gets pushed there is a 4sec yellow interval, 5 sec walk, 11 sec ped clear (don't walk flash), 4 sec all red then back to green. From my experience no one seems to use it for crossing the street.

French Street\Bridge Street

Signal Timing Information

Email on April 3, 2017 by Nicolas Bosonetto (nbosonetto@lowellma.gov), City Transportation Engineer

The signal at French Street at Bridge Street is just three phases with no detection or preemption: Attached are some counts I did two years ago.

- Ø2 is through on Bridge Street (2 lanes). Permissive lefts and rights on shared lanes. 25 sec green, 2 sec yel, 2 sec red
- Ø5 is left and right from French (2 lanes). 19 sec green, 2 sec yel, 2 sec red.
- Ø3 is a ped phase for the ped crossing across south approach of Bridge. The other approaches don't have ped buttons, heads, or ramps. This phase turns on 2 left arrows to allow French St to turn left only and the ped walk is 5 sec with 9 ped clear phase.

Merrimack Street\Worthen Street

Signal Timing Information

Email on March 28, 2017 by Nicolas Bosonetto (nbosonetto@lowellma.gov), City Transportation Engineer

Merrimack at Worthen is now a stop controlled intersection (signal is on flash – red for Worthen and yellow for Merrimack) – no left turns allowed from Worthen. All ped heads and buttons are bagged.

Merrimack Street\Arcand Drive\Dutton Street

Signal Timing Information

Email on April 26, 2017 by Nicolas Bosonetto (nbosonetto@lowellma.gov), City Transportation Engineer

- Phases 2 & 6 run concurrent (Dutton and Moody) with permissive left turns. Min green is 15 secs, gap is 5 sec, max is 45 sec, yellow 4 sec, red 2 sec.
- Phases 4 & 8 run concurrent (Merrimack approaches) with permissive left turns. Same timing as above.
- Phase 9 is exclusive ped phase with 7 walk, 12 clearance.
- The driveway coming out of Cobblestones (old section of Dutton) is video activated with 3 green, 3 yellow, 2 red.
- All signals have single point video detection systems.

The Merrimack corridor lights are GPS based, they don't have a master controller. They were synced at one time, but need to be done again.
The Cobblestones approach (phase 3) has a 3 sec min green, 2 sec gap, and 15 sec Max.

Merrimack Street\Central Street

Signal Timing Information

Email on March 28, 2017 by Nicolas Bosonetto (nbosonetto@lowellma.gov), City Transportation Engineer

Merrimack at Central – the mins are Ø2 & Ø6 = 20 secs, Ø1 = 15 sec, Ø4 = 6 sec. everything else is the same as the attached plan.

Merrimack Street\Prescott Street\Bridge Street\Kearney Square

Signal Timing Information

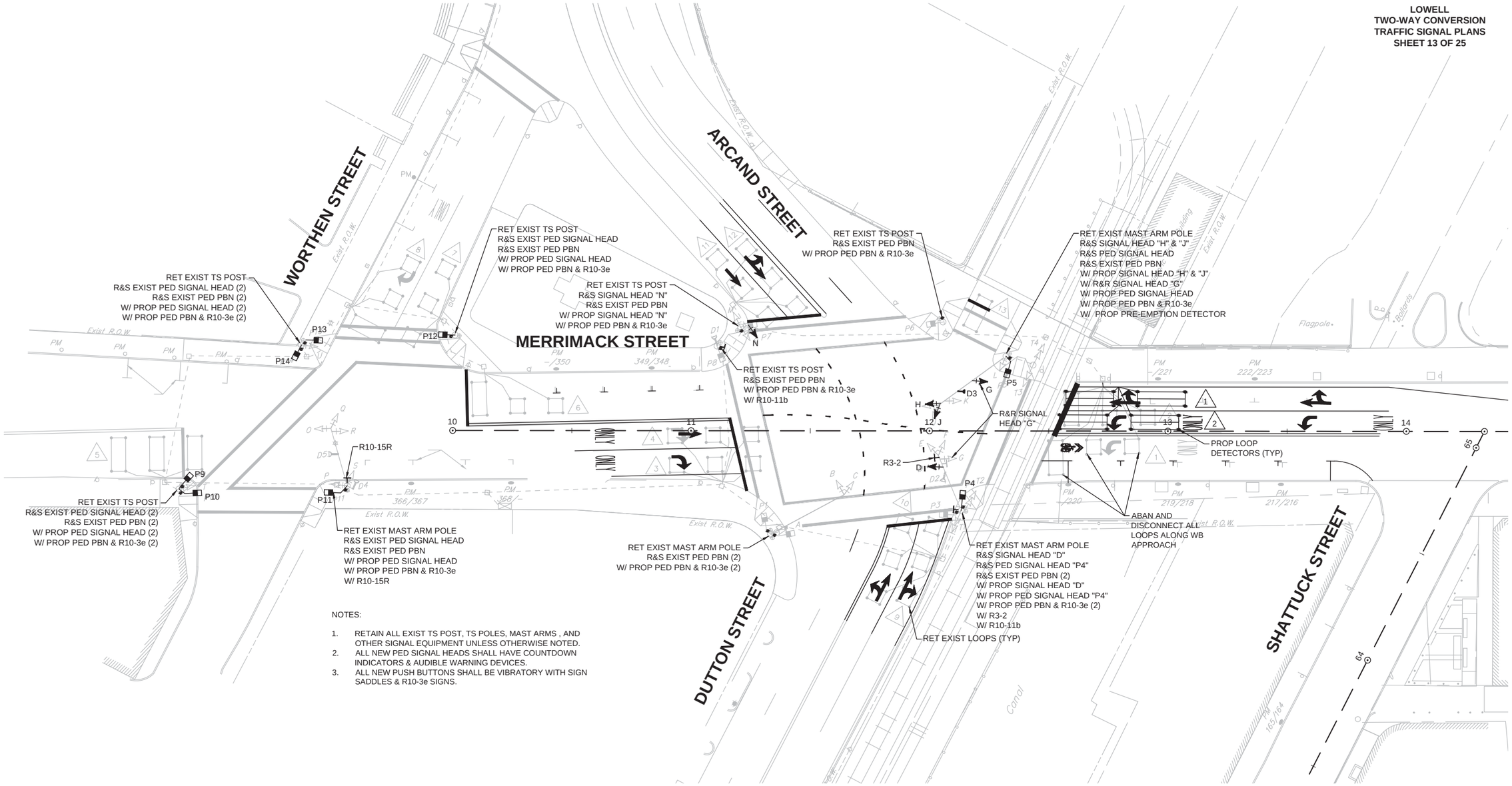
Email on March 28, 2017 by Nicolas Bosonetto (nbosonetto@lowellma.gov), City Transportation Engineer

Prescott at Merrimack – the mins are 10 secs for all phases, Max 1 is 45 secs for all phases. Everything else is the same as attached plan.

This sheet is for double sided printing purposes

LOWELL
TWO-WAY CONVERSION
TRAFFIC SIGNAL PLANS
SHEET 13 OF 25

TO462_LOWELL_6_SIGNAL PLANS.DWG Plotted on 27-Jan-2014 3:25 PM



NOTES:

1. RETAIN ALL EXIST TS POST, TS POLES, MAST ARMS , AND OTHER SIGNAL EQUIPMENT UNLESS OTHERWISE NOTED.
2. ALL NEW PED SIGNAL HEADS SHALL HAVE COUNTDOWN INDICATORS & AUDIBLE WARNING DEVICES.
3. ALL NEW PUSH BUTTONS SHALL BE VIBRATORY WITH SIGN SADDLES & R10-3e SIGNS.

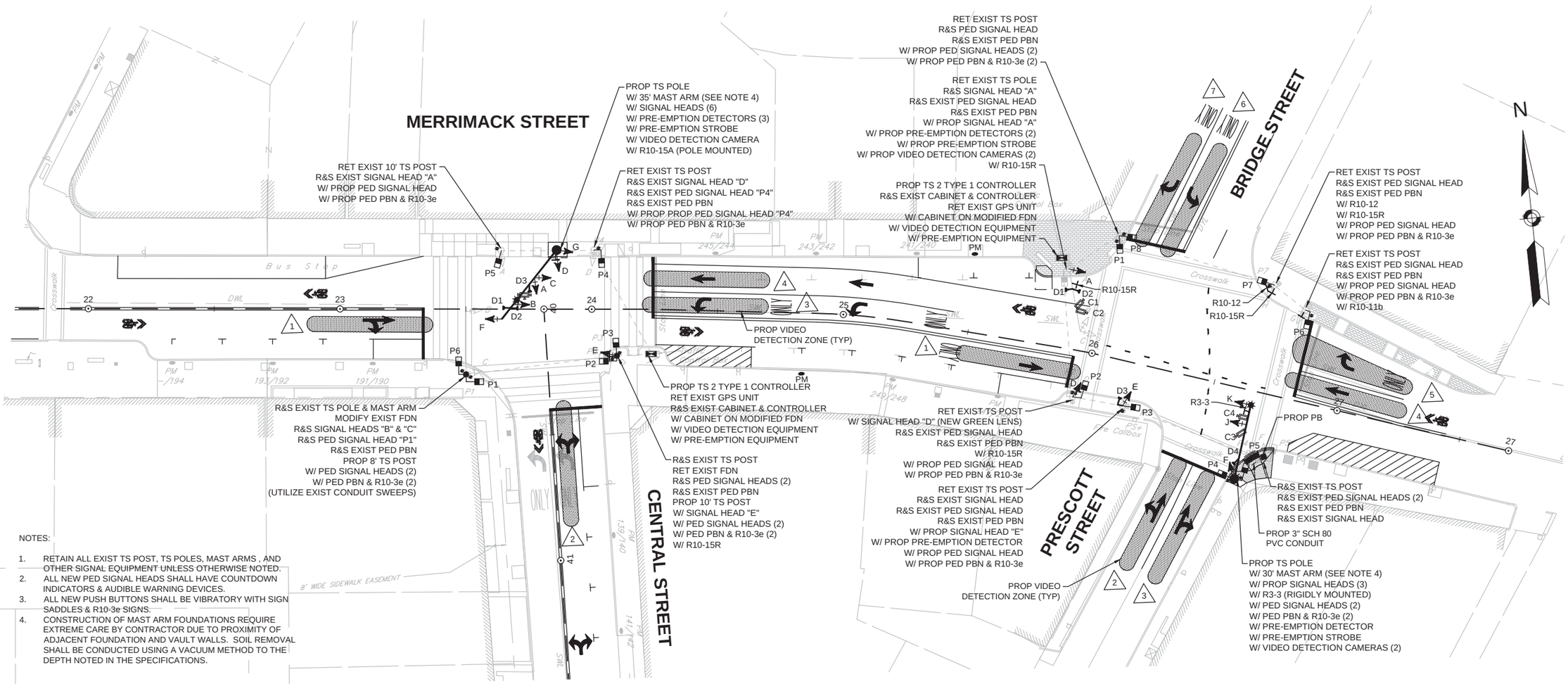
20 0 20 40

SCALE 1" = 20'

SEE SHEET 12 FOR SIGN SUMMARY

LOWELL
TWO-WAY CONVERSION
TRAFFIC SIGNAL PLANS
SHEET 16 OF 25

T0462_LOWELL_6_SIGNAL PLANS.DWG Plotted on 27-Jan-2014 3:25 PM



NOTES:

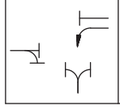
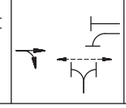
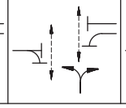
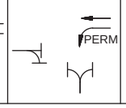
1. RETAIN ALL EXIST TS POST, TS POLES, MAST ARMS , AND OTHER SIGNAL EQUIPMENT UNLESS OTHERWISE NOTED.
2. ALL NEW PED SIGNAL HEADS SHALL HAVE COUNTDOWN INDICATORS & AUDIBLE WARNING DEVICES.
3. ALL NEW PUSH BUTTONS SHALL BE VIBRATORY WITH SIGN SADDLES & R10-3e SIGNS.
4. CONSTRUCTION OF MAST ARM FOUNDATIONS REQUIRE EXTREME CARE BY CONTRACTOR DUE TO PROXIMITY OF ADJACENT FOUNDATION AND VAULT WALLS. SOIL REMOVAL SHALL BE CONDUCTED USING A VACUUM METHOD TO THE DEPTH NOTED IN THE SPECIFICATIONS.

20 0 20 40

SCALE 1" = 20'

SEE SHEET 12 FOR SIGN SUMMARY

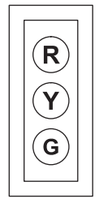
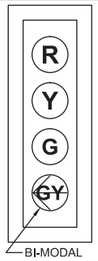
T0462_LOWELL_6_SIGNAL PLANS.DWG Plotted on 27-Jan-2014 3:25 PM

PROPOSED SEQUENCE AND TIMING															
APPROACH	DIRECTION	HOUSING	1	2	3	4	5	6	7	8	9	10	11	12	FLASHING OPERATION
MINIMUM INTERVAL			10			10			6			10			
VEHICLE EXTENSION			2			2			2			2			
MAXIMUM 1			20			50			40			50			
MAXIMUM 2			20			50			40			50			
YELLOW CLEARANCE				3.0			3.0			3.0			3.0		
RED CLEARANCE					1.0			1.0			1.0			1.0	
WALK						7.0			7.0						
PEDESTRIAN CLEARANCE						9.0	3.0	1.0	9.0	3.0	1.0				
MERRIMACK STREET	EB	E,F	R	R	R	G	Y	R	R	R	R	R	R	R	FY
MERRIMACK STREET	WB-L	B	←G R	←Y R	R	R	R	R	R	R	R	G	Y	R	FY
MERRIMACK STREET	WB-T	C,G	R	R	R	R	R	R	R	R	R	G	Y	R	FY
CENTRAL STREET	NB	A,D	R	R	R	R	R	R	G	Y	R	R	R	R	FR
CONCURRENT PEDESTRIAN	Ø2&Ø6 PED	P1-P2	DW	DW	DW	W/FDW	DW	DW	DW	DW	DW	DW	DW	DW	OUT
CONCURRENT PEDESTRIAN	Ø4 PED	P3-P6	DW	DW	DW	DW	DW	DW	W/FDW	DW	DW	DW	DW	DW	OUT
DETECTOR			NON-LOCK			NON-LOCK			NON-LOCK			NON-LOCK			
RECALL			OFF			SOFT			OFF			SOFT			
			Ø1			Ø2			Ø4			Ø6			Ø3,Ø5, Ø7,&Ø8
															NOT USED

NOTES:
1. AUTOMATIC FLASHING OPERATION PER M.U.T.C.D. SECTIONS 4D.28 THRU 4D.31.
2. PEDESTRIAN CALL UPON PUSH BUTTON ACTIVATION ONLY
3. MAXIMUM 1 = NORMAL OPERATION
   MAXIMUM 2 = DURING COORDINATION
4. Ø2&Ø6 TO OPERATE IN DUAL ENTRY MODE
5. PERM = PERMISSIVE LEFT-TURN

SEQUENCE & TIMING NOTES:

1. IF THE ASSIGNED RIGHT OF WAY FOR ANY TRAFFIC MOVEMENT IS TO REMAIN IN EFFECT DURING THE NEXT CALLED PHASE, THE SIGNAL INDICATIONS FOR THAT TRAFFIC MOVEMENT WILL NOT CHANGE DURING THE CLEARANCE INTERVAL.
2. THE RIGHT OF WAY MAY BE ASSIGNED TO ANY PHASE OR ANY COMBINATION OF NON-CONFLICTING PHASES.
3. IF CALLS EXIST ON ALL PHASES, THE ASSIGNMENT OF RIGHT OF WAY SHALL BE IN ACCORDANCE WITH THE PREFERENTIAL PHASE SEQUENCE.
4. IF THE ASSIGNED RIGHT-OF-WAY FOR ANY TRAFFIC MOVEMENT IS TO CHANGE DURING THE NEXT CALLED PHASE, THE SIGNAL INDICATION FOR THAT MOVEMENT WILL DISPLAY THE APPROPRIATE CLEARANCE INTERVALS.
5. CONCURRENT PEDESTRIAN PHASE WILL ONLY BE CALLED UPON PUSH BUTTON ACTIVATION. UPON PUSH BUTTON ACTIVATION.

EXISTING / PROPOSED SIGNAL HEAD DATA			
A,B,C,D	A,C,D,E,F,G	B	P1-P6
REMOVED & STACK 		 BI-MODAL	
	ALL 12" LENSES W/ 5" LOUVERED BACKPLATES		ALL 16" L.E.D. W/ COUNTDOWN INDICATORS

PREEMPTION PHASING & PRIORITY			
DETECTOR	PREEMPT PHASE ASSIGNMENT	MOVEMENT	VEHICLE PHASE ASSIGNMENT
D1	1		Ø2
D2	2		Ø1&Ø6
D3	3		Ø4

EMERGENCY VEHICLE PRE-EMPTION NOTES:
1. EMERGENCY VEHICLE PRE-EMPTION SIGNALS SHALL BE OPTICALLY TRANSMITTED BY OPTICAL EMITTERS MOUNTED IN EMERGENCY VEHICLES AND RECEIVED BY OPTICAL DETECTORS LOCATED AT EACH INTERSECTION.
2. EMERGENCY VEHICLE PRE-EMPTION SIGNALS SHALL BE SERVICED ON A FIRST DETECTED FIRST SERVE BASIS.
3. IN RESPONSE TO A PRE-EMPTION SIGNAL RECEIVED AT AN INTERSECTION BY OPTICAL DETECTOR D1 (OR D2, D3) THE CONTROLLER SHALL HOLD OR ADVANCE TO AND HOLD IN EMERGENCY VEHICLE PRE-EMPTION PHASE #1 (OR #2, #3) GREEN FOR A MINIMUM OF TEN (10) SECONDS OR UNTIL PRE-EMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME PRE-EMPTION PHASE CLEARANCE (3 SECONDS: YELLOW AND 1 SECOND: ALL RED) AND SERVICE SUBSEQUENT EMERGENCY VEHICLE PRE-EMPTION PHASES AS NECESSARY.
4. NORMAL CLEARANCE SHALL BE PROVIDED ON PHASES THAT ARE TO BE TERMINATED BY PRE-EMPTION DEMAND.
5. CONFIRMATION STROBE SHALL BE ILLUMINATED WHENEVER ANY EMERGENCY VEHICLE PRE-EMPTION GREEN IS ON.
6. PEDESTRIAN INDICATIONS SHALL REMAIN IN SOLID "DON'T WALK" DURING ACTIVE PRE-EMPTION INTERVAL.

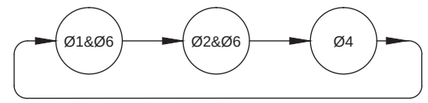
ITEM 816.03
MERRIMACK STREET AT CENTRAL STREET
LIST OF MAJOR ITEMS REQUIRED

QUANTITY	DESCRIPTION
1	8Ø TS 2 TYPE 1 CONTROLLER IN A TYPE P BASE MOUNTED CABINET ON MODIFIED FDN, PAINTED BLACK
1	R&S EXIST CONTROLLER AND CABINET
1	TS POLE W/ 35' MAST ARM, TYPE 2, PAINTED BLACK, INCL. FDN.
1	R&S TS POLE W/ 25' MAST ARM, MODIFY EXIST FDN.
1	10' TS POST, ORNAMENTAL, PAINTED BLACK, ON EXIST FOUNDATION
1	8' TS POST, ORNAMENTAL, PAINTED BLACK, ON MODIFIED FOUNDATION
1	R&S 8' TS POST
6	SIGNAL HEAD, 3-SECTION, 12" L.E.D. MODULES, LOUVERED BACKPLATES
1	SIGNAL HEAD, 4-SECTION, 12" L.E.D. MODULES, LOUVERED BACKPLATES
4	R&S SIGNAL HEAD
6	PEDESTRIAN SIGNAL HEAD, 16" L.E.D. MODULES, W/ COUNTDOWN INDICATOR & AUDIBLE WARNING DEVICES
6	PEDESTRIAN PUSH BUTTON (VIBRATORY) W/ R10-3e AND SIGN SADDLE
4	R&S PEDESTRIAN SIGNAL HEAD
3	R&S PEDESTRIAN PUSH BUTTON & SIGN SADDLE
1	VIDEO DETECTION CAMERA W/ EXTENSION ARM (OMNI-DIRECTIONAL)
1	VIDEO DETECTION CHASSIS AND CABLING
1	VIDEO DETECTION PROCESSOR MODULE
3	EMERGENCY PRE-EMPTION DETECTORS AND DETECTOR CABLING
2	EMERGENCY PRE-EMPTION 2-CHANNEL PHASE SELECTORS
1	EMERGENCY PRE-EMPTION SYSTEM CHASSIS
1	EMERGENCY PRE-EMPTION STROBE (WHITE LENS)
1	MALFUNCTION MANAGEMENT UNIT (MMU)
1	SPARE B.I.U. (BUS INTERFACE UNITS)
2	MAST ARM OR POST MOUNTED SIGNS (R10-15R, R10-15A AS NOTED - UNDER ITEM 832.)
1	CONTROLLER/COORDINATION PROGRAMMING & FINE TUNING
1	INTERSECTION CABLING FOR NEW SIGNAL HEADS / PRE-EMPTION

PLUS NECESSARY CONDUIT, CABLE, LABOR, MISCELLANEOUS MATERIAL AND EQUIPMENT TO COMPLETE THE INSTALLATION AND PROVIDE AN OPERATING TRAFFIC CONTROL SIGNAL.

	MONDAY THRU FRIDAY	SATURDAY	SUNDAY
PLAN 1/1/1 70" CYCLE	0600-1000	-	-
PLAN 2/1/1 80" CYCLE	1500-1900	-	-
PLAN 3/1/1 80" CYCLE	-	1000-1500	1000-1500
FREE OPERATION	0000-0600 1000-1500 1900-2400	0000-1000 1500-2400	0000-1000 1500-2400
FLASH OPERATION	NO PROGRAMMED FLASH MODE CONFLICT FLASH ONLY		

PROPOSED PHASE SEQUENCE



COORDINATION NOTES:

1. OFFSET: BEGINNING OF Ø6 YELLOW.
2. Ø6 "CALL NOT ACTUATED" DURING COORDINATION.
3. SPLIT TIMES EQUAL GREEN PLUS CLEARANCES.
4. INHIBIT MAX TERMINATION SHALL BE IN EFFECT DURING COORDINATION.
5. CONTRACTOR AND VENDOR SHALL ADJUST SIGNAL TIMINGS AND COORDINATION IN THE FIELD AS NECESSARY AND UPON APPROVAL BY ENGINEER AND CITY OF LOWELL.

	1/1/1	2/1/1	3/1/1
CYCLE LENGTH	70 SEC	80 SEC	80 SEC
OFFSET	11	4	4
SPLIT Ø1	18	16	16
SPLIT Ø2	31	31	31
SPLIT Ø4	21	33	33
SPLIT Ø6	49	47	47
COORDINATED PHASE	Ø6	Ø6	Ø6

CONSTRUCTION NOTES:
1. PULL BOXES SHALL NOT BE LOCATED WITHIN WHEELCHAIR RAMPS.
2. THE CONSTRUCTION SHALL CONFORM WITH MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, HIGHWAY DIVISION SPECIFICATIONS UNLESS OTHERWISE NOTED.
3. ALL NEW MAST ARM FOUNDATIONS SHALL CONFORM WITH MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, HIGHWAY DIVISION "MAST ARM & FOUNDATION DETAILS STANDARD DRAWINGS", DATED FEBRUARY 24, 2011
4. EACH LOOP GROUP SHALL BE SPLICED IN SINGLE PULL BOX AND WIRED TO SEPARATE CONTROLLER INPUT.
5. ALL SIGNAL HEADS AND SIGNS SHALL BE RIGIDLY MOUNTED.
6. CONTRACTOR SHALL FINE-TUNE THE TIMING AND COORDINATION PARAMETERS IN THE PRESENCE OF THE ENGINEER AND CITY OF LOWELL REPRESENTATIVES FOLLOWING INSTALLATION.

VIDEO DETECTOR DATA					
DETECTOR NO.	APPROX. SIZE	Ø CALLED	Ø EXTENDED	OPERATIONS	DELAY/ EXT.
1	±6'X50'	Ø2	Ø2	PRESENCE	0
2	±6'X50'	Ø4	Ø4	PRESENCE	0
3	±6'X50'	Ø1&Ø6	Ø1&Ø6	PRESENCE	0
4	±6'X50'	Ø6	Ø6	PRESENCE	0

NOTE: DELAY AND EXTENSION TIMINGS SHALL BE PROGRAMMED IN THE CONTROLLER ONLY.

T0462_LOWELL_6_SIGNAL PLANS.DWG Plotted on 27-Jan-2014 3:25 PM

PROPOSED SEQUENCE AND TIMING

APPROACH	DIRECTION	HOUSING	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	FLASHING OPERATION
MINIMUM INTERVAL			10			6			10			10			10			
VEHICLE EXTENSION			2			2			2			2			2			
MAXIMUM 1			40			25			40			40			50			
MAXIMUM 2			40			25			40			40			50			
YELLOW CLEARANCE				3.0			3.0			3.0			3.0			3.0		
RED CLEARANCE					1.5			1.5			1.5			1.5			1.5	
WALK			7.0						7.0			7.0			7.0			
PEDESTRIAN CLEARANCE			7.0	3.0	1.5				14.0	3.0	1.5	14.0	3.0	1.5	12.0	3.0	1.5	
MERRIMACK STREET	EB	J,K	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	FR
MERRIMACK STREET	WB-T/R	A	R	R	R	G R	Y R	R	R	R	R	G	Y	R	R	R	R	FR
MERRIMACK STREET	WB-T	C	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	FR
PRESCOTT STREET	NB	G,H	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	FR
BRIDGE STREET	SB-L	E,F	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	FR
BRIDGE STREET	SB-R	B,D	R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R	FR
CONCURRENT PEDESTRIAN	Ø2 PED	P3-P4	W/FDW	DW	DW	DW	DW	DW	W/FDW	DW	DW	DW	DW	DW	DW	DW	DW	OUT
CONCURRENT PEDESTRIAN	Ø4 PED	P5-P6	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	
CONCURRENT PEDESTRIAN	Ø6 PED	P7-P8	DW	DW	DW	DW	DW	DW	DW	DW	DW	W/FDW	DW	DW	DW	DW	DW	
CONCURRENT PEDESTRIAN	Ø8 PED	P1-P2	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	W/FDW	DW	DW	
DETECTOR			NON-LOCK			NON-LOCK			NON-LOCK			NON-LOCK			NON-LOCK			
RECALL			SOFT			OFF			SOFT			SOFT			SOFT			
			Ø2			Ø3			Ø4			Ø6			Ø8			Ø1,Ø5,&Ø7
						OL			PERM									NOT USED

NOTES:
1. AUTOMATIC FLASHING OPERATION PER M.U.T.C.D. SECTIONS 4D.28 THRU 4D.31.
2. PEDESTRIAN CALL UPON PUSH BUTTON ACTIVATION ONLY
3. MAXIMUM 1 = NORMAL OPERATION
   MAXIMUM 2 = DURING COORDINATION
4. PERM = PERMISSIVE LEFT-TURN
5. OL = OVERLAP
6. OVERLAP SHALL NOT BE ACTIVE DURING ANY PED INTERVAL.

ITEM 816.04

MERRIMACK STREET AT PRESCOTT STREET / BRIDGE STREET

LIST OF MAJOR ITEMS REQUIRED

QUANTITY	DESCRIPTION
1	8Ø TS 2 TYPE 1 CONTROLLER IN A TYPE P BASE MOUNTED CABINET ON MODIFIED FDN, PAINTED BLACK
1	R&S EXIST CONTROLLER AND CABINET
1	TS POLE W/ 30' MAST ARM, TYPE 2, SHOE BASE, PAINTED BLACK, INCL. FDN.
4	SIGNAL HEAD, 3-SECTION, 12" L.E.D. MODULES, LOUVERED BACKPLATES
1	SIGNAL HEAD, 4-SECTION, 12" L.E.D. MODULES, LOUVERED BACKPLATES
3	R&S SIGNAL HEAD
1	12" L.E.D. MODULE (GREEN BALL) W/ INTERVAL REWIRING
8	PEDESTRIAN SIGNAL HEAD, 16" L.E.D. MODULES, W/ COUNTDOWN INDICATOR & AUDIBLE WARNING DEVICES
8	PEDESTRIAN PUSH BUTTON (VIBRATORY) W/ R10-3e AND SIGN SADDLE
8	R&S PEDESTRIAN SIGNAL HEAD
7	R&S PEDESTRIAN PUSH BUTTON & SIGN SADDLE
4	VIDEO DETECTION CAMERA W/ EXTENSION ARM
1	VIDEO DETECTION CHASSIS AND CABLING
1	VIDEO DETECTION PROCESSOR MODULE
4	EMERGENCY PRE-EMPTION DETECTORS AND DETECTOR CABLING
2	EMERGENCY PRE-EMPTION 2-CHANNEL PHASE SELECTORS
1	EMERGENCY PRE-EMPTION SYSTEM CHASSIS
1	EMERGENCY PRE-EMPTION STROBE (WHITE LENS)
1	MALFUNCTION MANAGEMENT UNIT (MMU)
1	SPARE B.I.U. (BUS INTERFACE UNITS)
1	12" X 12" PULL BOX (UNDER ITEM 811.31)
20 FEET	3" SCH. 80 PVC CONDUIT (UNDER ITEM 804.3)
5	MAST ARM OR POST MOUNTED SIGNS (R10-15R, R10-12, R3-3 AS NOTED - UNDER ITEM 832.)
1	CONTROLLER/COORDINATION PROGRAMMING & FINE TUNING
1	INTERSECTION CABLING FOR NEW SIGNAL HEADS / PRE-EMPTION

PLUS NECESSARY CONDUIT, CABLE, LABOR, MISCELLANEOUS MATERIAL AND EQUIPMENT TO COMPLETE THE INSTALLATION AND PROVIDE AN OPERATING TRAFFIC CONTROL SIGNAL.

	MONDAY THRU FRIDAY	SATURDAY	SUNDAY
PLAN 1/1/1 70" CYCLE	0600-1000	-	-
PLAN 2/1/1 80" CYCLE	1500-1900	-	-
PLAN 3/1/1 80" CYCLE	-	1000-1500	1000-1500
FREE OPERATION	0000-0600 1000-1500 1900-2400	0000-1000 1500-2400	0000-1000 1500-2400
FLASH OPERATION	NO PROGRAMMED FLASH MODE CONFLICT FLASH ONLY		

COORDINATION NOTES:

1. OFFSET: BEGINNING OF Ø4&Ø8 YELLOW.
2. Ø4&Ø8 "CALL NOT ACTUATED" DURING COORDINATION.
3. SPLIT TIMES EQUAL GREEN PLUS CLEARANCES.
4. INHIBIT MAX TERMINATION SHALL BE IN EFFECT DURING COORDINATION.
5. CONTRACTOR AND VENDOR SHALL ADJUST SIGNAL TIMINGS AND COORDINATION IN THE FIELD AS NECESSARY AND UPON APPROVAL BY ENGINEER AND CITY OF LOWELL.

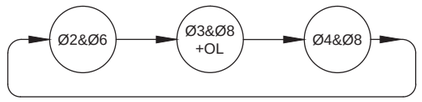
SEQUENCE & TIMING NOTES:

1. IF THE ASSIGNED RIGHT OF WAY FOR ANY TRAFFIC MOVEMENT IS TO REMAIN IN EFFECT DURING THE NEXT CALLED PHASE, THE SIGNAL INDICATIONS FOR THAT TRAFFIC MOVEMENT WILL NOT CHANGE DURING THE CLEARANCE INTERVAL.
2. THE RIGHT OF WAY MAY BE ASSIGNED TO ANY PHASE OR ANY COMBINATION OF NON-CONFLICTING PHASES.
3. IF CALLS EXIST ON ALL PHASES, THE ASSIGNMENT OF RIGHT OF WAY SHALL BE IN ACCORDANCE WITH THE PREFERENTIAL PHASE SEQUENCE.
4. IF THE ASSIGNED RIGHT-OF-WAY FOR ANY TRAFFIC MOVEMENT IS TO CHANGE DURING THE NEXT CALLED PHASE, THE SIGNAL INDICATION FOR THAT MOVEMENT WILL DISPLAY THE APPROPRIATE CLEARANCE INTERVALS.
5. CONCURRENT PEDESTRIAN PHASE WILL ONLY BE CALLED UPON PUSH BUTTON ACTIVATION. UPON PUSH BUTTON ACTIVATION.

EXISTING / PROPOSED SIGNAL HEAD DATA

A	B,C,G,H	D	E,F	A	E,F	J,K	P1-P8
REMOVED & STACK		REPLACE GREEN ARROW W/ 12" LENSE GREEN BALL INDICATION	REMOVED & STACK	BI-MODAL		RIGID-MOUNTED ON MAST-ARM	
				ALL 12" LENSES W/ 5" LOUVERED BACKPLATES			ALL 16" L.E.D. W/ COUNTDOWN INDICATORS

PROPOSED PHASE SEQUENCE



	1/1/1	2/1/1	3/1/1
CYCLE LENGTH	70 SEC	80 SEC	80 SEC
OFFSET	53	10	10
SPLIT Ø2	26	26	26
SPLIT Ø3	18	27	27
SPLIT Ø4	26	27	27
SPLIT Ø6	26	26	26
SPLIT Ø8	44	54	54
COORDINATED PHASE	Ø4 & Ø8	Ø4 & Ø8	Ø4 & Ø8

PREEMPTION PHASING & PRIORITY

DETECTOR	PREEMPT PHASE ASSIGNMENT	MOVEMENT	VEHICLE PHASE ASSIGNMENT
D1	1	→	Ø2
D2	2	←	Ø6
D3	3	↙ ↘	Ø3&Ø8
D4	4	↑ ↑ ↑	Ø4

EMERGENCY VEHICLE PRE-EMPTION NOTES:

1. EMERGENCY VEHICLE PRE-EMPTION SIGNALS SHALL BE OPTICALLY TRANSMITTED BY OPTICAL EMITTERS MOUNTED IN EMERGENCY VEHICLES AND RECEIVED BY OPTICAL DETECTORS LOCATED AT EACH INTERSECTION.
2. EMERGENCY VEHICLE PRE-EMPTION SIGNALS SHALL BE SERVICED ON A FIRST DETECTED FIRST SERVE BASIS.
3. IN RESPONSE TO A PRE-EMPTION SIGNAL RECEIVED AT AN INTERSECTION BY OPTICAL DETECTOR D1 (OR D2, D3, D4) THE CONTROLLER SHALL HOLD OR ADVANCE TO AND HOLD IN EMERGENCY VEHICLE PRE-EMPTION PHASE #1 (OR #2, #3, #4) GREEN FOR A MINIMUM OF TEN (10) SECONDS OR UNTIL PRE-EMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME PRE-EMPTION PHASE CLEARANCE (3 SECONDS: YELLOW AND 1.5 SECONDS: ALL RED) AND SERVICE SUBSEQUENT EMERGENCY VEHICLE PRE-EMPTION PHASES AS NECESSARY.
4. NORMAL CLEARANCE SHALL BE PROVIDED ON PHASES THAT ARE TO BE TERMINATED BY PRE-EMPTION DEMAND.
5. CONFIRMATION STROBE SHALL BE ILLUMINATED WHENEVER ANY EMERGENCY VEHICLE PRE-EMPTION GREEN IS ON.

CONSTRUCTION NOTES:

1. PULL BOXES SHALL NOT BE LOCATED WITHIN WHEELCHAIR RAMPS.
2. THE CONSTRUCTION SHALL CONFORM WITH MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, HIGHWAY DIVISION SPECIFICATIONS UNLESS OTHERWISE NOTED.
3. ALL NEW MAST ARM FOUNDATIONS SHALL CONFORM WITH MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, HIGHWAY DIVISION "MAST ARM & FOUNDATION DETAILS STANDARD DRAWINGS", DATED FEBRUARY 24, 2011
4. ALL NEW SIGNAL HEADS AND SIGNS ON PROPOSED MAST ARMS SHALL BE RIGIDLY MOUNTED. R&R SIGNAL HEADS SHALL BE ATTACHED TO MAST ARMS SIMILAR TO EXISTING ATTACHMENT.
5. CONTRACTOR SHALL FINE-TUNE THE TIMING AND COORDINATION PARAMETERS IN THE PRESENCE OF THE ENGINEER AND CITY OF LOWELL REPRESENTATIVES FOLLOWING INSTALLATION.
6. PEDESTRIAN INDICATIONS SHALL REMAIN IN SOLID "DON'T WALK" DURING ACTIVE PRE-EMPTION INTERVAL.

VIDEO DETECTOR DATA

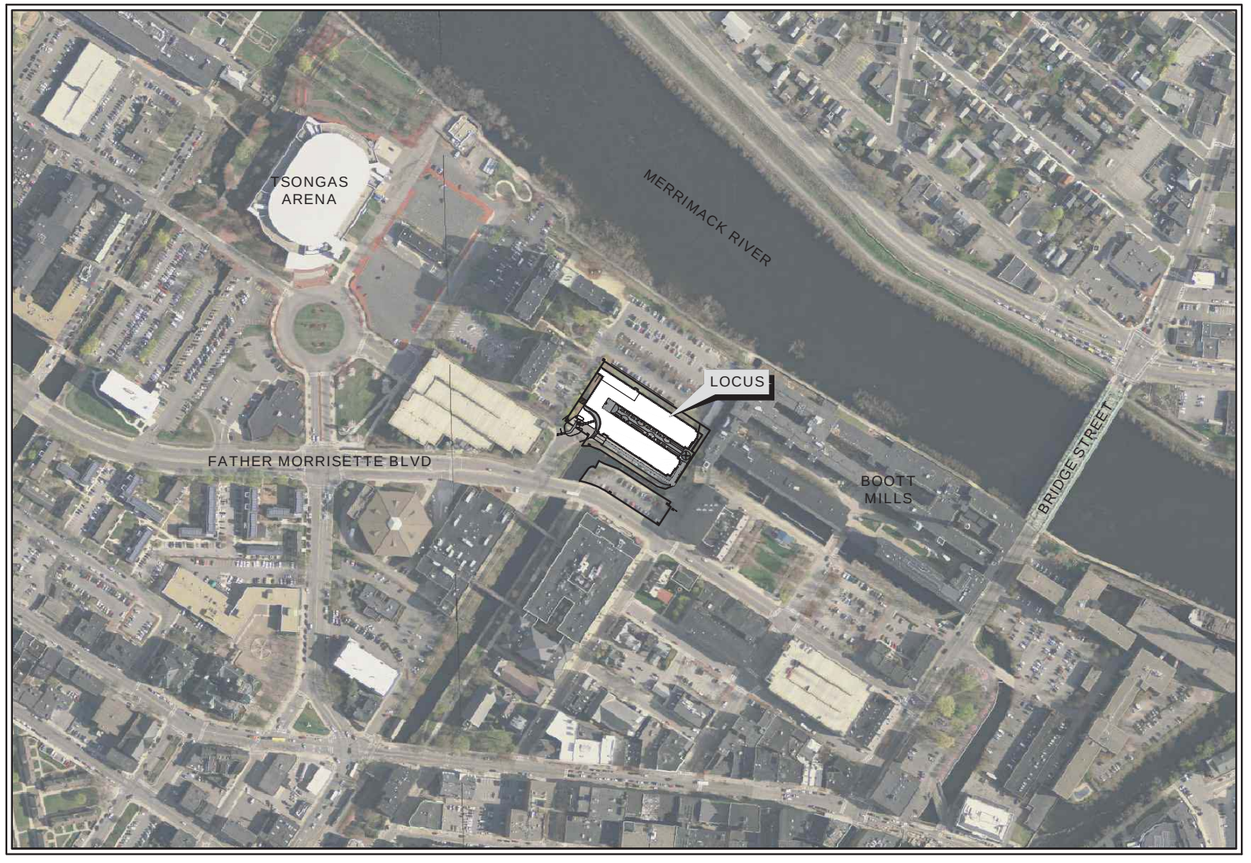
DETECTOR NO.	CAMERA NO.	APPROX. SIZE	Ø CALLED	Ø EXTENDED	OPERATIONS	DELAY/ EXT.
1	C4	±6'X50'	Ø2	Ø2	PRESENCE	0
2	C3	±6'X50'	Ø4	Ø4	PRESENCE	0
3	C3	±6'X50'	Ø4	Ø4	PRESENCE	0
4	C1	±6'X50'	Ø6	Ø6	PRESENCE	0
5	C1	±6'X50'	Ø6	Ø6	PRESENCE	0
6	C2	±6'X50'	Ø3	Ø3	PRESENCE	0
7	C2	±6'X50'	Ø8	Ø8	PRESENCE	0

NOTE: DELAY AND EXTENSION TIMINGS SHALL BE PROGRAMMED IN THE CONTROLLER ONLY.

PROPOSED STUDENT HOUSING

AT 1 MERRIMACK PLAZA

LOWELL
MASSACHUSETTS
SITE PLANS
ISSUED FOR PERMIT



NAD 83 MA MAINLAND

NEIGHBORHOOD LOCUS PLAN
SCALE: 1"=200'

APRIL 15, 2016

SCHEDULE OF DRAWINGS

SHEET NUMBER	PLAN TITLE
-	TITLE SHEET
C1.0	EXISTING CONDITIONS PLAN
C2.0	SITE DEMOLITION PLAN
C3.0	SITE LAYOUT PLAN
C4.0	GRADING & DRAINAGE PLAN
C5.0	UTILITIES PLAN
C6.0	LANDSCAPE PLAN
C7.0	DETAILS 1
C8.0	DETAILS 2

DEVELOPMENT TEAM

FUNCTION	TEAM MEMBER
DEVELOPER	VISION PROPERTIES, INC.
ARCHITECT	BENOIT DESIGN GROUP
CIVIL ENGINEER	PRIME ENGINEERING, INC.

PREPARED BY:

PRIME ENGINEERING INC

CIVIL ENGINEERING–LAND SURVEYING–ENVIRONMENTAL ASSESSMENT
P.O. BOX 1088, 350 BEDFORD STREET, LAKEVILLE, MA 02347
TEL: 508.947.0050 FAX: 508.947.2004

This sheet is for double sided printing purposes

APPENDIX G

Student and Staff Modes of Transportation Surveys

This sheet is for double sided printing purposes

Lowell High School

Lowell High School Mode of Transportation Survey
Conducted April 2017

Staff Arrival Times (Optional)	
Before 6am	4
6-6:25 am	12
6:30-6:55 am	41
7:00-7:20 am	168
7:25-7:40 am	89
After 8:00 am	14
3:00 PM	12
A. LRTA BUS	**2**
B. RIDE WITH OTHERS	**11**
a. Carpool with fellow staff members or others	8
b. Dropped off by family/friend.	3
i. ***Arcand Drive***	
ii. ***Bridge Street***	
iii. ***Fr. Morissette Blvd.***	*1*
iv. ***French Street***	
v. ***John Street***	
vi. ***Kirk Street***	*1*
vii. ***Merrimack Street (W&K)***	
viii. ***Merrimack Street (K&P)***	
ix. ***Paige Street***	*1*
x. ***Other***	
C. WALK	**17**
D. DRIVE SELF AND TYPICALLY PARK	**261**
a. Ayotte Garage	220
b. Other parking garage John St.	13
c. Other parking lot	6
d. On-street parking	3
e. In back of 1980 building	16
f. Handicapped	3
Total Staff Surveyed	**291**

Lowell High School Mode of Transportation Survey
Conducted April 2017

Student Arrival	TOTAL	%
A. LRTA BUS	**546**	**19.9%**
B. RIDE WITH OTHERS	**1,133**	**41.2%**
a. Carpool with fellow student or others	149	
b. Dropped off by family/friend.	984	
i. ***Arcand Drive***	*73*	
ii. ***Bridge Street***	*16*	
iii. ***Fr. Morissette Blvd.***	*299*	
iv. ***French Street***	*71*	
v. ***John Street***	*27*	
vi. ***Kirk Street***	*220*	
vii. ***Merrimack Street (W&K)***	*25*	
viii. ***Merrimack Street (K&P)***	*25*	
ix. ***Paige Street***	*121*	
x. ***Other***	*107*	
C. WALK	**741**	**27.0%**
D. DRIVE SELF AND TYPICALLY PARK	**285**	**10.4%**
a. Ayotte Garage	234	
b. Other parking garage_____	5	
c. Other parking lot	9	
d. On-street parking	13	
i. 0	*77*	
ii. 1	*100*	
iii. 2	*45*	
iiii. 3	*16*	
E. SPECIAL EDUCATION BUS	**42**	**1.5%**
Total Completed Surveys	**2,747**	**84.4%**
Total Student Population	**3,256**	

Lowell High School

Lowell High School Mode of Transportation Survey
Conducted April 2017

Staff Departure Times (Optional)	
Before 2:30 pm	52
2:35-2:45 pm	84
2:50-3:00 pm	73
3:05-3:30 pm	40
3:30-4:00 pm	24
After 4:00 pm	10
11:00 PM	12
A. LRTA BUS	**2**
B. RIDE WITH OTHERS	**8**
a. Carpool with fellow staff members or others	6
b. Picked up by family/friend.	2
i. ***Arcand Drive***	
ii. ***Bridge Street***	
iii. ***Fr. Morissette Blvd.***	
iv. ***French Street***	
v. ***John Street***	
vi. ***Kirk Street***	*1*
vii. ***Merrimack Street (W&K)***	
viii. ***Merrimack Street (K&P)***	
ix. ***Paige Street***	
x. ***Other***	*1*
C. WALK	**17**
D. DRIVE SELF	**214**
Total Staff Surveyed	**241**

Lowell High School

Lowell High School Mode of Transportation Survey
Conducted April 2017

Student Departure	TOTAL	%
A. LRTA BUS	**701**	**27.1%**
B. RIDE WITH OTHERS	**645**	**24.9%**
a. Carpool with fellow student or others	155	
b. Picked up by family/friend.	490	
i. ***Arcand Drive***	*26*	
ii. ***Bridge Street***	*13*	
iii. ***Fr. Morissette Blvd.***	*138*	
iv. ***French Street***	*27*	
v. ***John Street***	*13*	
vi. ***Kirk Street***	*61*	
vii. ***Merrimack Street (W&K)***	*21*	
viii. ***Merrimack Street (K&P)***	*15*	
ix. ***Paige Street***	*29*	
x. ***Other***	*147*	
C. WALK	**941**	**36.4%**
D. DRIVE SELF AND TYPICALLY PARK	**258**	**10.0%**
E. SPECIAL EDUCATION BUS	**41**	**1.6%**
Total Completed Surveys	**2,586**	**79.4%**
Total Student Population	**3,256**	

LOWELL PUBLIC SCHOOLS | Lowell High School
50 Fr. Morissette Blvd.
Lowell, Massachusetts 01852 | *Phone:* (978) 275-6308
Fax: (978) 937-8902
E-mail: rhowe@lowell.k12.ma.us

To: Brian Martin, Head of School

From: Roxane Howe, Discipline & Operations Specialist

Date: February 1, 2017

Re: Student Mode of Transportation

On January 25, 2017 a survey on student mode of transportation to and from school was conducted in advisory. The results are based on 77% of the student population participating. The following data indicates the percentage of students using the indicated method of transportation:

Morning Arrival

- Ride from family/friend 43%
- Walk 27%
- LRTA bus 20%
- Drive 8%
- Special Education bus 2%

Afternoon Departure

- Walk 34%
- LRTA bus 29%
- Ride from family/friend 27%
- Drive 8%
- Special Education bus 2%

sales. Beyond the retail program there is a need for flexible, technologically-equipped classroom space that allows for the use of online business and marketing simulations, software designed specifically for these types of classes, and online research. Positioning the other four business classrooms in the vicinity of the store would be beneficial in allowing more collaboration between the teachers. The bank is currently located within the cafeteria which allows for access by students and staff but does not allow for easy public access. There is a need for a larger space for the bank. The store and the bank should be co-located with the restaurant program in a configuration that allows for access through the main lobby for security purposes.

The program/plans provide (5) Business Finance/Marketing classroom/labs, (3) of which are recognized under Massachusetts Chapter 74 Program for Marketing and include the School Store. A separate space for the Bank is provided as a pull-out component of this program.

All Business programs would ideally be located as a cluster, but the larger priority is positioning the Bank, Store and associated Classrooms near the Cafeteria, Main Entry/Lobby and easily accessible for public and afterhours uses. Separate storage for retail/supplies is provided.

N. TRANSPORTATION POLICIES

Transportation is not provided to Lowell High students to get them to and from school. If a student wishes to use the Lowell Regional Transit Authority bus, the cost of a bus pass is $20.00 per month. A survey of students conducted during the 2014-2015 school year indicated that students commute to and from school using the following methods: ride from family/friend (33%), walk (32%), ride city bus (24%), drive (11%). Daily, 11 LRTA buses transport students at drop-off and pick-up times, lining up along French Street and Kirk Street.

Approximately 83 SPED students are transported to and from LHS separately each day with 10 total of the following: specialty equipped wheelchair vans, yellow buses, and smaller vehicles.

Transportation for Athletics is extensive. Daily, about 7 buses line up at the main entrance on Father Morissette Boulevard to transport students to practices at Cawley Stadium, the boat house and other locations. Students provide their own transportation home from practice. On game days, there can be up to 4 additional buses that pick up students (also at the Father Morissette location) for transportation to games.

Note; the Educational Program does not address parking needs. The site program is articulated in section 3.1.5 Site Development Requirements. The school currently benefits from its location that utilizes city transportation, wide streets and adjacent

LOWELL HIGH SCHOOL

AGENDA

- Updates / What Has Changed?
- Review Options / Phasing PSR

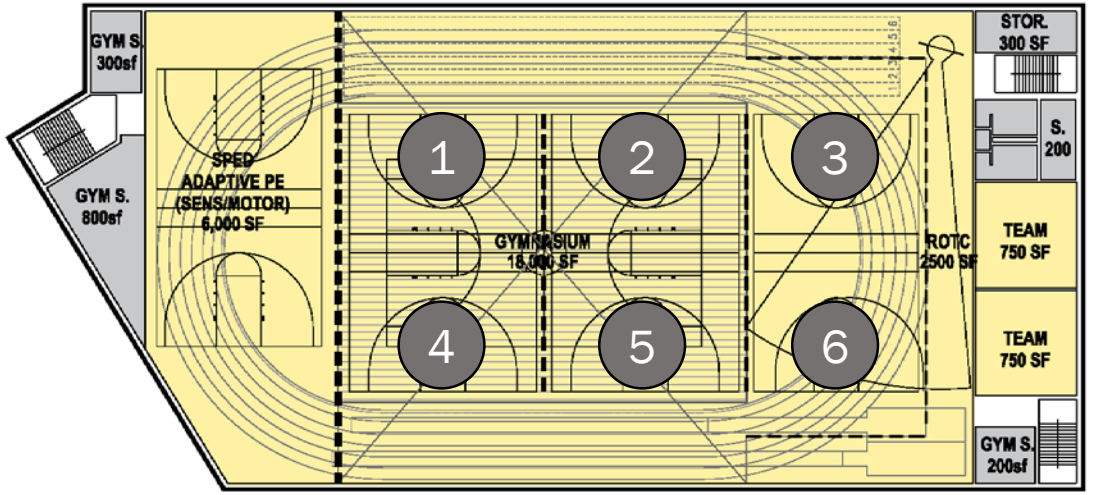
  (Preferred Schematic Report) Update
- Schedule / Next Steps



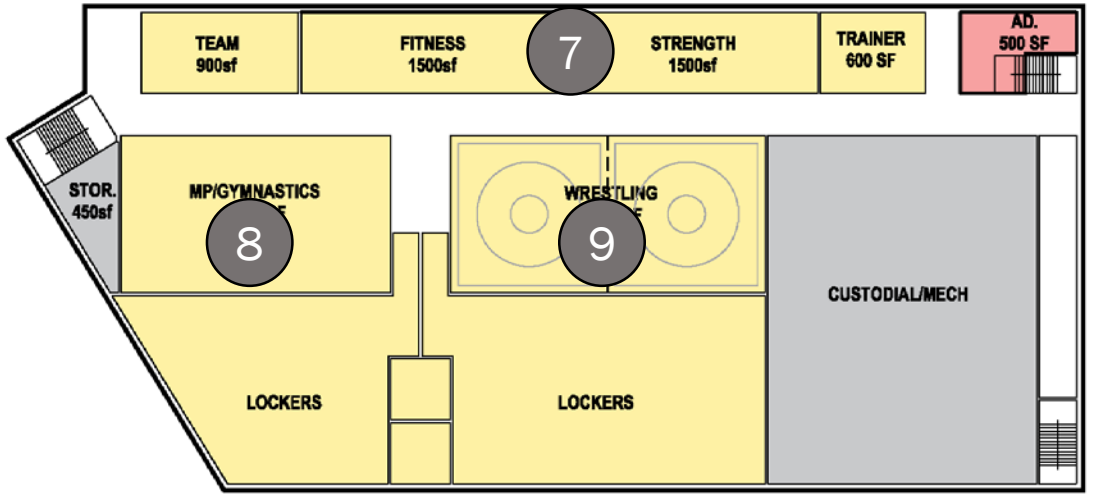
WHAT HAS CHANGED?

Change In Site:

- Existing Down-Town Location (**Option 2A**)
- Potential for Expanded Site (**Option 3A**)
- Required Look at All New (**New Option A**)



Gym Areas – 2nd Floor



Gym Areas – 1st Floor

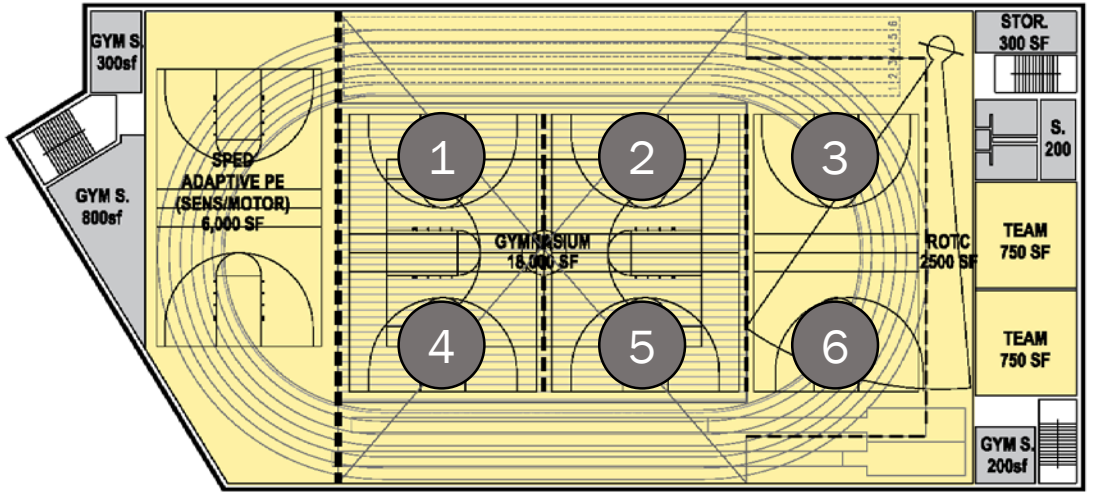
WHAT HAS CHANGED?

Change In Site

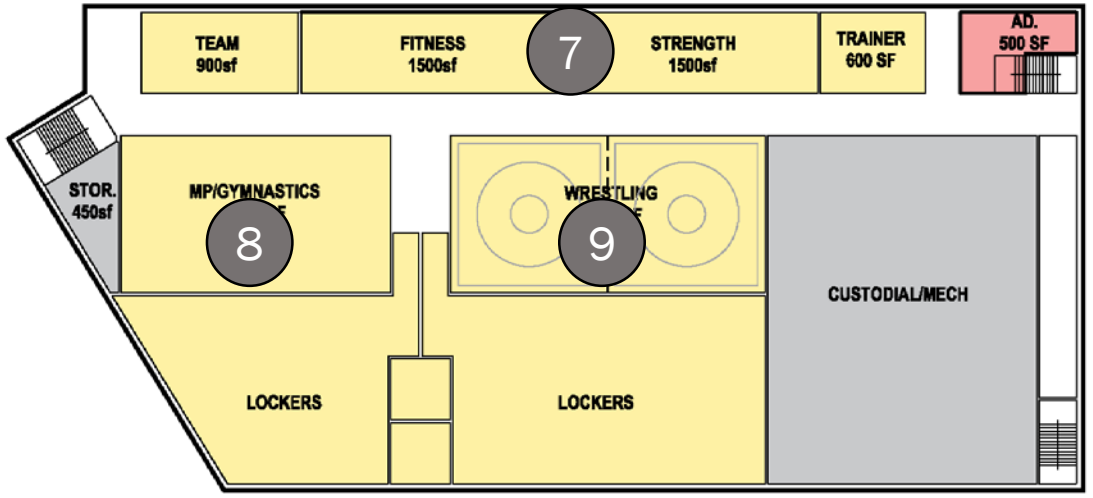
- Existing Down-Town Location (**Option 2A**)
- Potential for Expanded Site (**Option 3A**)
- Required Look at All New (**New Option A**)

MSBA Comments/Clarification:

- Pool Removed from the Project
- Co-Location of Gym with Other Programs Accepted Under Continued Review
- Auditorium Size (Over Max. Allowed, but Existing)
- Continued Review of Spaces (per Standards)



Gym Areas – 2nd Floor

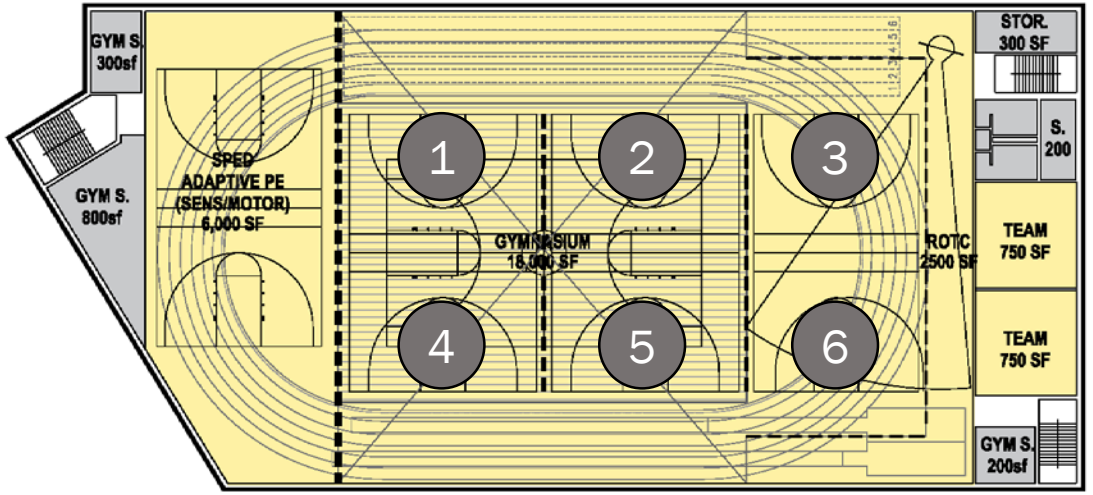


Gym Areas – 1st Floor

WHAT HAS CHANGED?

Change In Site

- Existing Down-Town Location (**Option 2A**)
- Potential for Expanded Site (**Option 3A**)
- Required Look at All New (**New Option A**)



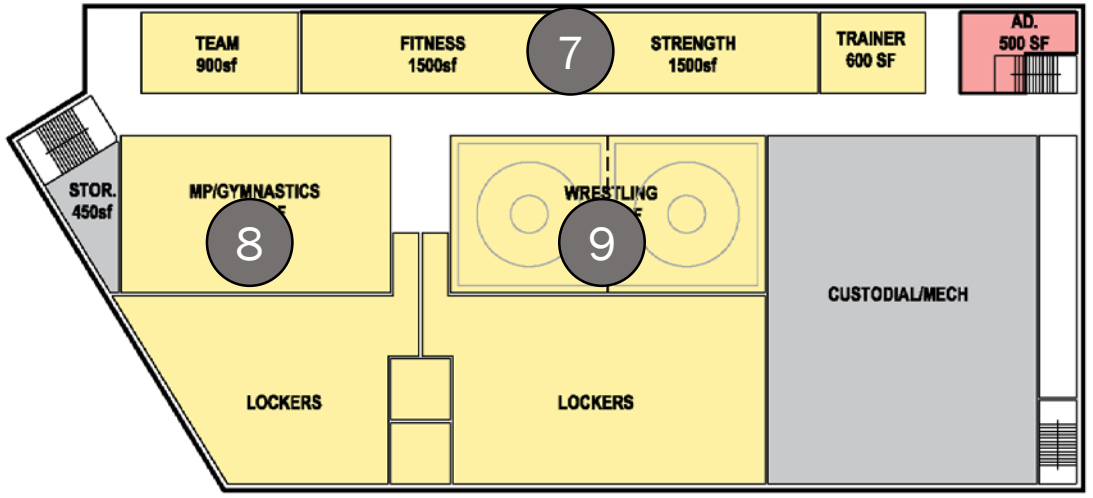
Gym Areas – 2nd Floor

MSBA Comments/Clarification:

- Pool Removed from the Project
- Co-Location of Gym with Other Programs Accepted Under Continued Review
- Auditorium Size (Over Max. Allowed, but Existing)
- Continued Review of Spaces (per Standards)

Design & Program Updates:

- Educational Program
- Space Summary
- Plan Options Refined
- Costs Currently Being Updated



Gym Areas – 1st Floor

PERKINS EASTMAN

COMMUNITY MEETING

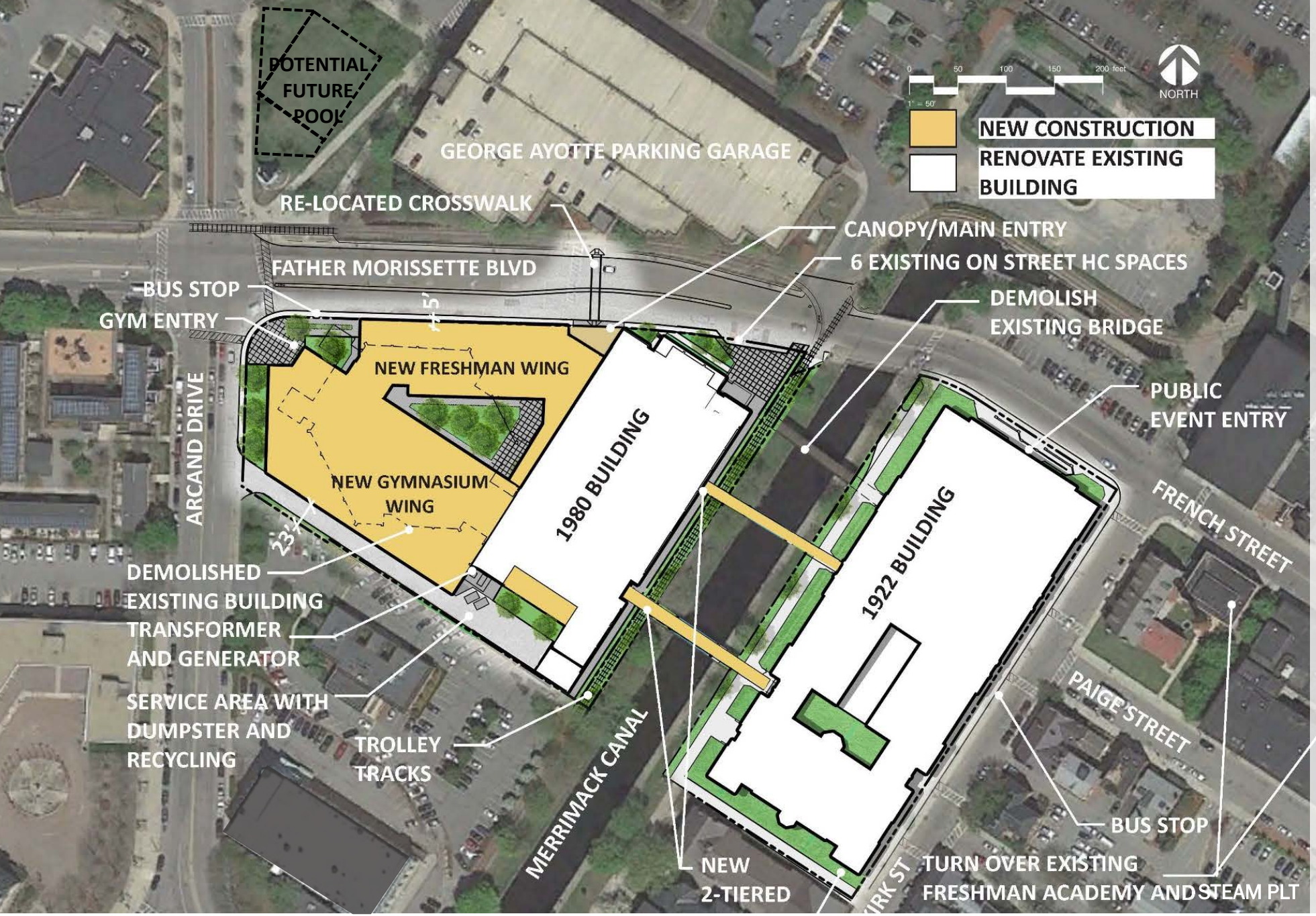
LOWELL HS PROJECT



EXISTING IMAGERY COURTESY OF GOOGLE EARTH

12 APRIL 2018

ADD/RENO 2A EXISTING SITE



Updated Educ Program

(pool removed)

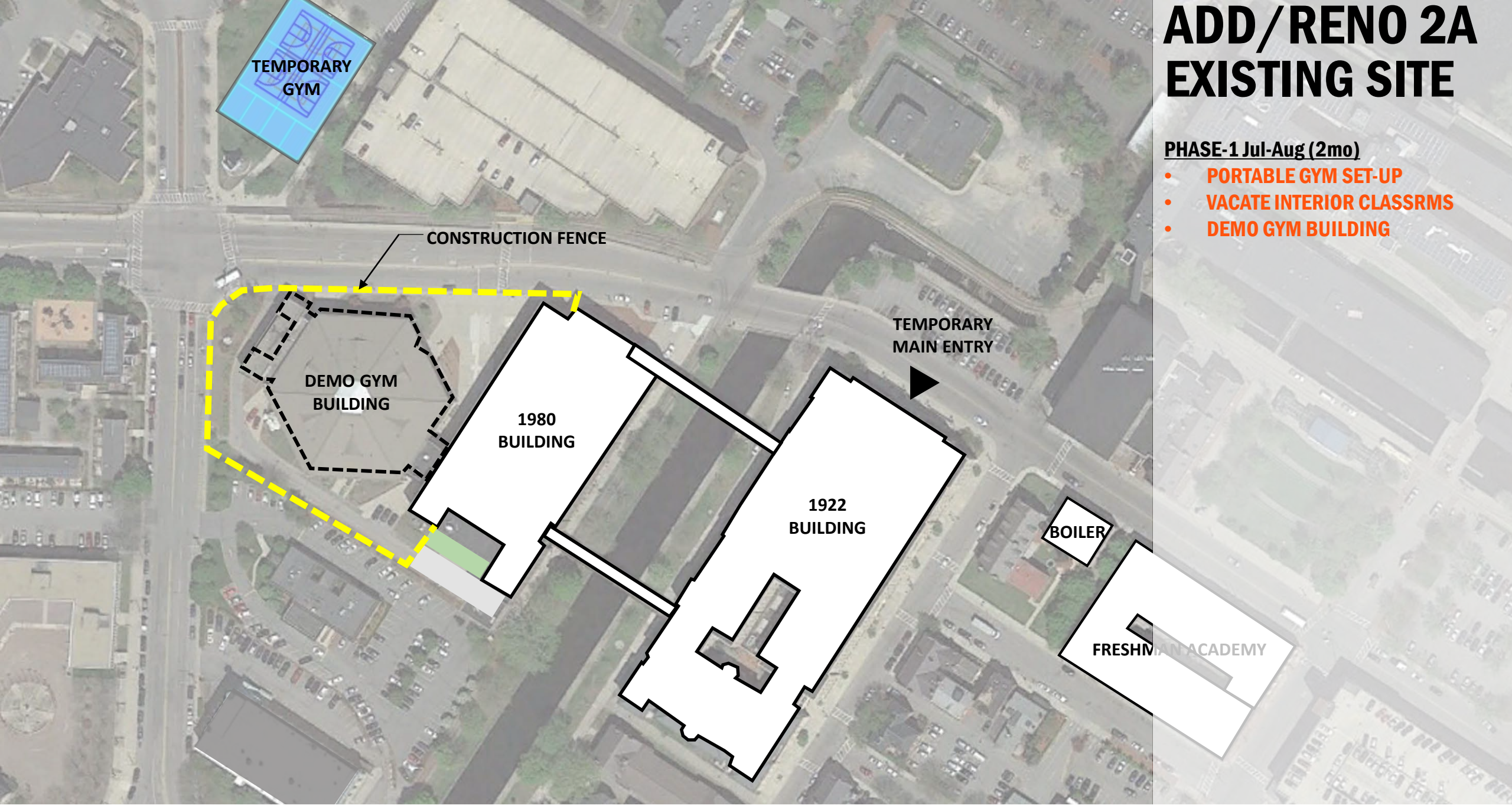
PRELIM. PROS/CONS:

+ **Consolidated Campus**
  (new freshman academy)
- **Temporary Gym Required**
- **Windowless Labs Remain**
- **Limited Green + Loading**

Phasing Est 4yrs + Summer

Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.

ADD/RENO 2A EXISTING SITE

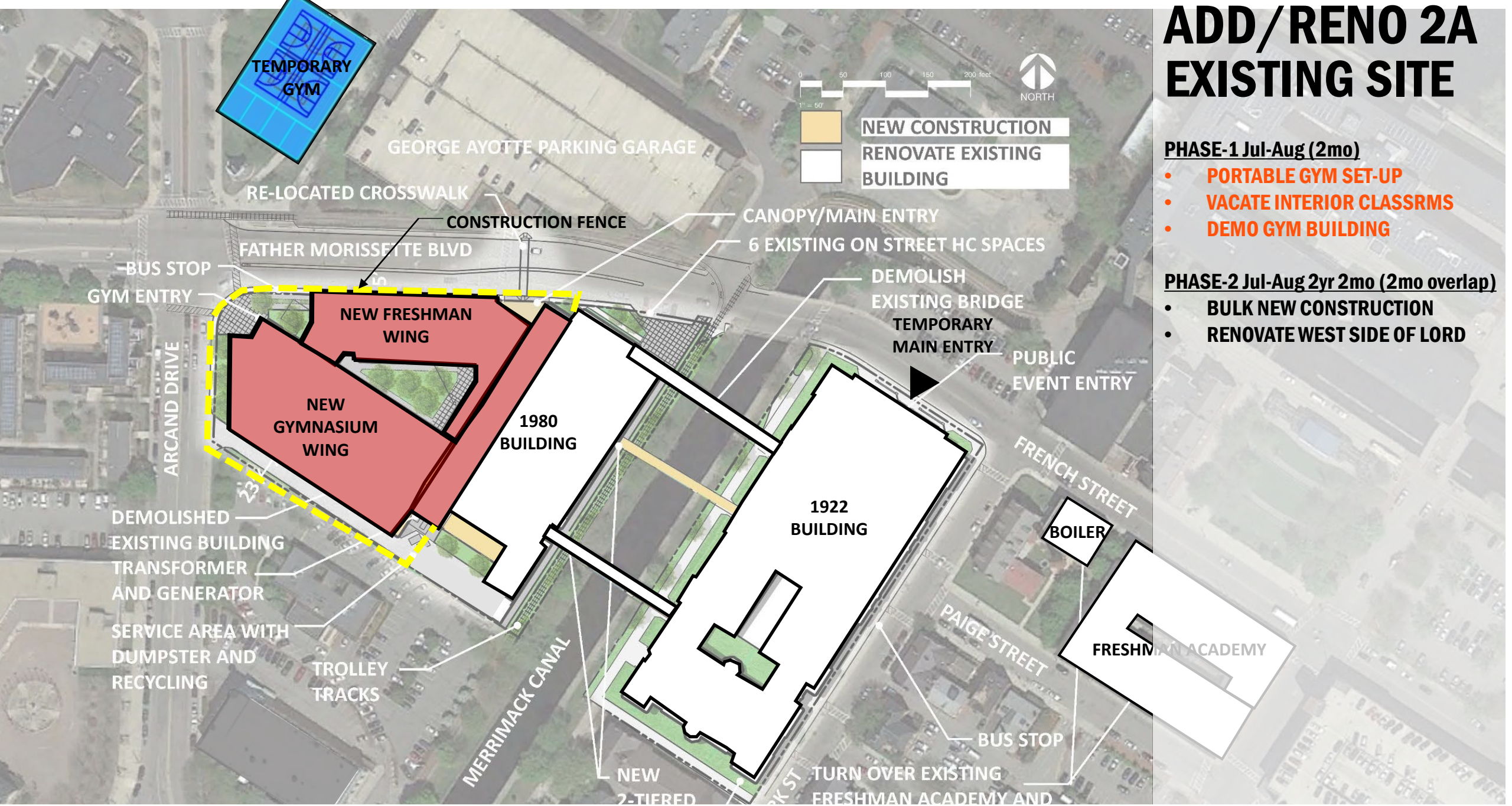


PHASE-1 Jul-Aug (2mo)

- PORTABLE GYM SET-UP
- VACATE INTERIOR CLASSRMS
- DEMO GYM BUILDING

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

ADD/RENO 2A EXISTING SITE



PHASE-1 Jul-Aug (2mo)

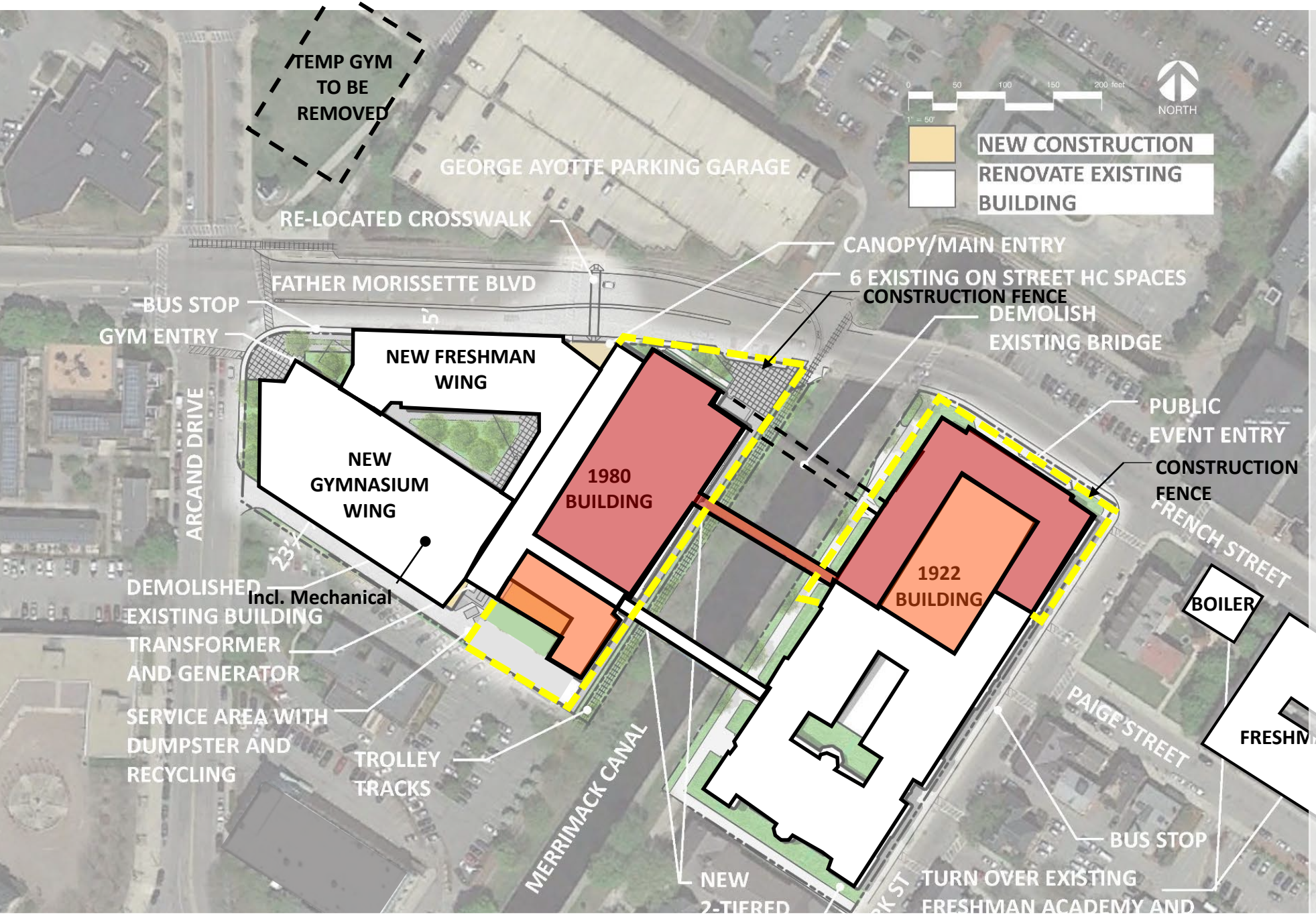
- PORTABLE GYM SET-UP
- VACATE INTERIOR CLASSRMS
- DEMO GYM BUILDING

PHASE-2 Jul-Aug 2yr 2mo (2mo overlap)

- BULK NEW CONSTRUCTION
- RENOVATE WEST SIDE OF LORD

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

ADD/RENO 2A EXISTING SITE



PHASE-1 Jul-Aug (2mo)

- PORTABLE GYM SET-UP
- VACATE INTERIOR CLASSRMS
- DEMO GYM BUILDING

PHASE-2 Jul-Aug 2yr 2mo (2mo overlap)

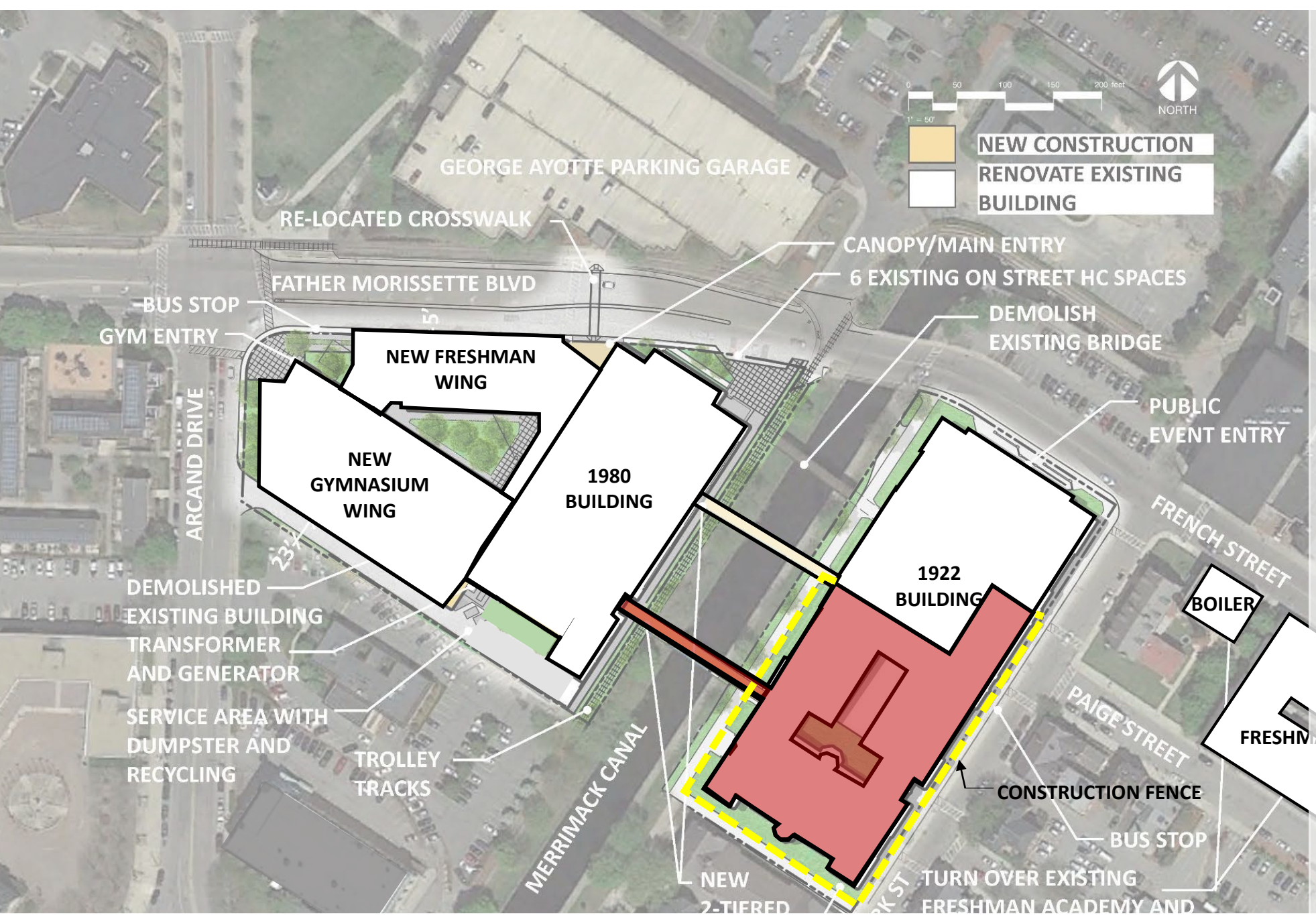
- BULK NEW CONSTRUCTION
- RENOVATE WEST SIDE OF LORD

PHASE-3 Jul-Aug 1yr 2mo (2mo overlap)

- RENOVATE REMAINDER OF LORD (SOUTH END RENO IN SUMMERS) (AUDITORIUM IN SUMMERS)
- RENOVATE NORTH END OF 1922
- BUILD NEW NORTH BRIDGE
- TEMP GYM TO BE REMOVED

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

ADD/RENO 2A EXISTING SITE



PHASE-1 Jul-Aug (2mo)

- PORTABLE GYM SET-UP
- VACATE INTERIOR CLASSRMS
- DEMO GYM BUILDING

PHASE-2 Jul-Aug 2yr 2mo (2mo overlap)

- BULK NEW CONSTRUCTION
- RENOVATE WEST SIDE OF LORD

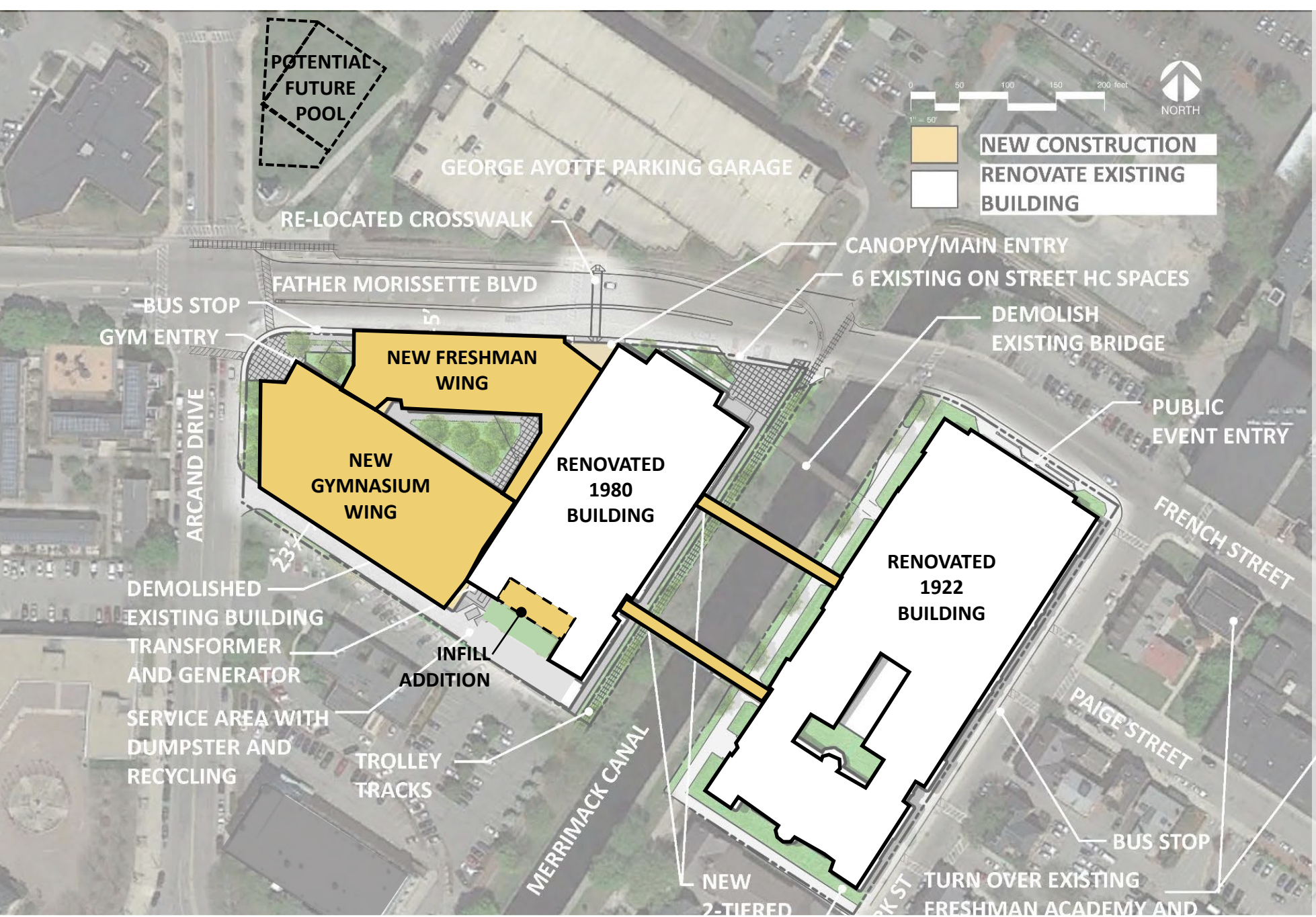
PHASE-3 Jul-Aug 1yr 2mo (2mo overlap)

- RENOVATE REMAINDER OF LORD (SOUTH END RENO IN SUMMERS) (AUDITORIUM IN SUMMERS)
- RENOVATE NORTH END OF 1922
- BUILD NEW NORTH BRIDGE

PHASE-4 Jul-Aug 1yr 2mo (2mo overlap)

- RENOVATE REMAINDER OF 1922
- BUILD NEW SOUTH BRIDGE

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager



ADD/RENO 2A EXISTING SITE

PHASE-1 Jul-Aug (2mo)
- PORTABLE GYM SET-UP
- VACATE INTERIOR CLASSRMS
- DEMOLISH GYM BUILDING

PHASE-2 Jul-Aug 2yr 2mo (2mo overlap)
- BULK NEW CONSTRUCTION
- RENOVATE WEST SIDE OF LORD

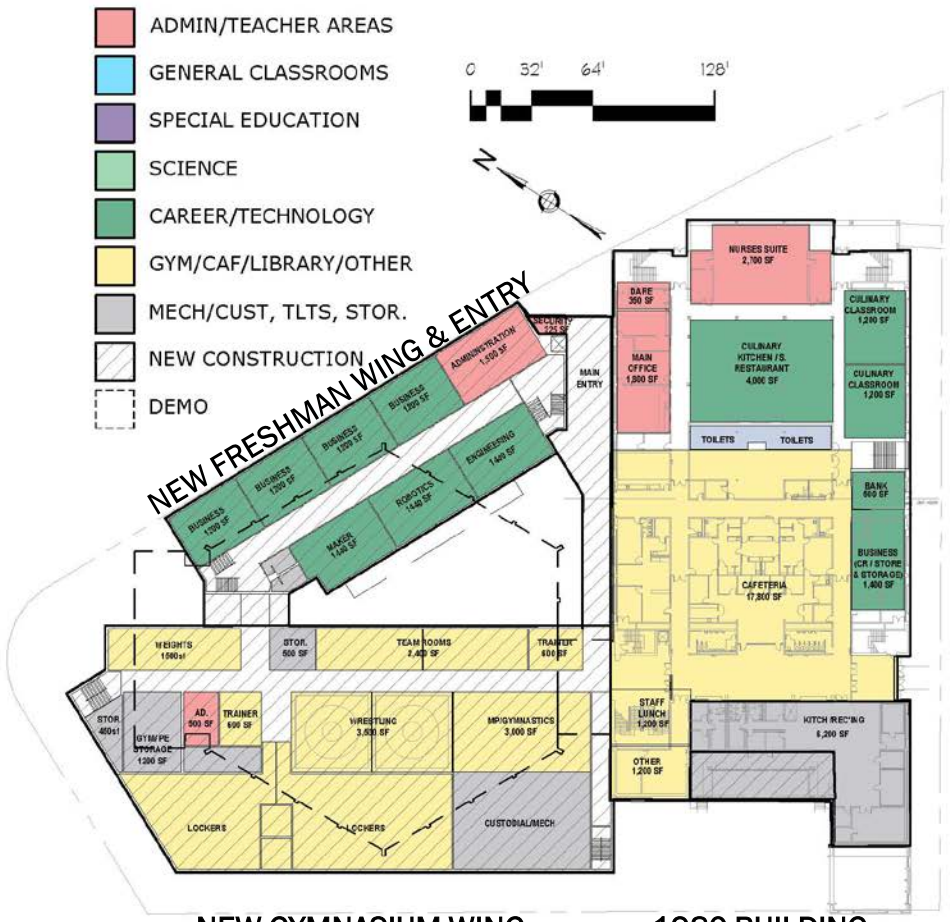
PHASE-3 Jul-Aug 1yr 2mo (2mo overlap)
- RENOVATE REMAINDER OF LORD (SOUTH END RENO IN SUMMERS) (AUDITORIUM IN SUMMERS)
- RENOVATE NORTH END OF 1922
- BUILD NEW NORTH BRIDGE

PHASE-4 Jul-Aug 1yr 2mo (2mo overlap)
- RENOVATE REMAINDER OF 1922
- BUILD NEW SOUTH BRIDGE

FINISHED FACILITY
Total Duration = 4 years + summer

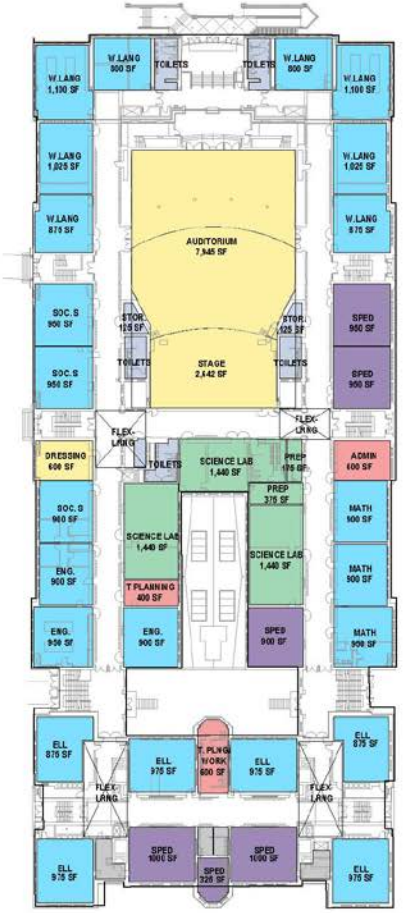
Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

LOWELL HIGH SCHOOL: OPTION 2A FLOOR PLANS



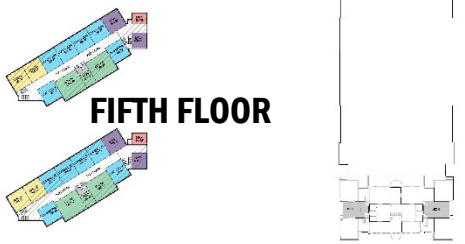
NEW GYMNASIUM WING

1980 BUILDING

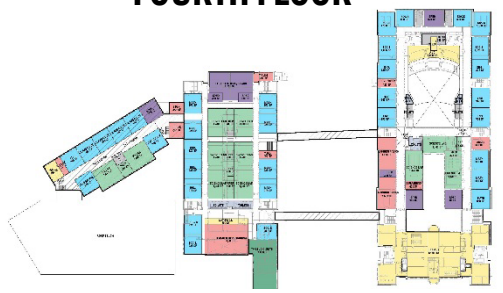


1922 BUILDING

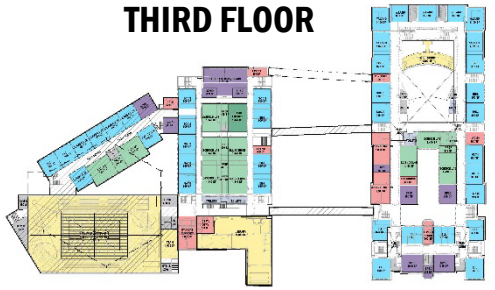
MAIN FLOOR PLAN



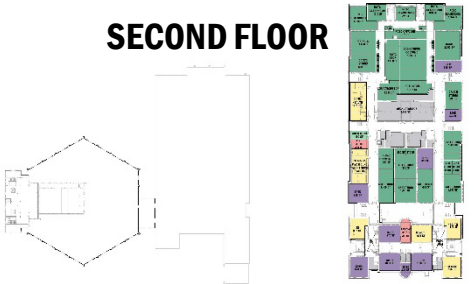
FIFTH FLOOR



FOURTH FLOOR

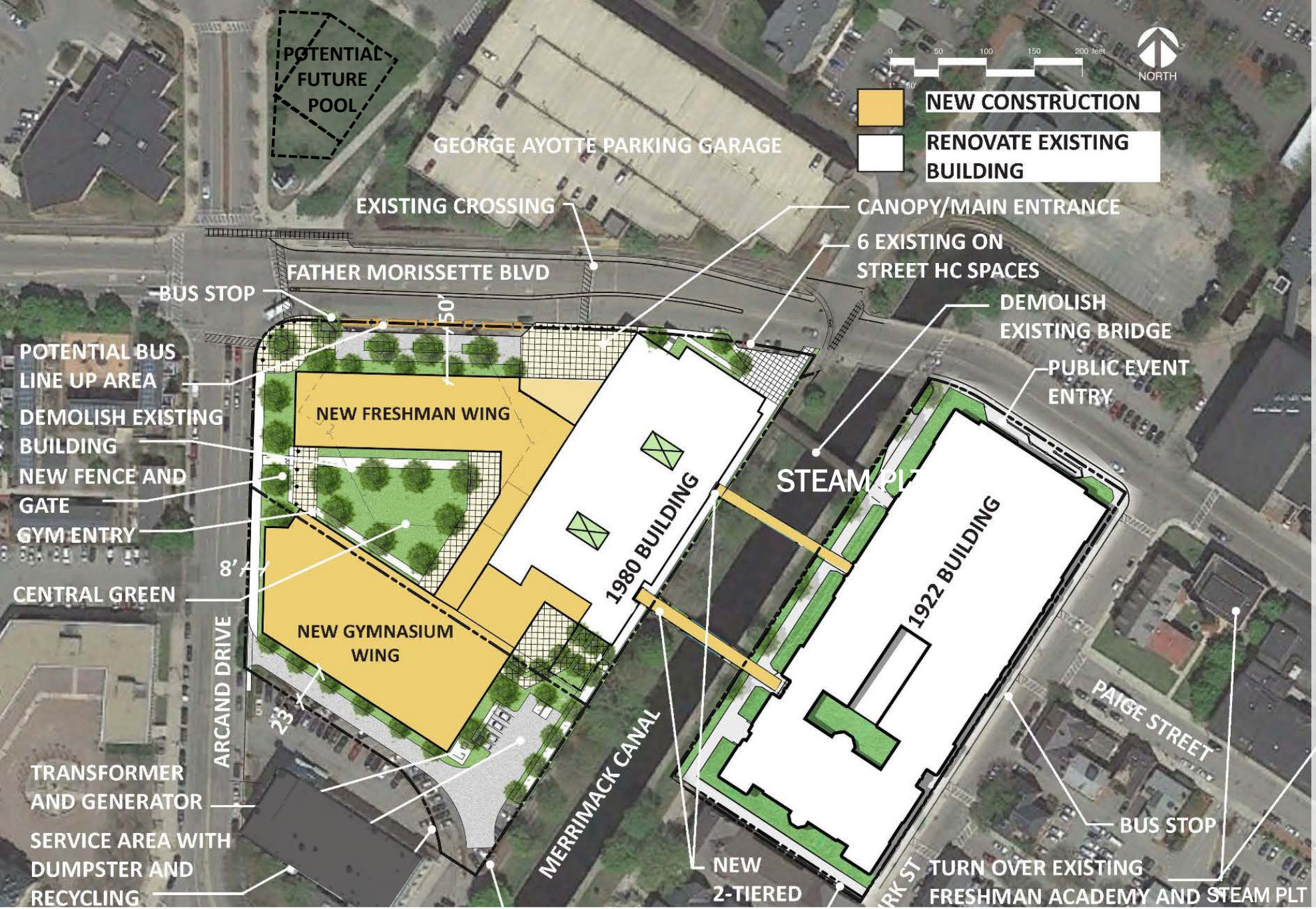


THIRD FLOOR



SECOND FLOOR

BASEMENT



ADD/RENO 3A EXPANDED SITE

Updated Educ Program
(pool removed)

PRELIM. PROS/CONS:

+ **Consolidated Campus**
  (new freshman academy)
+ **No Windowless Labs**
+ **Added Green + Loading**
— **Gym Areas More Remote**
— **Eminent Domain**

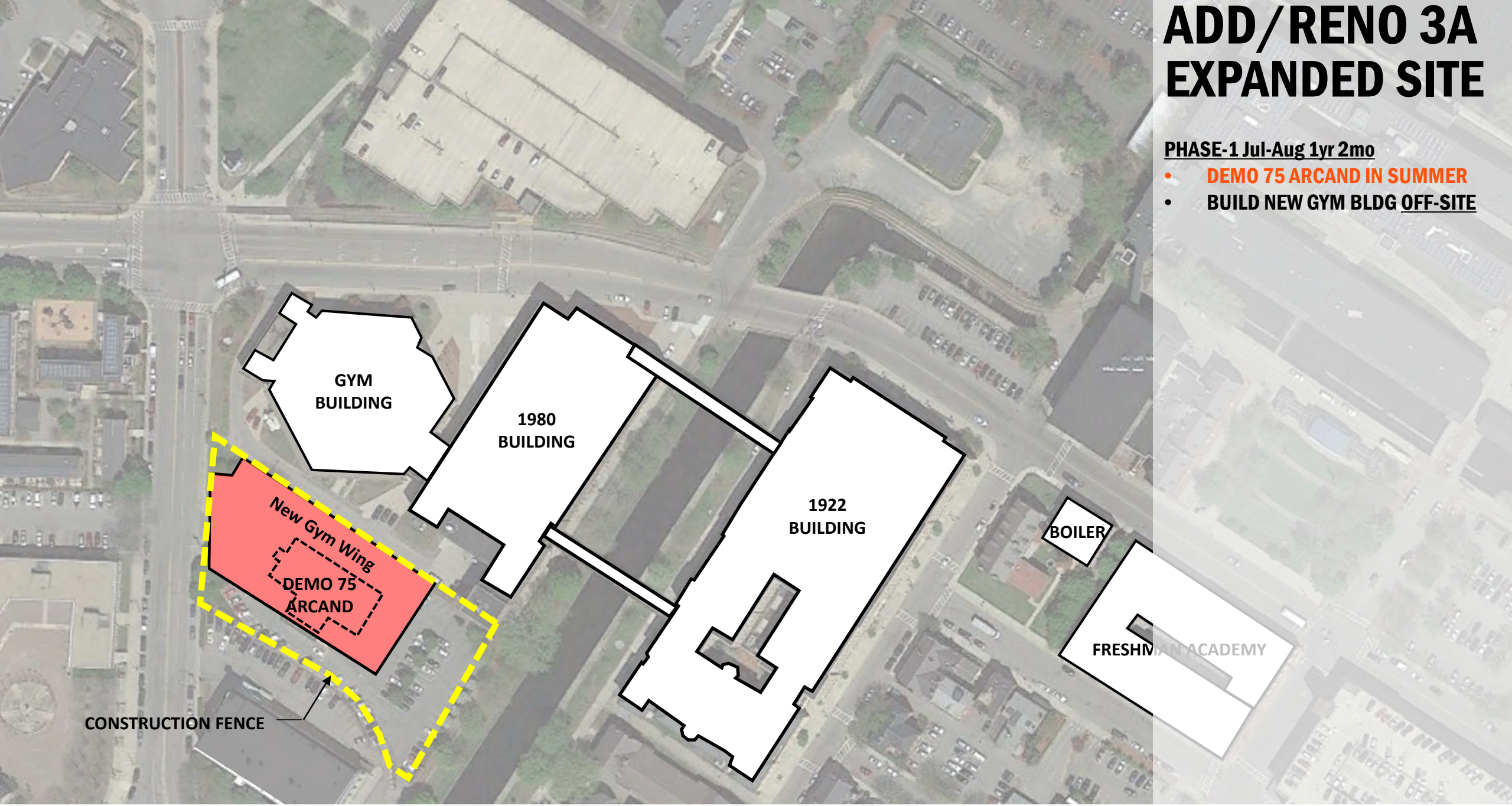
Phasing Est 5yrs
(but only 4 years on school site)

Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.

ADD/RENO 3A EXPANDED SITE

PHASE-1 Jul-Aug 1yr 2mo

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW GYM BLDG OFF-SITE



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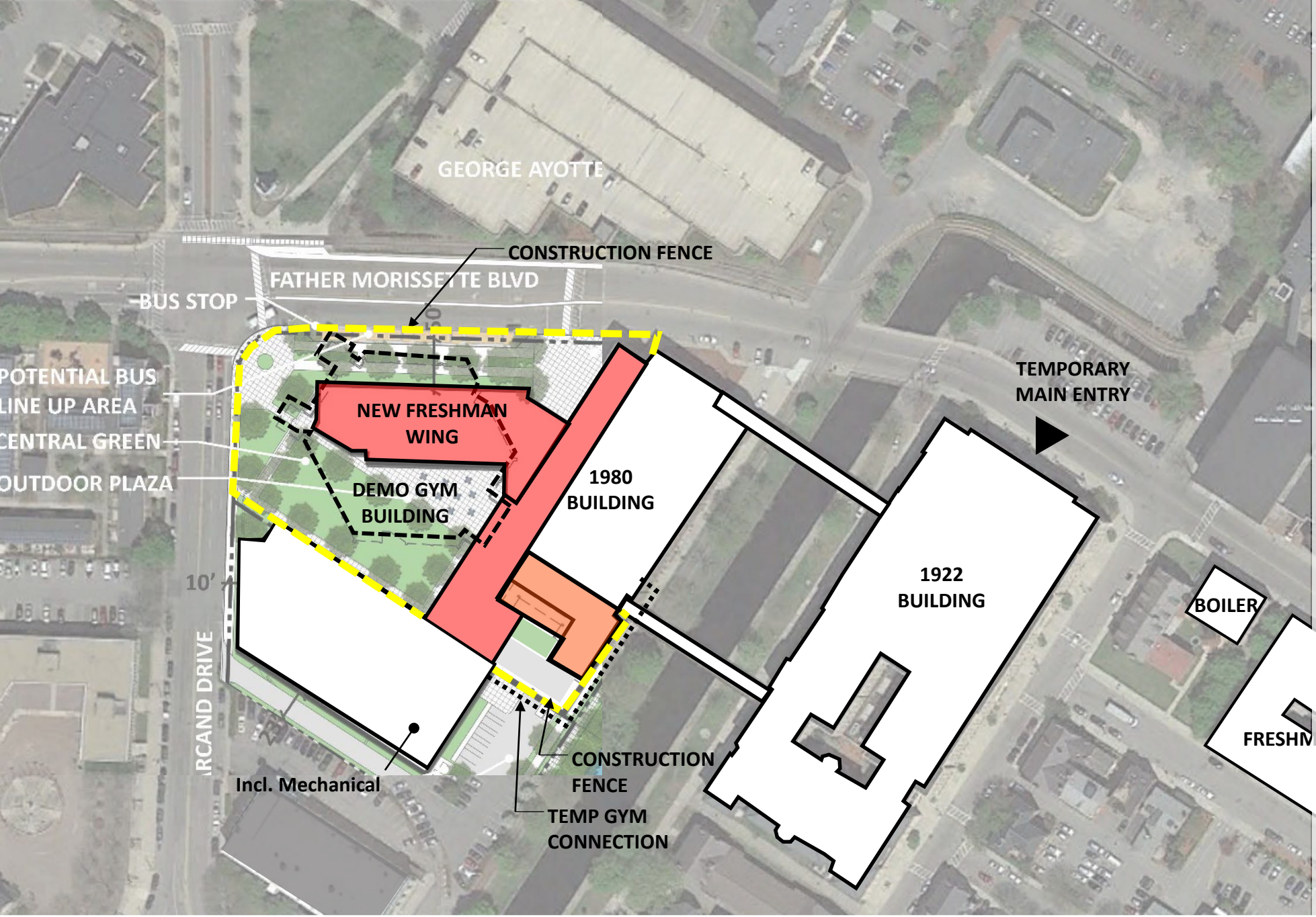
ADD/RENO 3A EXPANDED SITE



PHASE-1 Jul-Aug 1yr 2mo

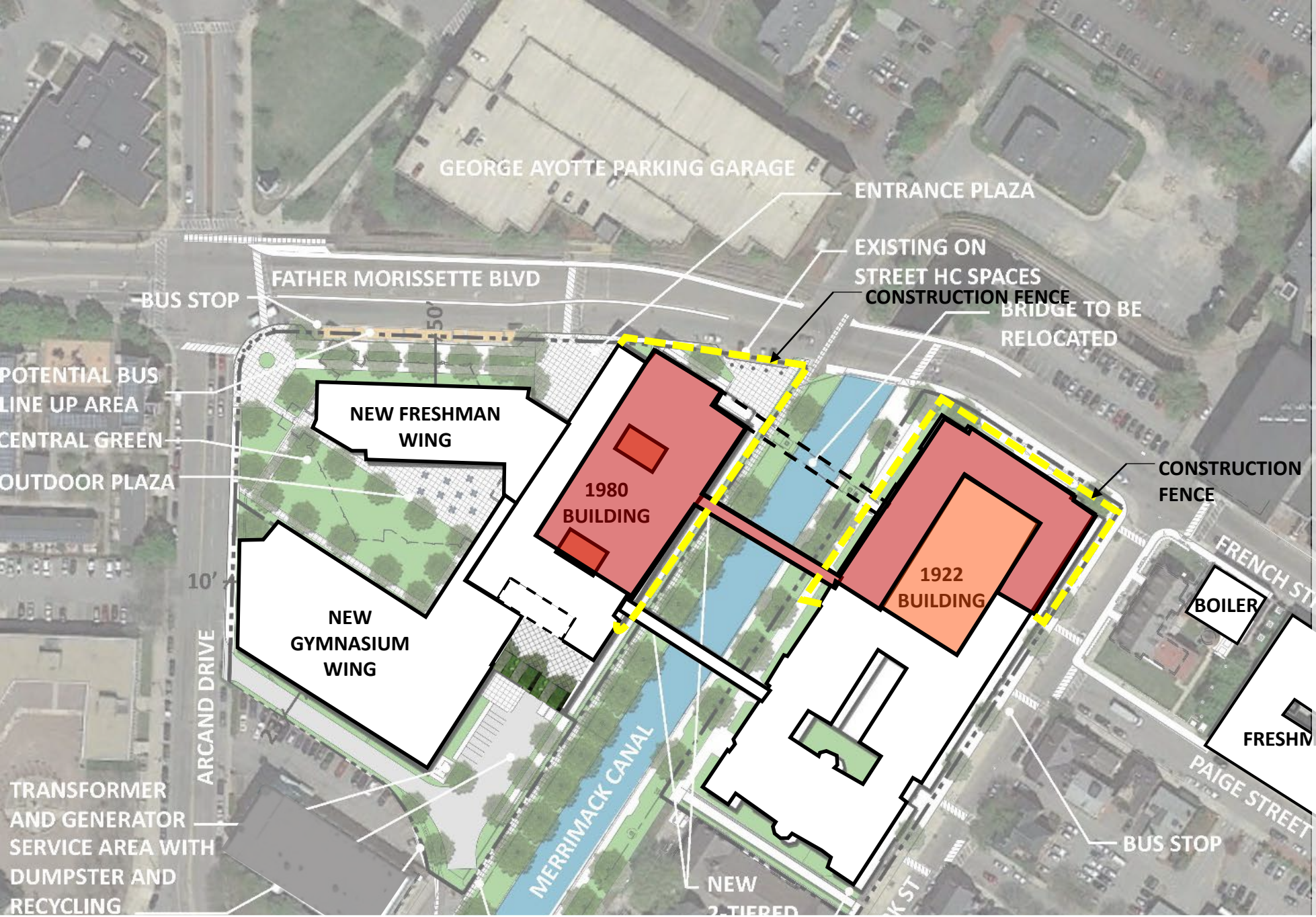
- DEMO 75 ARCAND IN SUMMER
- BUILD NEW GYM BLDG OFF-SITE

PHASE-2 Jul-Dec 1yr 6mo (2mo overlap)

- DEMO FIELD HOUSE IN SUMMER
- VACATE INTERIOR CLASSRMS
- BUILD NEW FRESHMAN ACADEMY
- RENOVATE WEST SIDE OF LORD (SOUTH END RENO IN SUMMERS)

Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.

ADD/RENO 3A EXPANDED SITE



PHASE-1 Jul-Aug 1yr 2mo

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW GYM BLDG OFF-SITE

PHASE-2 Jul-Dec 1yr 6mo (2mo overlap)

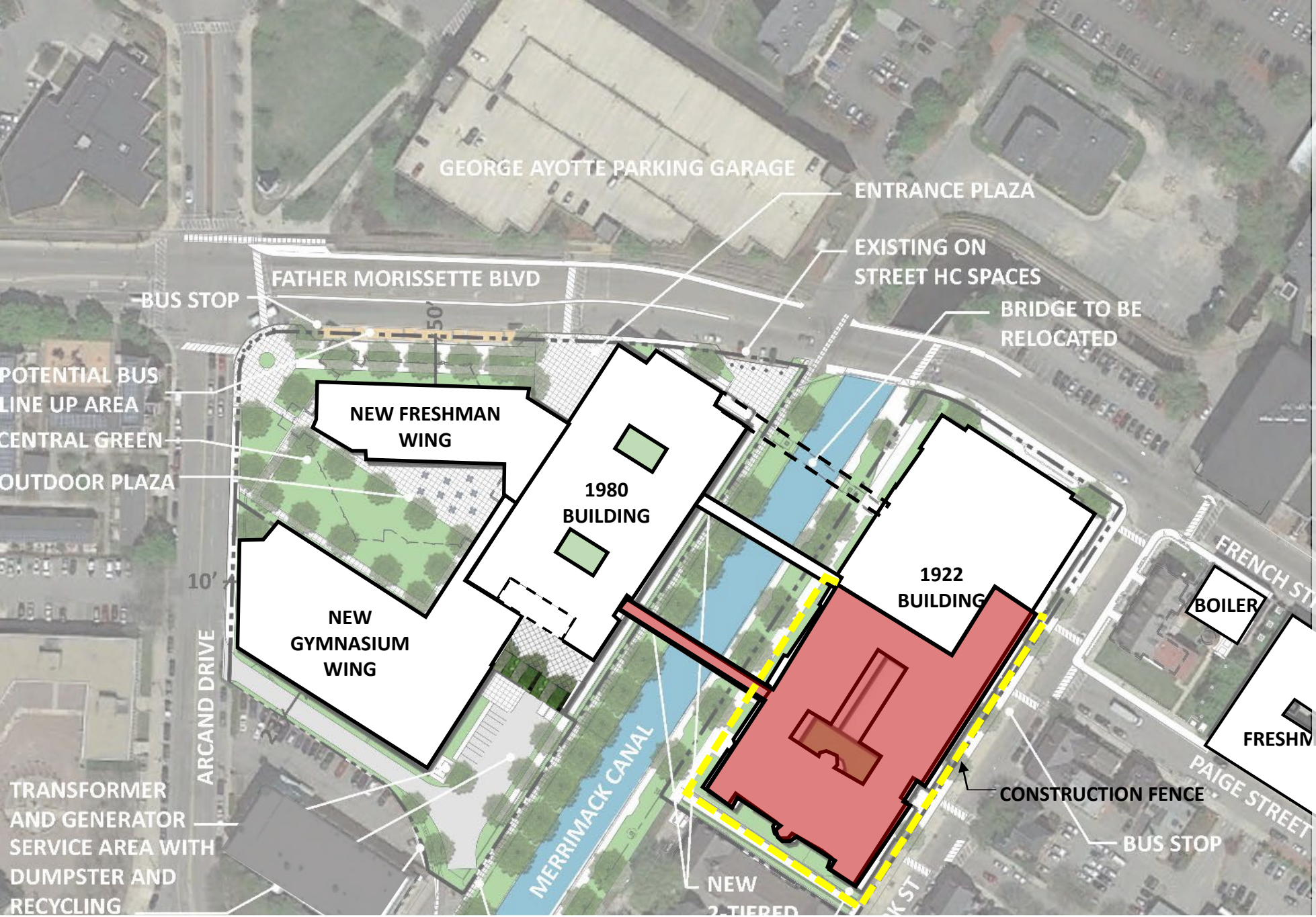
- DEMO FIELD HOUSE IN SUMMER
- VACATE INTERIOR CLASSRMS
- BUILD NEW FRESHMAN ACADEMY
- RENOVATE WEST SIDE OF LORD (SOUTH END RENO IN SUMMERS)

PHASE-3 Jan-Mar 1yr 3mo

- RENOVATE REMAINDER OF LORD
- RENOVATE NORTH END OF 1922 (AUDITORIUM IN SUMMERS)
- BUILD NEW NORTH BRIDGE

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

ADD/RENO 3A EXPANDED SITE



PHASE-1 Jul-Aug 1yr 2mo

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW GYM BLDG OFF-SITE

PHASE-2 Jul-Dec 1yr 6mo (2mo overlap)

- DEMO FIELD HOUSE IN SUMMER
- VACATE INTERIOR CLASSRMS
- BUILD NEW FRESHMAN ACADEMY
- RENOVATE WEST SIDE OF LORD (SOUTH END RENO IN SUMMERS)

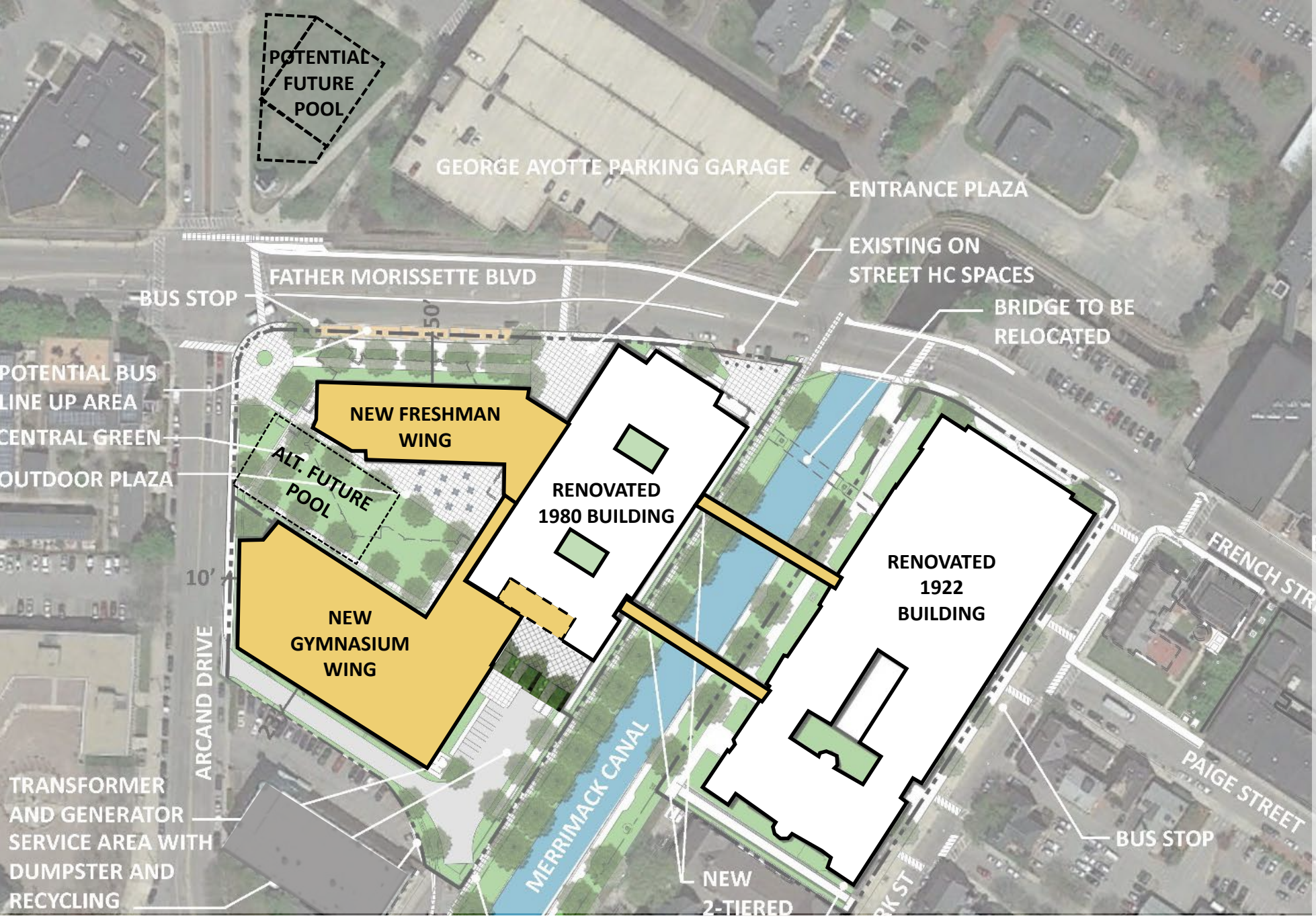
PHASE-3 Jan-Mar 1yr 3mo

- RENOVATE REMAINDER OF LORD
- RENOVATE NORTH END OF 1922 (AUDITORIUM IN SUMMERS)
- BUILD NEW NORTH BRIDGE

PHASE-4 Apr-Jun 1yr 3mo

- RENOVATE REMAINDER OF 1922
- BUILD NEW SOUTH BRIDGE

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager



ADD/RENO 3A EXPANDED SITE

PHASE-1 Jul-Aug 1yr 2mo

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW GYM BLDG OFF-SITE

PHASE-2 Jul-Dec 1yr 6mo (2mo overlap)

- DEMO FIELD HOUSE IN SUMMER
- VACATE INTERIOR CLASSRMS
- BUILD NEW FRESHMAN ACADEMY
- RENOVATE WEST SIDE OF LORD (SOUTH END RENO IN SUMMERS)

PHASE-3 Jan-Mar 1yr 3 mo

- RENOVATE REMAINDER OF LORD
- RENOVATE NORTH END OF 1922 (AUDITORIUM IN SUMMERS)
- BUILD NEW NORTH BRIDGE

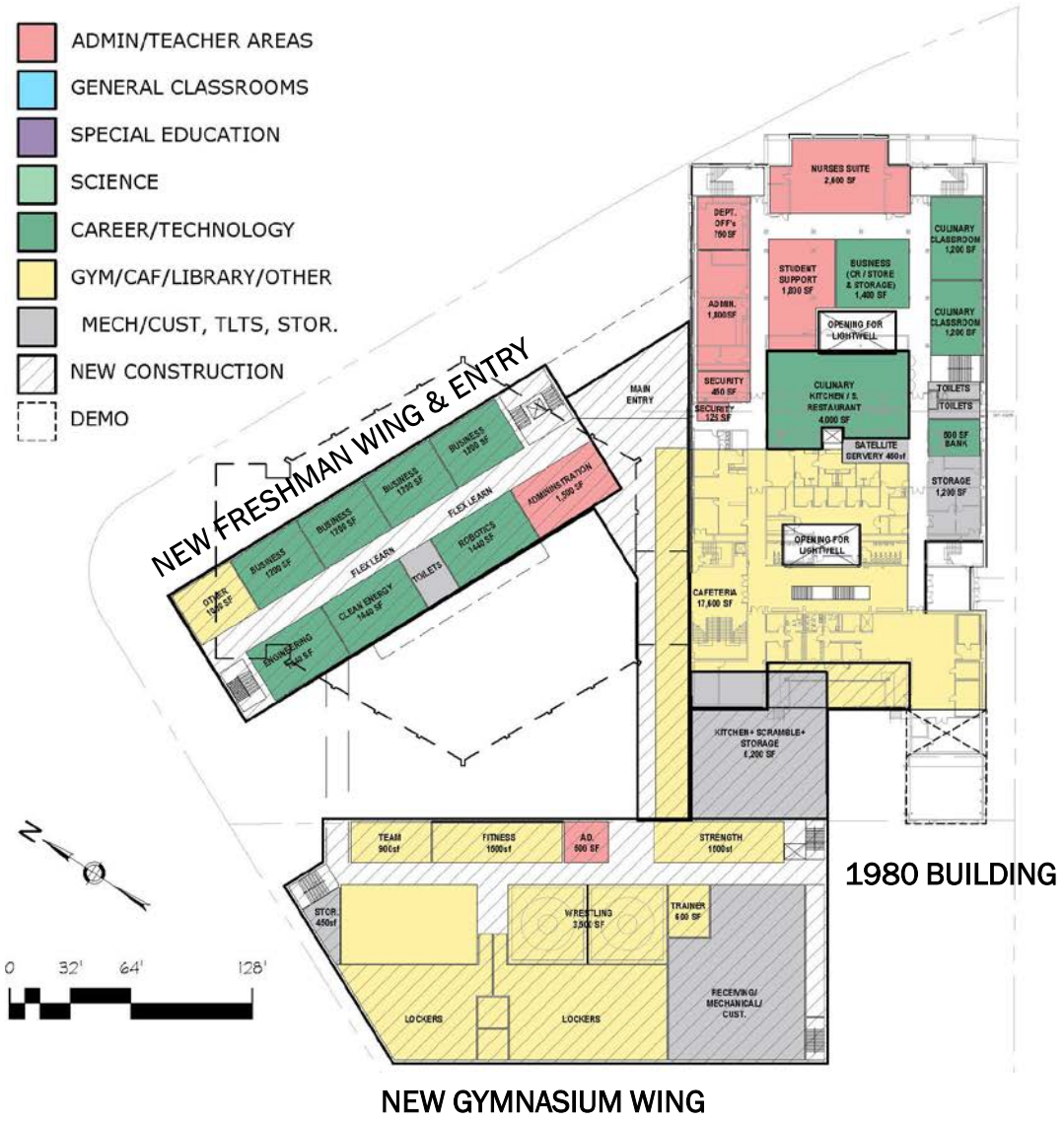
PHASE-4 Apr-Jun 1yr 3mo

- RENOVATE REMAINDER OF 1922
- BUILD NEW SOUTH BRIDGE

FINISHED FACILITY
Total Duration = 5 years (4 on site)

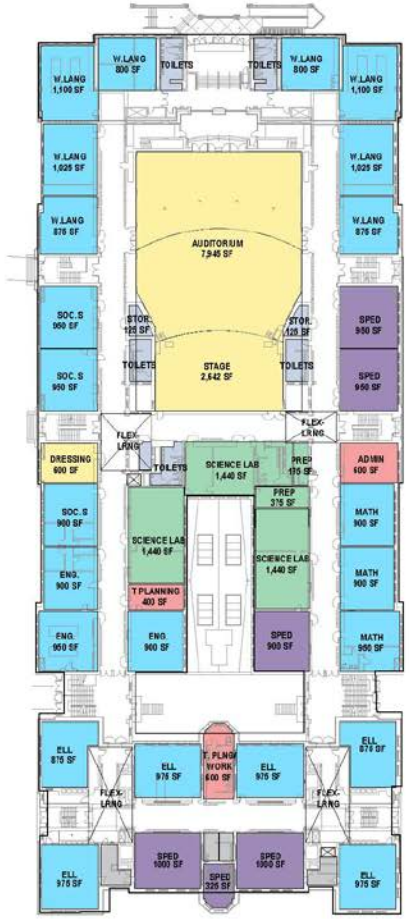
Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

LOWELL HIGH SCHOOL: OPTION 3A FLOOR PLANS



1980 BUILDING

NEW GYMNASIUM WING



1922 BUILDING

MAIN FLOOR PLAN

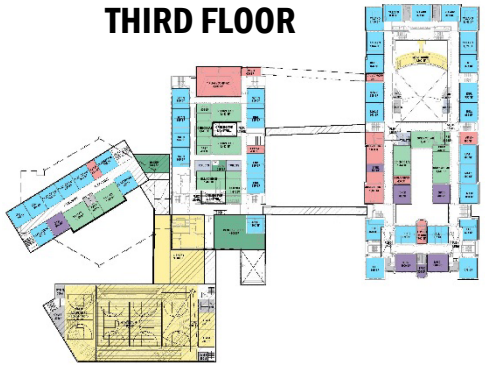


FIFTH FLOOR

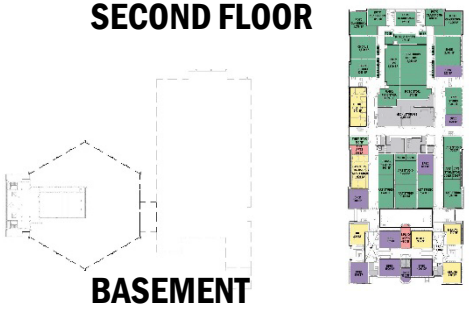
FOURTH FLOOR



THIRD FLOOR



SECOND FLOOR



BASEMENT



NEW OPTION A EXPANDED SITE

1922 BLDG UNUSED

Updated Educ Program

(pool removed)

PRELIM. PROS/CONS:

+ **Consolidated Campus**
  (via 5 story + basement)
+ **Good Classrm Orientation**
- **24 Temporary Classrms & Temporary Gym Required**
- **Limited Green Space**
- **Eminent Domain**

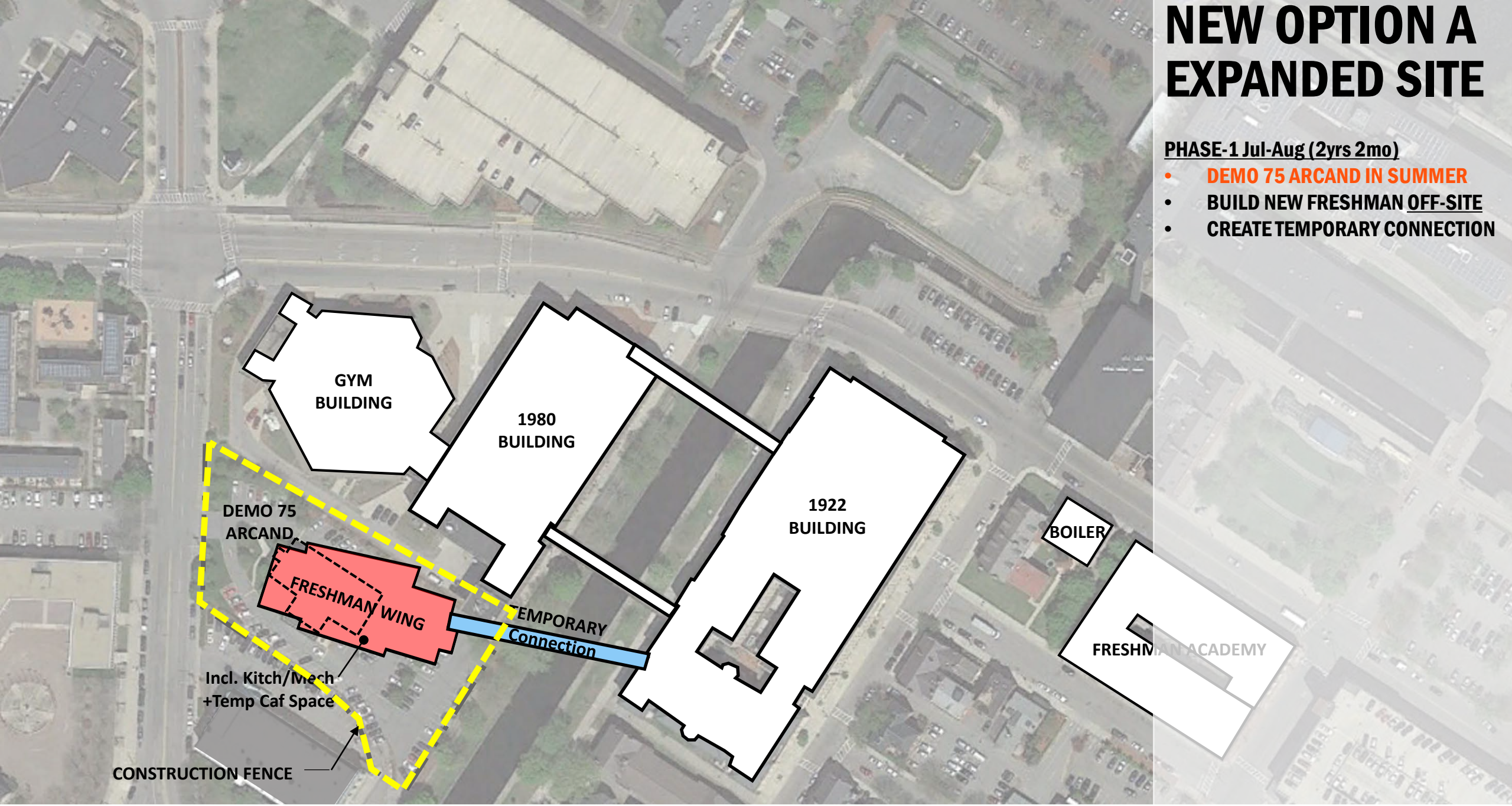
Phasing Est 4yrs + Summer
(but only 2 years on school site)

Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.

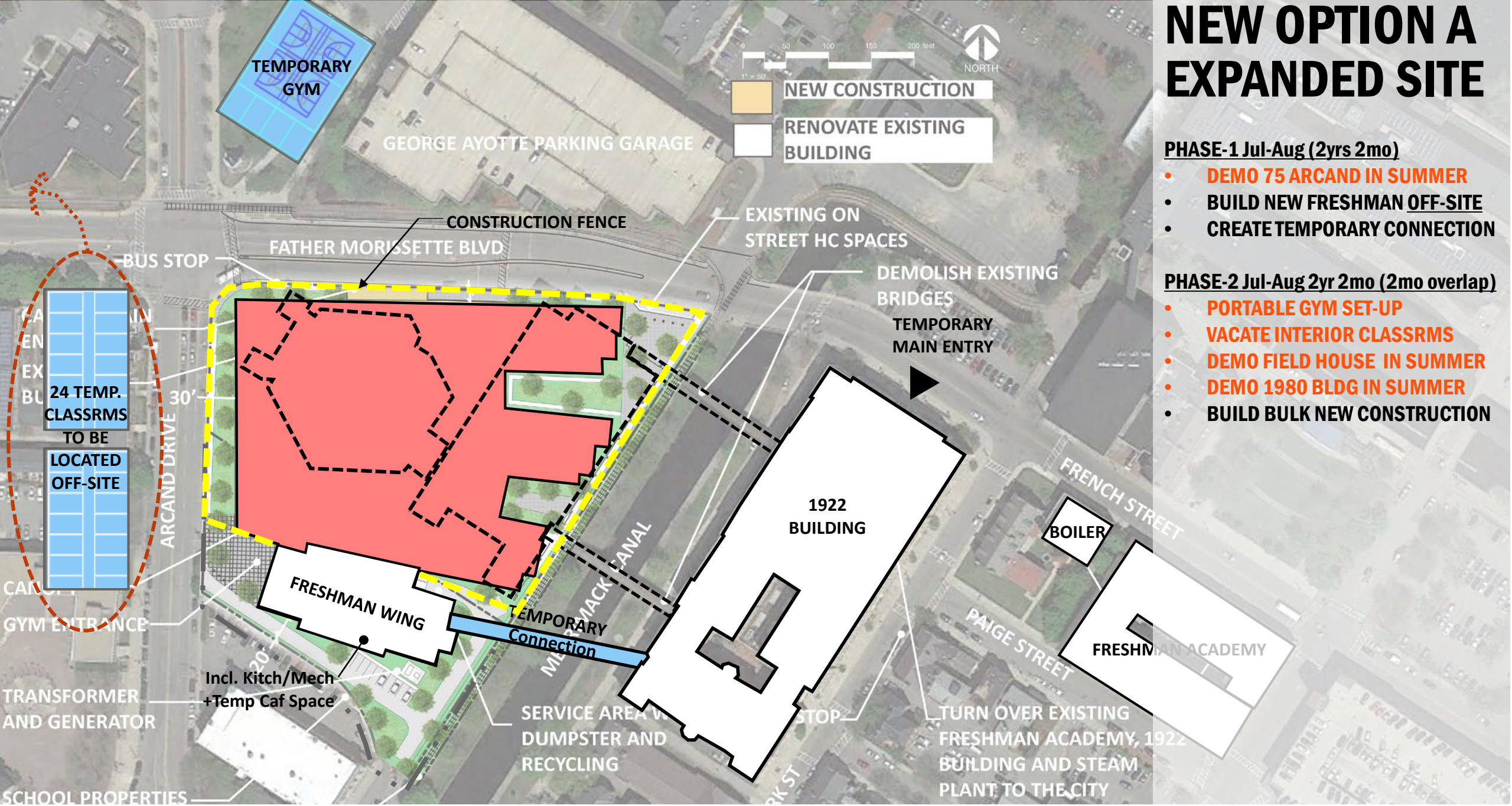
NEW OPTION A EXPANDED SITE

PHASE-1 Jul-Aug (2yrs 2mo)

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW FRESHMAN OFF-SITE
- CREATE TEMPORARY CONNECTION



Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager



NEW OPTION A EXPANDED SITE

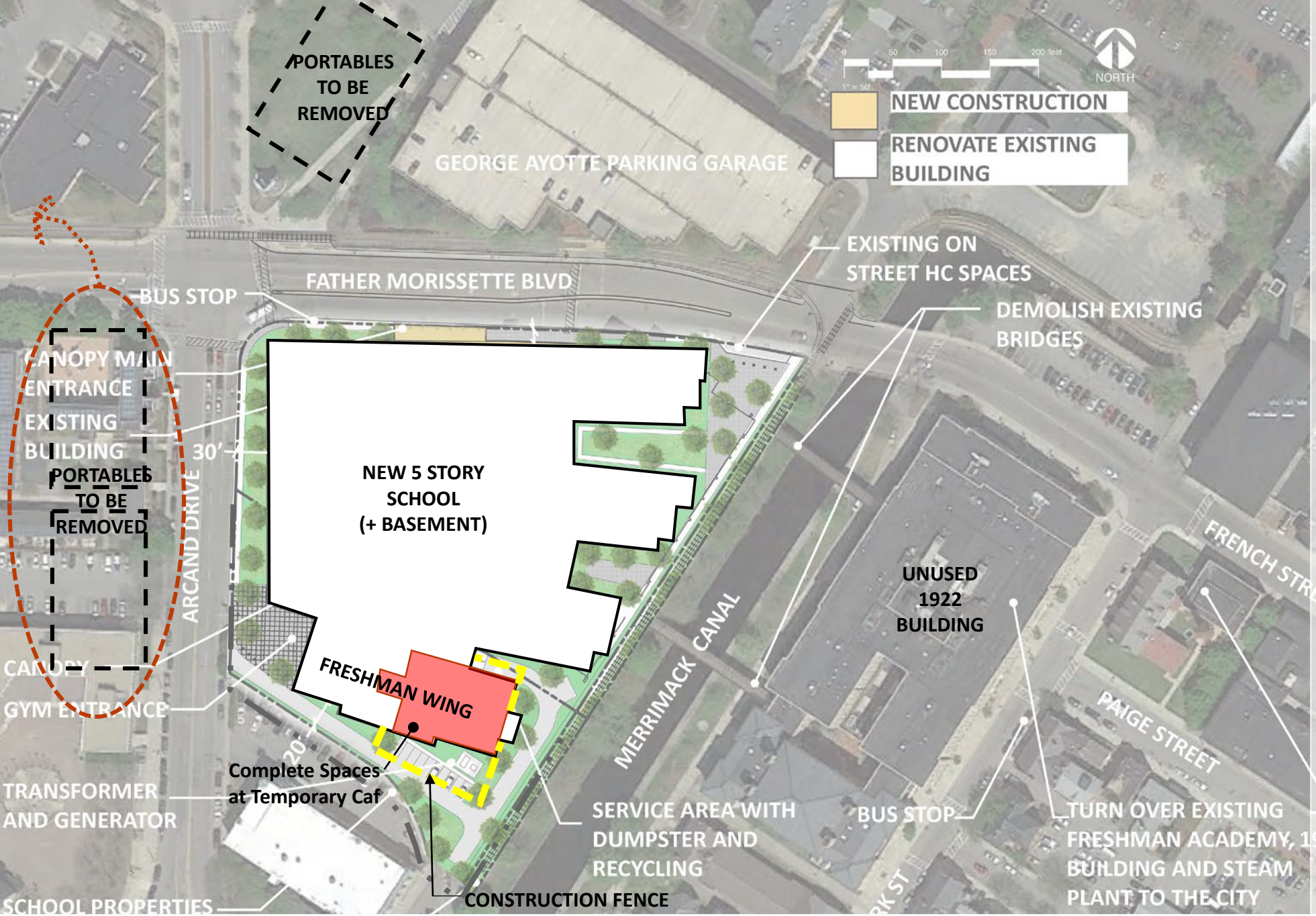
PHASE-1 Jul-Aug (2yrs 2mo)

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW FRESHMAN OFF-SITE
- CREATE TEMPORARY CONNECTION

PHASE-2 Jul-Aug 2yr 2mo (2mo overlap)

- PORTABLE GYM SET-UP
- VACATE INTERIOR CLASSRMS
- DEMO FIELD HOUSE IN SUMMER
- DEMO 1980 BLDG IN SUMMER
- BUILD BULK NEW CONSTRUCTION

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager



NEW OPTION A EXPANDED SITE

PHASE-1 Jul-Aug (2yrs 2mo)

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW FRESHMAN OFF-SITE
- CREATE TEMPORARY CONNECTION

PHASE-2 Jul-Aug 2yr 2mo (2mo overlap)

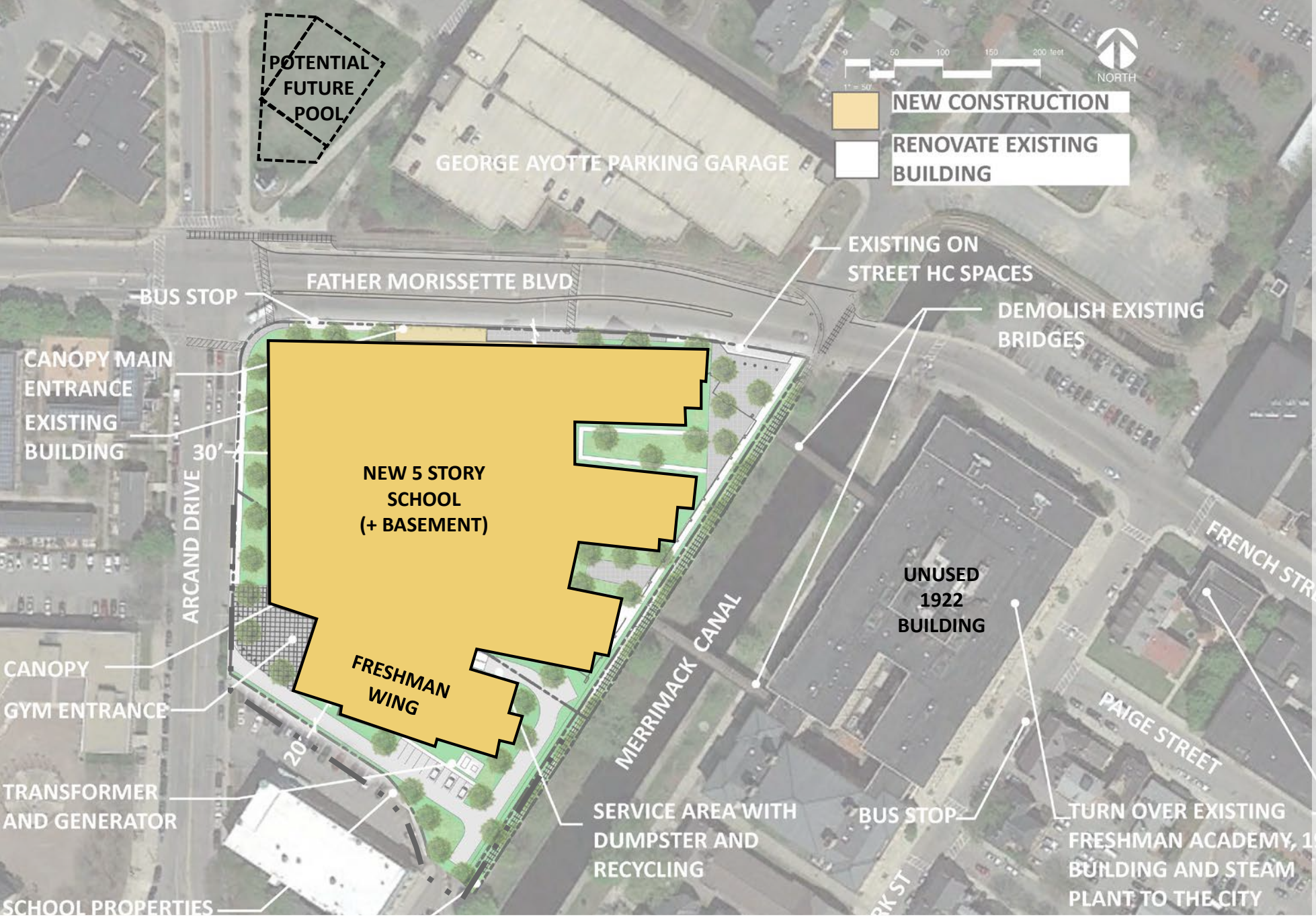
- PORTABLE GYM SET-UP
- VACATE INTERIOR CLASSRMS
- DEMO FIELD HOUSE IN SUMMER
- DEMO 1980 BLDG IN SUMMER
- BUILD BULK NEW CONSTRUCTION

PHASE-3 Jul-Aug (2mo overlap)

- REMOVE PORTABLES
- COMPLETE FIT-OUT AT TEMP CAF

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

NEW OPTION A EXPANDED SITE



PHASE-1 Jul-Aug (2yrs 2mo)

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW FRESHMAN OFF-SITE
- CREATE TEMPORARY CONNECTION

PHASE-2 Jul-Aug 2yr 2mo (2mo overlap)

- PORTABLE GYM SET-UP
- VACATE INTERIOR CLASSRMS
- DEMO FIELD HOUSE IN SUMMER
- DEMO 1980 BLDG IN SUMMER
- BUILD BULK NEW CONSTRUCTION

PHASE-3 Jul-Aug (2mo overlap)

- REMOVE PORTABLES
- COMPLETE FIT-OUT AT TEMP CAF

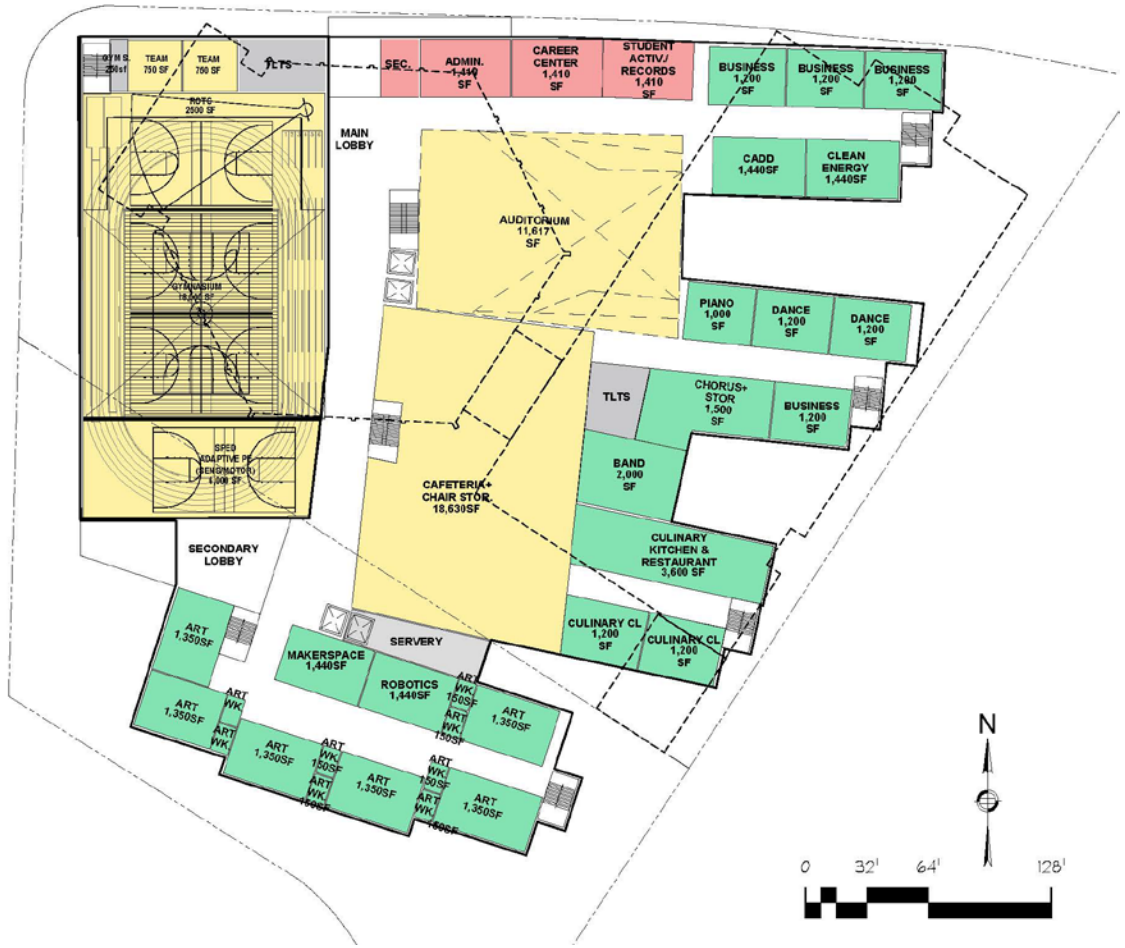
FINISHED FACILITY

Total = 4 yrs + Summer (2 on site)

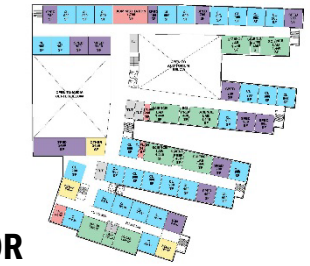
Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

LOWELL HIGH SCHOOL: NEW OPTION A FLOOR PLANS

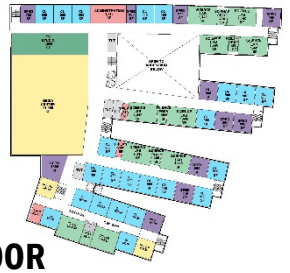
- ADMIN/TEACHER AREAS
- GENERAL CLASSROOMS
- SPECIAL EDUCATION
- SCIENCE
- CAREER/TECHNOLOGY
- GYM/CAF/LIBRARY/OTHER
- MECH/CUST, TLTS, STOR.
- NEW CONSTRUCTION
- DEMO



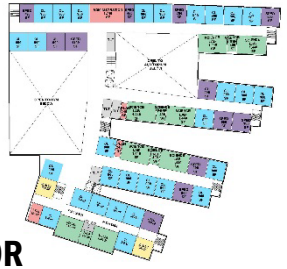
MAIN FLOOR PLAN



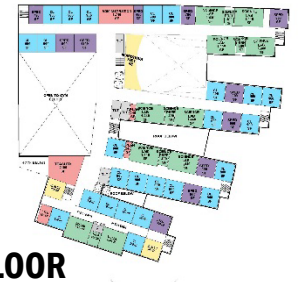
FIFTH FLOOR



FOURTH FLOOR



THIRD FLOOR



SECOND FLOOR



BASEMENT

LOWELL HIGH SCHOOL

- Schedule / Next Steps:
  - Ongoing: Estimate / Pricing Update
  - 4/30: SBC / City Council / Community Mtg.
    - Cost Update
    - SBC Vote Recommendation Preferred Option
  - 5/1: City Council Vote Preferred Option
  - 5/9: MSBA PSR (Preferred Schematic Report) Submission
  - 5/9: MSBA FAS (Facilities Assessment Subcommittee) Mtg.
  - 6/27: MSBA Board Approval PSR
  - 7/1/18 – 4/10/19: Schematic Design



PERKINS EASTMAN

SCHOOL BUILDING COMMITTEE / COMMUNITY MEETING

LOWELL HS PROJECT



EXISTING IMAGERY COURTESY OF GOOGLE EARTH

30 APRIL 2018

LOWELL HIGH SCHOOL

AGENDA



- Updates Since Last SBC Meeting 3/29:
  - Meetings:
    - City Departments, Sustainability, Security, Community Meeting
    - Energy Update
- Overview of Design Options
- Cost Estimate Update
- Community Forum
- SBC Vote Recommendation Preferred Option
- Next Steps

LOWELL HIGH SCHOOL

ENERGY UPDATE

02 ENERGY END USE PROFILES BY SECTOR

Figure 02. shows the annual aggregate energy end-use breakdown for each of the design options. Each color in the pie charts denotes various end-uses. The largest end-use for each options is heating, followed by internal loads and cooling energy use. Although the New Option A has heating as the predominant load, it is smaller than the renovation options.

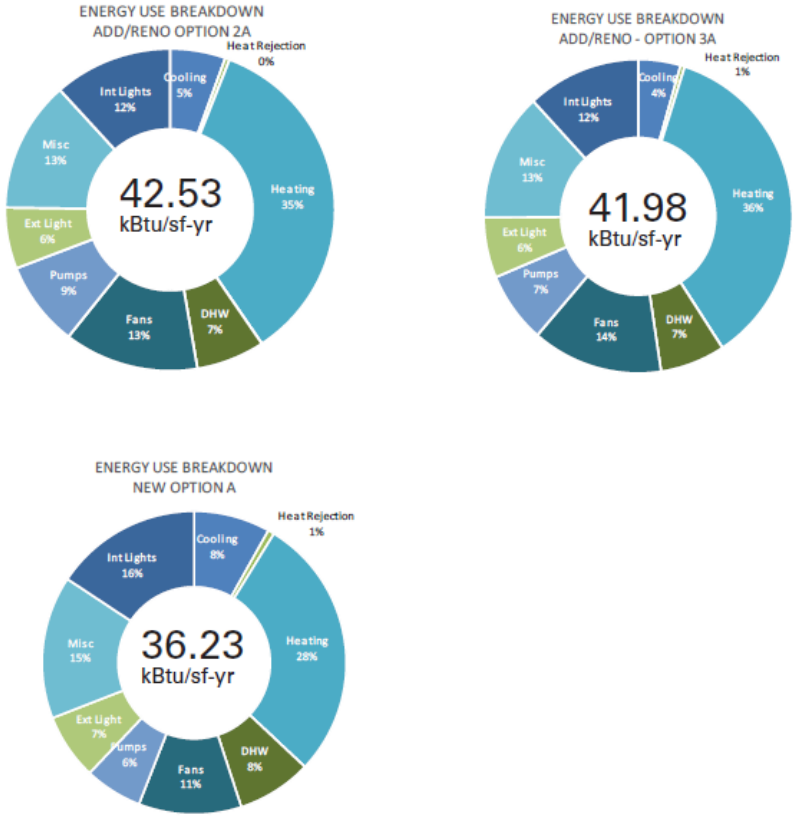


Figure 02. EUI Comparison by Design Options

03 ENERGY END USE PROFILE

Figure 03. shows the annual aggregate energy end-use breakdown for each design case. Each color in the bar chart denotes various end-uses.

The results illustrate that all the design options have a lower EUI than the existing building. The Add/Reno 2A and 3A have similar savings, and the New Option A has the most compared to the existing building. The greatest savings in the New Option A is from heating.

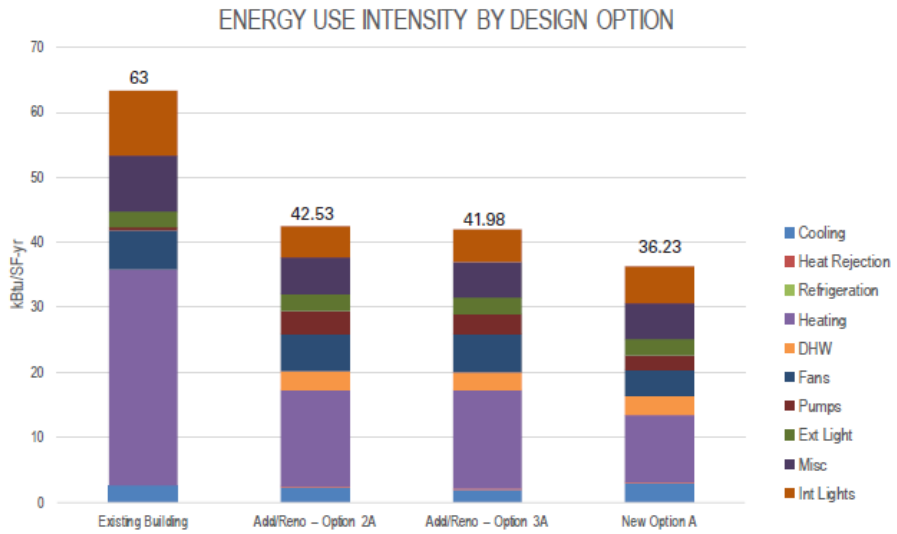
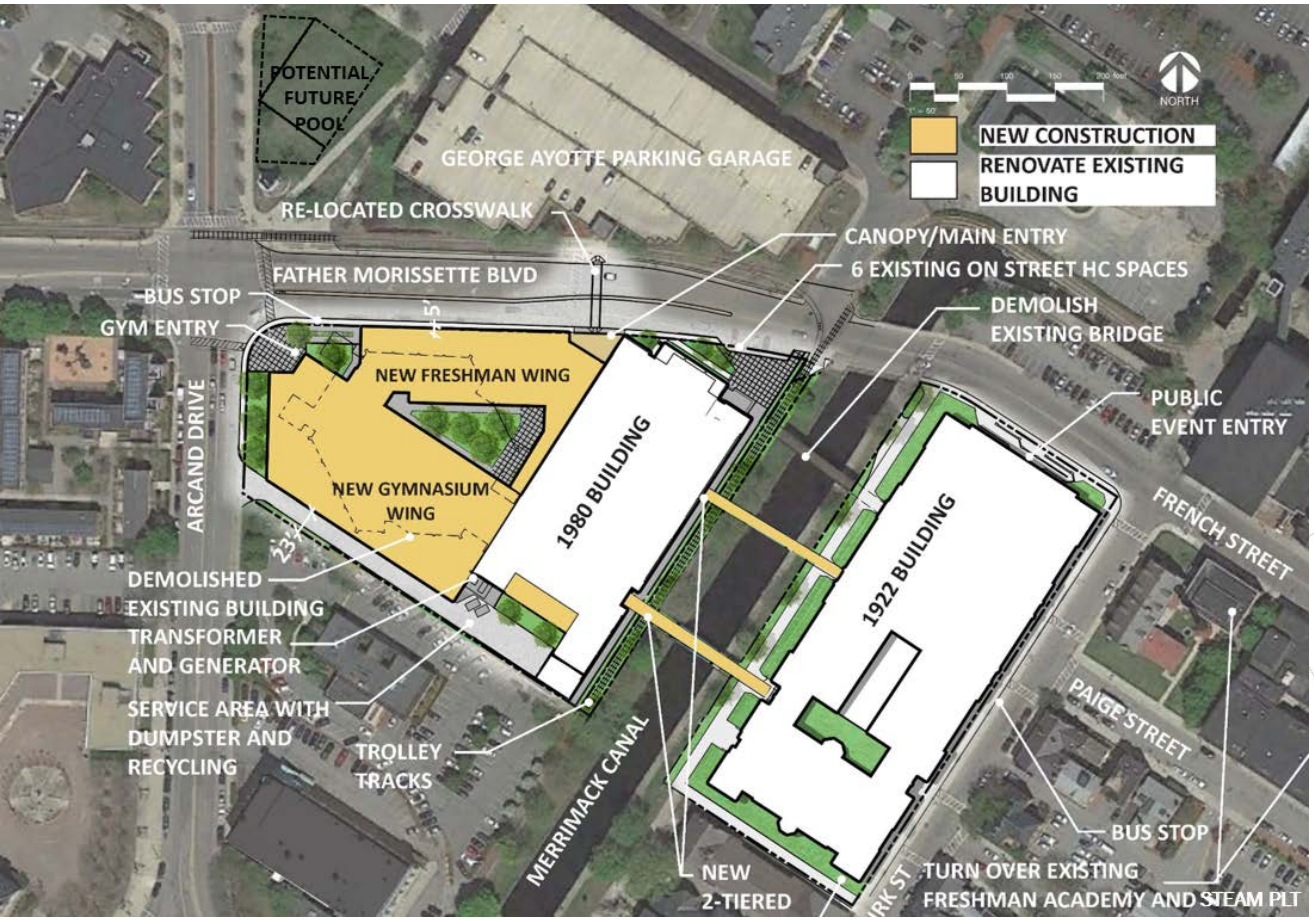


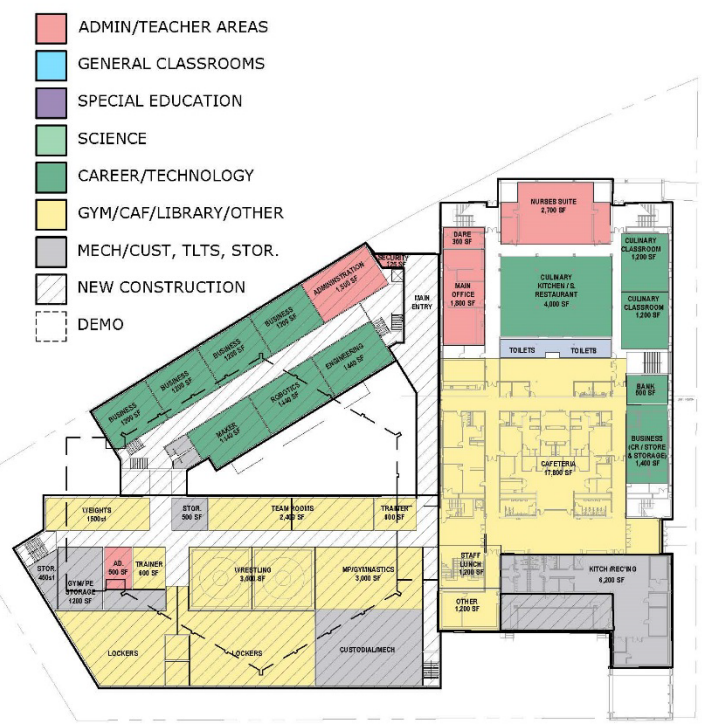
Figure 03. Annual Energy Use Profile by Design Options

			
Building/Site •Acreage •Gross Size •Stories/Ht	6.0 acres 618.7k gsf (445.5k reno+173.2k add) Exist'g (63'), 5 Story (68'-8"FA) and 2 Story (58' Gym)	7.4 = 6.0 acres +1.4 exp. lot 622.2k gsf (432.6k reno +189.6k add) Exist'g (63'), 5 Story (68'-8"FA) and 2 Story (58' Gym)	7.4 = 6.0 +1.4 exp. lot 579.4k gsf 5 Story+ Basement (68'-8")
Prelim. PROS/CONS	+ Consolidated Campus (new freshman academy) – Temporary Gym Required – Windowless Labs Remain – Limited Green + Loading	+ Consolidated Campus (new freshman academy) + No Windowless Labs + Added Green + Loading – Gym Areas More Remote – Eminent Domain	+ Consolidated Campus (via 5 story + basement) + Good Classroom Orientation – 24 Temporary Classrooms & Temporary Gym Required – Limited Green Space – Eminent Domain
Educ-Program	Meets Educational Objectives : +Freshman Academy Connected ±Public/Activity Areas Spread & Split +F.A. Teams + STEM/Hum. Clusters +Meets New Standards (Count/Size) +More Efficient/Effective Field House	Meets Educational Objectives : +Freshman Academy Connected ±Public/Activity Areas Spread & Split +F.A. Teams + STEM/Hum. Clusters +Meets New Standards (Count/Size) +More Efficient/Effective Field House	Meets Educational Objectives : +Freshman Academy Connected ±Public/Activity Areas Spread & Split +F.A. Teams + STEM/Hum. Clusters +Meets New Standards (Count/Size) +More Efficient/Effective Field House
Construction	4 Year (+ summer) Phased Project +Kitchen/Boiler Built in First Phase –Temporary Gym Facilities Required	5 Year Phased Project +Kitchen/Boiler Built in First Phase +No Modulars or Temporary Gym ±Only 4 Years of 5 On School Site –Land Acquisition/Eminent Domain	4 Year (+summer) Phased Project +Kitchen/Boiler/Temp Caf. Built in First Phase ±Only 2 Years of 4 On School Site –Land Acquisition/Eminent Domain –Temp. Gym and 24 Temp. Classrooms Req'd

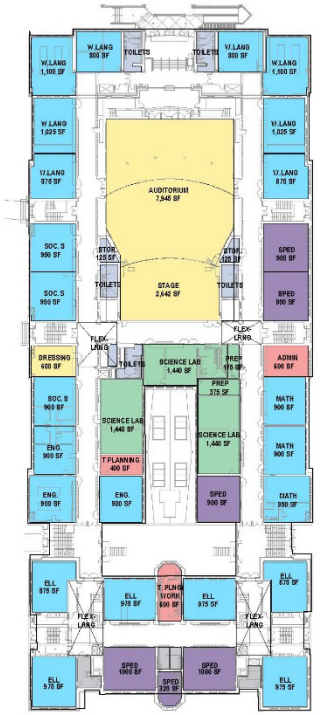
LOWELL HIGH SCHOOL: OPTION 2A



SITE PLAN



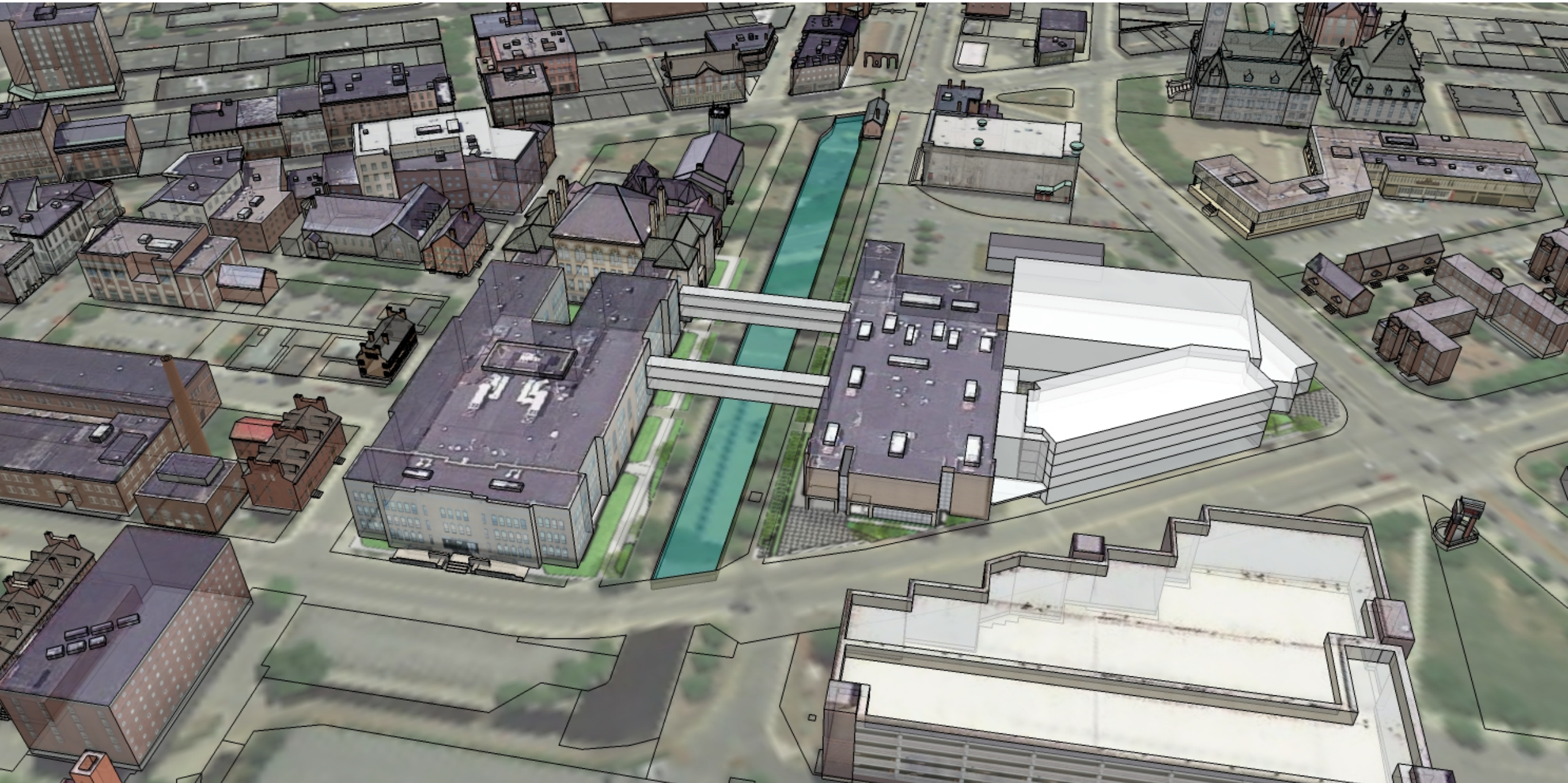
NEW GYMNASIUM WING 1980 BUILDING



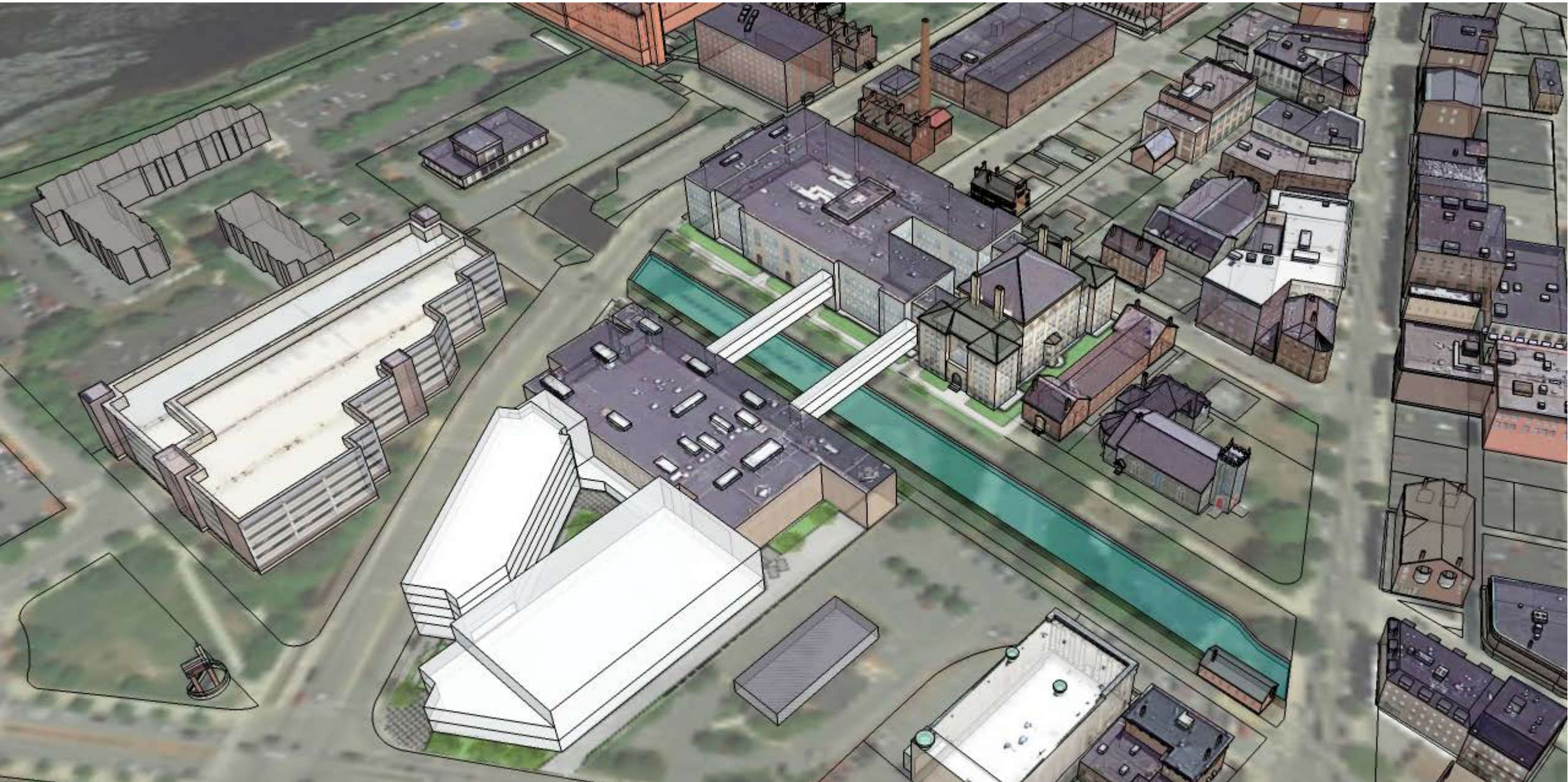
1922 BUILDING

MAIN FLOOR PLAN

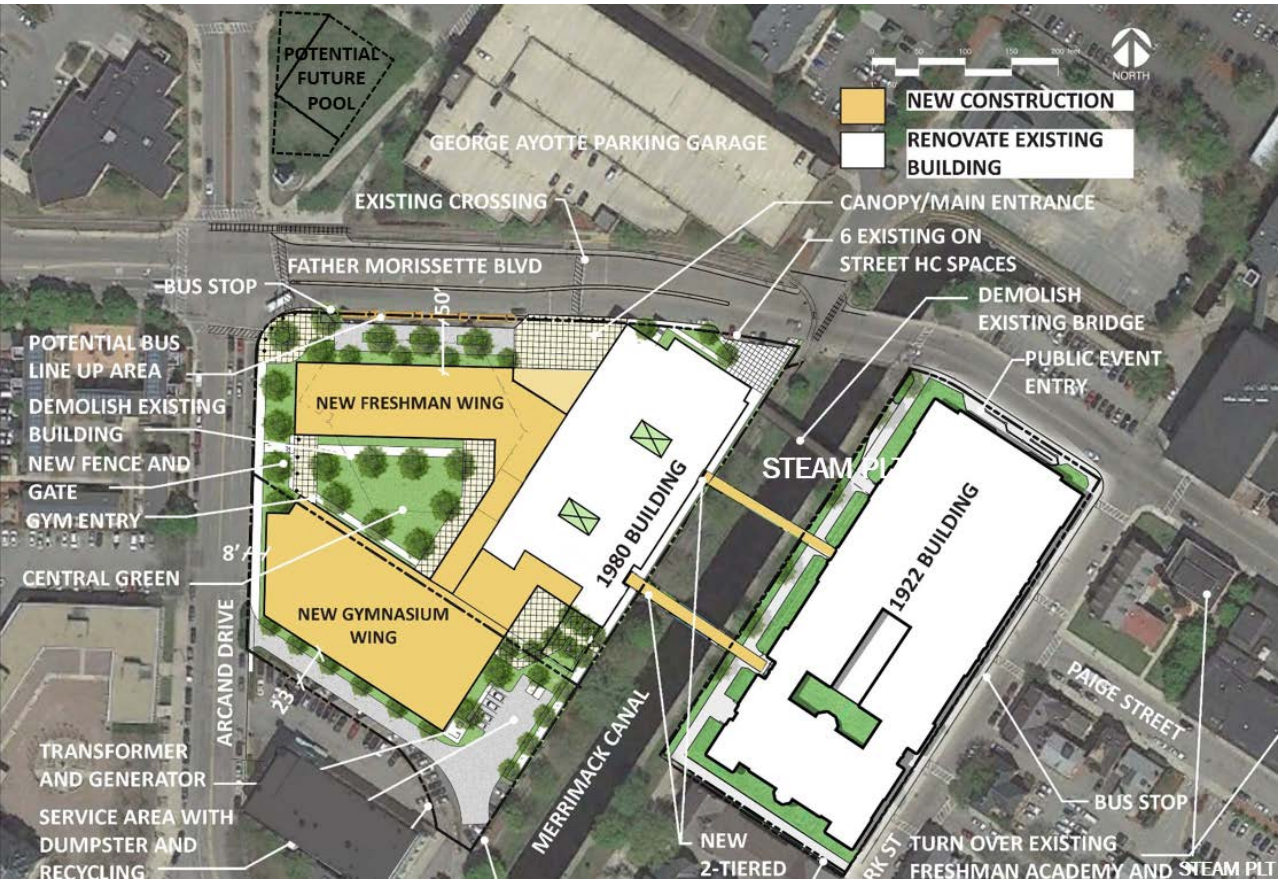
LOWELL HIGH SCHOOL: OPTION 2A MASSING



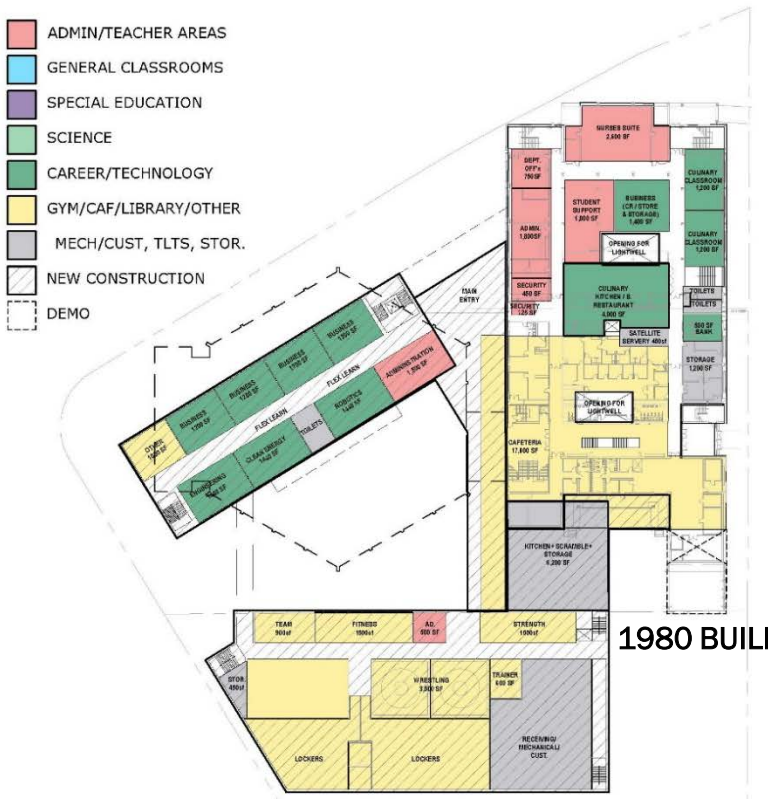
LOWELL HIGH SCHOOL: OPTION 2A MASSING

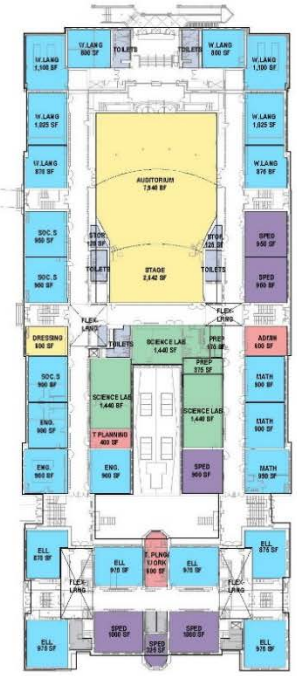


LOWELL HIGH SCHOOL: OPTION 3A – EXPANDED SITE



SITE PLAN





1980 BUILDING

1922 BUILDING

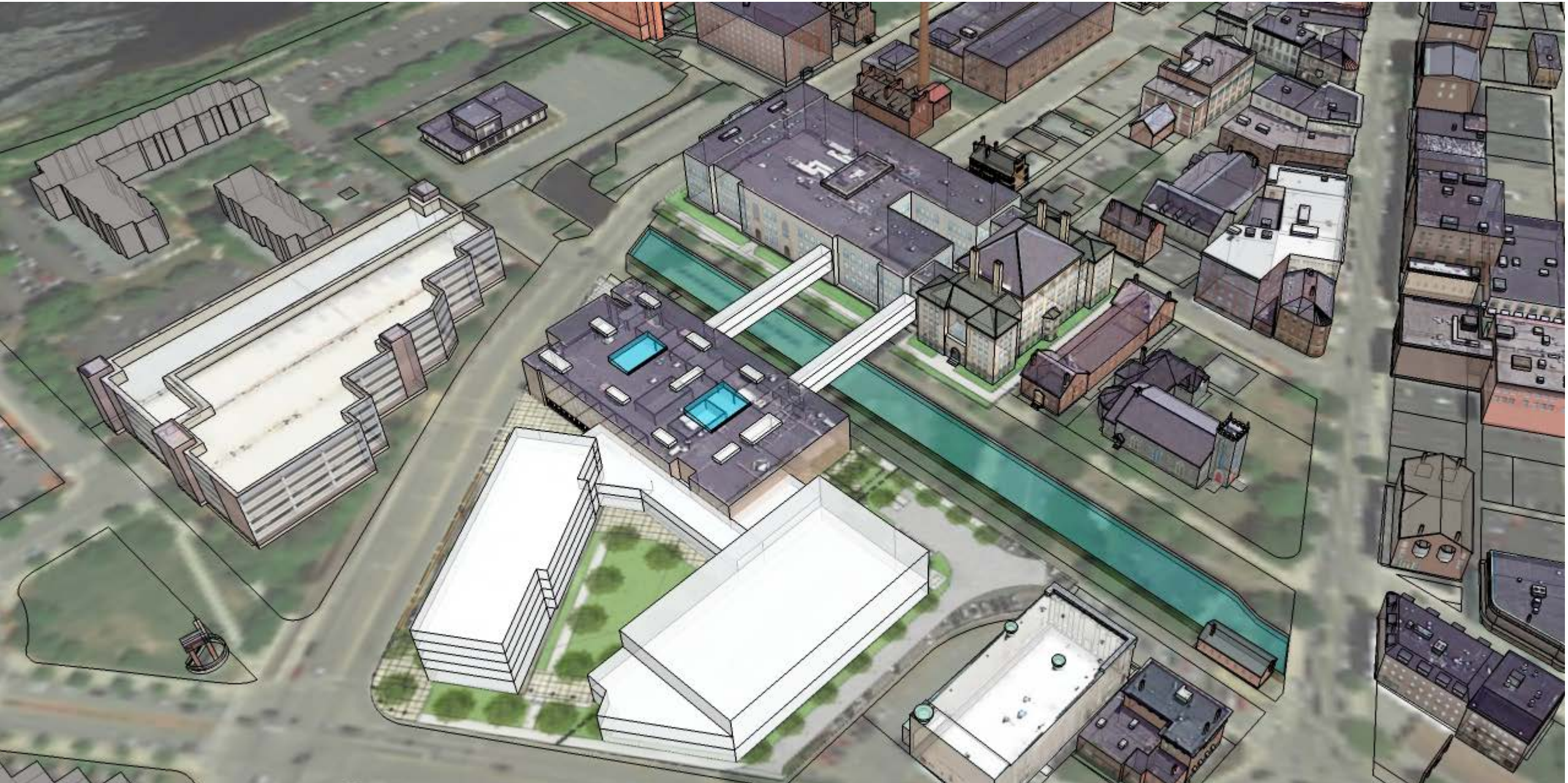
NEW GYMNASIUM WING

MAIN FLOOR PLAN

LOWELL HIGH SCHOOL: OPTION 3A – EXPANDED SITE MASSING



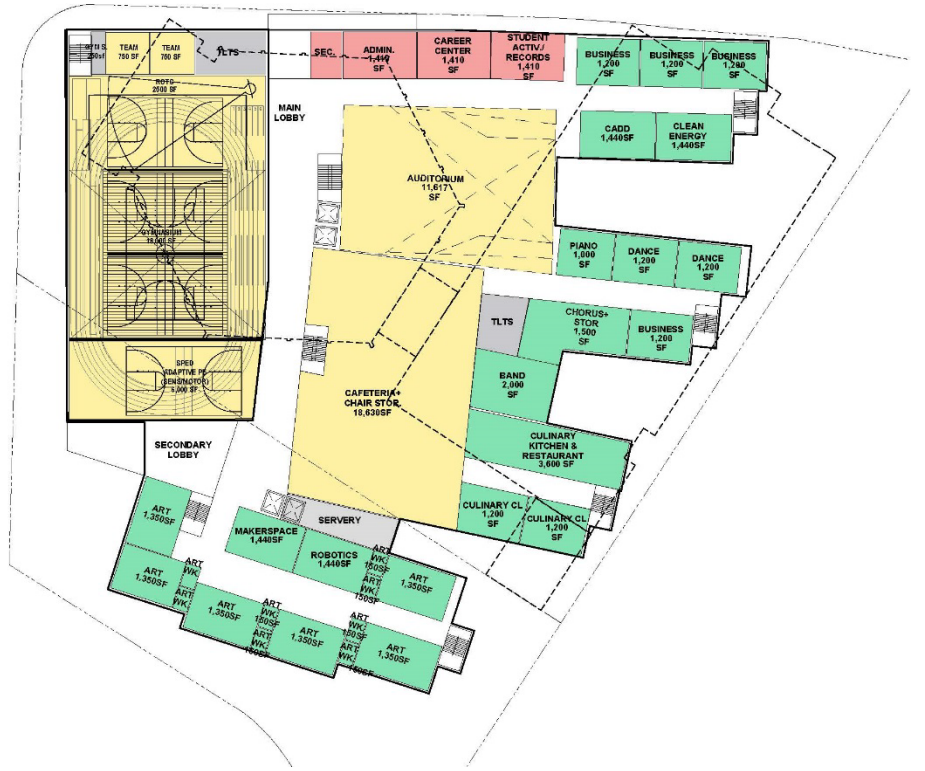
LOWELL HIGH SCHOOL: OPTION 3A – EXPANDED SITE MASSING



LOWELL HIGH SCHOOL: NEW OPTION A – EXPANDED SITE



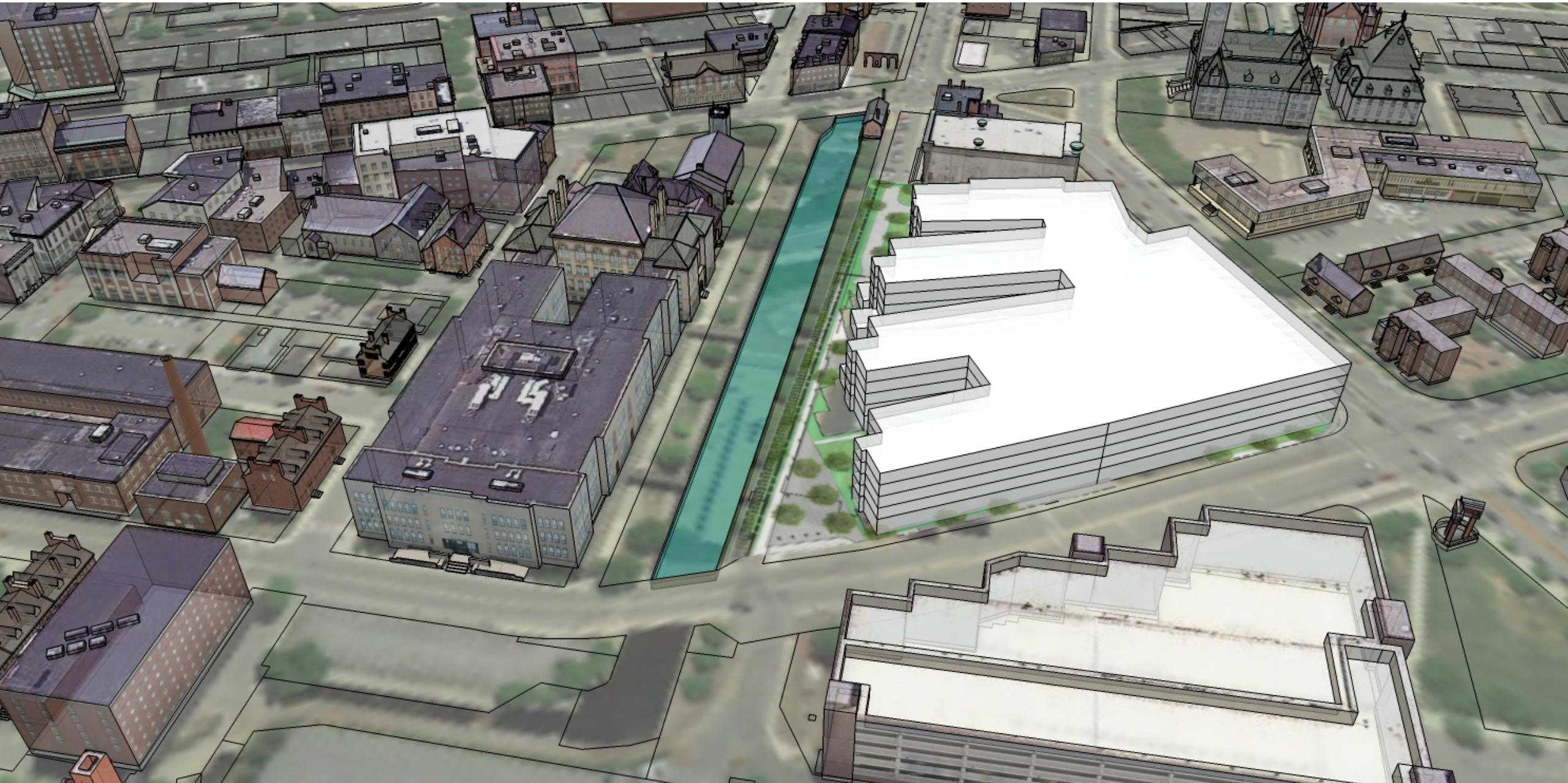
ADMIN/TEACHER AREAS
GENERAL CLASSROOMS
SPECIAL EDUCATION
SCIENCE
CAREER/TECHNOLOGY
GYM/CAF/LIBRARY/OTHER
MECH/CUST, TLTS, STOR.
NEW CONSTRUCTION
DEMO



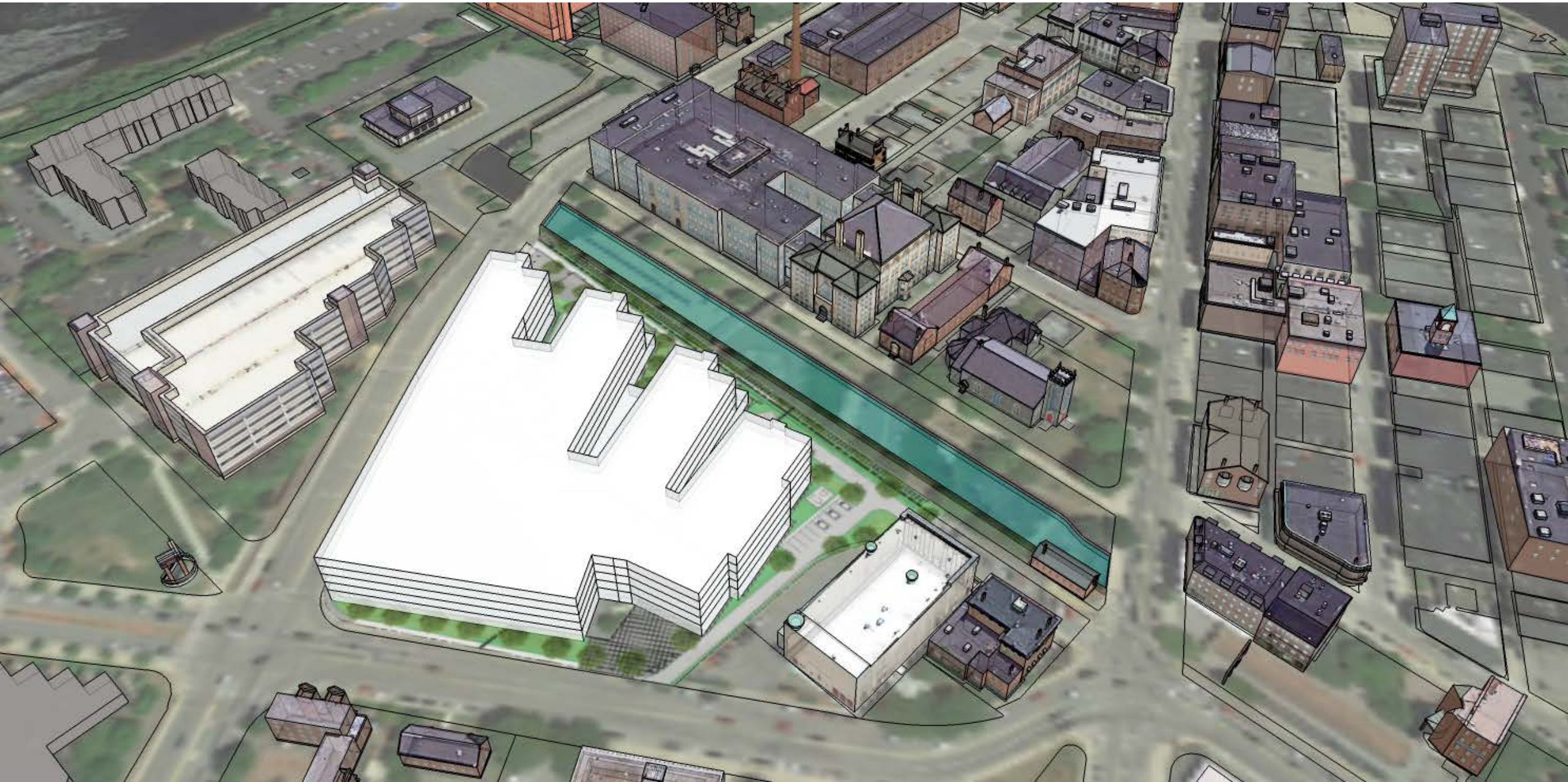
SITE PLAN

MAIN FLOOR PLAN

LOWELL HIGH SCHOOL: NEW OPTION A – EXPANDED SITE MASSING



LOWELL HIGH SCHOOL: NEW OPTION A – EXPANDED SITE MASSING



LOWELL HIGH SCHOOL

COST ESTIMATE UPDATE

✓ NEW COST ESTIMATORS

- Perkins Eastman (PM+C) and Skanska (In-house)
- New Estimators = Fresh set of eyes

✓ PROGRAM CHANGES

- Removal of Swimming Pool = Reduced Building Area

✓ REFINED PLAN OPTIONS

- Plan refinements = Condensing and tightening of spaces

✓ ESTIMATES RECONCILED WITHIN 1%

- Estimated Construction Cost $/SqFt is well within range of other current estimated MSBA projects



LOWELL HIGH SCHOOL

Reconciled Revised PSR Cost Estimate

Option		Perkins Eastman		Skanska		Delta
2A	Construction Cost	$262,135,000	424 $/sf	$259,340,000	419 $/sf	1.07%
	Project Budget	$333,040,000	538 $/sf	$329,630,000	533 $/sf	1.02%
3A	Construction Cost	$270,456,000	435 $/sf	$268,850,000	432 $/sf	0.59%
	Project Budget	$345,400,000	555 $/sf	$341,438,000	549 $/sf	1.15%
New	Construction Cost	$289,153,000	499 $/sf	$287,632,000	496 $/sf	0.53%
	Project Budget	$361,624,000	624 $/sf	$359,798,000	621 S/sf	0.50%

Note: all numbers are rounded.

	 ADD/RENO OPTION 2A	 ADD/RENO OPTION 3A	 NEW OPTION A
Building/Site •Acreage •Gross Size •Stories/Ht	6.0 acres 618.7k gsf (445.5k reno+173.2k add) Exist'g (63'), 5 Story (68'-8"FA) and 2 Story (58' Gym)	7.4 = 6.0 acres +1.4 exp. lot 622.2k gsf (432.6k reno +189.6k add) Exist'g (63'), 5 Story (68'-8"FA) and 2 Story (58' Gym)	7.4 = 6.0 +1.4 exp. lot 579.4k gsf 5 Story+ Basement (68'-8")
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Project Budget City Share	$333,040,000 $124,282,000	$345,400,000 $135,960,000	$361,624,000 $160,955,000

LOWELL HIGH SCHOOL

NEXT STEPS



- 5/1: City Council Vote SBC Recommendation Preferred Option
- 5/9: Submit PSR (Preferred Schematic Report)to MSBA
- 5/9: MSBA FAS (Facilities Assessment Sub-Com.)
- 6/27: MSBA Board Meeting PSR Approval
- 7/1: Schematic Design (SD) Start
  - Possible Existing Conditions Laser Scan Existing Buildings
  - Possible Geotechnical Borings 75 Arcand Drive

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www.LowellMA.gov

Kevin J. Murphy
City Manager
Michael McGovern
Assistant City Manager

School Building Committee MSBA Meeting

Meeting Minutes

Date: February 12, 2018
Time: 6:30 PM
Location: Mayor's Conference Room

1. - Attendance

Attendees: Kevin Murphy, Edward Kennedy, Rodney Elliott, Rady Mom, Connie Martin, Conor Baldwin, Maryann Ballotta, Nicolas Bosonetto, Marianne Busteed, James Cook, Gary Frisch, Robert Healy, Jay Mason, Maria Sheehy, Richard Underwood and Mike Vaughn.

Also in attendance: Mike McGovern, Elliott Veloso and Heather Varney.
From Skanska: Jim Dowd, Mary Ann Williams, and Dale Caldwell.
From Perkins Eastman: Joe Drown, and Robert Bell.

2. - Introduction New Members

K. Murphy welcomed the new members to the committee, introducing each of them to the group. C. Martin, M. Busteed, M. Sheehy and N. Bosonetto were present, while B. Barry and D. Cunningham were unable to attend. K. Murphy requested a motion to approve the new members, motioned by E. Kennedy and seconded by M. Vaughn. J. Cook noted B. Barry's opposition to the downtown site in the past, mentioning his email to the SBC asking if South Common could be looked into again. J. Cook stated that the SBC met over a year ago and eliminated the option, it doesn't make sense to reopen the option once it has been taken off the table.

3. - Review of the MSBA Meeting

K. Murphy noted that in the packet given to the SBC was a response to Councilor Leahy's motion on an update to the February 2, 2018. The document was published on the City Council agenda as well on the LHS Project website. K. Murphy noted that much is summarized in the document would be discussed later in this meeting by the engineers. On February 2, 2018 the city put forth the latest downtown options which were requested by MSBA. The Deputy Chief Executive Officer from the MSBA J. McCarthy noted that the downtown options will not be considered with a new pool unless the district builds a separate building or renovate the existing pool. K. Murphy noted that Perkins Eastman will discuss the difference between a gym and a fieldhouse. The MSBA requested at least one Add/Reno and the New School downtown option. Regarding eminent domain, the City would need full use and ownership of the property by

January 2019. After discussions, it has become apparent that the eminent domain issue should be addressed as early as July 2018 due to geotechnical testing on the expanded site.

E. Kenney motioned that the SBC should focus the review and eliminates options 4, 5, 6 and 7; seconded by J. Cook. Add/Reno Option 2 and Add/Reno Option 3 may not need as much effort in design as the new school on the expanded site. E. Kennedy noted that the new school on the expanded site would require a large number of modular classrooms. K. Murphy recommended that the SCB delete Options 4 and 5 that include renovation of the Lord building, as these options are most disruptive to students. He agrees with the engineers that options 6 and 7 would be a difficult endeavor. K. Murphy requested a motion to delete options 4, 5, 6 and 7 and move forward with options 2, 3 and the new school on the expanded site. All in favor, so voted.

Option 2A

R. Bell reviewed the three options for the SBC members. Option 2A is the existing site bringing the Freshman Academy on the campus. It is the same option as previously presented except it has the pool removed. This option would require a modular gym space and would keep the existing windowless labs in the Lord Building. The new gym building would provide flexibility and efficiency. The design plan would separate the students from contractors. There is limited greenspace in the layout with restricted loading and service docks. The phasing of this option would take 4 years and a summer.

Option 3A Expanded Site

R. Bell noted that option 3A is the expanded site on the adjacent property with the pool being removed. This option would allow construction off of the new gym facilities odd of the school site without the need for any modular classrooms or gym facility. There would be approximately 40 rooms available for swing space within the existing building(s) and just over 60 new rooms made available in the new Freshman Academy, totaling 100 rooms for swing space. The expanded site allows for breathing room, more natural lighting, greenspace and receiving areas. The phasing for this option would last for 4 ½ years and a summer; only 3 years of which would be on the actual school site(s).

The issue of a fieldhouse versus a gymnasium depending on MSBA specifications was addressed. R. Bell noted that a fieldhouse would include an area for track and field events such as javelin tournaments. He mentioned that based on student population the gym would require 9 physical education stations. R. Bell stated that it is possible for the design to be constructed so that a dividing wall can be put up between the gymnasium and some of the stations. He noted that the function of the facility warrants further conversations with the MSBA. The design team noted that Mayor Samaras told the MSBA that stacking the gym would be a management nightmare for the school administration and would be better suited as a continuous space.

New School Revised

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City Hall ● 375 Merrimack Street ● Lowell, MA 01852
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www.LowellMA.gov

Kevin J. Murphy
City Manager
Michael McGovern
Assistant City Manager

The option to build a new school on the existing site was revised to eliminate the pool from the programming. The building would be five stories in addition to the basement for a condensed footprint. The third, fourth and fifth floors would have wings that fan out for daylight. This option would leave the 1922 building unused. The new school option would require extensive modular classrooms, a temporary gym and provide no additional greenspace. The phasing for this option would last 3 ½ years plus one summer.

R. Elliott inquired to the physical education square footage allotment and if the MSBA would limit funding. R. Bell noted that the MSBA standards do not scale to the size of some communities, especially a municipality the size of Lowell that values having s single high school. He continued that this is part of what makes the City's culture and school great. The default gym square footage for any high school is 12,000 square feet. The calculation for Lowell's enrollment, even with gym class sizes at 26 students, is 9 gym stations with a standard size of 3,000 sf (half of a basketball court). The city would require 27,000 square feet of space for physical education. This is more complicated with the additional 9,000 square feet of space needed for ROTC marching and Special Education adaptive physical education. Of the 27,000 square feet of physical education needs, 9,000 square feet would be on the floor below for gymnastics, fitness and weight room stations. The 27,000 square foot size is created by having an 18,000 square foot Gymnasium (the MSBA's maximum allowed) with the 9,000 square feet of ROTC and SPED PE added. The MSBA and the City will need to discuss multipurpose areas that provide the most flexibility possible.

R. Elliott asked about reimbursement for space for the gymnasium. R. Bell replied that it would depend on the MSBA accepting a continuous space or if there would need to be storage between to break up the space. E. Kennedy noted that the design team is requesting 27,000 square feet which is 1,400 square feet less that the current fieldhouse. R. Bell responded noting that the function of the space will be more effective than the current hexagon shape. He continued, stating that the MSBA normally approves 3,000 square feet for each station and should recognize the justification of the 27,000 square footage totals. R. Bell stated that the team would make a case to justify that the MSBA standards do not meet the scale of the city and will open an ongoing dialogue with the Authority. E. Kennedy stated that the pool was no longer on the table for the project. He mentioned the distinction between a fieldhouse and a gymnasium and if it fits into the current options. He wanted to clarify that Option 3 requires no modular classrooms or gymnasium, the New School would require extensive modular classrooms and Option 2 would need no modular classrooms but would require temporary gym space. K. Murphy stated that the project would proceed without a new pool, but the design team will look into identifying a possible location for a pool in the future.

K. Murphy inquired if there were any other break out areas aside from the weight and wrestling rooms. R. Bell commented that there is less square footage, but more functionality in

the new because of the shape of the existing fieldhouse. C. Martin noted that the existing building includes multiple floors including the pool and locker space; it seems that there is a real reduction in athletic space. She continued that the pool counts as one station and removing it from the plan would reduce the stations by 2,800 square feet. R. Bell noted that at the need for gym stations was calculated without the pool, because it was not to be listed under the MSBA's physical education category.

J. Cook asked to confirm the modular classrooms and temporary gymnasiums required for each option. He specifically inquired to the number of modular classrooms for the new school. R. Bell responded that the team did not fully flush out the new construction option yet (it was removed much earlier in the process), and did not wish to give an incorrect estimate until further research was conducted. R. Bell confirmed that Option 2A would require a temporary gym, Option 3 would require no modular classrooms or temporary gyms and the New School option would require extensive modular classrooms and a temporary gym. K. Murphy requested a motion to proceed with options 2A, 3A and New School; motioned by C. Martin and seconded by M. Ballotta.

3. - Eminent Domain

K. Murphy discussed the administrations understanding of the eminent domain schedule based on the February 2, 2018 MSBA meeting. The MSBA noted that the city would need to have full use and ownership of the property by January 2019. The consultants advise that it would be beneficial to begin the process prior to this in order to gain access to the parcel for testing. J. Drown stated that there was hazardous material and geotechnical testing done on the current downtown site, the same testing would need to be performed on the expanded parcel. K. Murphy stated there was discussion about commercial tenants being able to stay on the property for a minimum of 4 months after the taking; the city would not be able to evict the tenants prior to that. E. Veloso noted that research shows that upon recording of a taking, the City Council would take ownership removing the prior owner's right to damages. The Council would vote on an issue of order taking and would need to be recorded within thirty days to the Registry of Deeds. Under MGL c. 79, § 8B, upon recording of the Order of Taking, tenants are not required to vacate the property until at least four months after notice of the taking is provided to him. J. Cook inquired to how long tenants have to leave. E. Veloso noted that it would be a minimum of four months after receiving notice. If tenants still refuse to leave after that time, the City can provide a notice for refusal of possession. After thirty days of this notice, the Sheriff or Deputy of the county could then be brought in to take possession. Under MGL Ch. 79 § 6A, the city would be required to provide moving costs and expenses, which would include business equipment. Under MGL Ch. 79 § 7A, the Department of Housing and Community Development would also require the city to develop and submit a relocation plan for displaced tenants if there

are more than five business units. J. Cook noted that there has been misinformation provided by the media projecting the project to be delayed by years. E. Veloso commented that this is not likely unless the city has taken the land in bad faith and not for public use, or it was taken in an improper way. M. Vaughn inquired to of the tenants would be able to claim damages if the City tests on the property after possession. E. Veloso noted that the Law Department has not found any case law or statutes that suggest that the tenant could hinder the City's testing after the property has been properly taken and the Order of Taking recorded in the registry of deeds. E. Kennedy asked how many tenants are currently on the property. E. Veloso stated that he was not positive about the number of tenants at the time but stated that he believed it was four and that the number would dictate what relocation assistance the City would have to provide. E. Kennedy inquired to when testing is scheduled in relation to the taking and when the design team would submit to the MSBA. The taking would take place during the summer, assuming that the group targets moving forward from the PDP to the PSR. R. Elliott asked about the cost in general of acquiring the property and relocating the current tenants. E. Veloso commented on the reasonable cost as it includes certain limitations on a case by case basis depending on the nature of the business and the equipment used. E. Veloso stated that he believed that specialized equipment at a doctor's office, such as an x-ray machine, would be included in an estimate for the cost of moving and storage until tenants find an alternative site. R. Elliott asked who is responsible for the eminent domain process. E. Veloso responded that the taking authority, the City Council, would be responsible. He noted that the city could not take the eminent domain without two prior appraisals of the property. The appraisal would include the land value and the nature of the property (commercial / residential) as well as the fair market value of the equipment. J. Mason inquired if the property and damages would be appraised by the same appraiser. E. Veloso stated that he believed the approach would be holistic and value of the property would be based on fair market value. E. Veloso stated that it would be better to start the process sooner rather than later. N. Bosonetto asked if the door was closed on making an offer for the property. K. Murphy replied that no doors have been closed on the matter. E. Kennedy inquired to extending the 4 month period that tenants are allowed to stay on the property. E. Veloso noted that the four months is a minimum, and that theoretically the City could allow tenants to stay for an extended period.

4. - Schedule

E. Kennedy inquired to the current plan on submitting to the MSBA at the August meeting as the consultants completed the analysis of the three. J. Drown replied that the MSBA scheduled Board meetings take place every two months. To get onto the June meeting agenda, everything would need to be submitted by May 2018. He continued, that the information presented in June would need to have estimates in place, conversations and meetings to discuss the decision would

need to be held in advance of the meeting. The cost estimates would need to be in place by late February, early March if the city was to meet the deadline for the June meeting. J. Drown also mentioned that MSBA asked the City to take another look at the new school option, not just to dust off the original plan. J. Drown commented that Options 2 and 3 were taken as far as the Cawley new school site. The team needs to do the most work on bringing the new school at the down town site up to the same level as Options 2 and 3 because it was ruled out earlier in the process. R. Bell noted that the team would do their best to meet the June meeting. He also mentioned that extracting the pool would not be an excessive amount of work but they would need to update the market price changes and educational programming. J. Drown stated that the Educational Leadership Team and the School Committee would need to approve the educational program. The city would also host community meetings to address the citizens' concerns. J. Drown also mentioned that the MSBA needs the cost estimate analyzed closely, the design cannot just be dusted off.

E. Kennedy inquired if the reason that the August meeting is targeted is primarily due to the MSBA requirement to include the new school design. Many meetings were set up last year which will need to be set up again. The SBC as a group urged the design team to open an additional dialogue with the MSBA to ensure that the process is expedited as quickly as possible. E. Kennedy mentioned that the MSBA indicated an excess space that is not used for academic purposes which could be the equivalent of $17 million in construction cost (when using the cost per square foot from the Somerville project $625). R. Bell replied that the space stem from the education plan that was created with involvement from the school and community. The amount of square footage listed as other is important to the school and community but not supported by the MSBA. The educational plan conflicts with the MSBA guidelines, as is true for many school districts. For example, a network room for 1,000 students would need to be 200 square feet. The needs of LHS triple that, and the design team has included those specifications in the plans, as is true for the gym space, offices and teacher space. C. Martin asked about the educational plan in terms of the fieldhouse, other space and administrative space. R. Bell replied that many of the MSBA requirements do not reach the scale that Lowell needs, but this is something that will be addressed in future discussions. M. Vaughn inquired to what the impact of the schedule change from the August to June MSBA meeting would have on the eminent domain schedule. R. Bell noted that this would be a point of discussion with the MSBA. R. Underwood asked if the SBC could proceed with just options 2 and 3 as the new school site is bound to have little support in the community. R. Bell replied that the team will touch base with the MSBA on this as well. R. Underwood noted that it is a waste of time and money, in his opinion, for the design team to spend additional resources looking into something that is not going to be picked as a preferred option. E. Kennedy noted that the MSBA is providing the funding for most of the project so if they are asking us to do something, we should do it. He continued, stating that the expense of the

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City Manager
Michael McGovern
Assistant City Manager

modular classrooms and gym space is part of the issue though. The MSBA needs to acknowledge that the city is much larger than others.

5. - Next Steps

K. Murphy stated that the future SBC meetings will take place in the City Council chambers and will be covered by LTC. He confirmed that the SBC will continue to meet at night as it is easier for all the members to attend. The next meeting date will be determined in within a week and will advise the committee and public of the time and date. E. Kennedy asked if the city would provide information prior to the March date as the information is received from the consultants. K. Murphy noted that the Law Department will propose a schedule for eminent domain with both the June and August MSBA meeting dates. K. Murphy also stated that the team will find out the answer regarding the gym and fieldhouse. R. Healy motioned to adjourn at 7:50PM, seconded by M. Vaughn.

Notes taken and certified by:

HEATHER VARNEY
Notary Public
Commonwealth of Massachusetts
My Commission Expires Oct. 2, 2020

PERKINS EASTMAN

February 12, 2018

List of Tasks Required to Revise Lowell High School PSR Submittal

1. Redesign options eliminating pool.

2. Rewrite educational program by the school department to align with educational goals.
   a. Meet with PE / Health directors and coordinators (discuss pool & field house).

3. Update space summary.

4. Developing phasing for options that don't yet have phasing. (Options which were eliminated during the PDP).

5. Develop presentations and attend educational leadership (ELT) meetings. ELT needs to regroup around all MSBA comments on the educational plan, but specifically the pool and gym.

6. Develop presentations and present to the School Committee at meetings. The School Committee needs to re-review and approve the Educational Plan and Space Summary.

7. Develop presentations and present to the School Building Committee at (SBC) meetings. The SBC needs to assess the range of options, evaluate all options per MSBA and cull them down to the preferred option with reasons for their decisions. Additional SBC matters include; Phasing/Logistics, Traffic, Cost and Land Taking.

8. Develop presentations and present to community meetings. The design team will continue to communicate to the public at 2 meetings to inform the community of ongoing project development as directed by the City.

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9. Develop presentations and present to the City Council at LCC meetings. Similarly the LCC reviews the recommendation of the SBC incorporating community input in assessing the range of options, evaluating all options per MSBA and cull them down to the preferred option with the reasons for their decisions. The LCC oversight includes; project Phasing/Logistics, Traffic, Cost and Land Taking.

10. Reopen Lowell and Mass Historic dialogue.
    Prepare project notification form (PNF).
    Resubmit PNF.
    Mass Historic Response Period 30Days.

11. Canal Air Rights update.

12. Geoenvironmental update.

13. Geotechnical update.

14. Hazardous materials update.

15. Traffic study (downtown focus).

16. New independent cost estimates.

17. Reconciliation of independent costs estimates.

18. SBC review and vote recommendation.

19. City Council review and vote PSR.

20. Revise and update PSR.

21. Submit PSR to MSBA.

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22. MSBA reviews and provides comments.

23. Respond to MSBA comments within 2 weeks.

24. Develop presentation and attend Facilities Assessment Subcommittee (FAS) meeting.

25. Develop presentation and attend MSBA board meeting.

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SCHOOL BUILDING COMMITTEE

LOWELL HS PROJECT



EXISTING IMAGERY COURTESY OF GOOGLE EARTH

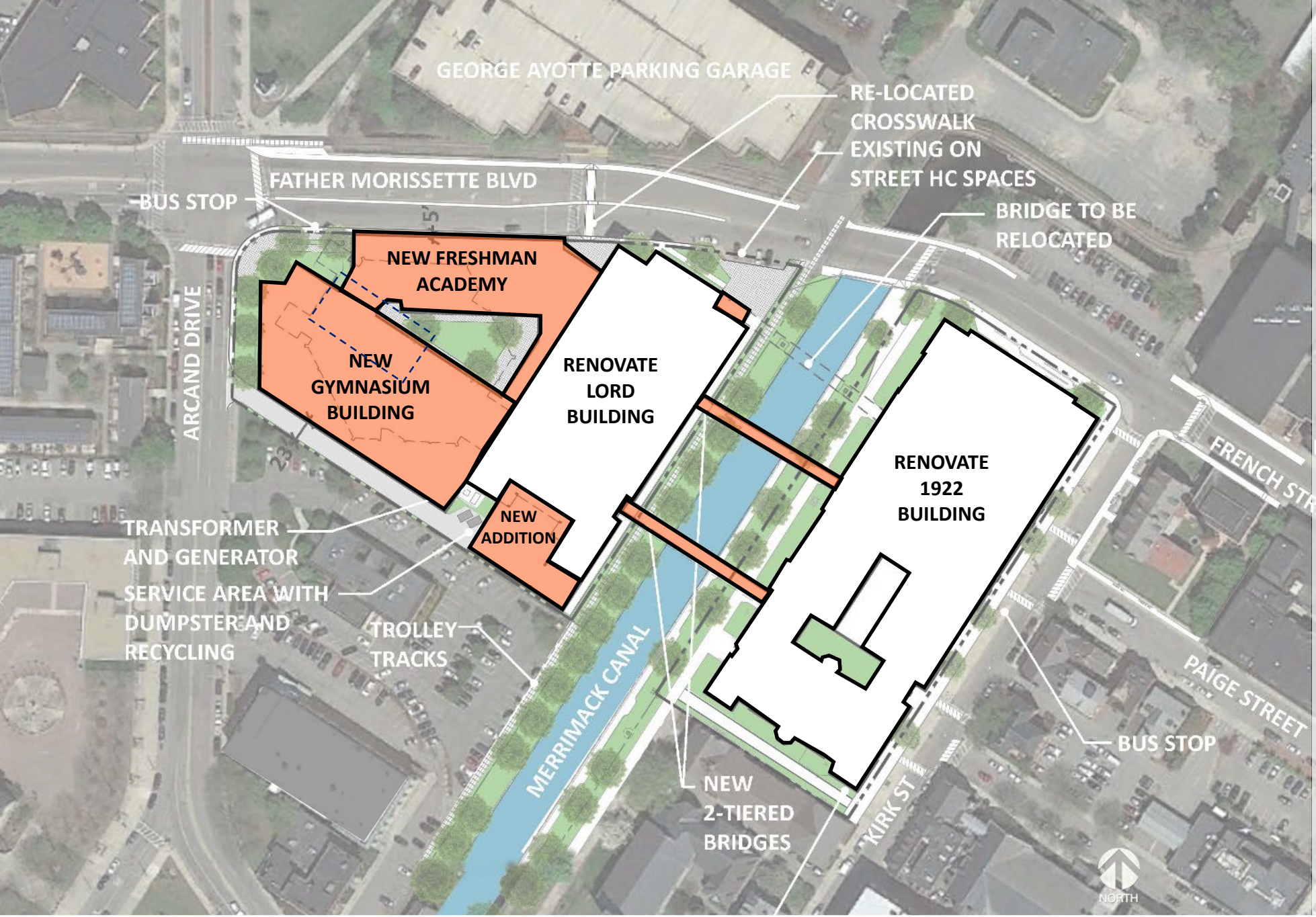
12 FEBRUARY 2018

LOWELL HS

AGENDA

- Vote to Approve New SBC Members
- Review of 2/1/18 Meeting w/ MSBA
- Vote Options to Explore in PSR Update:
  - Add/Reno Option 2A
  - Add/Reno Option 3A - Expanded Site
  - Add/Reno Option 4A
  - Add/Reno Option 5A - Expanded Site
  - Add/Reno Option 6 - Expanded Site
  - Add/Reno Option 7-Expanded Site
  - New School Revised -Expanded Site
- Eminent Domain Schedule (by City)
- Schedule
- Next Steps





ADD/RENO 2A EXISTING SITE

POOL TO BE REMOVED

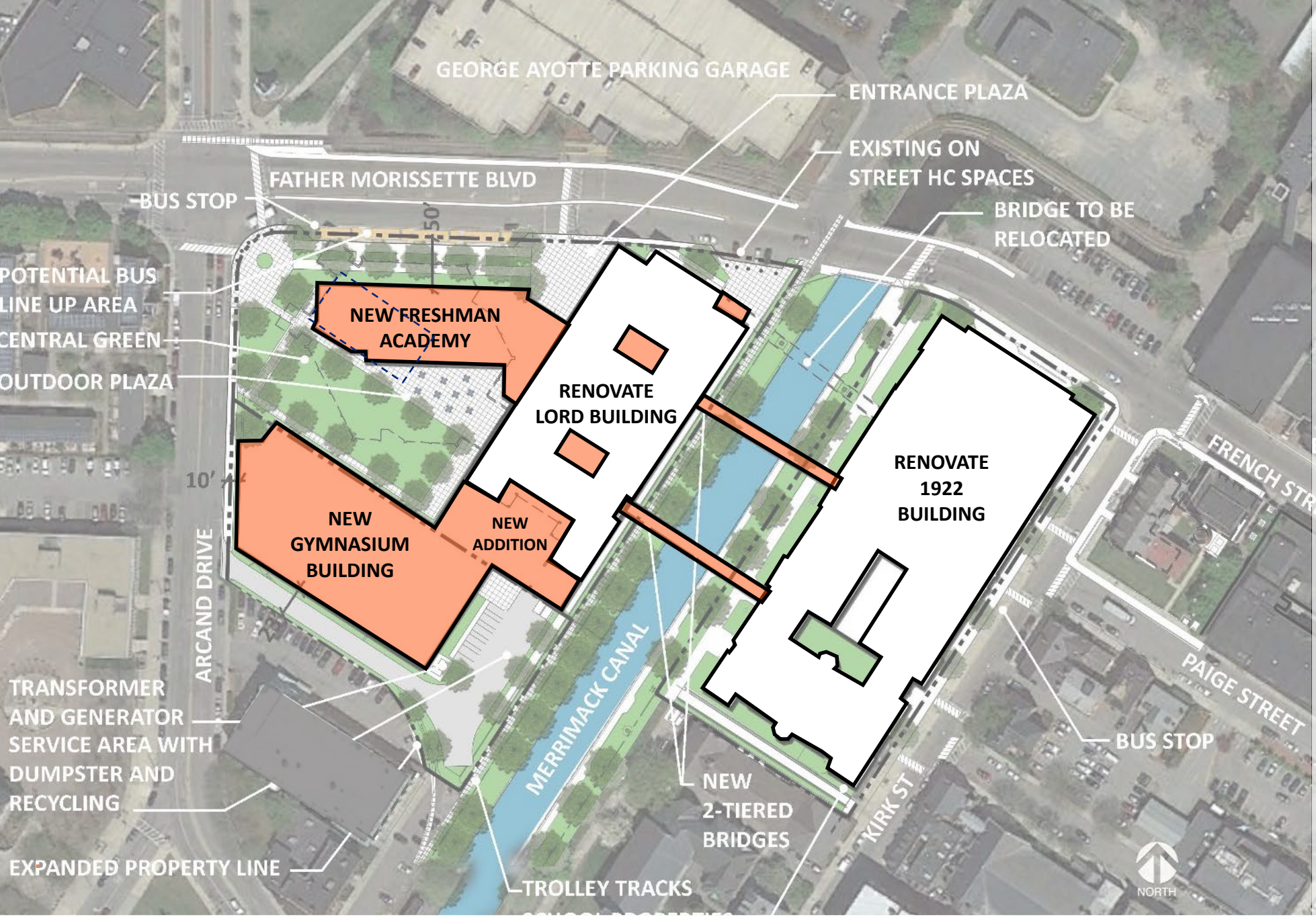
(future loc. to be identified)

PRELIM. PROS/CONS:

+ **Consolidated Campus**
  (new freshman academy)
+ **More Flex/Efficient Gym**
- **Temporary Gym Required**
- **Windowless Labs Remain**
- **Limited Green + Loading**

Phasing Est =4yrs +summer

Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.



ADD/RENO 3A EXPANDED SITE

POOL TO BE REMOVED

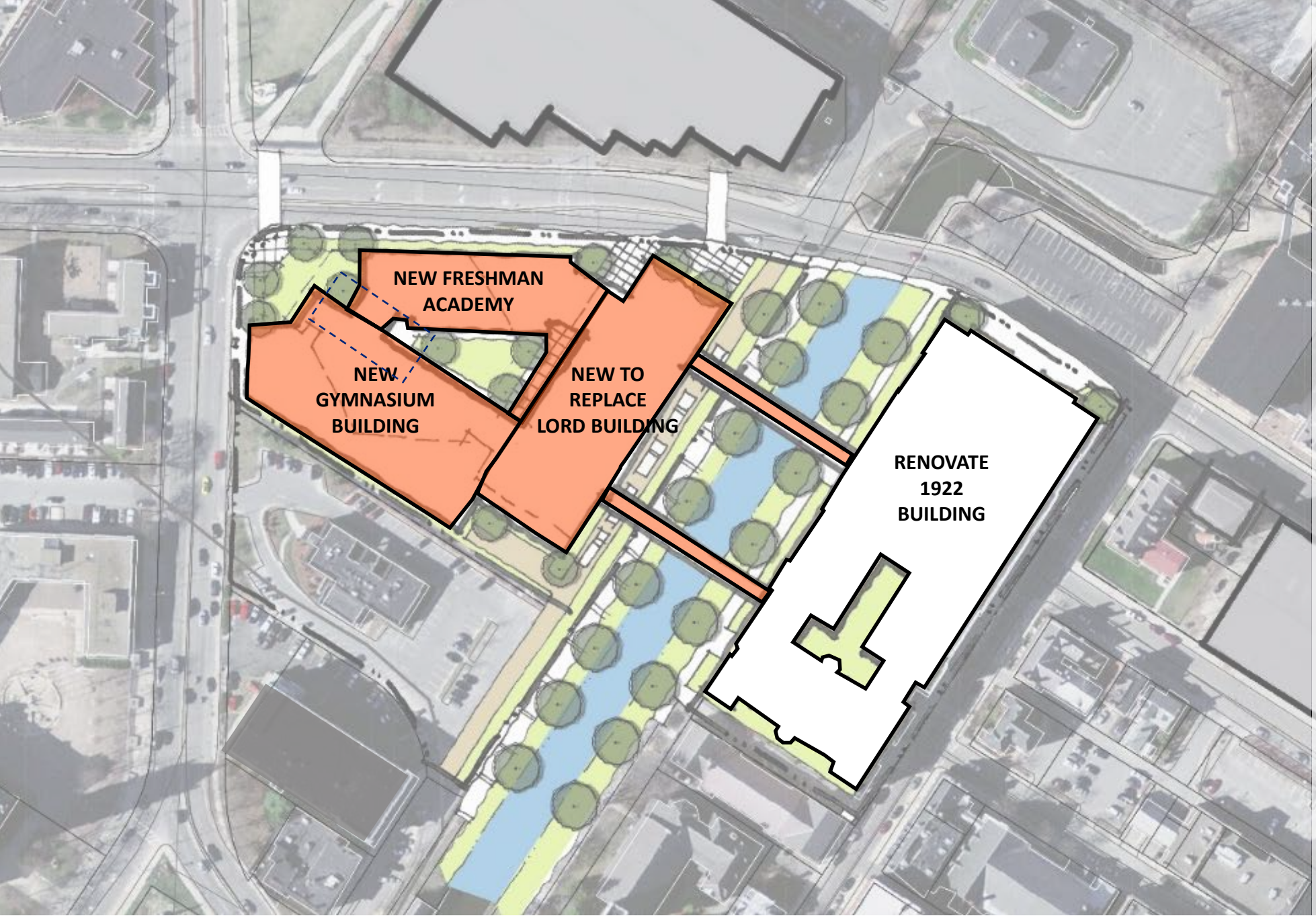
(future loc. to be identified)

PRELIM. PROS/CONS:

+ **Consolidated Campus** (new freshman academy)
+ **More Flex/Efficient Gym**
+ **No Windowless Labs**
+ **Added Green + Loading**
— **Gym Areas More Remote**
— **Eminent Domain**

Phasing Est =4.5y +summer
(but only 3 years on school site)

Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.



ADD/RENO 4A EXISTING SITE

POOL TO BE REMOVED

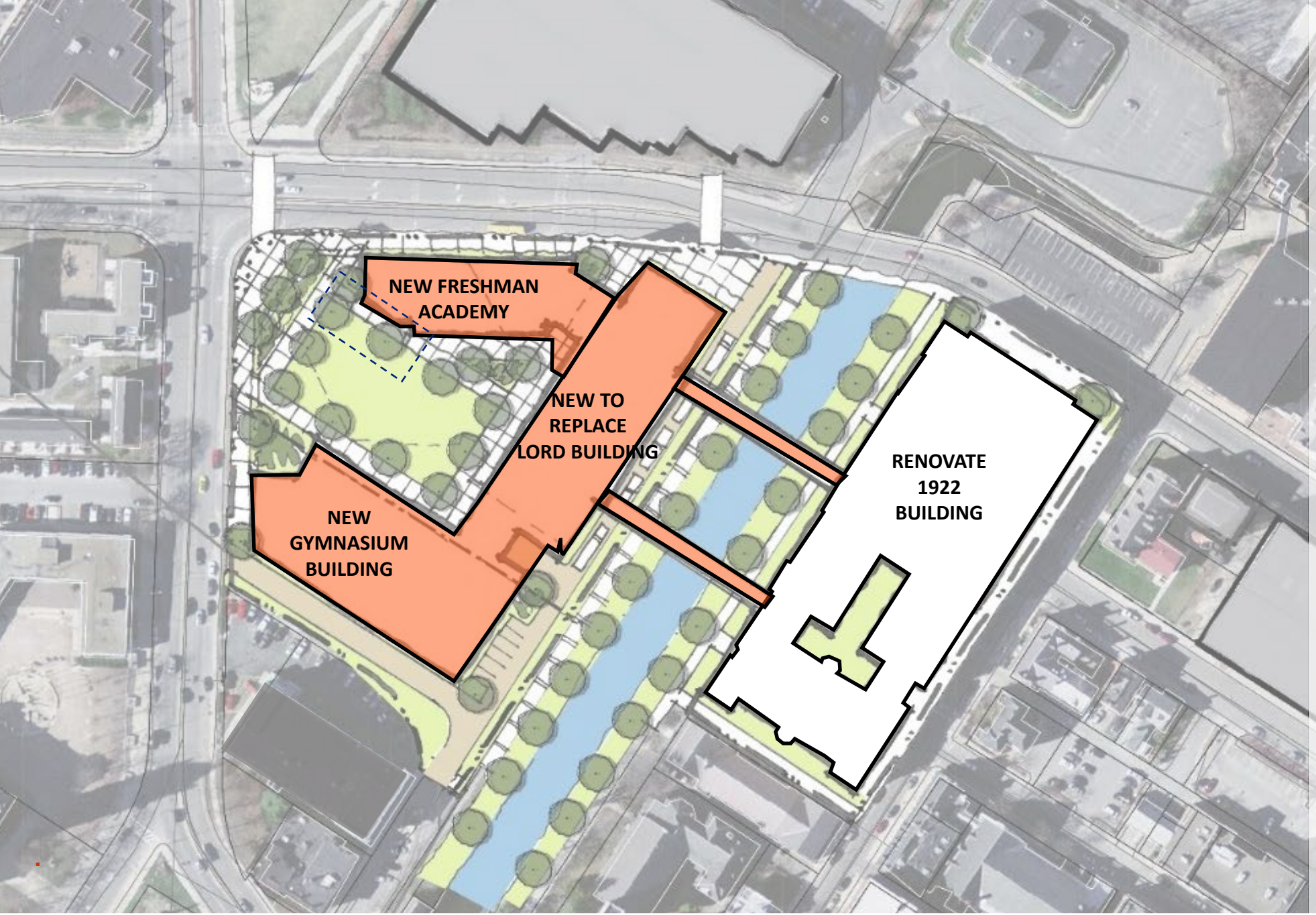
(future loc. to be identified)

PRELIM. PROS/CONS:

+ **Consolidated Campus**
  (new freshman academy)
+ **More Flex/Efficient Gym**
+ **No Windowless Labs**
— **Temporary Gym Required**
— **Extensive Temp Classrms**
— **Limited Green + Loading**
— **Public Spaces Forced Up**
+ **Potential Loop Rd on Site**

Phasing Est =5yrs +summer

Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.



ADD/RENO 5A EXPANDED SITE

POOL TO BE REMOVED

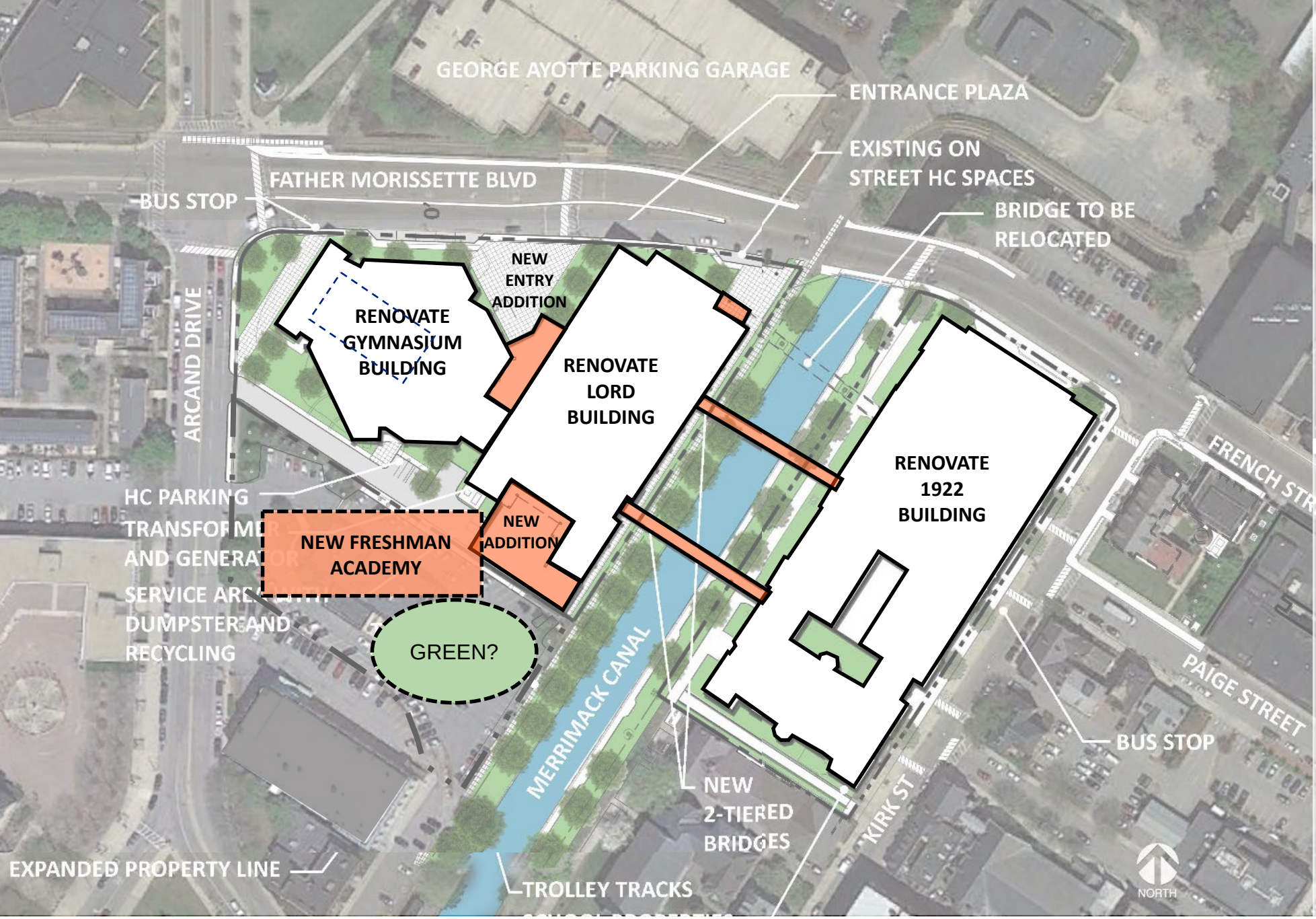
(future loc. to be identified)

PRELIM. PROS/CONS:

+ **Consolidated Campus** (new freshman academy)
+ **More Flex/Efficient Gym**
+ **No Windowless Labs**
+ **Added Green + Loading**
— **Gym Areas More Remote**
— **Extensive Temp Classrms**
— **Public Spaces Forced Up**
— **Eminent Domain**
+ **Potential Loop Rd on Site**

Phasing Est =5.5y +summer

Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.



ADD/RENO 6 EXPANDED SITE

EXIST. POOL REMAINS

(renovation cost separated)

PRELIM. PROS/CONS:

+ **Consolidated Campus**
(new freshman academy)

+ **Added Green + Loading**

— **Existing Inefficient Gym**

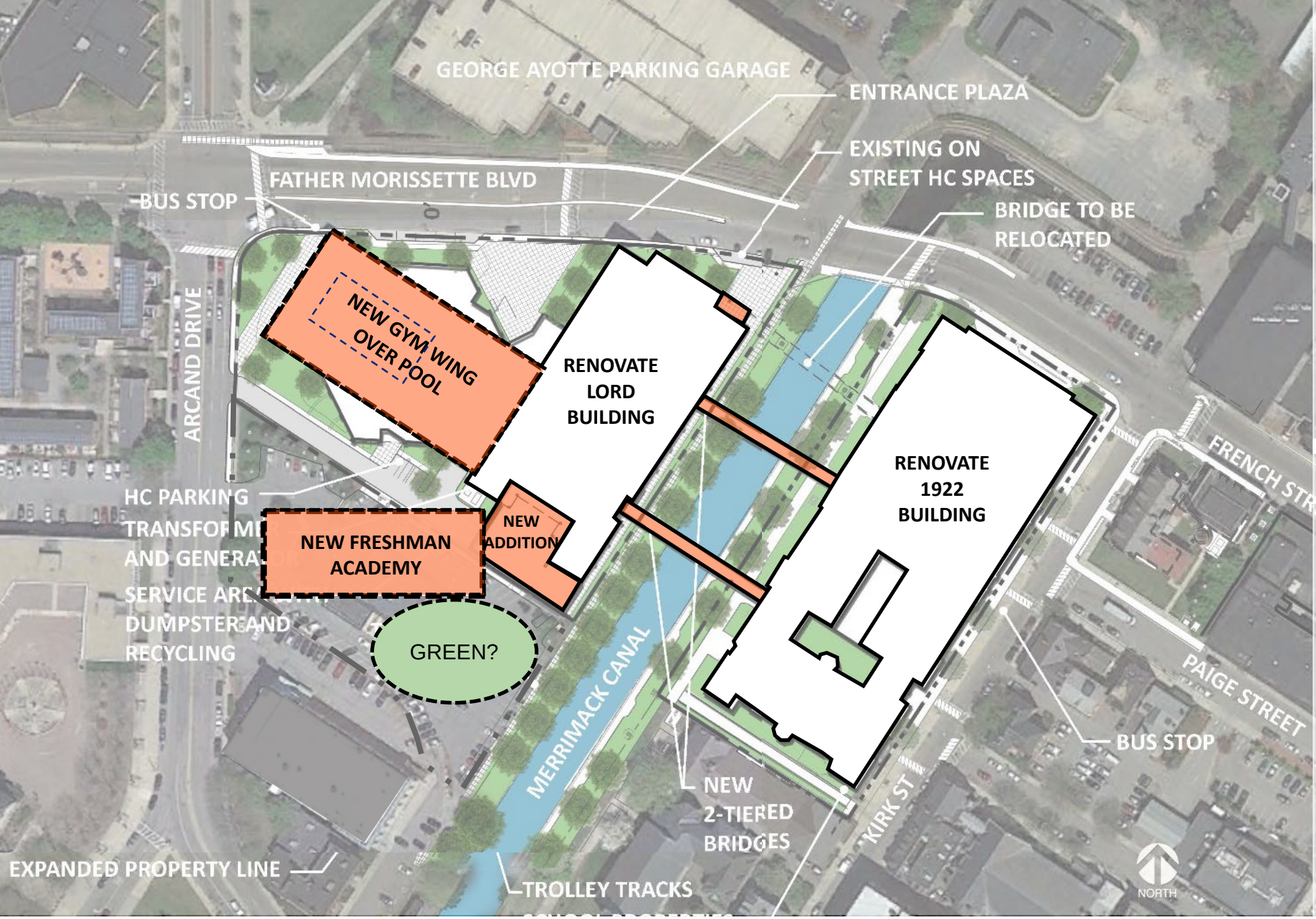
— **Temporary Gym Likely**

— **Windowless Labs Remain**

— **Eminent Domain**

Phasing Est = TBD

Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.



ADD/RENO 7 EXPANDED SITE

EXIST. POOL REMAINS

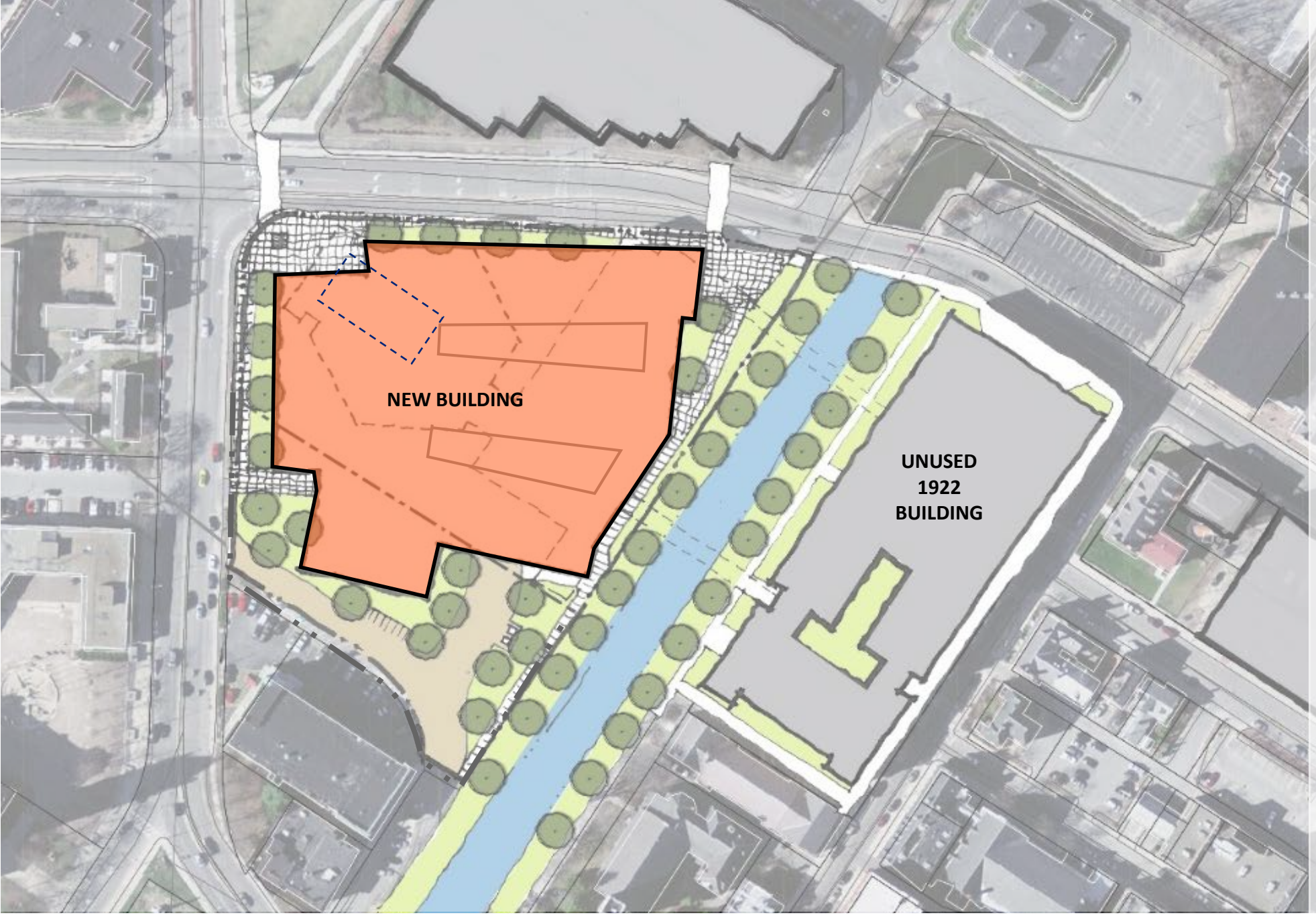
(renovation cost separated)

PRELIM. PROS/CONS:

+ **Consolidated Campus**
  (new freshman academy)
+ **Added Green + Loading**
- **Existing Inefficient Gym**
- **Temporary Gym Required**
- **Windowless Labs Remain**
- **Eminent Domain**

Phasing Est = TBD

Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.



ALL NEW - REV. EXPANDED SITE

1922 BLDG UNUSED

POOL TO BE REMOVED

(future loc. to be identified)

PRELIM. PROS/CONS:

+/- **Consolidated (5-Story)**
(new freshman floor)

+ **Good Classrm Orientation**

+ **More Flex/Efficient Gym**

— **Substantial Temporary Classrms + Gym Rquired**

— **Limited Green Space**

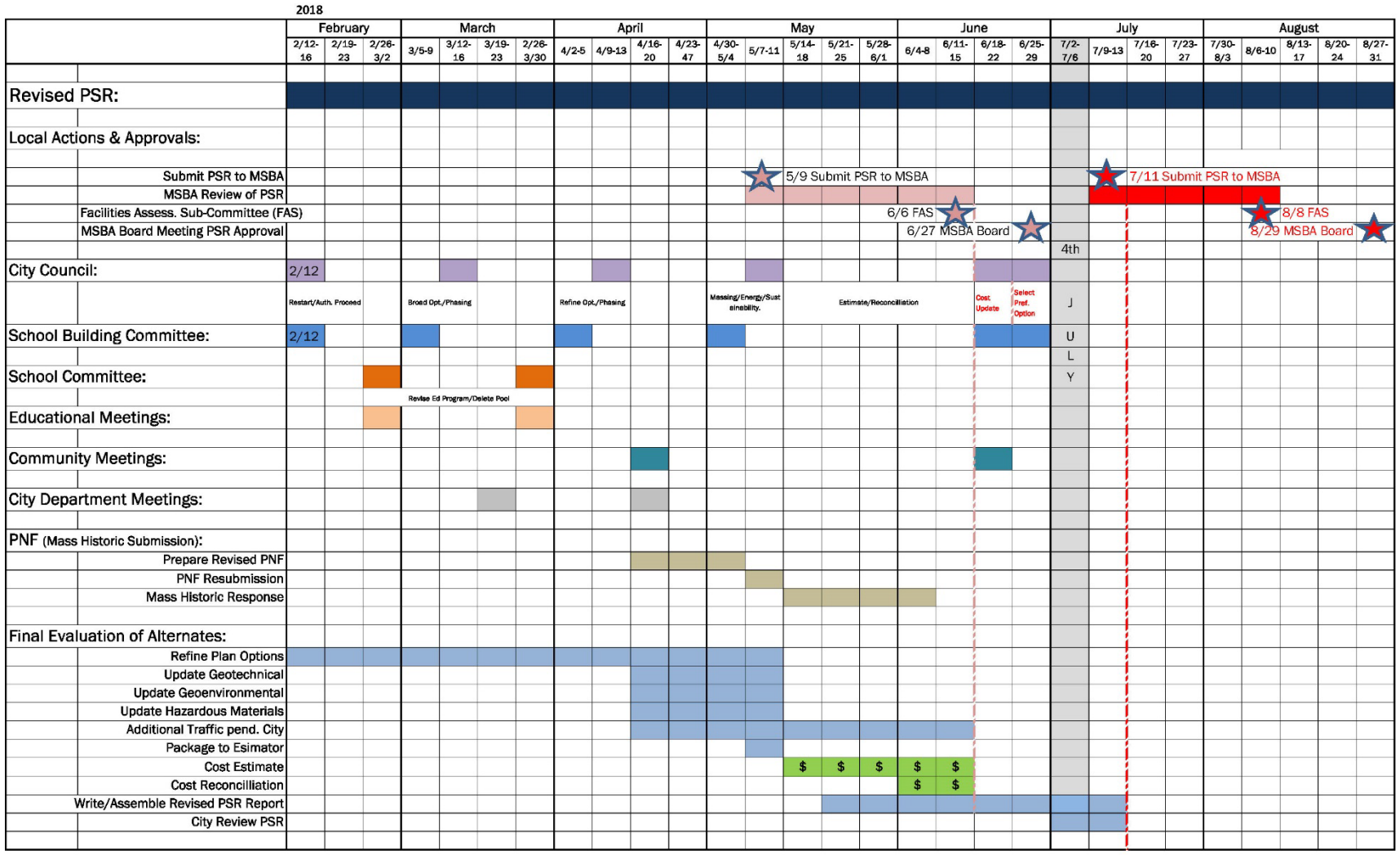
— **Eminent Domain**

SCALE IN FEET

Phasing Est =3.5y +summer

Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.

LOWELL HS: SCHEDULE



LOWELL HS

- Next Steps
  - Authorization to Proceed
  - Reboot ELT
  - Meet w/ PE Health Directors
    - Pool / Field House
  - Rewrite Educational Program
  - School Committee
    - Vote Revised Ed. Program



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Kevin J. Murphy
City Manager

School Building Committee MSBA Meeting

Meeting Minutes

Date: March 29, 2018
Time: 6:30 PM
Location: City Council Chambers

I. - Attendance

Present: William Samaras, Rodney Elliott, Edward Kennedy, Connie Martin, Conor Baldwin, Maryann Ballotta, Marianne Busteed, David Cunningham, Gary Frisch, Robert Healy, Salah Khelfaoui, Jay Mason, Maria Sheehy and Mike Vaughn.

Also in attendance: Senator Eileen Donoghue & City Councilor John Leahy

City: Mike McGovern, Elliott Veloso, Heather Varney, Alex Magee
Skanska: Maryann Williams
Perkins Eastman: Joe Drown, Robert Bell, Alicia Caritano and Dawn Guarriello
Traverse (Landscape): Ashley Iannuccilli

W. Samaras called the meeting to order at 6:38 PM

II. - Revised Educational Plan Approval

R. Bell discussed the revised education plan that is based on the site changes. He noted that the MSBA determined that the pool would not be part of the project. The revised education plan was presented to the School Committee along with the space summary. He discussed the changes to reference of a pool, adaptive physical education, ROTC, Katie's Closet and the Community Health room. The space summary noted changes to the upper and lower gym area. R. Bell clarified the depiction in the presentation, noting that the numbers 1-6 on the upper level identify the six gym stations, the MSBA maximum as contiguous space, but co-located with a U-shaped area designated for ROTC marching and additional space for adaptive PE. R. Bell noted that the MSBA recently reviewed and does not take issue with the colocation of the gym spaces noted in the preliminary letter to the design team. He also mentioned that the MSBA reserves the right to continue review of the space summary. The Department of Elementary and Secondary Education did not have an issue with the co-location either.

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Space Summary

E. Kennedy asked the design team whether they had received a communication from MSBA questioning the size of the project. R. Bell stated that following the normal course of action, the MSBA can accept or reject the size of certain rooms at end of Schematic Design. R. Bell commented that the team answered all the questions in the prior communication to the MSBA. R. Bell noted that the educational team met with the Superintendent of Schools, faculty staff, facility groups, to discuss goals and desires of the district.

W. Samaras inquired how the dialogue would go with MSBA if they will not allow space because of scaling limitations in place. R. Bell stated that the dialogue is submitted through the formal MSBA submission process in the PDP and PSR narratives. R. Bell noted that the team must articulate why the space should be larger and commented that it's a good sign that they will continue to review it. R. Bell commented that the MSBA realizes their template does not scale to fit a larger school. If the MSBA objected, they might use stronger language in their response. R. Bell noted that it may be frustrating when the City resubmits in May, because the review comments will tend to default back to 'the MSBA will continue to review.' R. Bell continued, noting that based on dialogue thus far, the MSBA recognizes that the space scale does not fit a school this size and that it is not their intent to penalize the District for having one large school rather than three or four high schools. R. Bell mentioned that it is worth defending the spaces and design, such as the co-location of the gym for more multi-purpose use and flexibility to better serves students and community.

Senator Donoghue noted this is a huge high school project, much larger than MSBA normally deals with. She stated that MSBA must get constant reminders regarding the size of the school. Senator Donoghue inquired if there are space changes between plans 2A and 3A. Perkins Eastman noted the education plan is the same for all of the options. Senator Donoghue asked how much square footage may not be reimbursable. Perkins Eastman replied they will need to get back to the committee. W. Samaras commented on the necessity of having an auditorium that will fit at least an entire class, as the MSBA limitations now would not allow for that.

III. - Eminent Domain Proceedings Update

E. Veloso noted the City Council voted to begin process to take 75 Arcand Dr. via eminent domain. He mentioned that the Law department will identify parties affected by and prepare for the taking process. He stated that the Law department is confident that the City can move forward with appropriate scheduling. At this point the City has begun process, but E. Veloso noted he is hesitant to describe the process due to attorney client privilege. E. Veloso stated that Law is proceeding on the process and moving forward as we speak. E. Kennedy commented on the need for two appraisals and discussed the 45 day window from time accepted and ability to

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proceed. M. Vaughn stated that this was correct. E. Kennedy noted the substantial amount of equipment for the medical practices, much of which may be depreciated. He inquired to how inventory within building will be dealt with, who will handle appraisal of equipment, how to proceed and arrive at a dollar value and if this will occur after the eminent domain taking. Mr. Veloso discussed relocation process for tenants. P. Sleeper was introduced as the relocation specialist out of Arlington MA, with over 50 combined years dealing with eminent domain. P. Sleeper stated that appraisers have 30 days to give to the owner an acceptance or rejection of the initial offer. He mentioned that the June 5, 2018 date needs to consider time for the tenant to consider what the City is offering. Mr. Sleeper and his associates will treat with sensitivity and compassion; as he hopes to have all practices relocated by December 2018. Mr. Sleeper's company will identify comparable space downtown and in other neighborhoods for the tenants. He mentioned it is a possibly to convert office space into a working dental office. P. Sleeper state that ideally businesses would like to close down Friday and reopen Monday in another location. He also mentioned that he has a lot of experience with takings in other municipalities. P. Sleeper discussed his hope to meet with tenants within a week or two. He mentioned the need to determine how much relocation benefits each tenant will receive, which will then be given to the City Manager's office as an estimate. If tenants do not accept the estimate, they can go to city, or DHC to figure out next steps. P. Sleeper stated that he will explain that the City has right to eminent domain to each tenant. He also stressed that he cannot waste taxpayer money but will be open-minded for the tenants' sake. P. Sleeper noted that he has a standardized 10-item list that he addresses to protect each of the businesses. E. Kennedy mentioned that the appraisals are scheduled to take 45 days and include a 30-day owner review; he questioned the required time and the timeline. P. Sleeper noted that a letter will need to be delivered by May 5, 2018 offering an estimate, in which the tenant then has 30 days to review and accept. He noted for the relocation component, after City takes ownership, it can take some time to move tenants. The transportation of equipment can take place after the order of taking. By the end of April, the relocation plan will be presented to DHCD and City. Each tenant has 21 days to review the plan. Most information in the plan will come directly from the tenants, including square feet of office space and current rent per month. After the hopeful May 21, 2018 approval, the City will seek a quick turnaround from DHCD. P. Sleeper noted that he plans on having the approval before order of taking. E. Kennedy commented that it may be a tight schedule as it could be over 6 weeks for appraisals. He expressed his hopes to tighten it up to a 4-5-week period. M. Vaughn stated that he will work on a 30-day angle. E. Kennedy noted it is important for the City Council to have ownership in early June prior to the MSBA meeting. M. McGovern noted the June 5, 2018 deadline is aggressive and tight, but it gives three more weeks prior to June 27, 2018 MSBA meeting. This means that in that time, there will be three City Council meetings to get the vote prior to the MSBA meeting. E. Kennedy inquired if the City will attempt to firm up the

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schedule early next week and confirm with the School Building Committee, City Council and School Committee. M. Vaughn agreed.

W. Samaras inquired to the relocation, specifically if the plan would simply replicate their existing practice and what would happen if the tenants were looking to have more sinks or x-ray machines. P. Sleeper stated that the tenant would need to pay for additional space and equipment themselves, the plan only addresses replicating the existing practice. He mentioned that the goal is to make sure that the tenants survive and are happy somewhere else.

Senator Donoghue noted that with her experience of eminent domain on the Stoklosa School and the Early Garage that the proceedings are very technical, and that timing is critically important to the process. She inquired to the bid process and timing. M. Vaughn stated that the City had only received one quote after soliciting quotes from 36 local licensed appraisers. He continued that under Chapter 30 B, no sealed bid was required for the appraisals. Senator Donoghue noted the importance that the City proceed carefully every step of the way through the process.

J. Mason wanted to clarify that City had only heard back from one appraiser. M. Vaughn stated that some other appraisers alluded that more quotes will be received on Monday. E. Kennedy noted it may make sense to reenergize search. M. Vaughn replied that the search included research on the Massachusetts Appraisal website, and that requests were sent to the appraisal firms listed. E. Kennedy commented that the City selected the procurement method that would streamline process; some vendors have declined, some must have not responded at all. He asked if it was worthwhile to follow up with the vendors who did not respond at all. M. Vaughn stated that he plans on following up and was surprised that some vendors did not participate. Senator Donoghue noted with the lack of interest in appraisals, it may be beneficial to bid the project. E. Kennedy asked R. Bell if the appraisals need to be completed by June 5, 2018 and if it was critical or likely to have a favorable vote if the City did not have possession of property. J. Drown commented that the MSBA doesn't typically require ownership of property and that the team is hoping to be able to access the site this summer for boring testing. E. Kennedy said if not done by early June, maybe by the end of June, could still do testing on the scheduled timeline.

R. Elliott noted that under Massachusetts General Law Chapter 30 B, projects under a certain threshold only require the City to solicit quotes, which may be less costly and time consuming than bids. M. Vaughn has not seen anything on the state's procurement website COMMBUYS, but he did go to the appraisal association websites. He added that he can investigate goods and services published on Monday as well as the State website. R. Elliott noted that having one quote is fine since the City reached out to so many appraisers and anticipates having more respond. Mr. Vaughn noted that he anticipates having more submit but, in his experience, he does not believe something will arrive until it is sitting in his hands.

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IV. - REVIEW OF OPTIONS AND PHASING

Architects D. Guarriello and A. Iannuccilli updated the refined education program. The program removes the pool which results in less additions. D. Guarriello noted that the presentation is an overview at feasibility level now, including concepts. The team is looking at the three options Add/Reno 2A, Add/Reno 3A and Option A.

A. ADD/ RENO Option 2A

This option fits onto existing site; the image in the presentation shows the new gym and freshman academy, renovation of the ‘80s building and the ‘22 building. The temporary gym would be necessary. The result of the design after construction has limited green space and loading dock space. The project would take four years plus summer for construction. Freshman academy would be built almost up to sidewalk, which may raise concerns with breathing room as students enter and exit the school. Phase 1: The temporary gym would be built on the grass land next to parking garage owned by city. The demolition of the existing fieldhouse would start in the summer. The phasing would then incorporate better utilization of space in the ’80 building, ’22 building and the freshman academy. Phase 2: the existing gym would be removed and renovation to the west side ‘80s building would begin. Phase 3: renovation on the ’80 building would continue into the summer, allowing for continuous connection to new freshman academy, gym to the ‘22 building. Phase 4: the remainder of renovation work on ‘22 building and the construction of the second bridge would commence. The result is a new school consolidated on one campus with construction lasting four years and a summer. The phasing concept is preliminary, the number of rooms freed up and the number that the contractor can take are estimates. The construction manager hired after design complete will determine overall phasing. The presentation from the design team trying to create concept of how the project can be accomplished.

D. Guarriello noted the shuffled space on the ‘80 building. She continued to explain the slide with large yellow space representing a major cafeteria, and the kitchen as currently in school. The yellow colored spaces are all public; the blue are class rooms and the green class rooms represent science courses. J. Mason asked to clarify the ghosted walls going away to create cafeteria. R. Bell replied not really at design level of walls yet, and the group will not see this level of detail until later in the design process.

B. ADD/RENO Option 3A

This option is similar to Option 3 presented to the group previously, only the pool was removed. The campus is consolidated with the freshman academy on site. As shown previously, the design will bring light wells into the ‘80 building; window-less classrooms will now have natural

daylight. The design has green space on site for ROTC and physical education classes. The option does locate the gym on new site, which moves that building further away from other parts of school. The project is estimated to take five years; which is three months more than previously presented. Major transition points where summer contractor can move fencing without impacting the students. Demolition of 75 Arcand Drive without disrupting school and building of the new gym, with no temporary gym or temporary class room required. Phase 2: the freshman academy would be relocated to the existing gym space; which would create swing space needed to renovate the '80 building same time. Summer work would take place in the south portion '80 building. Phase 3: complete the renovation of the '22 building. This option provides more outdoor green space, plaza space, and has the freshman academy and gym further away from street. This option would take five years, four years on school property and the first year would be off the site.

D. Guarriello noted option 3A was set back from Father Morrissett further. There is more space at the heart of school to work with. Natural lighting and the additional outdoor spaces make the design more vibrant.

C. New School Option A

This option is an all new facility on the '80s side of the canal with the expanded site. The building would be five stories plus the basement level. Overall the building consumes much of the footprint with limited plaza and green space. The new freshman wing would be temporarily connected to the '22 building, construction would then occur to remove existing bridges. This option would require twenty-four additional modular classrooms off site. Possible modular host sites are illustrated in presentation materials. Part of the phasing would take the cafeteria off line; convert the new freshman academy into a temporary café which will then be converted back into classrooms in the final phase. This option would take four years and a summer. E. Kennedy noted this was a little different and asked the design team please review for audience at home which options require modulars and amount required.

Option 2A – Existing site would require a modular gym and locker / team room space.

Option 3A – Expanded site would require no modulars of any kind.

Option A – Expanded site would require the most modular class rooms (twenty-four) as well as a gym, locker room and team space.

D. Guarriello mentioned that the modulars are not eligible for reimbursement and cost is fully shifted to the City.

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E. Kennedy inquired if the freshman academy building would be suitable for the swimming pool, perhaps a municipal pool down the road. R. Bell commented it would take many of the engineers to look at this analyze the architecture, and that would be a very different study. W. Samaras asked what a temporary gym would look like. R. Bell replied there are structures that may sound interesting, inflatable roof structures are envisioned, and have been used in Boston. The gym would be a large shell of space with a gym floor. M. Williams noted the modular gym is required but it is not something that the City can rent, it must be purchased. W. Samaras inquired if it was reimbursable if it needs to be procured. Senator Donoghue mentioned the last site, Option A, with 24 modular classrooms and inquired where the modulars would be placed. R. Bell replied that a potential offsite and laydown space/staging area is included in the presentation. The map illustrates stared locations – fourteen parcels of use or available that may or may not be within walking distance. The design team has begun looking into closest ones, particularly the parking lot behind the post office, where approximately half the modulars would fit. Senator Donoghue inquired if security concerns would be addressed in option 3A. D. Guarriello replied that the concerns have not yet been addressed but the plan will be discussed on April 4, 2018.

V. - Community Outreach

M. McGovern commented that there is an April 12, 2018 community meeting, similar to a previously held meeting at Senior Center. He noted that the Manager's Office is currently speaking to various local and neighborhood stakeholders to put this together. The meeting will be set up as a break out style community meeting, with a presentation by Skanska and Perkins Eastman, and then give participants time to have a discussion and come back with questions.

At the end of April, when cost estimates are received, the School Building Committee meeting and City Council presentation will need to take place. The SBC meeting could take place Thursday night and then the City Council could vote on the next Tuesday. W. Samaras noted that the group can talk about dates and what the committee would like to do moving forward.

E. Kennedy motioned to set a SBC meeting on Monday April 30th, noting a recommendation to be made to the City Council on a preferred option. Seconded by D. Cunningham.

M. McGovern noted that the April 12, 2018 community meeting would take place at LHS cafeteria as the Senior Center already has something else scheduled. He noted that the cafeteria may work out better for seating at tables for question and answers. The community meeting on April 12, 2018 will be recorded and replayed by LTC.

E. Kennedy motioned that the second community meeting take place at the same time and date at the SBC meeting on April 30, 2018. Seconded by J. Mason.

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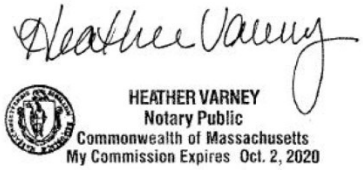
A. Caritano noted that the estimator will look at package and submit to MSBA on May 9, 2018. The Facility Sub Committee meeting will take place by June, prior to the then MSBA meeting June 7, 2018 meeting.

City Councilor J. Leahy spoke regarding the safety of the designed options.

E. Kennedy inquired when the School Building Committee receives information and materials if the School Committee and City Council could be included. M. McGovern noted that the School Building Committee, City Council and School Committee will receive the package. The package will also be posted on the City and LHS Project websites.

Motion to adjourn by R. Healy. Seconded by E. Kennedy. 8:05 PM.

Notes taken by Alex Magee and certified by:



PERKINS EASTMAN

SCHOOL BUILDING COMMITTEE

LOWELL HS PROJECT



EXISTING IMAGERY COURTESY OF GOOGLE EARTH

29 MARCH 2018

LOWELL HIGH SCHOOL

AGENDA

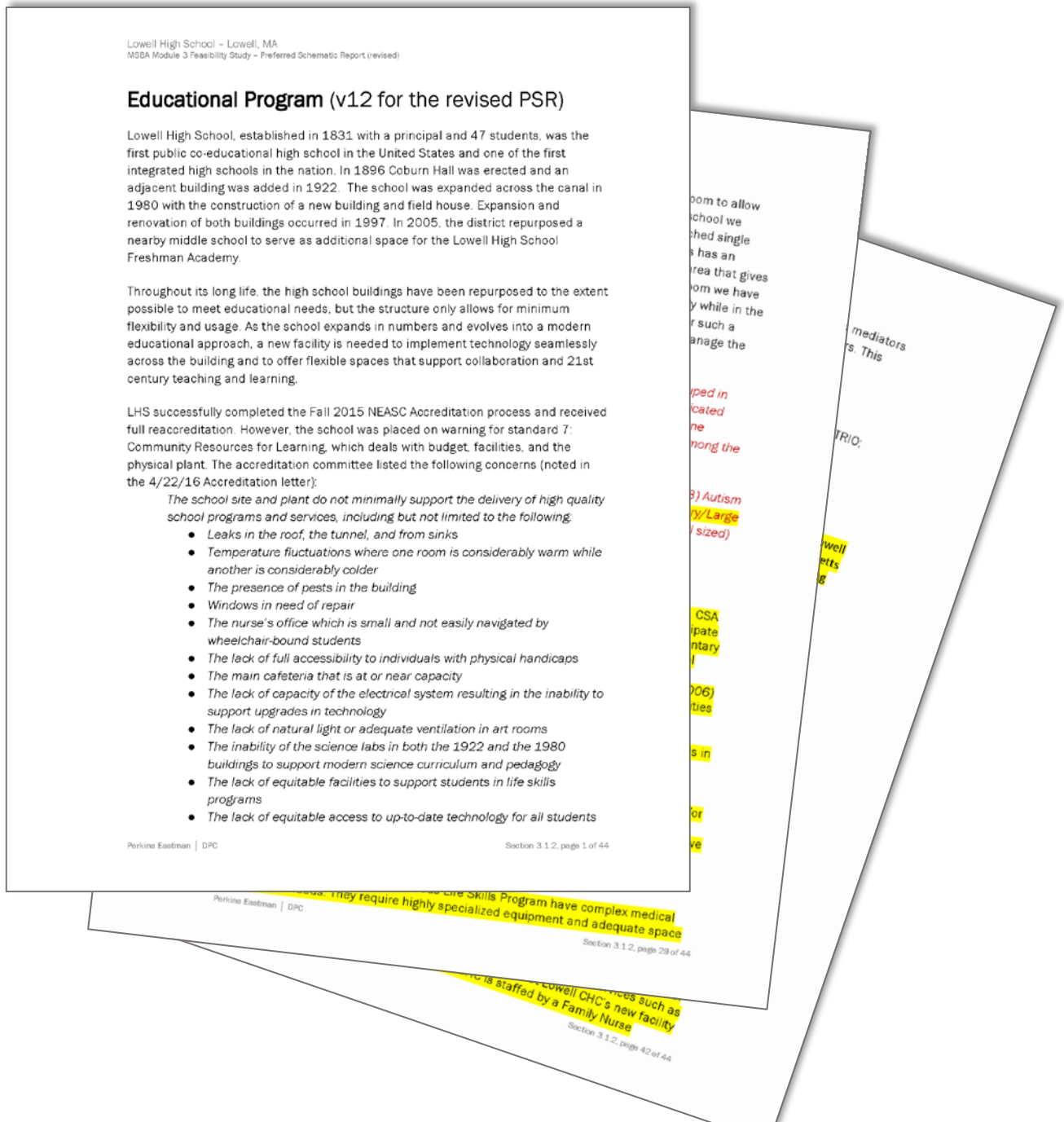
- 3/21 SC Approval Rev. Educational Plan
- City Update Eminent Domain
- Review Options/Phasing PSR Update:
  - Add/Reno Option 2A
  - Add/Reno Option 3A - Expanded Site
  - New Option A - Expanded Site
- Schedule
- Community Outreach
- Next Steps



EDUCATIONAL PROGRAM

Updates Since Prior Approval

- **Removed References to Pool** (pg. 26-27 & 41)
- Additional Description for **Adaptive PE/Sensory-Motor** (pg. 29-30)
- **ROTC Classroom Clarification** – Classroom Count Includes PT (pg. 33)
- Additional Descriptions for **Catie's Closet & Comm. Health** (pg. 42-43)



MSBA COMMENTS SINCE PRIOR PSR

Spaces Accepted

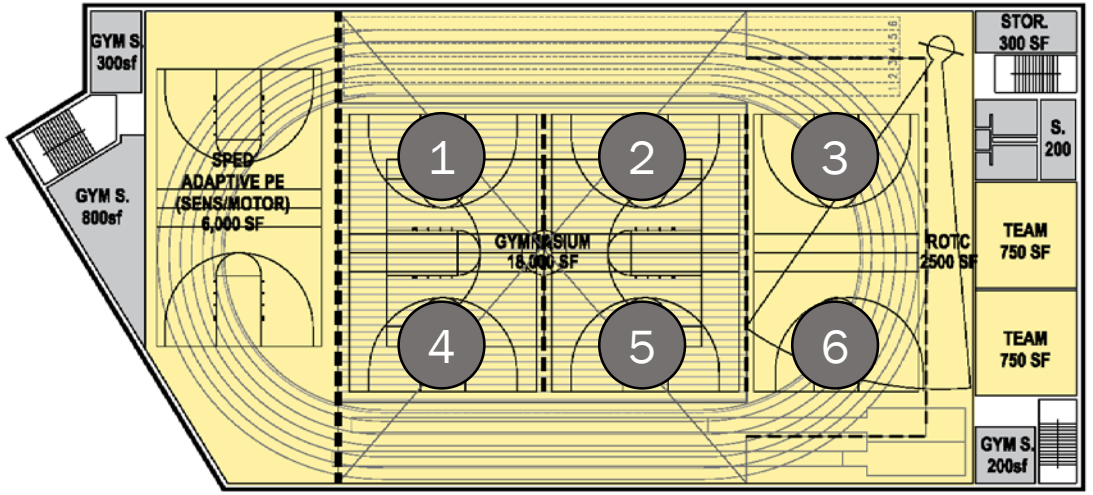
- Core Academics
- Art & Music
- Vocations & Tech (except as noted below)
- Health & Phys-Ed (except as noted below)
- Media Center
- Food Service
- Other Category (except as noted below)

Spaces Under Review (as noted above), and:

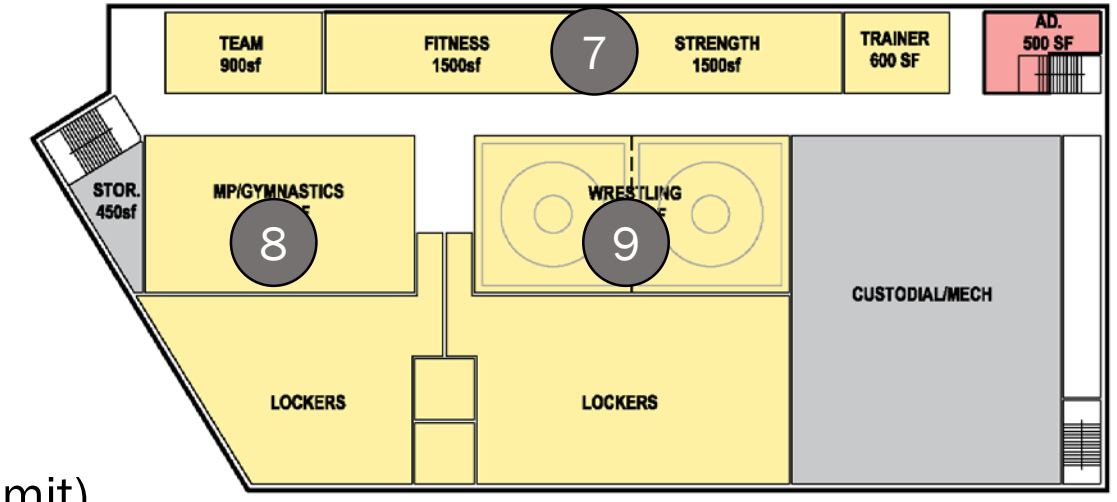
- Special Education (subject to DESE review)
- Admin. & Guidance (under review)
- Custodial & Maintenance (under review)
- Store, Bank, TV Studio, Athl. Secr/Bursar/Conf)
- Catie's Closet & Community Health Center
- Co-Location of Gym & Other Programs

Spaces Rejected (other than the Pool):

- Auditorium Delta (2,126sf above MSBA upper limit)



Gym Areas – 2nd Floor



Gym Areas – 1st Floor

SPACE SUMMARY UPDATES

guidelines that scale

unscaled, typically ok

unscaled, but should

Core Academics - unchanged

Special Educ. – unchanged

LOWELL HIGH SCHOOL	Existing Conditions			Proposed Total				MSBA Guidelines (refer to MSBA Educational Program & Space Standard Guidelines)			
ROOM TYPE	ROOM NFA[1]	# OF RMS	area totals	ROOM NFA[1]	# OF RMS	area totals		ROOM NFA[1]	# OF RMS	area totals	Comments
CORE ACADEMIC SPACES			136,088			161,620	-7K OFFSET BY SPED/ART/TECH			169,040	
Classroom - Freshman (incl Health)	849	27		900	24	21,600					
Classroom - Gr. 10-12 (incl. Health & ELL)	825	95		900	88	79,200					
Classroom - General		122			112		UTILIZ+CL SIZE=LES	850	120	102,000	825 SF min - 950 SF max
Teacher Planning - Freshman	493	1	493	450	4	1,800					
Tchr Plng (Tch-Out, Lng, Ktch, Comp, Copy)	604	8	4,834	450	13	5,850					
Dept Off's (Eng, SS, Mth, Sci, WL/ELL, Instr)	112	6	671	125	6	750					
Teacher Develop/Training (Little Thtr + Cntrl)	3,568	1	3,568	3,600	1	3,600					
Teacher Planning		16			24			100	120	12,000	
Small Group Seminar (20-30 seats)				450	6	2,700		500	8	4,000	
Science Classroom / Lab - Freshman	978	7	6,849	1,440	8	11,520					
Science Classroom / Lab - Gr.10-12	900	19	17,100	1,440	20	28,800					
Science Classroom / Lab (incl. 3 ELL Sci)		26			28		UTILIZ+CL SIZE=LES	1,440	31	44,640	3 x85% ut=20 Seats-1 per /day/student
Prep Room	156	7	1,091	200	28	5,600		200	31	6,200	
Central Chemical Storage Rm				200	1	200		200	1	200	reasonable not to scale (typically)
Unassigned Green House/Growing Room	196	1	196	200	0	0	INCL. VIA PREP				
Clean Room (w/ Micro/Bio Tech Lab)				400	0	0	INCL. VIA PREP				
SPECIAL EDUCATION			21,950			38,950	+2 SPED CR's/ART/TECH			34,240	
LIFE SKILLS (69 stu's =78 prorated)											
Life Skills CRs (2 ages +Kitch/Laund/Mail)	968	4	3,870	1,200	4	4,800					
Life Skills Hygene (Wash/Changing Room)				450	1	450					
Life Skills Intensive CR +Tlt (2 age grps)	872	2	1,744	950	2	1,900					
Life Skills Sensory Room	344	1	344	450	1	450					
Life Skills (CSA) Autism CR + Tlt & Quiet	816	2	1,632	950	8	7,600					
Life Skills - AdaptivePE / Sensory-Motor				3,000	2	6,000					
ADJUSTMENTS (40 stu's =46 prorated)											
Adjustments CR	738	7	5,169	900	8	7,200					
Adjust Social Worker	165	1	165	150	1	150					
Counseling Room				200	1	200					
Storage				100	1	100					
FUNDAMNTL (190 stu's =214 prorated)											
Fundamentals - Freshman	810	2	1,619	450	2	900					
Fundamentals - Gr.10-12	545	7	3,812	450	8	3,600	+1 PER SPED DEPT				
Fundamentals Instruct. Support CR (for 24+)				1,900	1	1,900					
OTHER SPECIAL NEEDS											
OT/PT (part-time)				therapy occurs in CRs							
Deaf/Hearing Impared Suite	1,066	1	1,066	450	1	450					
Speech & OT/PT (Office for 3 + mtgs for 6)	178	3	534	450	1	450					
Psych + Evaluators/Testing	299	2	598	150	4	600					
Social Worker	189	1	189	150	1	150					
PALS Mentoring Office/Conf	161	2	321	part of soc worker							
SPED Dept Chair	241	1	241	250	1	250					
SPED Eval Team Chair	237	1	237	150	2	300					
SPED Office (Clerk/Waiting/Files)	304	1	304	300	1	300					
Conference (1 for 12, 1 for 20)				600	2	1,200					

SUBJECT TO DESE REVIEW

SPACE SUMMARY UPDATES

guidelines that scale

unscaled, typically ok

unscaled, but should

Core Academics - unchanged

Special Educ. – unchanged

Art & Music - unchanged

Voc. & Tech. - unchanged

Proposed Space Summary v12 (for revised PSR)

	Spaces Existing			Spaces Proposed			Spaces per Guidelines			
	3125stu/25class/.71util.=176rms		177	3520stu/24class/.85util.=172rms		172	3520stu/23class/.85util.=181rms		183	
LOWELL HIGH SCHOOL	Existing Conditions			Proposed Total			MSBA Guidelines (refer to MSBA Educational Program & Space Standard Guidelines)			
ROOM TYPE	ROOM NFA[1]	# OF RMS	area totals	ROOM NFA[1]	# OF RMS	area totals	ROOM NFA[1]	# OF RMS	area totals	Comments
ART & MUSIC			19,851			17,700	+5K OFFSET BY CR's/SPED/TECH		13,075	
Art CR (incl. Photo/Anim, Graph, TV Prod)	1,301	6	7,803	1,350	6	8,100	1,200	6	7,200	Assumed use - 25% Population - 5 times/week
Art Workroom w/ Storage & kiln	370	4	1,482	150	6	900	150	6	900	
Band - 50 - 100 seats	2,791	1	2,791	2,000	1	2,000	1,500	1	1,500	BROKEN FORMULA (+ see note below)
Chorus - 50 - 100 seats (incl. Drama)	2,652	1	2,652	1,500	1	1,500 PER TEST PLAN	1,500	1	1,500	reasonable if combined count w/ tech
Dance (also uses stage)	866	1	866	1,200	2	2,400				
Ensemble						0	200	1	200	reasonable if combined count w/ tech
Piano/Digital Lab	1,186	1	1,186	1,000	1	1,000				
Music Practice (incl. Guitar)	81	3	244	75	5	375	75	17	1,275	
Music Storage	256	7	1,789	500	2	1,000	500	1	500	reasonable not to scale (typically)
Fine Arts Dept Office	155	1	155	125	1	125				
Music Admin - Conf/ Off	183	4	731	300	1	300				
Dark Room	152	1	152			0				
VOCATIONS & TECHNOLOGY			28,533			35,615	3K OFFSET BY CR's/SPED/ART		38,400	
ROTC Classroom/PT (385 stu = 434 prorated)	955	4	3,819	900	5	4,500				
Culinary Arts Classroom	1,163	2	2,325	1,200	2	2,400	EXCEPT STORE & BANK + TV AREA UNDER REVIEW			
Business (Accounting/Pers-Finance/Law)	869	2	1,738	1,200	2	2,400				
Business (Mktg/Sports Mktg) CH.74	994	2	1,987		incl. below		Ch.74 calc's NOT in MSBA totals			Exist 281stu in 14.5sect 5x/wk of 35p cyc at 85% =2.4rms of 20
Business (Retail Mktg - CR) CH.74	812	1	812	1,200	3	3,600	FTE	SF/stu.	SF Reg's	Adjust to 3.16 in 15.5sect x5/wk of 35p cyc at 85% =2.6 rms of 20
Business (Retail Mktg - Store) CH.74	532	1	532		incl. above		60	110	6,600	20:1 stu/tchr ratio (2200sf min, 12' clear), 3 rm capacity = 60
Tech Clrm. - (E.G. Drafting, Business)		12			12		1,200	12	14,400	Assumed use - 50% Population - 5 times/week
ROTC MP/Gym w/ Stor (Drills/Band)	755	1	755	2,500	1	2,500				
Culinary Arts Kitch + Restaurant (for 25-30)	2,494	1	2,494	2,975	1	2,975				
Costume Shop w/ Sewing, Storage	727	1	727	1,440	1	1,440				
Scene Shop	future conversion of storage above			1,440	1	1,440				
TV Studio (w/ cntrl, edit/scrn, off/wait, equip)	3,882	1	3,882	4,000	1	4,000				
Robotics/CADD (w/ Engnr)	1,577	1	1,577	1,440	2	2,880				
Clean Enegry Lab (w/ Engnr)	1,577	1	1,577	1,440	1	1,440				
Maker Space (w/ Freshman Integr. Sci)	1,512	1	1,512	1,440	1	1,440				
Business (Bank/Credit Union)	287	1	287	400	1	400				
Tech Shop - (E.G. Consumer, Wood)		8			10		2,000	12	24,000	Assumed use - 50% Population - 5 times/week
ROTC Off/ Conf.	788	2	1,576	800	2	1,600				
ROTC Storage (4sf/cadet + mock weapons)	254	7	1,779	600	3	1,800 434 x4 =1736 + 64				
Culinary Arts Storage	216	2	432	300	2	600				
Scene and Costume Storage	722	1	722	0		0 IN ROOM STOR.				
Retail/Store Storage				200	1	200				

SPACE SUMMARY UPDATES

guidelines that scale

unscaled, typically ok

unscaled, but should

Core Academics - unchanged

Special Educ. – unchanged

Art & Music - unchanged

Voc. & Tech. - unchanged

Health & PE - unchanged

Media Center - unchanged

Aud. & Drama - unchanged

Food Service - unchanged

Proposed Space Summary v12 (for revised PSR)

LOWELL HIGH SCHOOL	Spaces Existing: 3125stu/25class/.71util.=176rms 177 — Existing Conditions			Spaces Proposed: 3520stu/24class/.85util.=172rms 172 — Proposed Total				Spaces per Guidelines: 3520stu/23class/.85util.=181rms 183 — MSBA Guidelines (refer to MSBA Educational Program & Space Standard Guidelines)			
ROOM TYPE	ROOM NFA[1]	# OF RMS	area totals	ROOM NFA[1]	# OF RMS	area totals		ROOM NFA[1]	# OF RMS	area totals	Comments
HEALTH & PHYSICAL EDUCATION			46,121			41,700	+6K (MORE STA)			35,912	
Gymnasium (6 lane 134.1m trck, LJ, TJ, SP)	28,408	1	28,408	3,000	6	18,000	REMOVE 1 LN OFFSET w/ LCKRS	12,000	1	12,000	DOESN'T SCALE, BUT TIED TO ENROLL.
PE Alternatives (Wrestling 42x84 req'd)	1,960	1	1,960	3,500	1	3,500		3,000	1	3,000	DOESN'T SCALE, BUT TIED TO ENROLL.
Fitness & Functional Strngth	1,474	2	2,948	3,000	1	3,000					
Multi-Purpose (Gymnastics/Yoga/Cheering)	currently off-site			3,000	1	3,000					
Gym Storeroom (incl. Gymnastics w/ MP)	1,133	1	1,133	1,400	1	1,400		300	1	300	DOESN'T SCALE, BUT TIED TO SIZE
Locker Rooms - Boys / Girls w/ Toilets	3,245	2	6,490	3,600	2	7,200		19,712	1	19,712	5.6 sf/student total
Varsity Lockers - Boys/ Girls w/ Toilets	870	2	1,740	1,200	2	2,400					
Phys. Ed. Storage (incl. Equipment)	258	5	1,292	250	6	1,500		500	1	500	DOESN'T SCALE, BUT TIED TO SIZE
Athletic Director's Office (Lord 1st fl -South)	185	1	185	150	1	150		150	1	150	reasonable not to scale (typically)
AD Secr, Bursor, Conf (Lord 1st fl - South)	155	3	464	150	3	450					
Health Instructor's Office w/ Shower & Toilet	170	5	852	125	4	500		250	1	250	DOESN'T SCALE, BUT TIED TO ENROLL.
Trainers Room	216	3	649	600	1	600					not recognized, but common in HS's
MEDIA CENTER			13,164			21,900				21,900	
Media Center / Reading Room	9,137	1	9,137	21,900	1	21,900		21,900	1	21,900	
Computer Lab											
Tech Ctr, Stor + Training Lab (incl instr sp.)	666	3	1,998		included above						
Data Processing + Scheduler	1,036	1	1,036		included above						
MCAS/Testing Stor (incl instr specialist)	993	1	993		included above						
AUDITORIUM / DRAMA			20,233			15,516	+5K (MODEST 1/3 SEATING REQUEST)			10,400	
Auditorium	11,627	1	11,627	11,616	1	11,616		7,500	1	7,500	2/3 Enrollment @ 10 SF/Seat - 750 seats MAX
Stage	2,614	1	2,614	2,600	1	2,600		1,600	1	1,600	reasonable not to scale, but small
Auditorium Storage (incl Prop Storage)	598	2	1,196	500	1	500		500	1	500	
Make-up / Dressing Rooms				300	2	600		300	2	600	reasonable not to scale (typically)
Controls / Lighting / Projection	233	1	233	200	1	200		200	1	200	
Theater - Freshman	3,438	1	3,438								
Stage - Freshman	691	1	691								
Dressing/Storage	217	2	434								
DINING & FOOD SERVICE			21,955			25,180				25,180	
Cafeteria - Freshman	4,215	1	4,215	5,000	1	5,000					
Cafeteria / Student Lounge / Break-out	10,408	1	10,408	12,600	1	12,600		17,600	1	17,600	3 seatings - 15SF per seat
Chair / Table Storage	156	1	156	1,030	1	1,030		1,030	1	1,030	
Scramble Serving Area	2,486	1	2,486	600	1	600		600	1	600	reasonable not to scale (typically)
Kitchen - Freshman	466	1	466	1,000	1	1,000					
Kitchen	3,553	1	3,553	3,820	1	3,820		4,820	1	4,820	1600 SF for first 300 + 1 SF/student Add'l
Staff Lunch Room	671	1	671	1,130	1	1,130		1,130	1	1,130	20 SF/Occupant

✓ EXCEPT EXTRA 450 AD + PLANS UNDER REVIEW

✓

✓ EXCEPT REDUCE 2,216sf (IF NEW?)

✓

✓

Version
11.24.2010

SPACE SUMMARY UPDATES

guidelines that scale

unscaled, typically ok

unscaled, but should

Core Academics - unchanged

Special Educ. – unchanged

Art & Music - unchanged

Voc. & Tech. - unchanged

Health & PE - unchanged

Media Center - unchanged

Aud. & Drama - unchanged

Food Service - unchanged

Medical - unchanged

Admin & Guid - unchanged

Proposed Space Summary v12 (for revised PSR)

LOWELL HIGH SCHOOL	Spaces Existing: 3125stu/25class/.71util.=176rms 177 — Existing Conditions			Spaces Proposed: 3520stu/24class/.85util.=172rms 172 — Proposed Total				Spaces per Guidelines: 3520stu/23class/.85util.=181rms 183 — MSBA Guidelines (refer to MSBA Educational Program & Space Standard Guidelines)			
ROOM TYPE	ROOM NFA[1]	# OF RMS	area totals	ROOM NFA[1]	# OF RMS	area totals		ROOM NFA[1]	# OF RMS	area totals	Comments
MEDICAL			2,215			2,610	✓			2,610	
Medical Suite Toilet	62	2	124	60	4	240		60	1	60	reasonable not to scale, but needs 2
Nurses' Office / Waiting Room	217	2	434	450	1	450		250	1	250	DOESN'T SCALE, BUT TIED TO ENROLL.
Interview Room				100	8	800		100	8	800	
Examination Room / Resting	103	8	820	100	10	1,000		100	15	1,500	
Medical Suite Toilet - Freshman	47	1	47								
Nurses' Office - Freshman	126	1	126								
Exam / Resting - Freshman	332	2	664								
Lactation Room				60	2	120					
ADMINISTRATION & GUIDANCE			15,423			13,055	+3.5K PER REAL NEED ? MSBA CONT'D REVIEW			9,785	
General Office / Waiting Room / Toilet	231	1	231	300	1	300		1,760	1	1,760	
Freshman Office / Waiting Rm / Tlt	793	1	793	200	1	200					
House Office / Waiting Rm / Tlt (B, C, D, E)	509	3	1,527	200	4	800					
Teachers' Mail and Time Room	138	1	138	250	1	250		100	1	100	DOESN'T SCALE, BUT TIED TO SIZE
Duplicating Room - C, D Houses	178	2	355	200	1	200		200	1	200	reasonable not to scale (typically)
Records Room - Main, E House	58	2	115	200	1	200		200	1	200	reasonable not to scale (typically)
Principal's Office w/ Conference Area	305	1	305	375	1	375		375	1	375	DOESN'T SCALE, BUT TIED TO SIZE
Principal's Office w/ Conf Area - Freshman	206	1	206	150	1	150					⇩
Principal's Secretary / Waiting	268	1	268	125	1	125		125	1	125	reasonable not to scale (typically)
Asst Principal's Office - AP1 (Discipl/Oper)	280	1	280	200	1	200		150	1	150	reasonable not scaled if other off's do
Asst Principal's Office - AP2 (Dir.ofCurric)	541	1	541	200	1	200		150	1	150	DOESN'T SCALE, BUT TIED TO SIZE
Asst Principal's Office (B,C,D,E)	265	4	1,058	150	4	600					⇩
Supervisory / Spare Office (Accts Payable)	137	1	137	120	1	120		120	1	120	reasonable not scaled if other off's do
Conference Room (Administration)	386	2	772	450	1	450		450	1	450	DOESN'T SCALE, BUT TIED TO SIZE
Conference Room - Freshman	175	1	175	200	1	200					⇩
Conference Room - B House	81	1	81								
Guidance Office				150	10	1,500		150	18	2,700	
Guidance Office - Freshman	187	3	562	included above							
Guidance Office - B, C, D, E House	152	8	1,219	included above							
Social Worker Office - Freshman	129	1	129	150	1	150					
Social Worker Office - B, C, D, E House	169	4	676	150	4	600					
Guidance Waiting Room - C House	292	1	292	100	5	500		100	1	100	DOESN'T SCALE, BUT TIED TO SIZE
Guidance Waiting Room - Freshman	559	1	559	included above							
Guidance Storeroom				100	5	500		100	1	100	DOESN'T SCALE, BUT TIED TO SIZE
Guidance Storeroom - Freshman	124	1	124	included above							
Career Center	677	2	1,354	1,030	1	1,030		1,030	1	1,030	not recognized, but common in HS's
Records Room - Freshman	77	1	77	465	1	465		465	1	465	DOESN'T SCALE, BUT TIED TO SIZE
Kitchenette - Freshman	200	1	200	100	1	100					⇩
Student Support Offices - Freshman	115	2	229	150	1	150					OFTEN w/ SPED, BUT SMALLER SCALE
Student Support Conf. - Freshman	230	1	230	200	1	200					⇩
Sudent Support Suite (incl. Safe Harbors)	1,183	1	1,183	1,200	1	1,200					
Student Support Offices - Gr.10-12	85	3	256	150	3	450					
Student Support Conf. Gr.10-12	140	1	140	150	1	150					
Dir of Students	278	1	278	200	1	200					
ELL Dept Head + Testing	81	2	161	120	2	240					

SPACE SUMMARY UPDATES

guidelines that scale

unscaled, typically ok

unscaled, but should

Core Academics - unchanged

Special Educ. – unchanged

Art & Music - unchanged

Voc. & Tech. - unchanged

Health & PE - unchanged

Media Center - unchanged

Aud. & Drama - unchanged

Food Service - unchanged

Medical - unchanged

Admin & Guid - unchanged

Cust. & Maint. - unchanged

Other – pool removed -7,150sf

Proposed Space Summary v12 (for revised PSR)

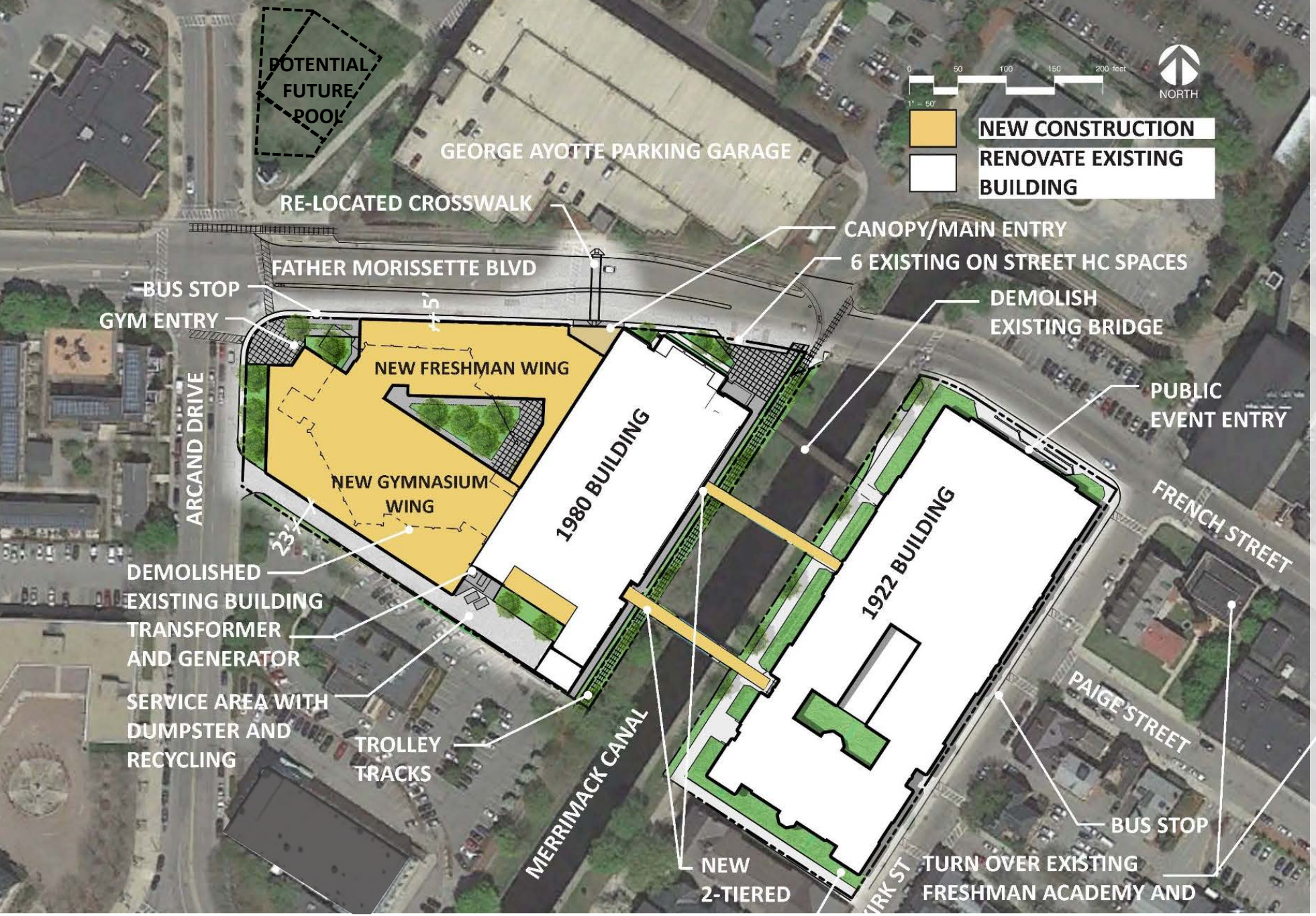
LOWELL HIGH SCHOOL	Spaces Existing: 3125stu/25class/.71util.=176rms 177 — Existing Conditions			Spaces Proposed: 3520stu/24class/.85util.=172rms 172 — Proposed Total				Spaces per Guidelines: 3520stu/23class/.85util.=181rms 183 — MSBA Guidelines (refer to MSBA Educational Program & Space Standard Guidelines)			
ROOM TYPE	ROOM NFA[1]	# OF RMS	area totals	ROOM NFA[1]	# OF RMS	area totals		ROOM NFA[1]	# OF RMS	area totals	Comments
Teachers' Work Room - Freshman	386	2	772	250	5	1,250		1,760	1	1,760	
CUSTODIAL & MAINTENANCE			6,775			5,440	+1K PER LDG SCALE			4,265	
Custodian's Office + Lockers	77	3	232	150	2	300		150	1	150	
Custodian's Workshop	525	1	525	500	1	500		250	1	250	
Custodian's Storage	72	26	1,884	375	2	750		375	1	375	
Recycling Room / Trash	85	1	85	400	1	400		400	1	400	
Receiving and General Supply	84	1	84	1,030	1	1,030		1,030	1	1,030	
Storeroom + Books	220	11	2,417	1,860	1	1,860		1,860	1	1,860	
Network / Telecom Room	86	18	1,548	75	8	600		200	1	200	
OTHER			19,764			6,800	+7K SQFTs REQUESTED			0	
Unassigned Computer Lab - Freshman	868	2	1,736								
Unassigned Computer Lab - Gr.10-12	960	7	6,721								
Unassigned Science Lab - Freshman	1,385	1	1,385								
Unassigned Green House/Growing Room	207	2	413								
Spare Off, Wait, Conf (220A,B,C)	185	3	556								
Lowell Comm Hlth Center	608	1	608	1,500	1	1,500					
Lowell Comm Hlth Center - Exam	80	3	241	included above							
Lowell Comm Hlth Center - Office	103	2	205	included above							
Lowell Comm Hlth Center - File and Storage	146	3	437	included above							
Lowell Comm Hlth Center - Toilet	72	1	72	included above							
Catie's Closet - Freshman	225	1	225	350	2	700					
Catie's Closet - Gr.10-12	364	1	364	included above							
Trio - Gear Up/Talent/Upward - Freshman	473	1	473	500	3	1,500					
Trio - Upward	579	1	579	included above							
Trio - Suite (recept, wait, 2 offices, conf)	197	5	984	included above							
In School Suspension - Freshman	809	1	809	450	1	600					
In House Detention Gr.10-12	969	1	969	900	1	900					
Score Mediation (Office, Entry, Stor)	132	3	395	150	2	300					
Interactive Learning Center + Storage	995	1	995	use typ CRs/laptops							
Latino Connection	228	1	228	250	1	250					
Student Activities (Lord 1st fl - North)	284	1	284	300	1	300					
Substitute Teacher's Office	127	1	127	150	1	150					
Conseling Services	occurs in available space			use typ CRs/other space							
DARE Office & Security	233	3	700	150	2	300					
SRO Office & Entry (Lord 1st fl - North)	129	2	258	150	2	300					
Total Building Net Floor Area (NFA)			352,071			386,086	+21.5K(7K OTH +6K PE+5K AUD +3.5K ADMIN)			364,807	
Proposed Student Capacity / Enrollment			3,125			3,520				3,520	157
Total Building Gross Floor Area (GFA)[2]			628,558			579,129				552,640	Note: MSBA does not incl. Ch.74 calc's
Grossing factor (GFA/NFA)			1.79			1.50				1.51	

? MSBA CONT'D REVIEW

✓ EXCEPT HEALTH CTR & CATIE'S

Version
11.24.2010

ADD/RENO 2A EXISTING SITE



Updated Educ Program
(pool removed)

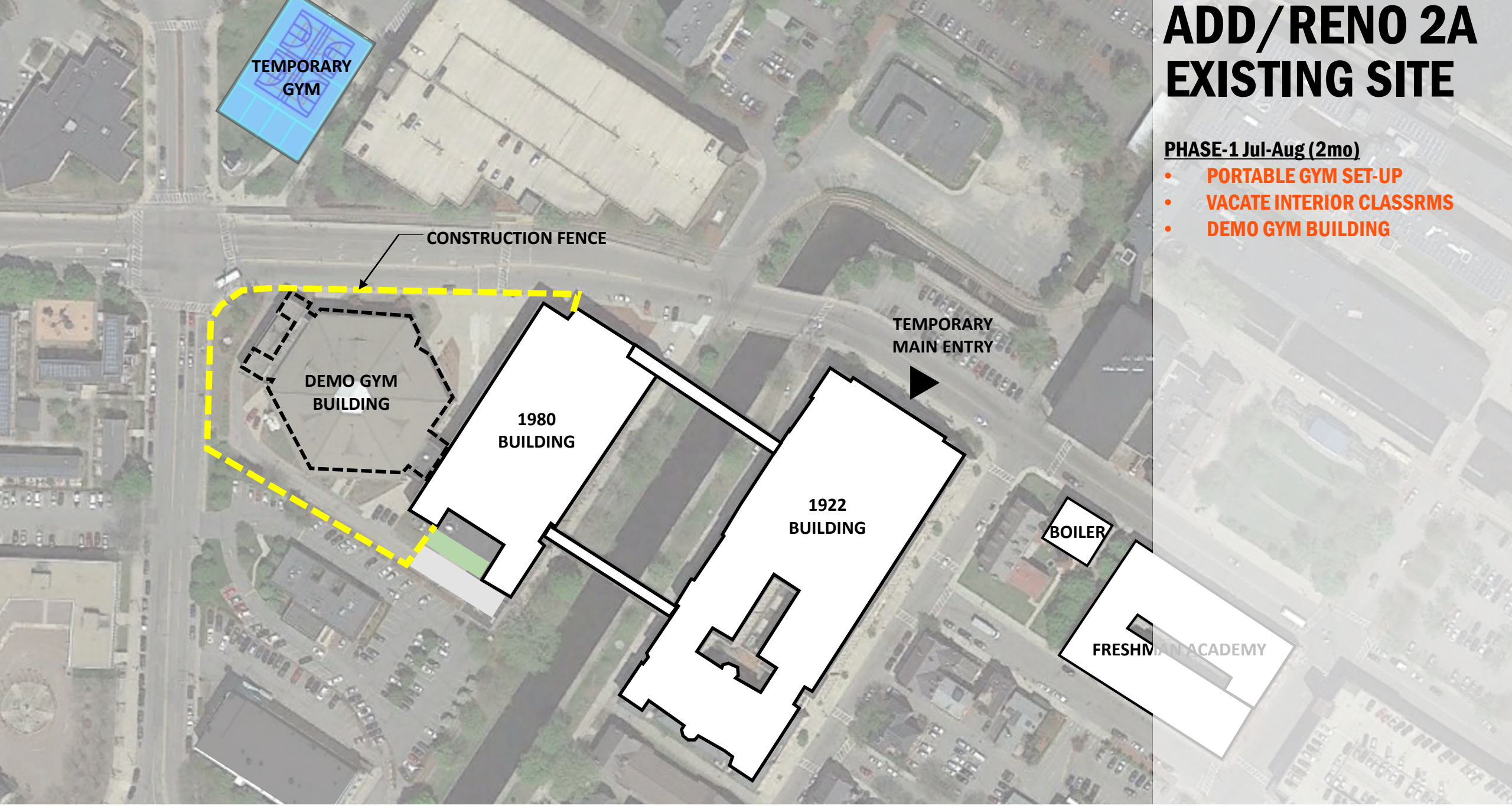
PRELIM. PROS/CONS:

+ **Consolidated Campus**
  (new freshman academy)
- **Temporary Gym Required**
- **Windowless Labs Remain**
- **Limited Green + Loading**

Phasing Est 4yrs + Summer

Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.

ADD/RENO 2A EXISTING SITE

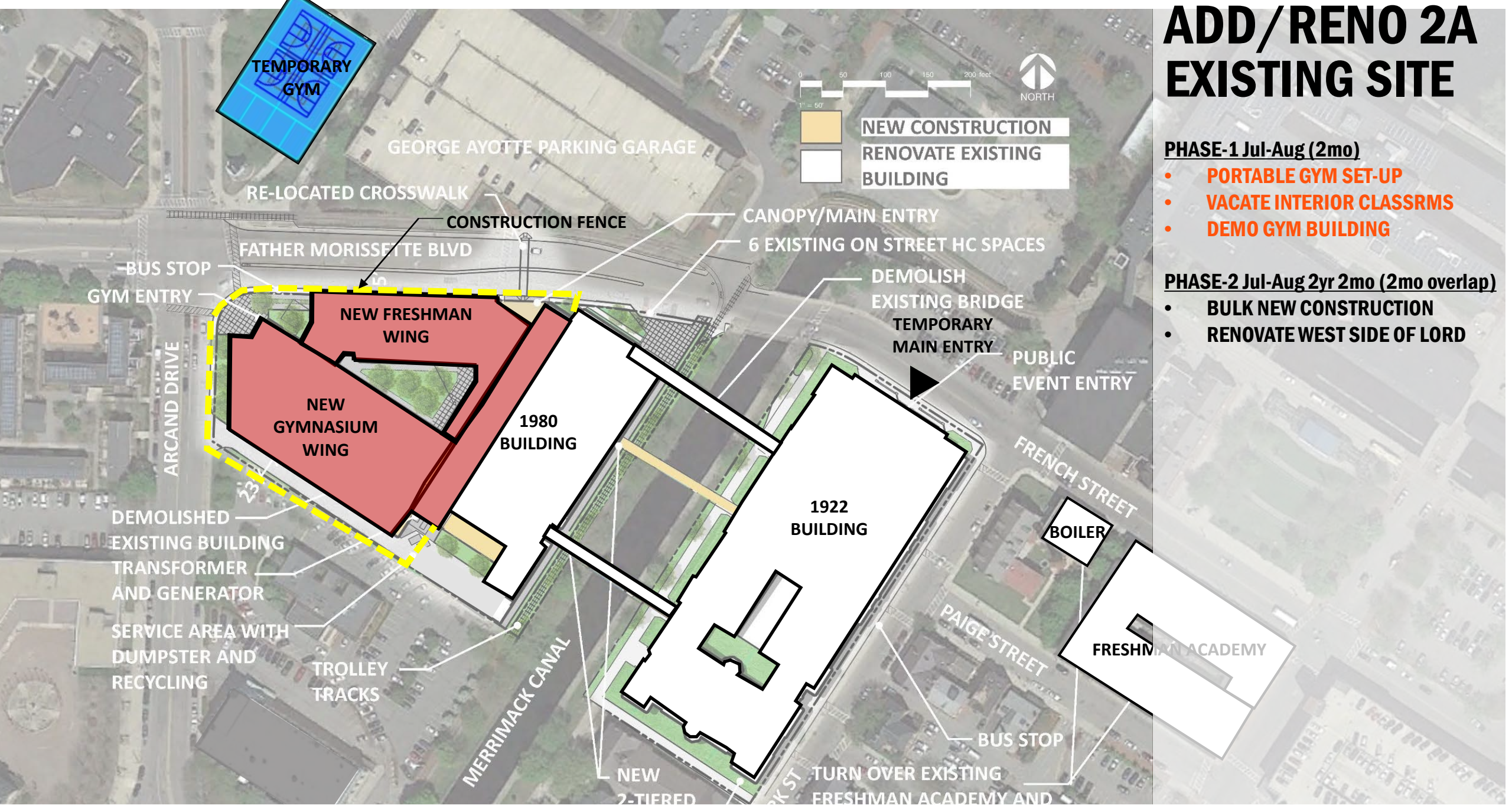


PHASE-1 Jul-Aug (2mo)

- PORTABLE GYM SET-UP
- VACATE INTERIOR CLASSRMS
- DEMO GYM BUILDING

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

ADD/RENO 2A EXISTING SITE



PHASE-1 Jul-Aug (2mo)

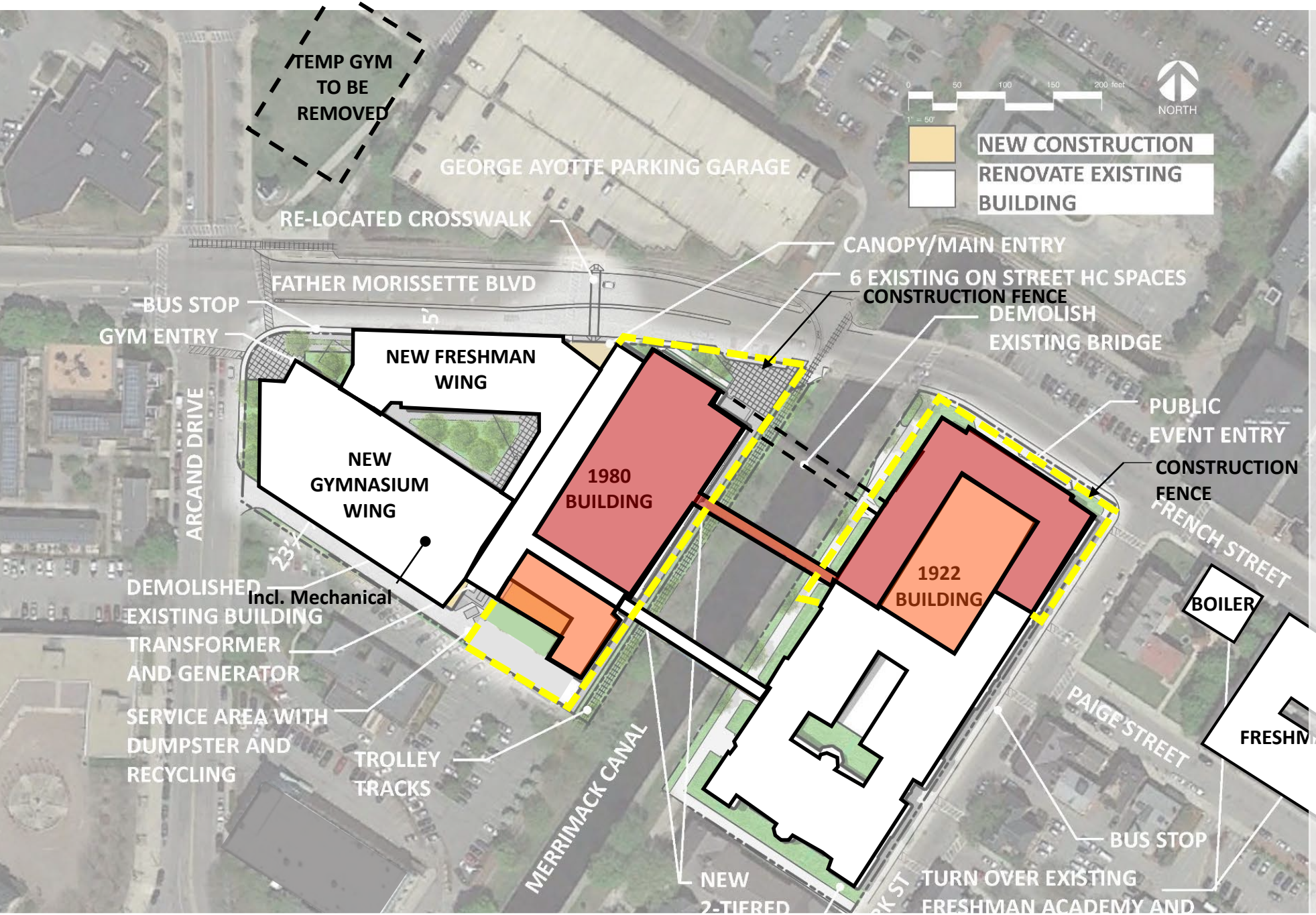
- PORTABLE GYM SET-UP
- VACATE INTERIOR CLASSRMS
- DEMO GYM BUILDING

PHASE-2 Jul-Aug 2yr 2mo (2mo overlap)

- BULK NEW CONSTRUCTION
- RENOVATE WEST SIDE OF LORD

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

ADD/RENO 2A EXISTING SITE



PHASE-1 Jul-Aug (2mo)

- PORTABLE GYM SET-UP
- VACATE INTERIOR CLASSRMS
- DEMO GYM BUILDING

PHASE-2 Jul-Aug 2yr 2mo (2mo overlap)

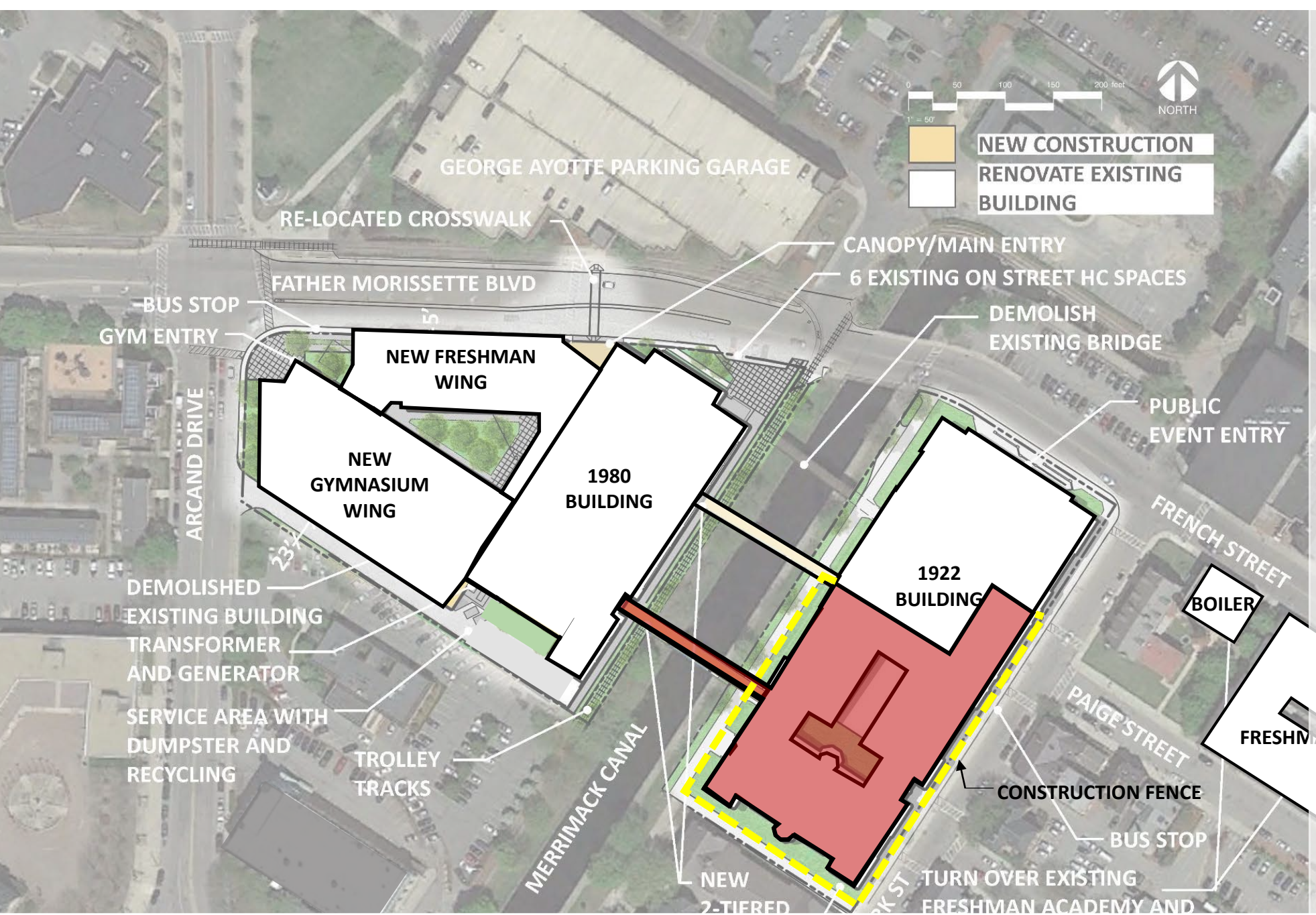
- BULK NEW CONSTRUCTION
- RENOVATE WEST SIDE OF LORD

PHASE-3 Jul-Aug 1yr 2mo (2mo overlap)

- RENOVATE REMAINDER OF LORD (SOUTH END RENO IN SUMMERS) (AUDITORIUM IN SUMMERS)
- RENOVATE NORTH END OF 1922
- BUILD NEW NORTH BRIDGE
- TEMP GYM TO BE REMOVED

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

ADD/RENO 2A EXISTING SITE



PHASE-1 Jul-Aug (2mo)

- PORTABLE GYM SET-UP
- VACATE INTERIOR CLASSRMS
- DEMO GYM BUILDING

PHASE-2 Jul-Aug 2yr 2mo (2mo overlap)

- BULK NEW CONSTRUCTION
- RENOVATE WEST SIDE OF LORD

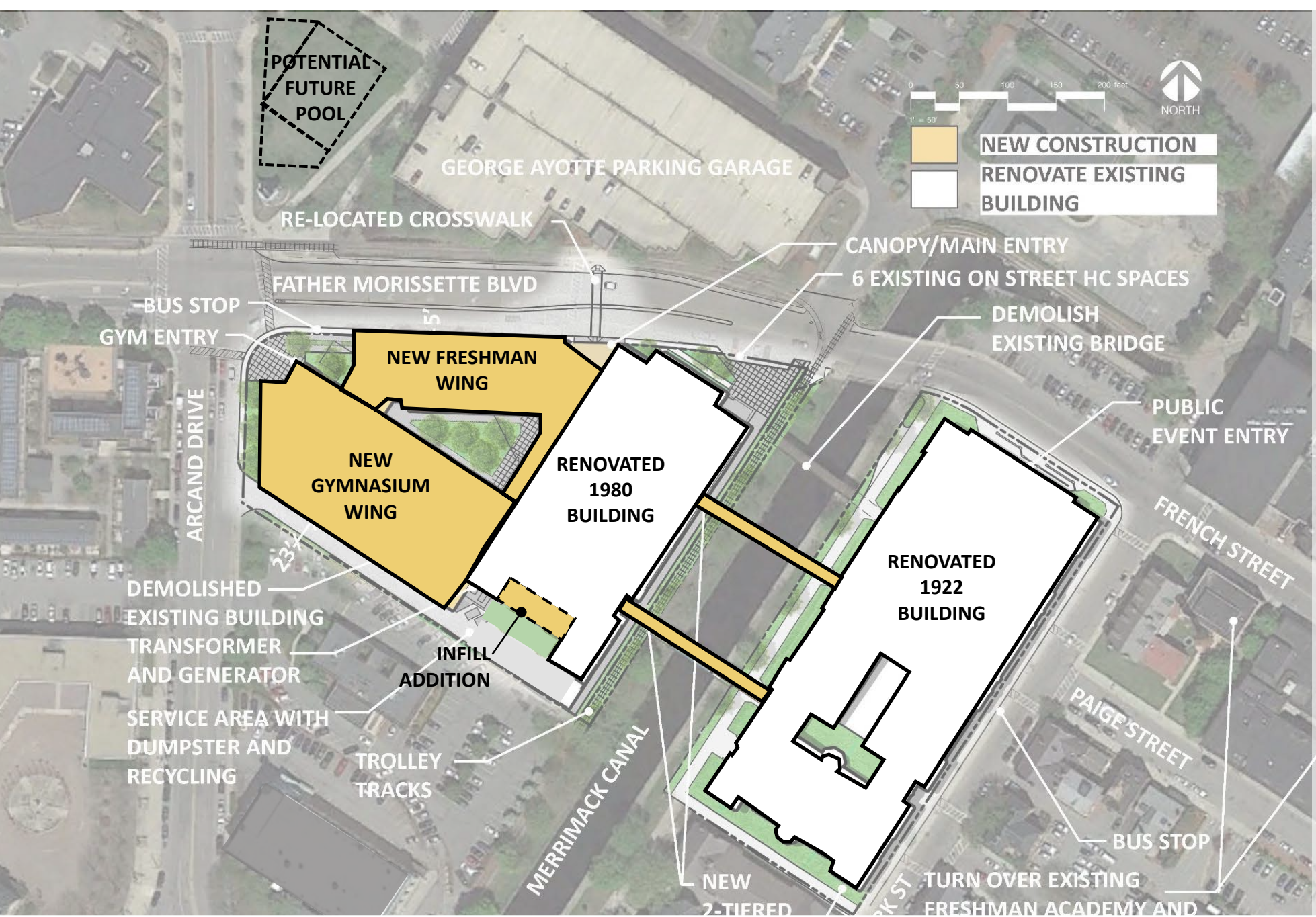
PHASE-3 Jul-Aug 1yr 2mo (2mo overlap)

- RENOVATE REMAINDER OF LORD (SOUTH END RENO IN SUMMERS) (AUDITORIUM IN SUMMERS)
- RENOVATE NORTH END OF 1922
- BUILD NEW NORTH BRIDGE

PHASE-4 Jul-Aug 1yr 2mo (2mo overlap)

- RENOVATE REMAINDER OF 1922
- BUILD NEW SOUTH BRIDGE

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager



ADD/RENO 2A EXISTING SITE

PHASE-1 Jul-Aug (2mo)
- PORTABLE GYM SET-UP
- VACATE INTERIOR CLASSRMS
- DEMOLISH GYM BUILDING

PHASE-2 Jul-Aug 2yr 2mo (2mo overlap)
- BULK NEW CONSTRUCTION
- RENOVATE WEST SIDE OF LORD

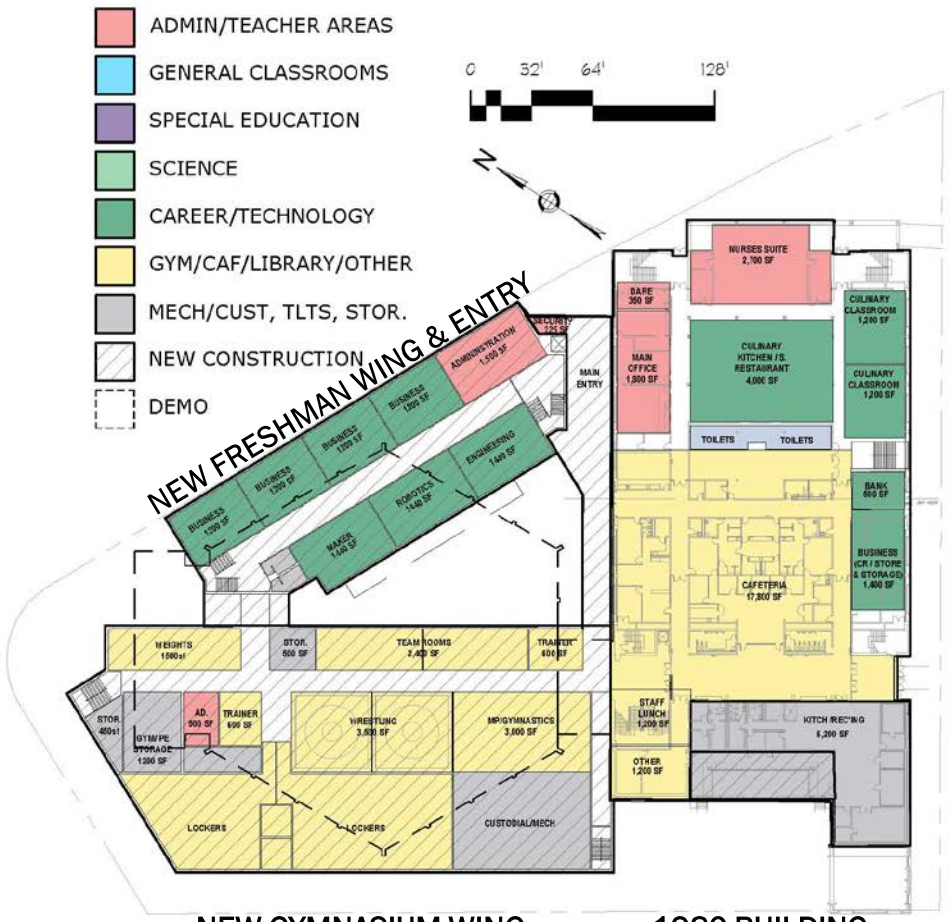
PHASE-3 Jul-Aug 1yr 2mo (2mo overlap)
- RENOVATE REMAINDER OF LORD (SOUTH END RENO IN SUMMERS) (AUDITORIUM IN SUMMERS)
- RENOVATE NORTH END OF 1922
- BUILD NEW NORTH BRIDGE

PHASE-4 Jul-Aug 1yr 2mo (2mo overlap)
- RENOVATE REMAINDER OF 1922
- BUILD NEW SOUTH BRIDGE

FINISHED FACILITY
Total Duration = 4 years + summer

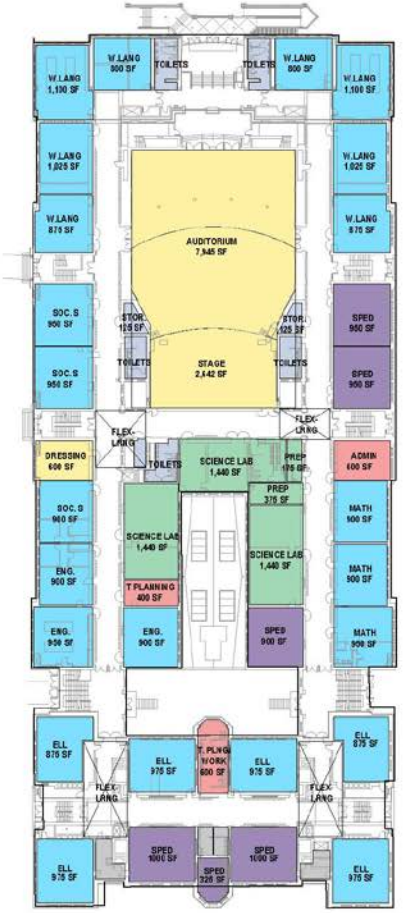
Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

LOWELL HIGH SCHOOL: OPTION 2A FLOOR PLANS



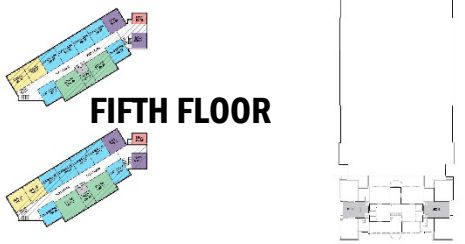
NEW GYMNASIUM WING

1980 BUILDING

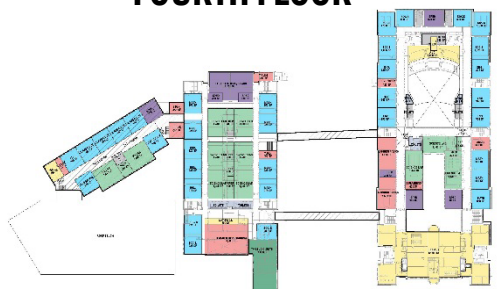


1922 BUILDING

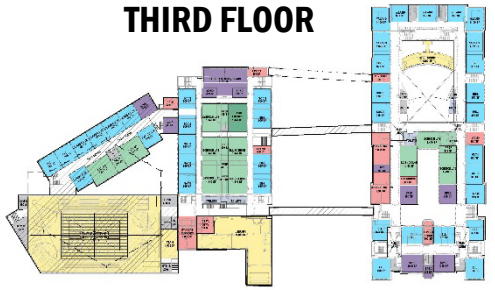
MAIN FLOOR PLAN



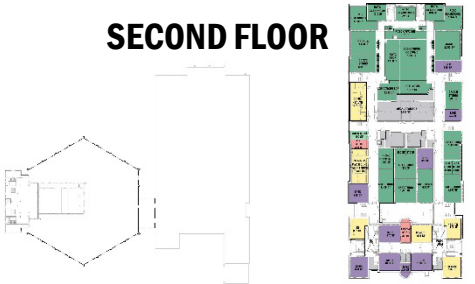
FIFTH FLOOR



FOURTH FLOOR

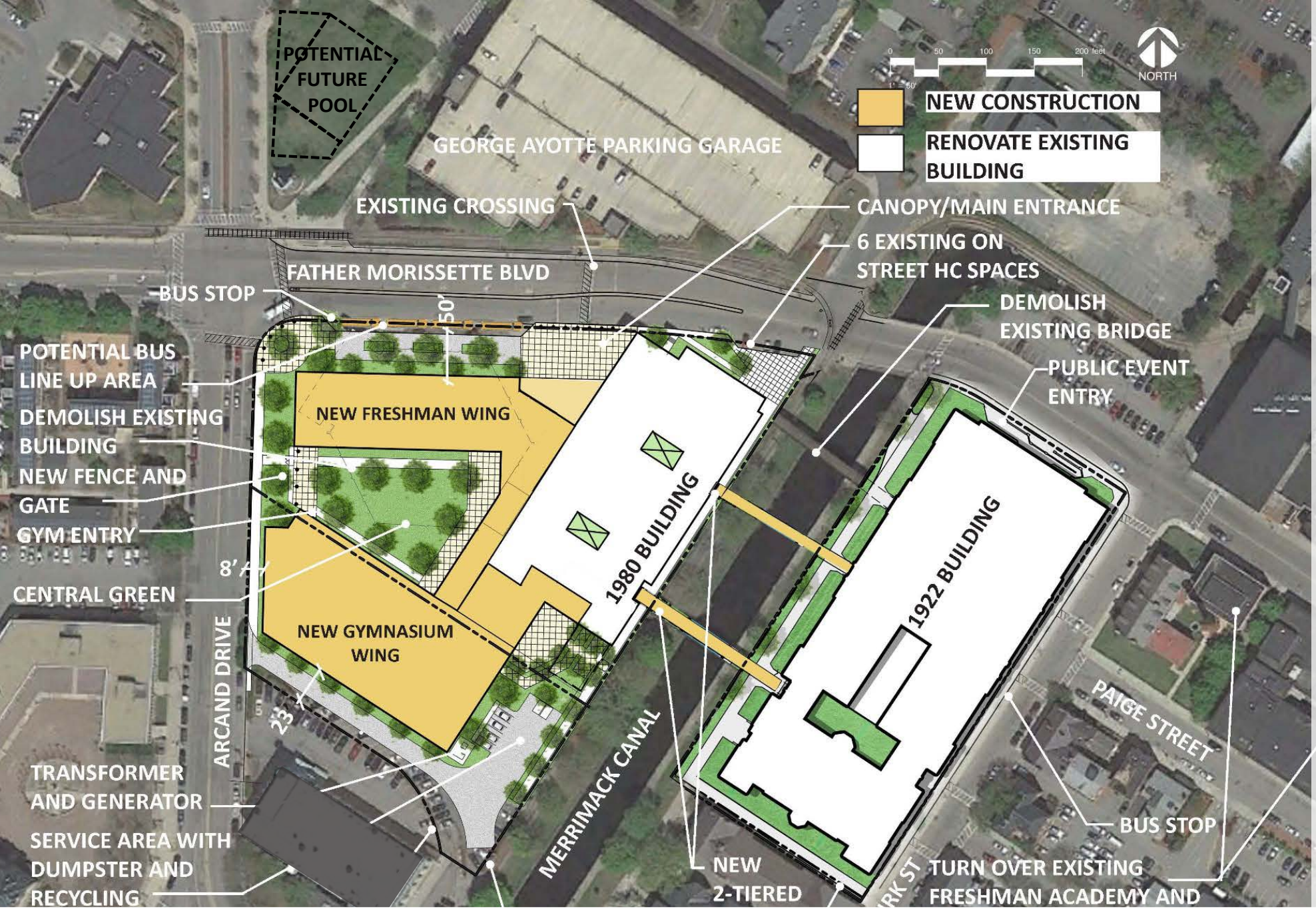


THIRD FLOOR



SECOND FLOOR

BASEMENT



ADD/RENO 3A EXPANDED SITE

Updated Educ Program
(pool removed)

PRELIM. PROS/CONS:

+ **Consolidated Campus**
  (new freshman academy)
+ **No Windowless Labs**
+ **Added Green + Loading**
— **Gym Areas More Remote**
— **Eminent Domain**

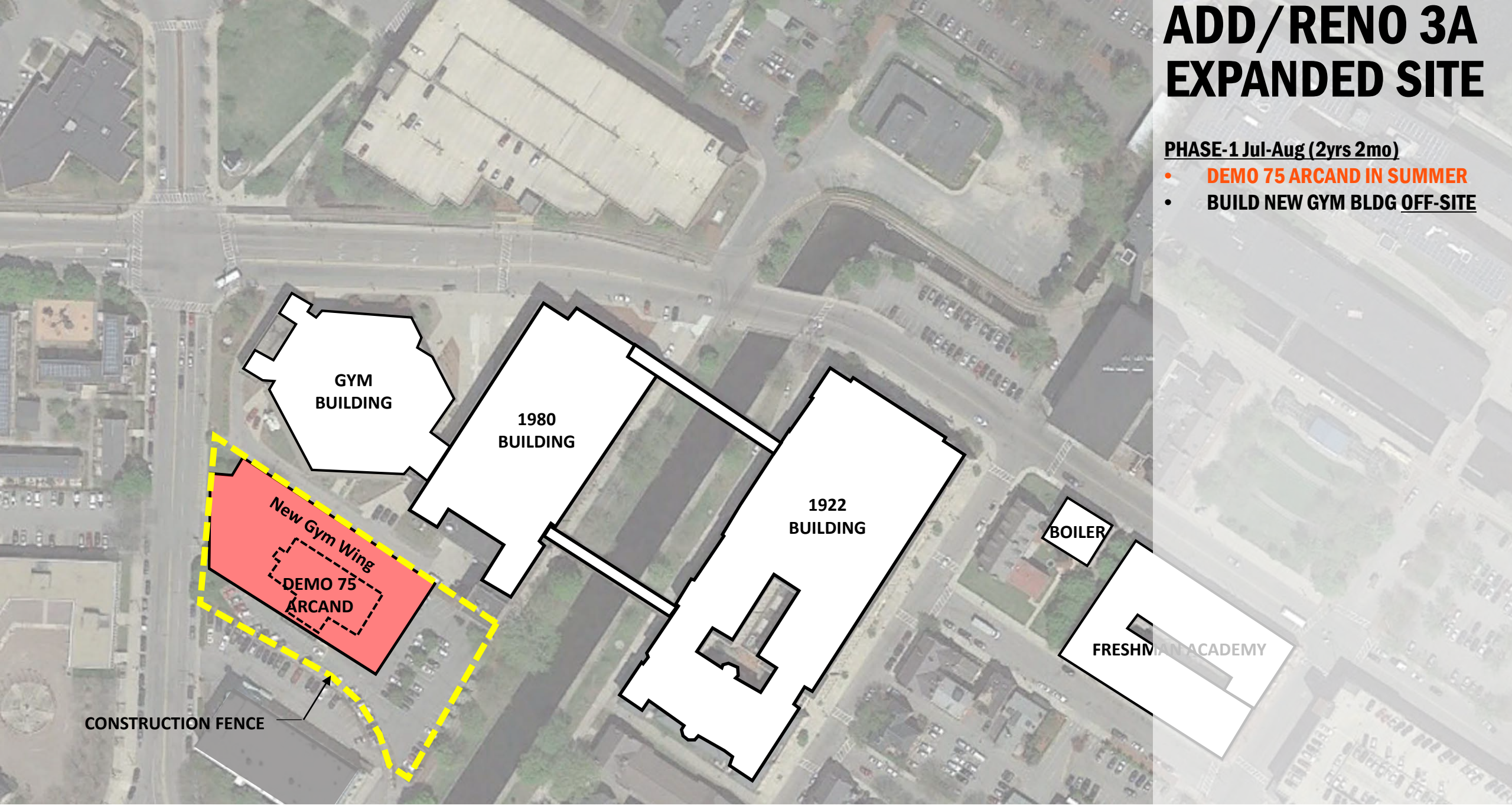
Phasing Est 5yrs
(but only 3 years on school site)

Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.

ADD/RENO 3A EXPANDED SITE

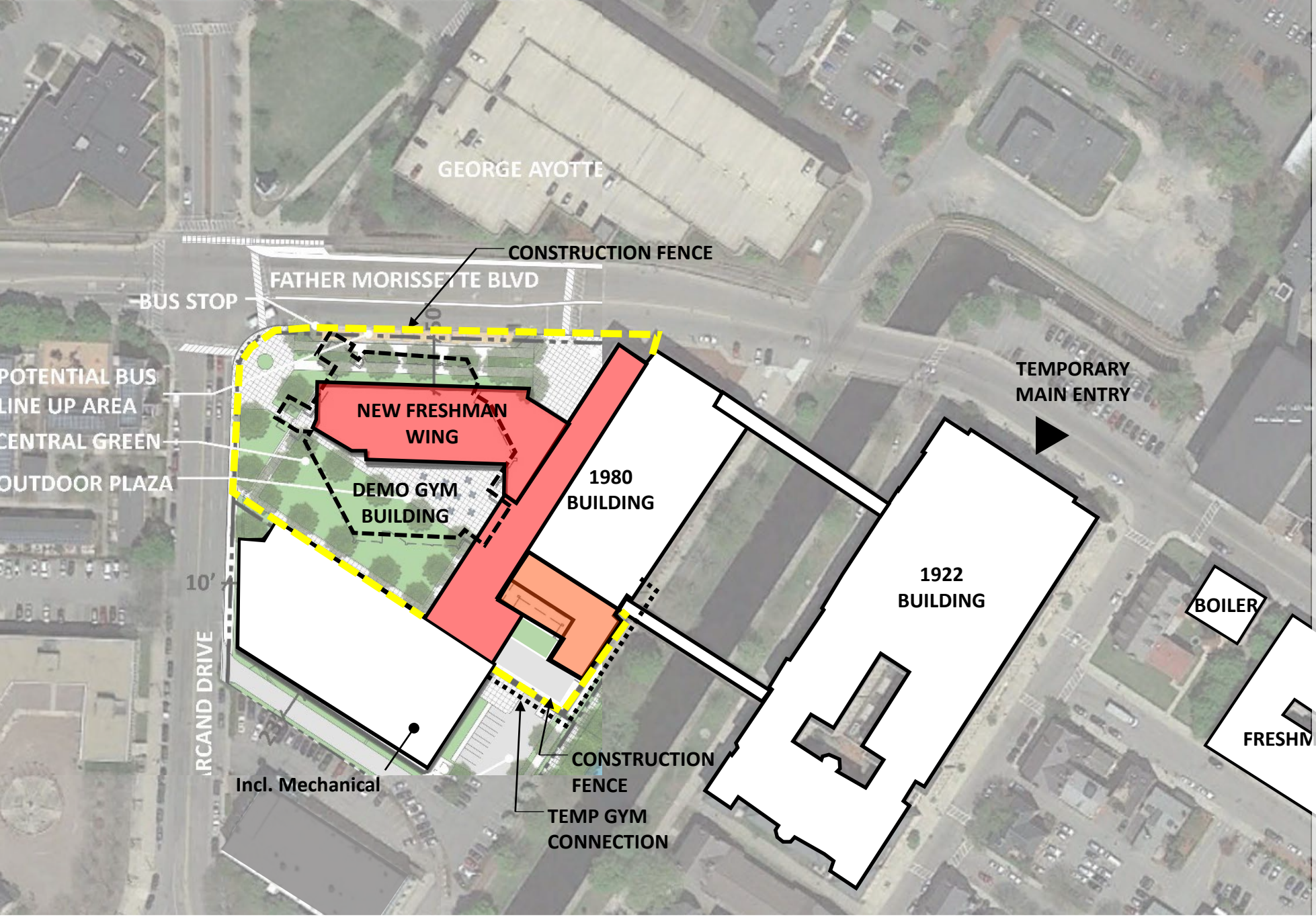
PHASE-1 Jul-Aug (2yrs 2mo)

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW GYM BLDG OFF-SITE



Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

ADD/RENO 3A EXPANDED SITE



PHASE-1 Jul-Aug (2yrs 2mo)

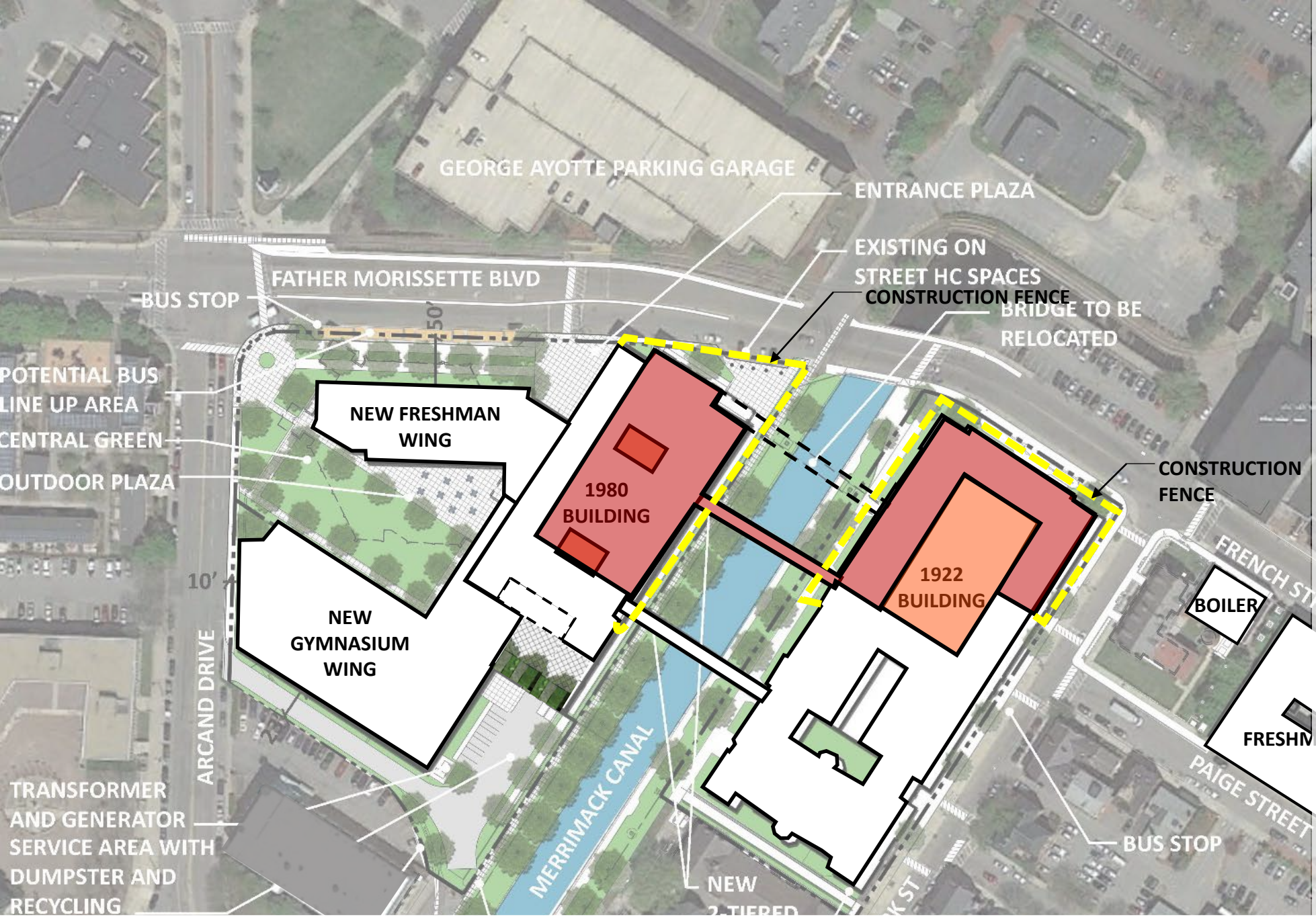
- DEMO 75 ARCAND IN SUMMER
- BUILD NEW GYM BLDG OFF-SITE

PHASE-2 Jul-Dec 1yr 6mo (2mo overlap)

- DEMO FIELD HOUSE IN SUMMER
- VACATE INTERIOR CLASSRMS
- BUILD NEW FRESHMAN ACADEMY
- RENOVATE WEST SIDE OF LORD (SOUTH END RENO IN SUMMERS)

Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.

ADD/RENO 3A EXPANDED SITE



PHASE-1 Jul-Aug (2yrs 2mo)

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW GYM BLDG OFF-SITE

PHASE-2 Jul-Dec 1yr 6mo (2mo overlap)

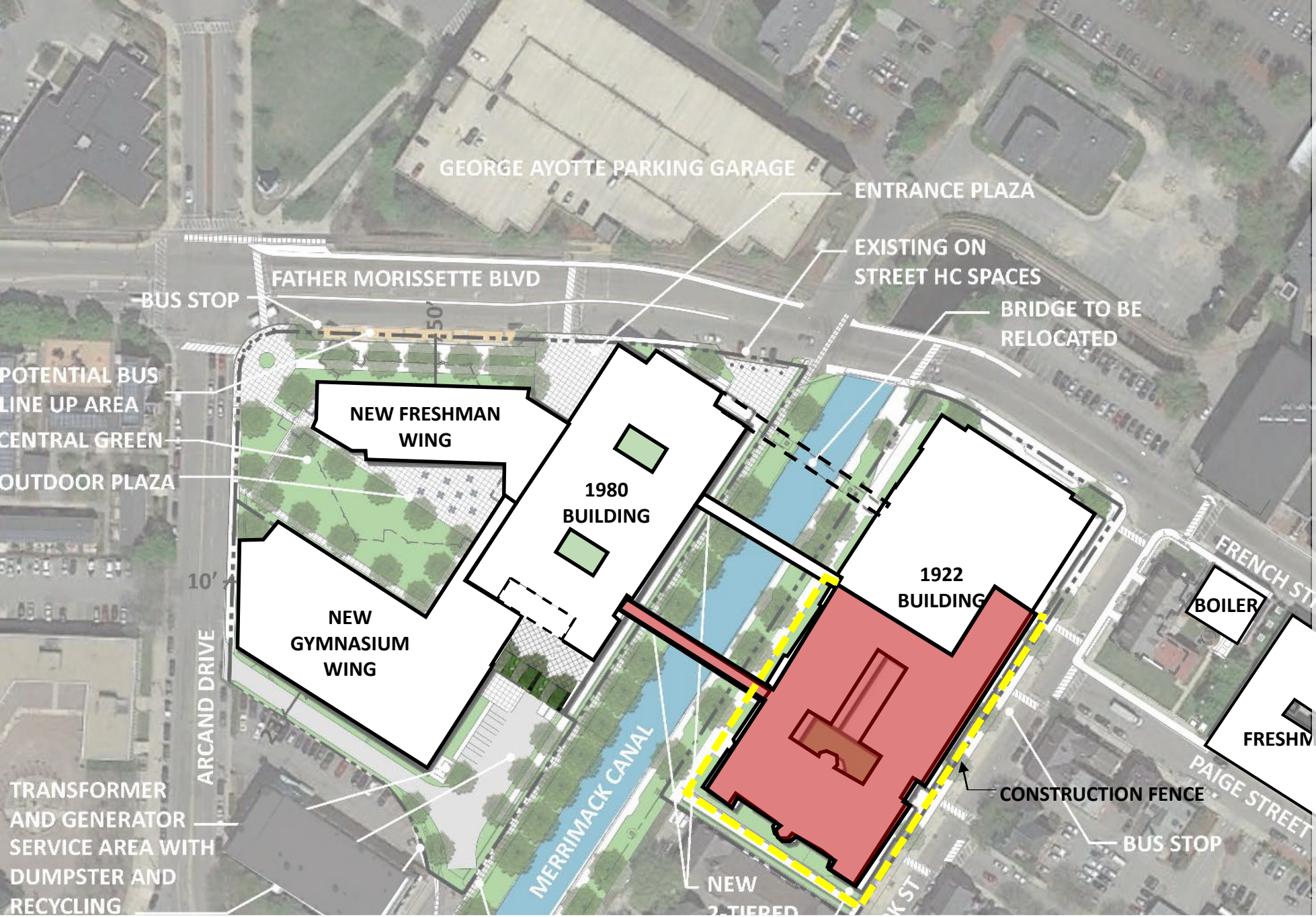
- DEMO FIELD HOUSE IN SUMMER
- VACATE INTERIOR CLASSRMS
- BUILD NEW FRESHMAN ACADEMY
- RENOVATE WEST SIDE OF LORD (SOUTH END RENO IN SUMMERS)

PHASE-3 Jul-Aug 1yr 2mo (2mo overlap)

- RENOVATE REMAINDER OF LORD
- RENOVATE NORTH END OF 1922 (AUDITORIUM IN SUMMERS)
- BUILD NEW NORTH BRIDGE

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

ADD/RENO 3A EXPANDED SITE



PHASE-1 Jul-Aug (2yrs 2mo)

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW GYM BLDG OFF-SITE

PHASE-2 Jul-Dec 1yr 6mo (2mo overlap)

- DEMO FIELD HOUSE IN SUMMER
- VACATE INTERIOR CLASSRMS
- BUILD NEW FRESHMAN ACADEMY
- RENOVATE WEST SIDE OF LORD (SOUTH END RENO IN SUMMERS)

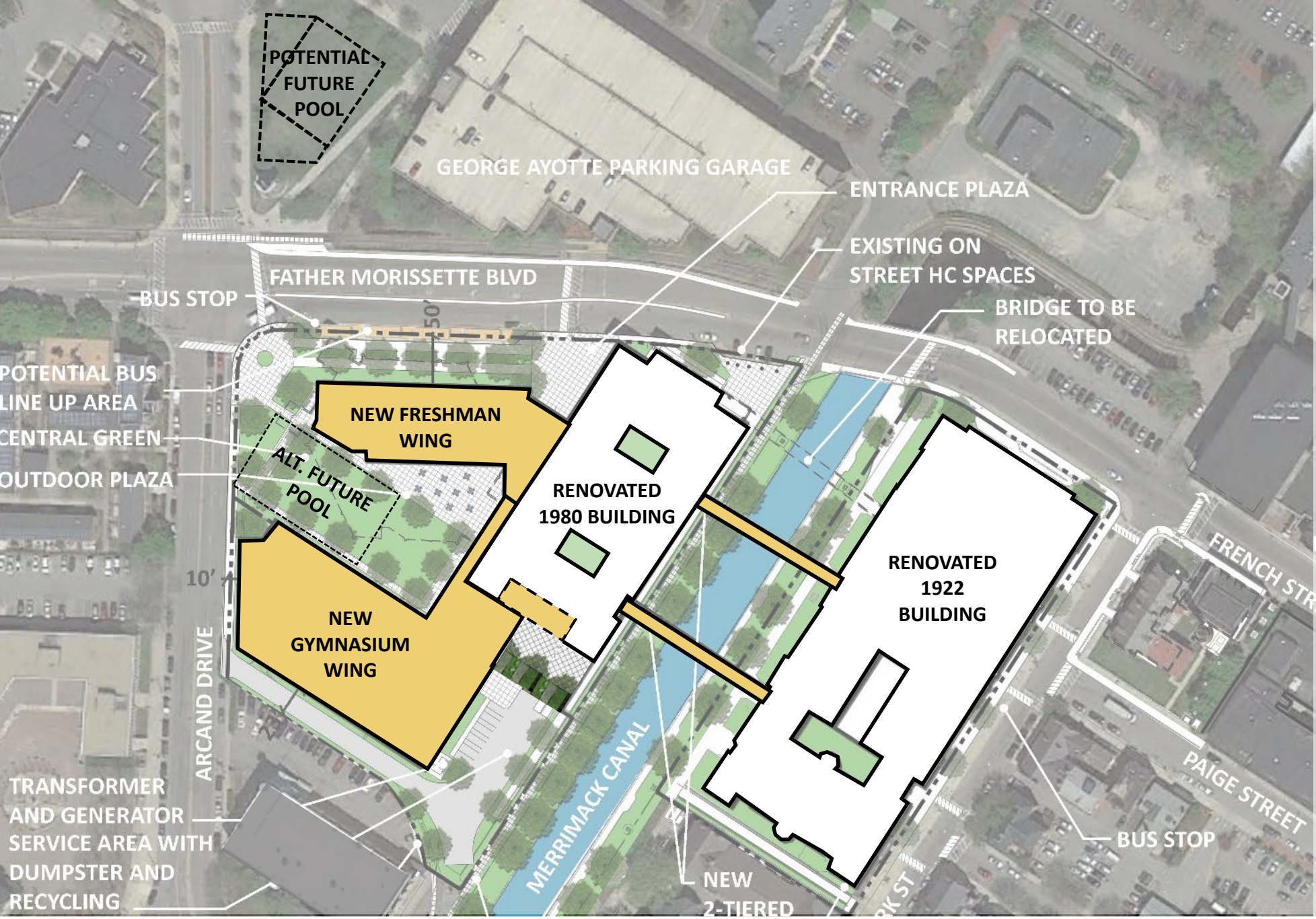
PHASE-3 Jul-Aug 1yr 2mo (2mo overlap)

- RENOVATE REMAINDER OF LORD
- RENOVATE NORTH END OF 1922 (AUDITORIUM IN SUMMERS)
- BUILD NEW NORTH BRIDGE

PHASE-4 Jul-Aug 1yr 2mo (2mo overlap)

- RENOVATE REMAINDER OF 1922
- BUILD NEW SOUTH BRIDGE

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager



ADD/RENO 3A EXPANDED SITE

PHASE-1 Jul-Aug (2yrs 2mo)

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW GYM BLDG OFF-SITE

PHASE-2 Jul-Dec 1yr 6mo (2mo overlap)

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- BUILD NEW NORTH BRIDGE

PHASE-4 Jul-Aug 1yr 2mo (2mo overlap)

- RENOVATE REMAINDER OF 1922
- BUILD NEW SOUTH BRIDGE

FINISHED FACILITY
Total Duration = 5 years (4 on site)

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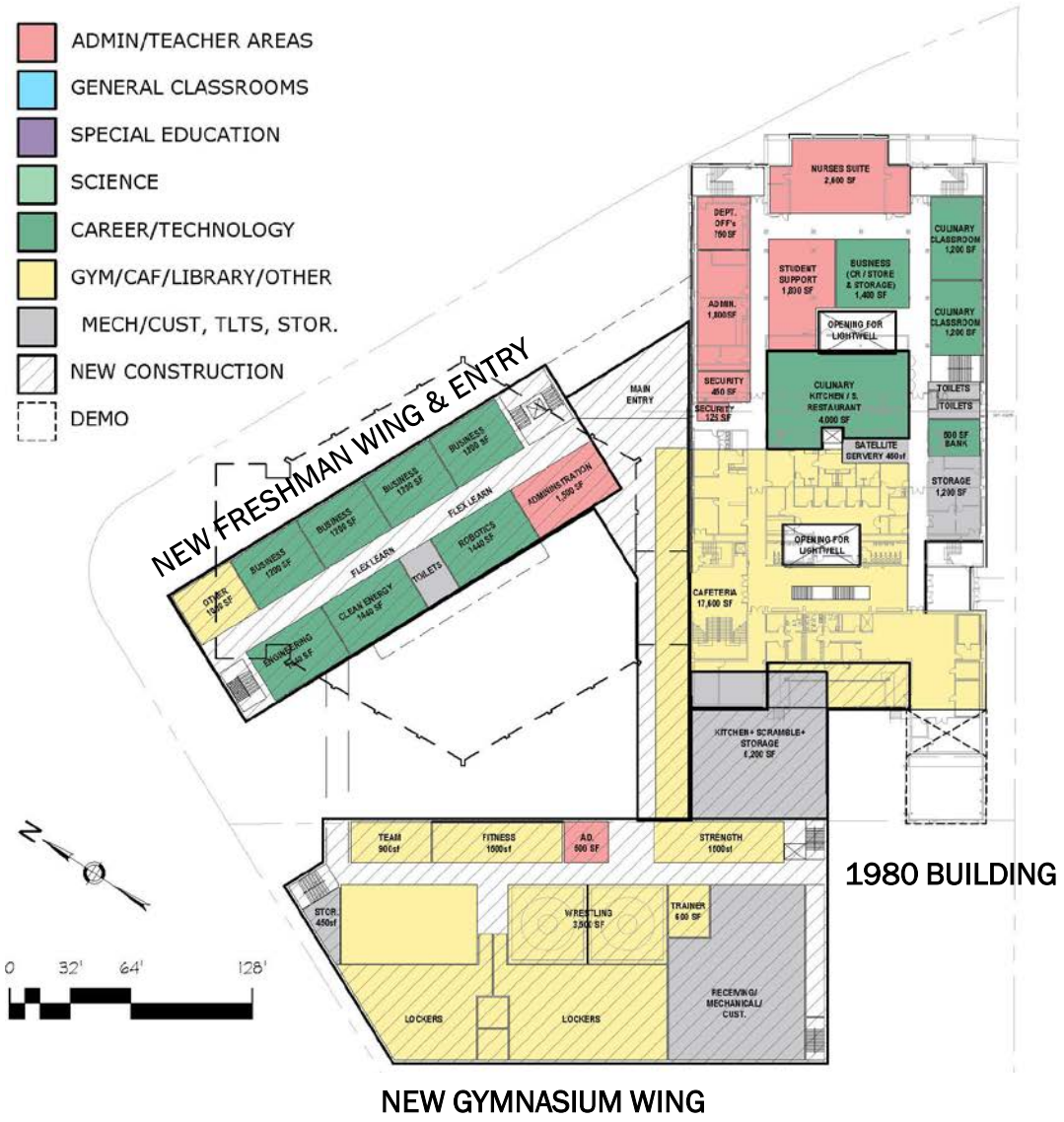
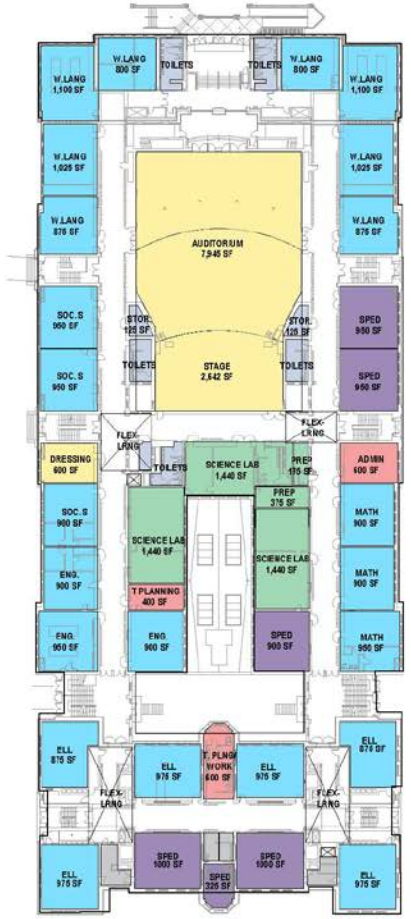
LOWELL HIGH SCHOOL: OPTION 3A FLOOR PLANS



1980 BUILDING

NEW GYMNASIUM WING



1922 BUILDING

MAIN FLOOR PLAN

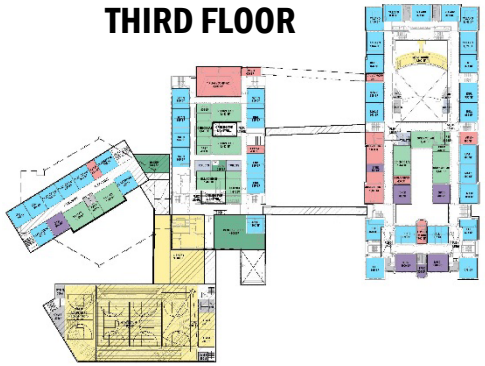


FIFTH FLOOR

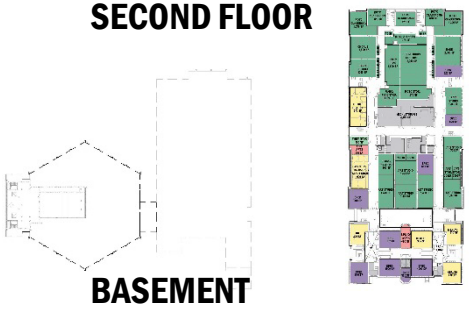
FOURTH FLOOR



THIRD FLOOR



SECOND FLOOR



BASEMENT



NEW OPTION A EXPANDED SITE

1922 BLDG UNUSED

Updated Educ Program

(pool removed)

PRELIM. PROS/CONS:

+ **Consolidated Campus**
  (via 5 story + basement)
+ **Good Classrm Orientation**
- **24 Temporary Classrms & Temporary Gym Required**
- **Limited Green Space**
- **Eminent Domain**

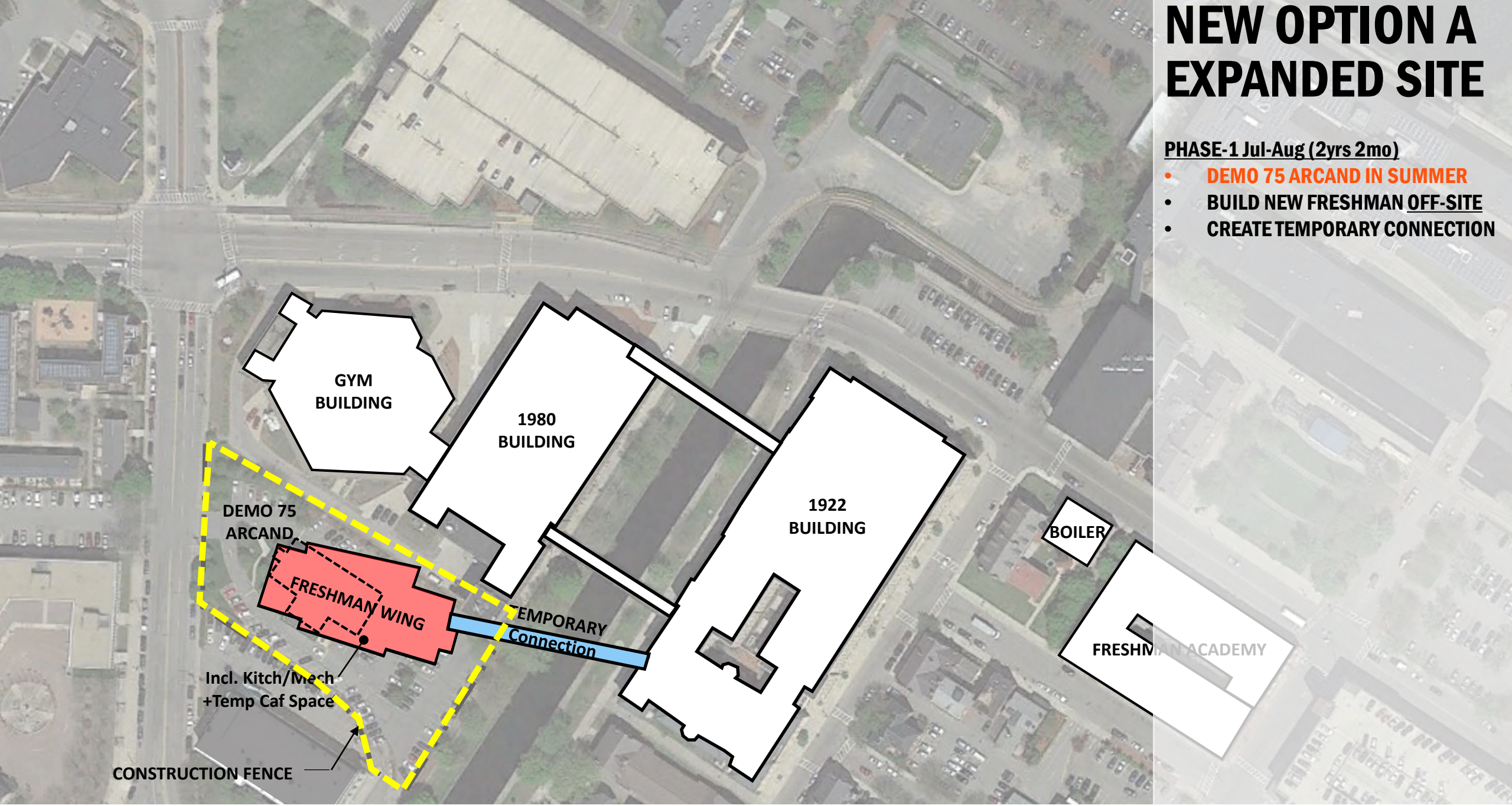
Phasing Est 4yrs + Summer
(but only 2 years on school site)

Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.

NEW OPTION A EXPANDED SITE

PHASE-1 Jul-Aug (2yrs 2mo)

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW FRESHMAN OFF-SITE
- CREATE TEMPORARY CONNECTION



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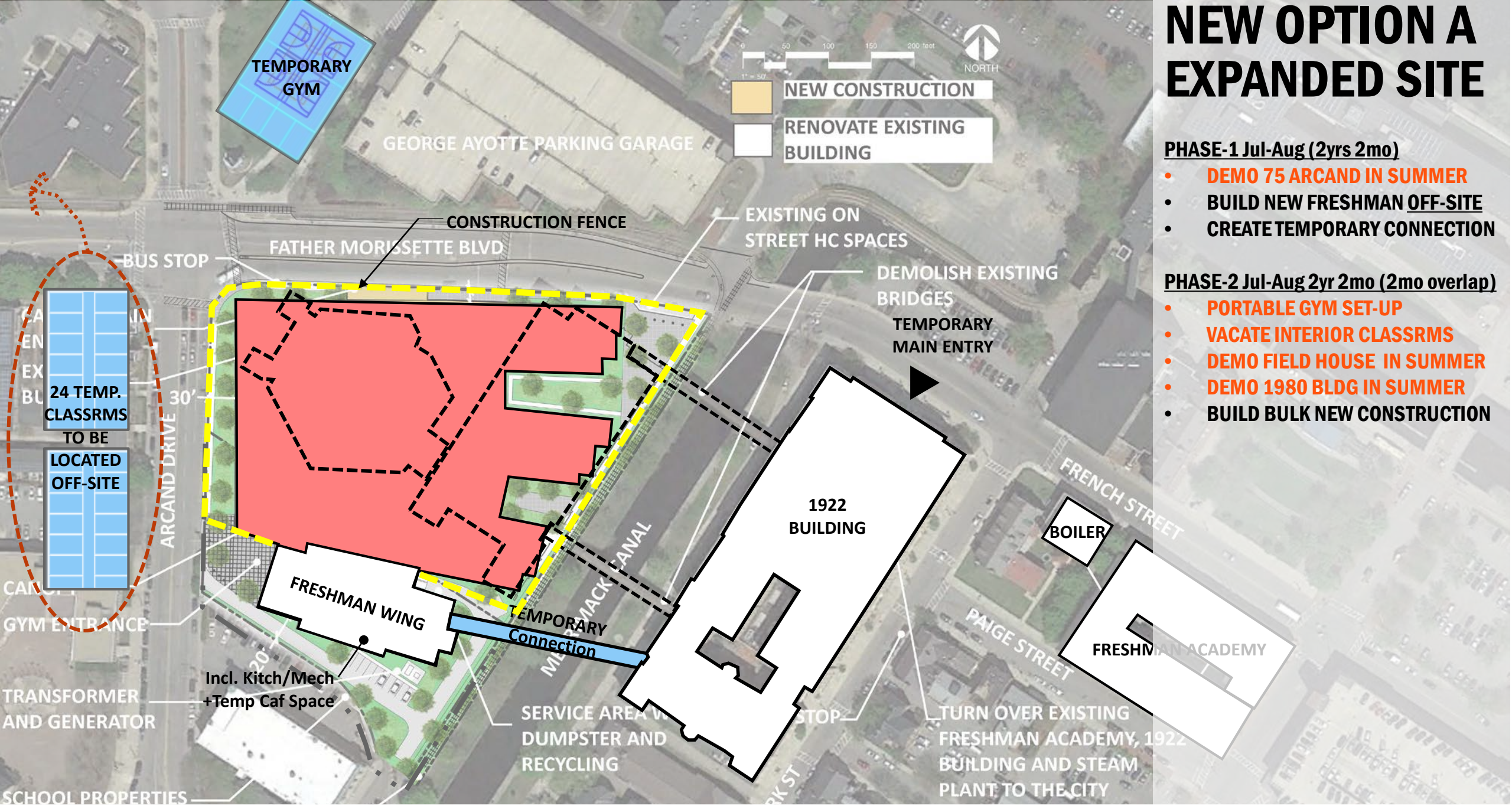

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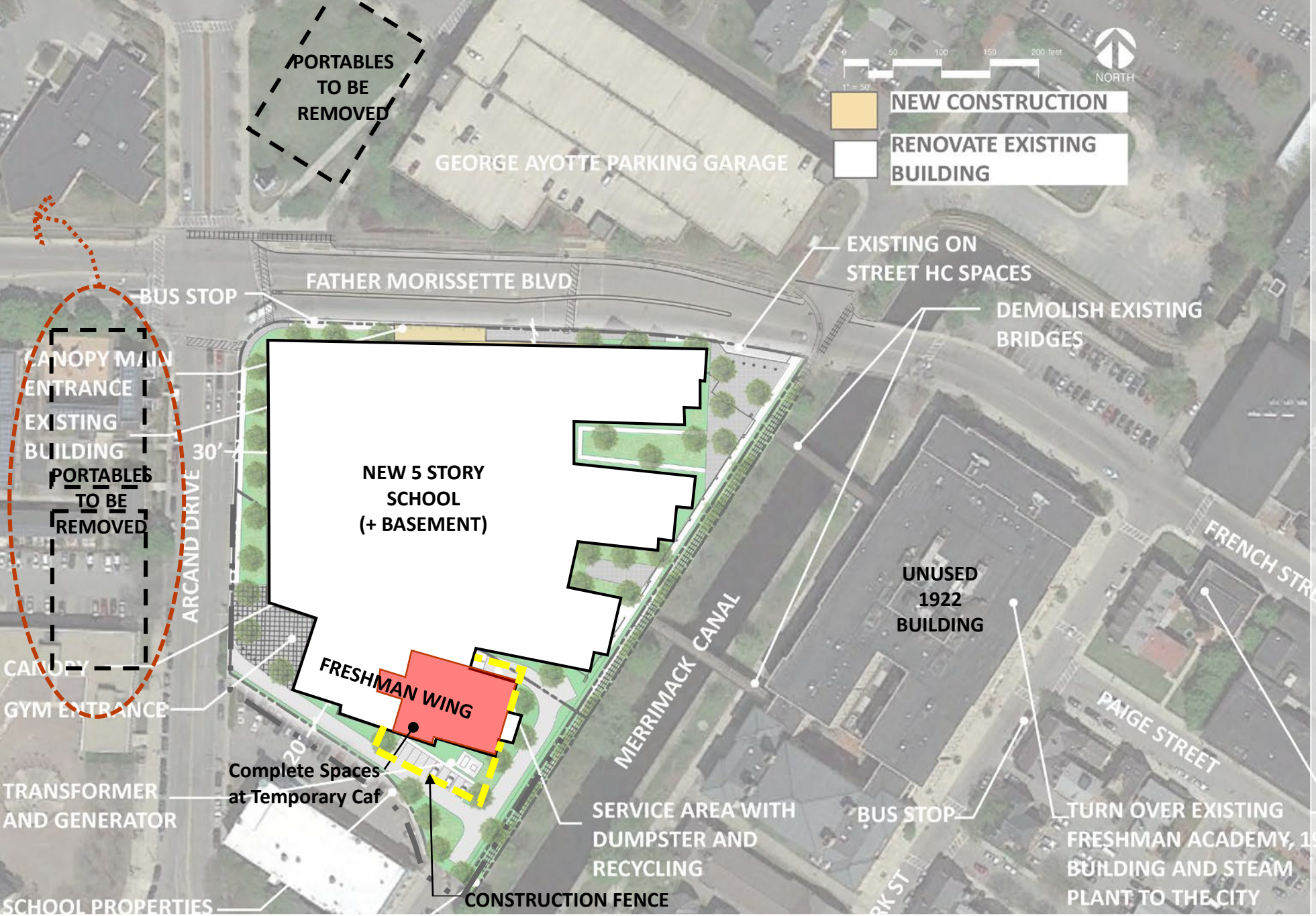
- BUILD NEW FRESHMAN OFF-SITE
- CREATE TEMPORARY CONNECTION

PHASE-2 Jul-Aug 2yr 2mo (2mo overlap)

- PORTABLE GYM SET-UP
- VACATE INTERIOR CLASSRMS
- DEMO FIELD HOUSE IN SUMMER
- DEMO 1980 BLDG IN SUMMER
- BUILD BULK NEW CONSTRUCTION

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager



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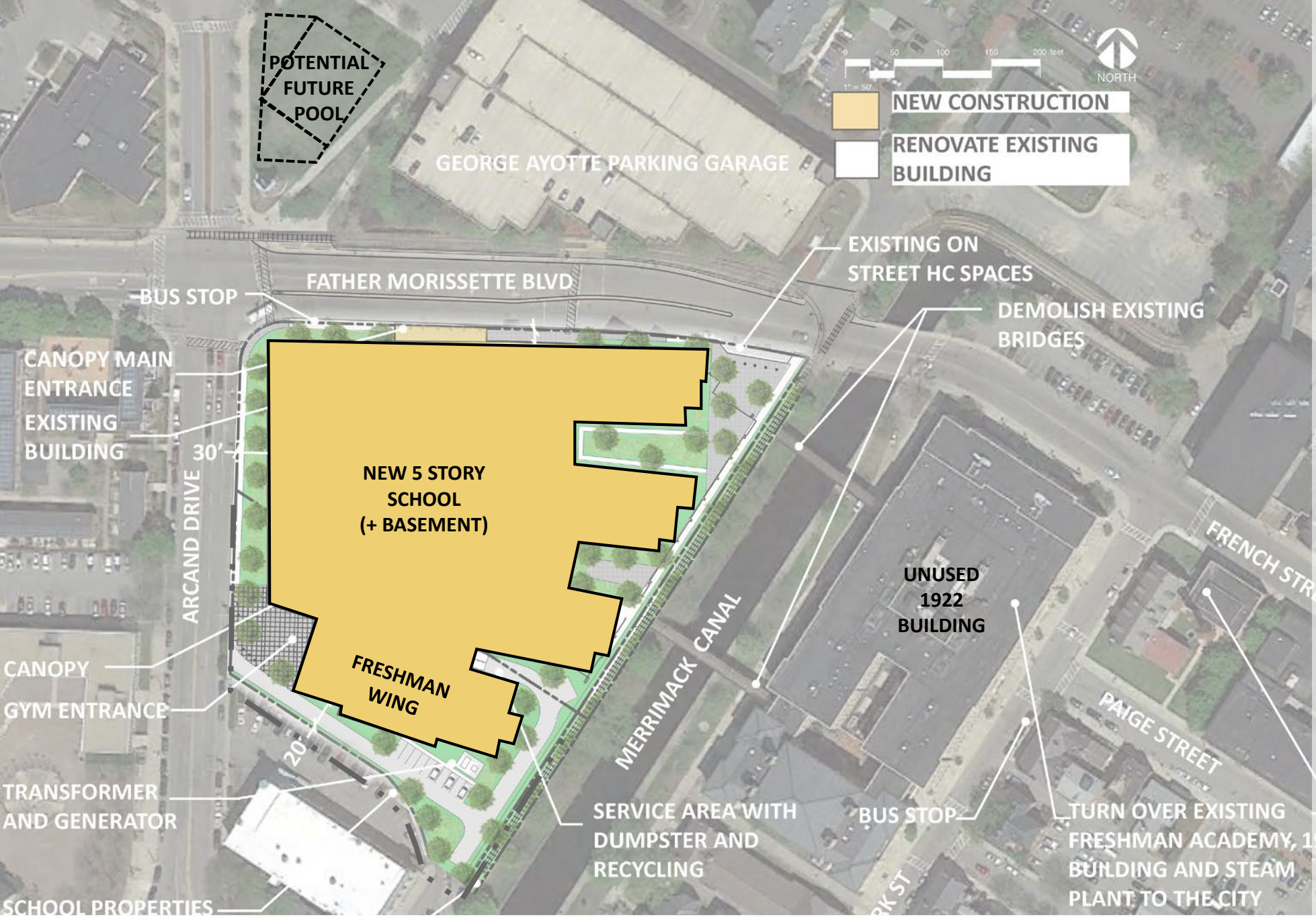
- VACATE INTERIOR CLASSRMS
- DEMO FIELD HOUSE IN SUMMER
- DEMO 1980 BLDG IN SUMMER
- BUILD BULK NEW CONSTRUCTION

PHASE-3 Jul-Aug (2mo overlap)

- REMOVE PORTABLES
- COMPLETE FIT-OUT AT TEMP CAF

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager



NEW OPTION A EXPANDED SITE

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- DEMO FIELD HOUSE IN SUMMER
- DEMO 1980 BLDG IN SUMMER
- BUILD BULK NEW CONSTRUCTION

PHASE-3 Jul-Aug (2mo overlap)

- REMOVE PORTABLES
- COMPLETE FIT-OUT AT TEMP CAF

FINISHED FACILITY

Total = 4 yrs + Summer (3 on site)

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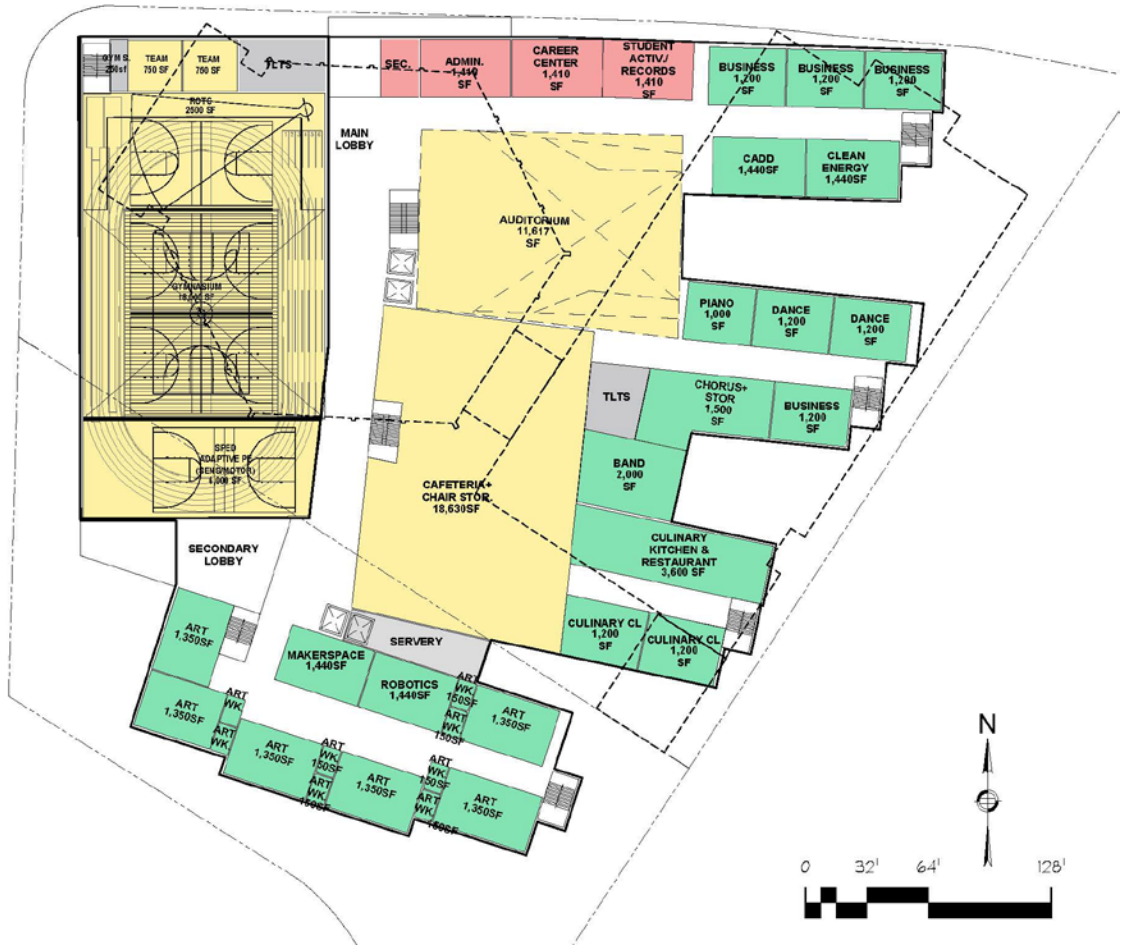
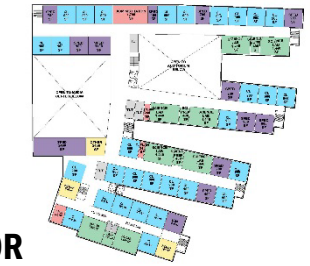
LOWELL HIGH SCHOOL: NEW OPTION A FLOOR PLANS

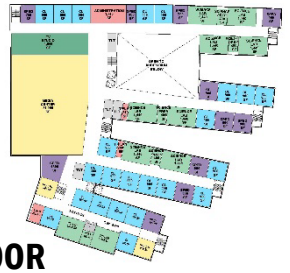
- ADMIN/TEACHER AREAS
- GENERAL CLASSROOMS
- SPECIAL EDUCATION
- SCIENCE
- CAREER/TECHNOLOGY
- GYM/CAF/LIBRARY/OTHER
- MECH/CUST, TLTS, STOR.
- NEW CONSTRUCTION
- DEMO



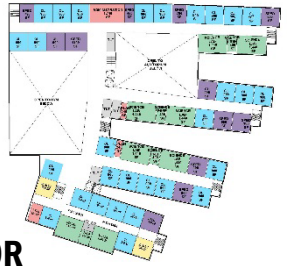
MAIN FLOOR PLAN



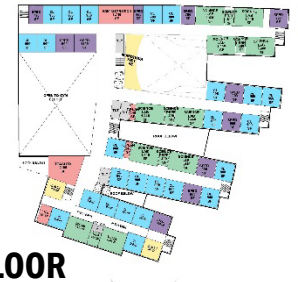
FIFTH FLOOR



FOURTH FLOOR



THIRD FLOOR

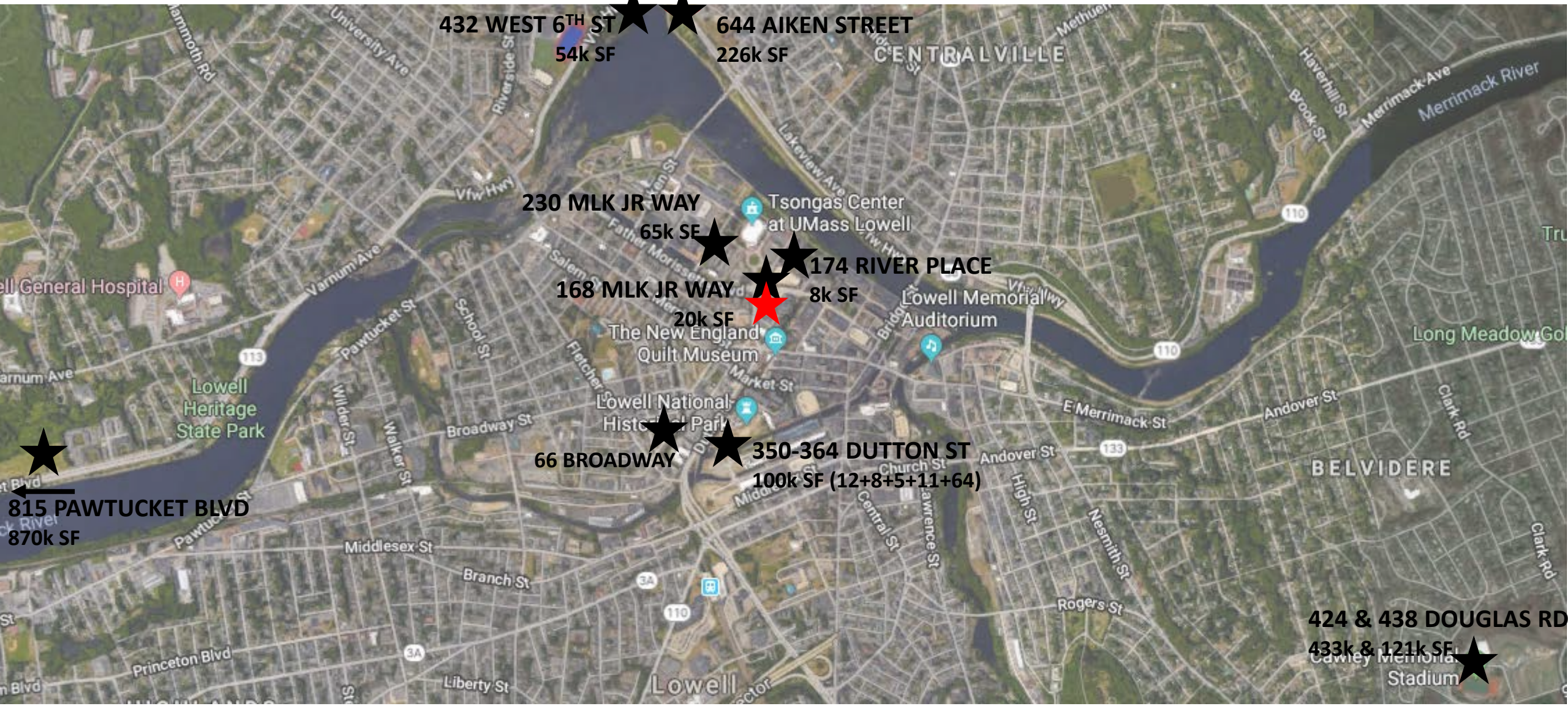


SECOND FLOOR



BASEMENT

LOWELL HIGH SCHOOL: POTENTIAL OFF-SITE LAY DOWN/STAGING AREAS



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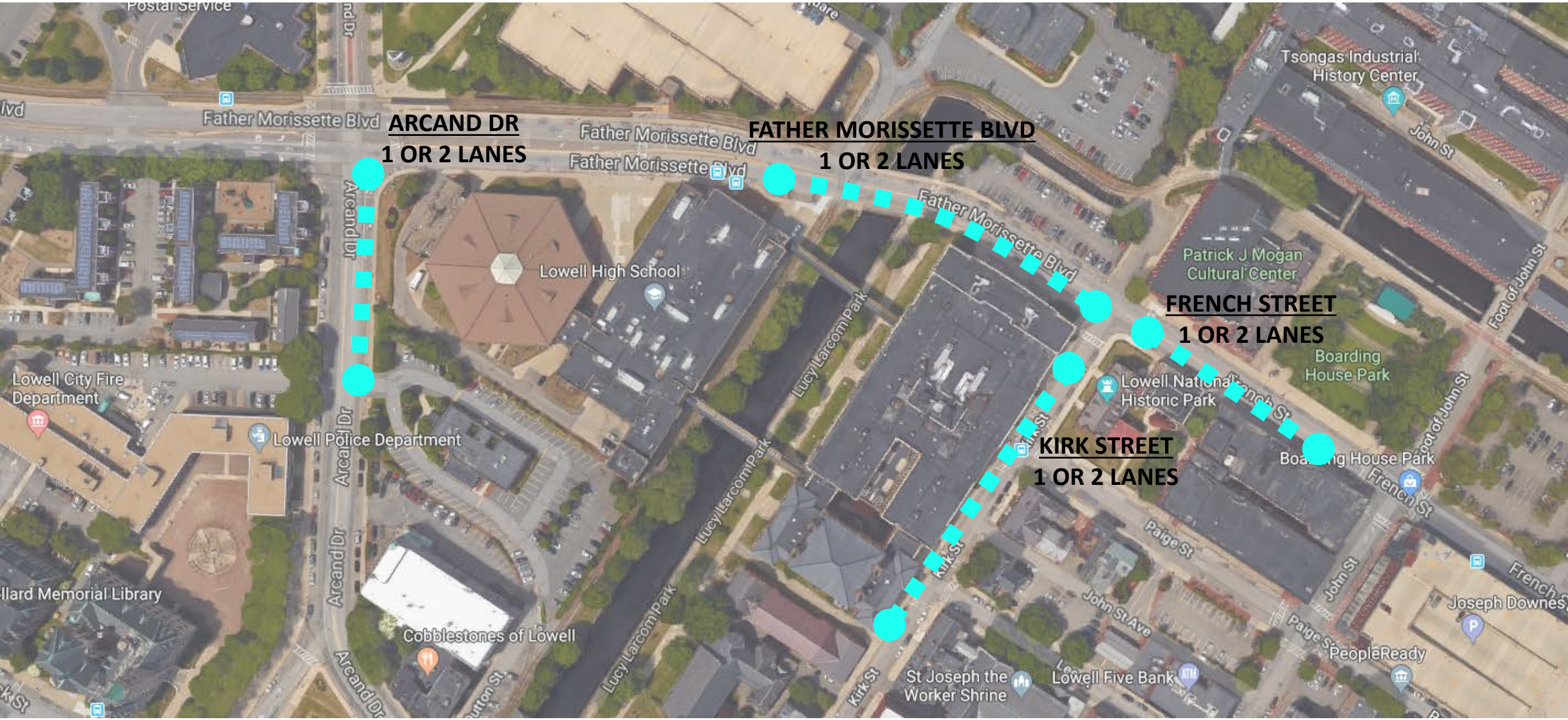
LOWELL HIGH SCHOOL: POTENTIAL LANE CLOSURES



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LOWELL HIGH SCHOOL: SCHEDULE

LHS REVISED PSR SCHEDULE SBC 3/29/18	February '18			March '18				April '18				May '18					June '18			
	2/12-16	2/19-23	2/26-3/2	3/5-9	3/12-16	3/19-23	3/26-3/30	4/2-6	4/9-13	4/16-20	4/23-27	4/30-5/4	5/7-11	5/14-18	5/21-25	5/28-6/1	6/4-8	6/11-15	6/18-22	6/25-29
Revised PSR:																				
City Council:																				
Options w/ Phasing							3/29													
Updates: Cost/Energy/Sust/Massing/ Vote Rec. Preferred Option											4/26	Council Presenation PSR Options w/ Costs								
Vote on SBC Recommendation PSR												★	5/1 Council Vote SBC Recommendation Preferred Option							
School Building Committee Meetings:																				
Restart/ Select Options PSR																				
Options w/ Phasing							3/29													
Updates: Cost/Energy/Sust/Massing/ Vote Recomendation Preferred Option											4/26									
School Committee Meetings										*SBC Vote Recommendation Preferred Option*										
Approve Revised Ed Program / Delete Pool						3/21														
Educational Meetings:																				
ELT Revise Ed Program / Delete Pool Draft			2/26																	
Security / Sustainability Meetings								4/4												
City Department Meetings/Other Approvals:																				
Emminent Domain by City																				
City All Department Meeting								4/4												
Mass Historic: Prepare Revised PNF																				
PNF Resubmission							3/26													
Mass Historic PNF Review/Response																				
Community Meetings:									4/12			pend. City								
Final Evaluation of Alternates:																				
Refine Plan Options Plans/Narratives/Phasing																				
Package to Estimators								4/2												
Cost Estimate								$	$											
Cost Reconcilliation										$										
Assemble Revised PSR Report																				
Energy Update																				
Design Team to Update Reports for Preferred Option																				
City Review PSR																				
Submit PSR													5/9							
Respond to MSBA Comments																				
Prepare MSBA Presentation																				
Local Actions & Approvals:																				
Submit PSR to MSBA													★	5/9 Submit PSR to MSBA						
MSBA Review of PSR																				
Facilities Assess. Sub-Committee (FAS)																	★	6/6 FAS		
MSBA Board Meeting PSR Approval																			6/27 MSBA Board	★

LOWELL HIGH SCHOOL

- Next Steps
  - Estimate / Pricing Update
  - Security Meeting
  - Sustainability Meeting
  - All City Department Meeting
  - Community Meetings



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www.LowellMA.gov

Eileen Donoghue
City Manager
Michael McGovern
Assistant City Manager

Scho0ol Building Committee Meeting

Meeting Minutes

Date: April 30, 2018
Time: 6:30 PM
Location: City Council Chambers

I. - Attendance

Present: Eileen Donoghue, William Samaras, Conor Baldwin, Maryann Ballotta, Brian Barry, Marianne Busteed, James Cook, David Cunningham, James Donison, Gary Frisch, Edward Kennedy, Salah Khelfaoui, Connie Martin, Jay Mason, Rady Mom, Maria Sheehy, Richard Underwood, Michael Vaughn.

Also in attendance:

City Councilors: John Leahy, Vesna Nuon, James Milinazzo, Rita Mercier, David Conway, & Karen Cirillo

School Committee Members: Andre Descouteaux, Gerry Nutter and Jackie Doroghty

City: Mike McGovern, Mike Geary, and Heather Varney
Skanska: Maryann Williams, Dale Caldwell, Jim Dowd
Perkins Eastman: Joe Drown, Robert Bell, Alicia Caritano, Dawn Guarriello

Taverse Landscape Architects: Ashley Iannuccilli

City Manager E. Donoghue called the meeting to order at 6:30 PM.

II. - Update on Tasks Since Last SBC Meeting

A. Caritano discussed the overview of meetings on the LHS project since the March 2018 School Building Committee meeting. On April 4, 2018 the Sustainability meeting was held consisting of a work shop for 22 people including the members of the School Department, Skanska, Perkins Eastman, and their consultants, and the City. The group discussed sustainable strategies for the new high school. A. Caritano noted that there was also a City Department Head meeting on April 4, 2018 in which all relevant department managers were present to discuss approvals needed and the timeline. The Security meeting on April 12, included a workshop of 17 people to discuss security issues for all the options and current trends. A. Caritano also mentioned the April 12, 2018 community meeting in which the open forum provided a good amount of input. She stated that the team has updated the estimated EUI,

energy use intensity, for the design options to provide a relative comparison for each of the options as compared to the existing buildings. The EUI for the existing buildings is 63 kBtu/SF-yr, Option 2A is 42.53, Option 3A is 41.98, and New A is 36.23. The energy update serves as a benchmark for future study which will include lifecycle cost analysis.

III. - Design Option Overview and Cost Update

B. Bell provided an overview of the three design options. All options meet the Educational program including relocating the Freshman Academy to provide a consolidated campus. Option 2A has a, limited green space and loading, windowless labs, and requires a temporary gymnasium. Option 3A incorporates the adjacent land at 75 Arcand Drive which allows for a larger entry plaza, an expanded footprint which includes lightwells in the 1980 building so that there are no windowless labs, and additional greenspace and loading. Option 3A also requires no temporary facilities, but requires Eminent Domain. New Option A, also takes the adjacent land and requires Eminent Domain. However the footprint fills the site and has a limited entry plaza, and green space. In addition, New Option A requires a temporary gymnasium and 24 temporary classrooms. R. Bell noted that the presentation includes the pros and cons for each option in additional to specific building specifications.

D. Guarriello discussed the massing of all the options. There were multiple meetings, during the PSR where the Design Team explained the design options included the proposed plans and phasing. She noted that the floor plans illustrated in the presentation are only for the main floor so that the audience can get an idea of the layout. She also mentioned that the size of the new gymnasium, locker room and fitness area is consistent among options 2A and 3A.

D. Guarriello discussed Option 3A, which includes the expanded site with more greenspace, new bridges and light wells. She noted that the building is set back from the property line giving students more space on the Father Morrissett Blvd. J. Mason inquired to the comparison of the two courtyard sizes for Options 2A and 3A. A. Iannuccilli stated that 2A is approximately 3,600 square feet, and 3A is 15,000 square feet. D. Guarriello compared the square footage to the size of four classrooms for 2A and sixteen classrooms for 3A. A. Ianunuccilli also compared the size to the green space across the street from the high school by the parking garage which is 14,000 square feet.

D. Guarriello discussed New A, which is almost up to the property line at the street. She mentioned that the design lets light into the classrooms as they are set up in bars. D. Guarriello stated that the auditorium would be located in the windowless space.

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J. Drown noted that the team has been working on an updated cost estimate. He mentioned that there are a few points to make note of including a schedule conflict which resulted in Perkins Eastman bringing in new cost estimators, PM&C, and the project estimator staffing at SKANSKA also changed. These staffing changes resulted in a "fresh set of eyes" on the project. J. Drown noted that the space program changed as the swimming pool was removed, reducing the size of the school. While refining the design Perkins Eastman has the opportunity to make the design more efficient. J. Drown also noted that the cost estimates reconciled within 1% of one another. By the end of the meeting, both estimators understood how other was viewing the project, which was a very constructive important meeting. The estimated project cost is within the MSBA average of $400-$500 / square foot construction.

J. Drown noted that the slide for reconciled revised PSR cost estimate includes projected costs from Perkins on right and SKASNKA on left. He explained that the construction cost includes the cost of the building and the site. The Project Budget includes the construction cost as well as the other soft project costs such as Design Team, Operation Project Manager fees, and construction contingencies etc. Option 2A construction cost is $ 262,135,000 with a project budget of $333,040,000. Option 3A construction cost is $270,456,000 with a project budget of $345,400,000. New A construction cost is $289,153,000 with a project budget of $361,624,000. The city share for 2A is $124,282,000; for 3A is $135,960,000 and New A is $160,955,000.

W. Samaras inquired to the reimbursement cost, if the City would ever be able to obtain a higher rate of reimbursement, how the city may begin conversations with the state on this topic. M. Williams addressed this noting that the City may open discussions with the MSBA to consider spaces that exceed the space summary guidelines if the argument about the scale of the school and student population can be justified, and argue that the school does not fit with the average model used as a guideline. B. Barry inquired if there was a different reimbursement rate for each option. M. Williams noted that the team looked at the last set of responses from MSBA on the comments for ineligible costs. It is a snapshot in time, the spaces consider ineligible cost for reimbursements will need to be carried by the City, unless the MSBA does approve items for reimbursement. She continued, noting that the guidelines are generally for schools with a thousand students. This is an important part of why the size of school may fall outside the guidelines. B. Barry asked why the construction costs go down so much. A. Caritano replied that Option New A includes temporary classrooms, which are not required for any other option, and constitute a large chunk of the cost. B. Barry inquired to why the gross numbers illustrated for state reimbursement on Option 2A is $209,000,000, and Option New A reimbursement is

$8,000,000 less. J. Drown stated that there more factors than just if an item is ineligible or eligible, they also need to be within the maximum $/sf for reimbursement in order to be reimbursed. He noted that with Option New A, some of the limits were reached, making the costs ineligible for reimbursement. R. Bell reinforced this noting that the design hit the cap on the reimbursement; a building may be more expensive even if the footprint is smaller. D. Guarriello stated that the differential between the reconciled revised PSR cost estimates has a substantial amount of money that is ineligible as it relates to reimbursable $/ sf.

E. Kennedy followed up to W. Samaras' notion that the City's portion could go down and asked what the team meant by being conservative. J. Drown stated that the city portion can go down, but this is not known until the city enters into a conversation with the MSBA. E. Kennedy inquired to why the portion may go down. J. Drown noted that the square footage is scaled down, and more spaces become eligible with more money reimbursed by the MSBA.

E. Kennedy asked if there will be a negotiation. M. Williams replied that the team will not know until final project budget scope when the City receives more feedback from the MSBA submission, how the reimbursement will be reflected. E. Kennedy asked what the duration of Schematic Design will be, and if it would be July 1. M. Williams stated that April 10, 2019 is when the MSBA Board approval would be scheduled for Schematic Design. The team would submit February of 2019. With the local appropriation, the state gives the city 120 days to appropriate funding for the project by mid-august, which is reflected in the project schedule. E. Kennedy asked if the loan order could be brought before the City Council in late spring, early summer. M. Williams replied yes. D. Guarriello noted that the team would definitively know when the OPM fills out the 3011 forms to determine the square footage ineligible. M. Williams added that a caveat to this is that the funding agreement will not be signed until eminent domain is complete, at which time the city would have to have complete control of the land. W. Samaras inquired if there would be negotiation with the MSBA. R. Bell stated that the Irish Auditorium at LHS is one of the spaces that may be ineligible currently. There may be an argument that making the existing facility smaller may cost more, which makes it prudent to renovate the existing space instead. J. Mason asked if at the end of schematic design, the City would have a number with the MSBA that could change during the design element. M. Williams noted that when the OPM submits form 3011 with the scope and budget, there may be some communication prior to the agreement; but once the Scope and Budget Conference is held, that would be the final number agreed upon with no more negotiations. D. Guarriello stated that the MSBA sets a total maximum grant amount which may fluctuate during construction; the number can change when change orders are deemed ineligible. She noted that at the end of schematic design, only 20% of the design will be complete, but Perkins Eastman will be further along in the process than the district and community may typically see for a project in Schematic Design. B. Barry asked if the

gymnasium and Freshman Academy is the same size in options 2A and 3A. R. Bell noted that the size is the same for all three options.

IV. - Community Forum

Two members of the community spoke. E. Donoghue noted that the City Manager's Office is tasked with updating the project website to make sure that it is up to date and accurate. She mentioned that the office will work regularly with the consultants. M. Williams noted that the project design for a phased occupied demolition and construction that will take 21 months after the project is approved by the MSBA and the City. The start of the construction will begin August 1, 2021. Option 2A would take 4 years plus a summer, 3A would take five years and the New A would take 4 years.

B. Barry inquired if the extent of the rehabilitation is to gut the entire buildings or to keep much of the existing structure. R. Bell stated that this could depend on the design once the team gets into more detail. He explained that on a preliminary level, based on the wall thickness, the team will make judgments to take out a whole wall rather than to make many holes in the wall. R. Bell noted that the walls would not be recognizable. The idea is not to completely gut the buildings at this point, but a substantial gut is likely. The walls, stairs, corridors may remain as shells, or may be moved based on a number of variables. B. Barry inquired to if there would be all new systems in the buildings or if existing electric and heating systems will remain. R. Bell noted that there would be all new plumbing, heating and electric systems. J. Drown noted that the 1980 building will be entirely redone with new systems, right down to the wire.

V. - Vote on Recommended Preferred Option to the City Council for the PSR Submittal to the MSBA

E. Donoghue asked if there were any additional comments or concerns prior to the vote. B. Barry stated that this was his first meeting but he has followed the project all along. He noted that the SBC is charged with coming up with the best and most cost effective site to recommend to the City Council. He stated that he does not think that any of three options before the committee at the moment are the most effective, all have compromises in them. He mentioned that he sent a communication regarding looking into South Common prior to being on the committee. E. Kennedy motioned to vote to recommend a preferred option to the City Council.

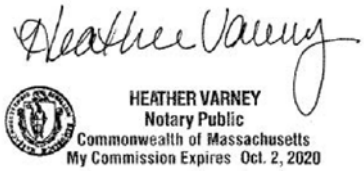
City Manager Eileen Donoghue	Option 3A
Mayor William Samaras	Option 3A
Conor Baldwin	Option 3A

Maryann Ballotta	Option 3A
Brian Barry	Option 2A
David Beati	Absent
Head of School Marianne Busteed	Option 3A
James Cook	Option 3A
David Cunningham	Option 3A
James Donison	Option New A
Councilor Rodney Elliott	Absent
Gary Frisch	Option 3A
Robert Healy	Absent
Councilor Edward Kennedy	Option 3A
Superintendent Salah Khelfaoui	Option 3A
School Committee Member Connie Martin	Option 3A
Jay Mason	Option 3A
State Representative Rady Mom	Option 3A
Maria Sheehy	Option 3A
Richard Underwood	Option 3A
Michael Vaughn	Option 3A

1 Option 2A, 16 Option 3A, 1 Option New A. The School Building Committee approves Option 3A as the recommended preferred option to the City Council. So voted.

E. Kennedy motioned to adjourn, seconded by M. Vaughn. Meeting adjourned 7:25 PM.

Notes taken and certified by:



PERKINS EASTMAN

SCHOOL BUILDING COMMITTEE / COMMUNITY MEETING

LOWELL HS PROJECT



EXISTING IMAGERY COURTESY OF GOOGLE EARTH

30 APRIL 2018

LOWELL HIGH SCHOOL

AGENDA



- Updates Since Last SBC Meeting 3/29:
  - Meetings:
    - City Departments, Sustainability, Security, Community Meeting
    - Energy Update
- Overview of Design Options
- Cost Estimate Update
- Community Forum
- SBC Vote Recommendation Preferred Option
- Next Steps

LOWELL HIGH SCHOOL

ENERGY UPDATE

02 ENERGY END USE PROFILES BY SECTOR

Figure 02. shows the annual aggregate energy end-use breakdown for each of the design options. Each color in the pie charts denotes various end-uses. The largest end-use for each options is heating, followed by internal loads and cooling energy use. Although the New Option A has heating as the predominant load, it is smaller than the renovation options.

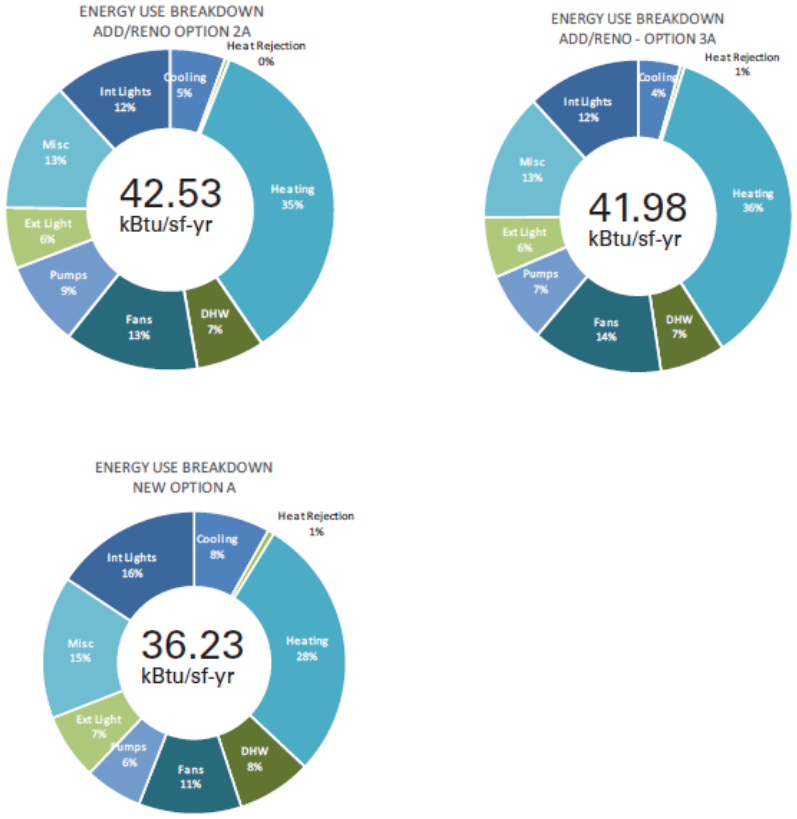


Figure 02. EUI Comparison by Design Options

03 ENERGY END USE PROFILE

Figure 03. shows the annual aggregate energy end-use breakdown for each design case. Each color in the bar chart denotes various end-uses.

The results illustrate that all the design options have a lower EUI than the existing building. The Add/Reno 2A and 3A have similar savings, and the New Option A has the most compared to the existing building. The greatest savings in the New Option A is from heating.

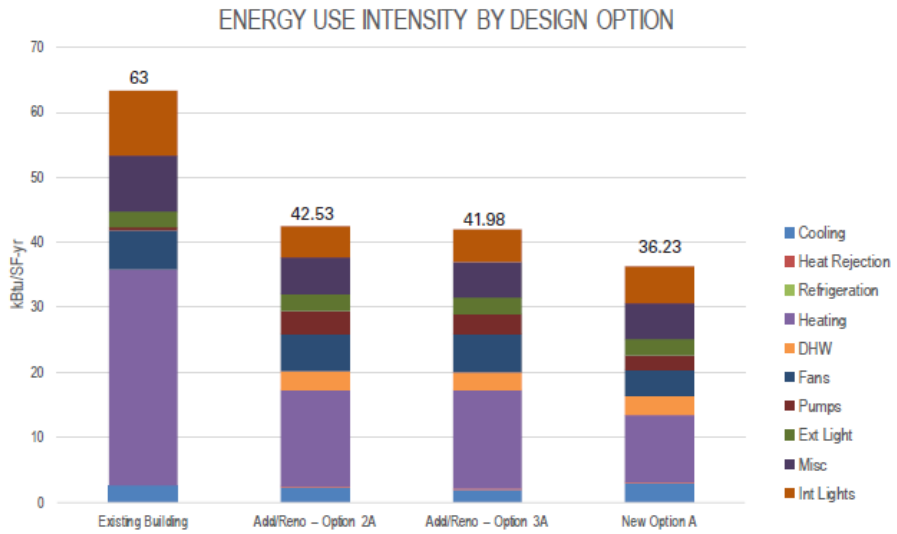
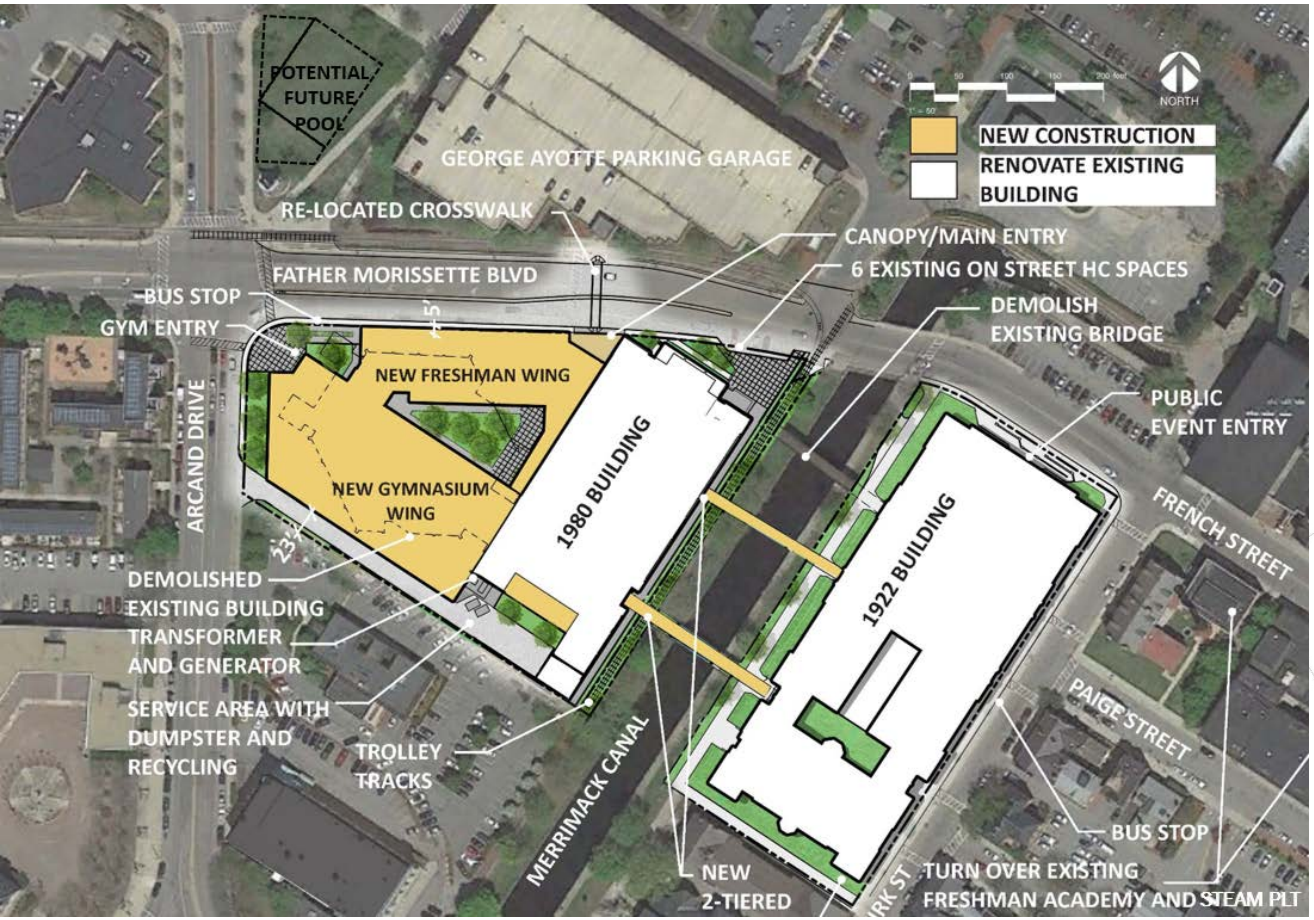


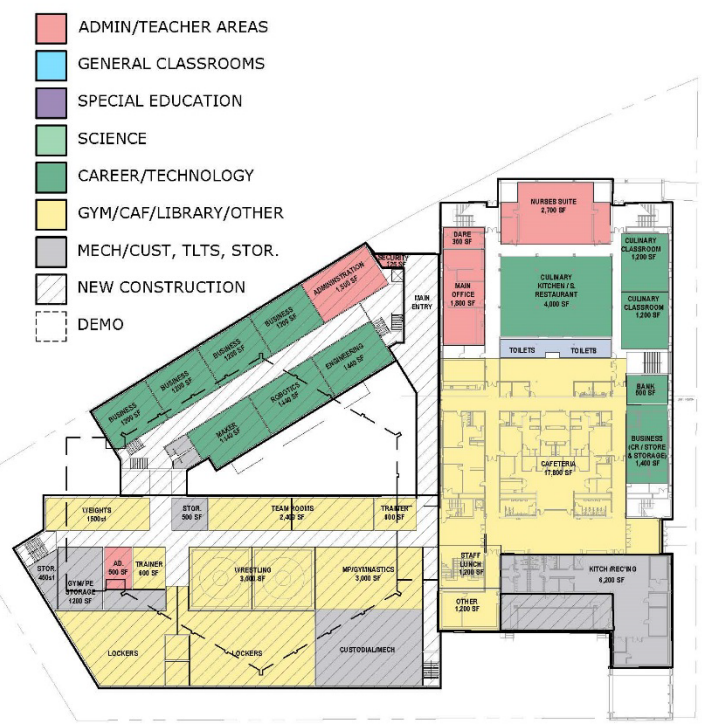
Figure 03. Annual Energy Use Profile by Design Options

			
Building/Site •Acreage •Gross Size •Stories/Ht	6.0 acres 618.7k gsf (445.5k reno+173.2k add) Exist'g (63'), 5 Story (68'-8"FA) and 2 Story (58' Gym)	7.4 = 6.0 acres +1.4 exp. lot 622.2k gsf (432.6k reno +189.6k add) Exist'g (63'), 5 Story (68'-8"FA) and 2 Story (58' Gym)	7.4 = 6.0 +1.4 exp. lot 579.4k gsf 5 Story+ Basement (68'-8")
Prelim. PROS/CONS	+ Consolidated Campus (new freshman academy) – Temporary Gym Required – Windowless Labs Remain – Limited Green + Loading	+ Consolidated Campus (new freshman academy) + No Windowless Labs + Added Green + Loading – Gym Areas More Remote – Eminent Domain	+ Consolidated Campus (via 5 story + basement) + Good Classroom Orientation – 24 Temporary Classrooms & Temporary Gym Required – Limited Green Space – Eminent Domain
Educ-Program	Meets Educational Objectives : +Freshman Academy Connected ±Public/Activity Areas Spread & Split +F.A. Teams + STEM/Hum. Clusters +Meets New Standards (Count/Size) +More Efficient/Effective Field House	Meets Educational Objectives : +Freshman Academy Connected ±Public/Activity Areas Spread & Split +F.A. Teams + STEM/Hum. Clusters +Meets New Standards (Count/Size) +More Efficient/Effective Field House	Meets Educational Objectives : +Freshman Academy Connected ±Public/Activity Areas Spread & Split +F.A. Teams + STEM/Hum. Clusters +Meets New Standards (Count/Size) +More Efficient/Effective Field House
Construction	4 Year (+ summer) Phased Project +Kitchen/Boiler Built in First Phase –Temporary Gym Facilities Required	5 Year Phased Project +Kitchen/Boiler Built in First Phase +No Modulars or Temporary Gym ±Only 4 Years of 5 On School Site –Land Acquisition/Eminent Domain	4 Year (+summer) Phased Project +Kitchen/Boiler/Temp Caf. Built in First Phase ±Only 2 Years of 4 On School Site –Land Acquisition/Eminent Domain –Temp. Gym and 24 Temp. Classrooms Req'd

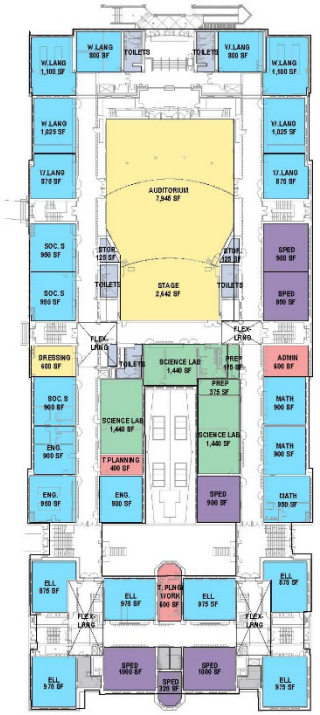
LOWELL HIGH SCHOOL: OPTION 2A



SITE PLAN



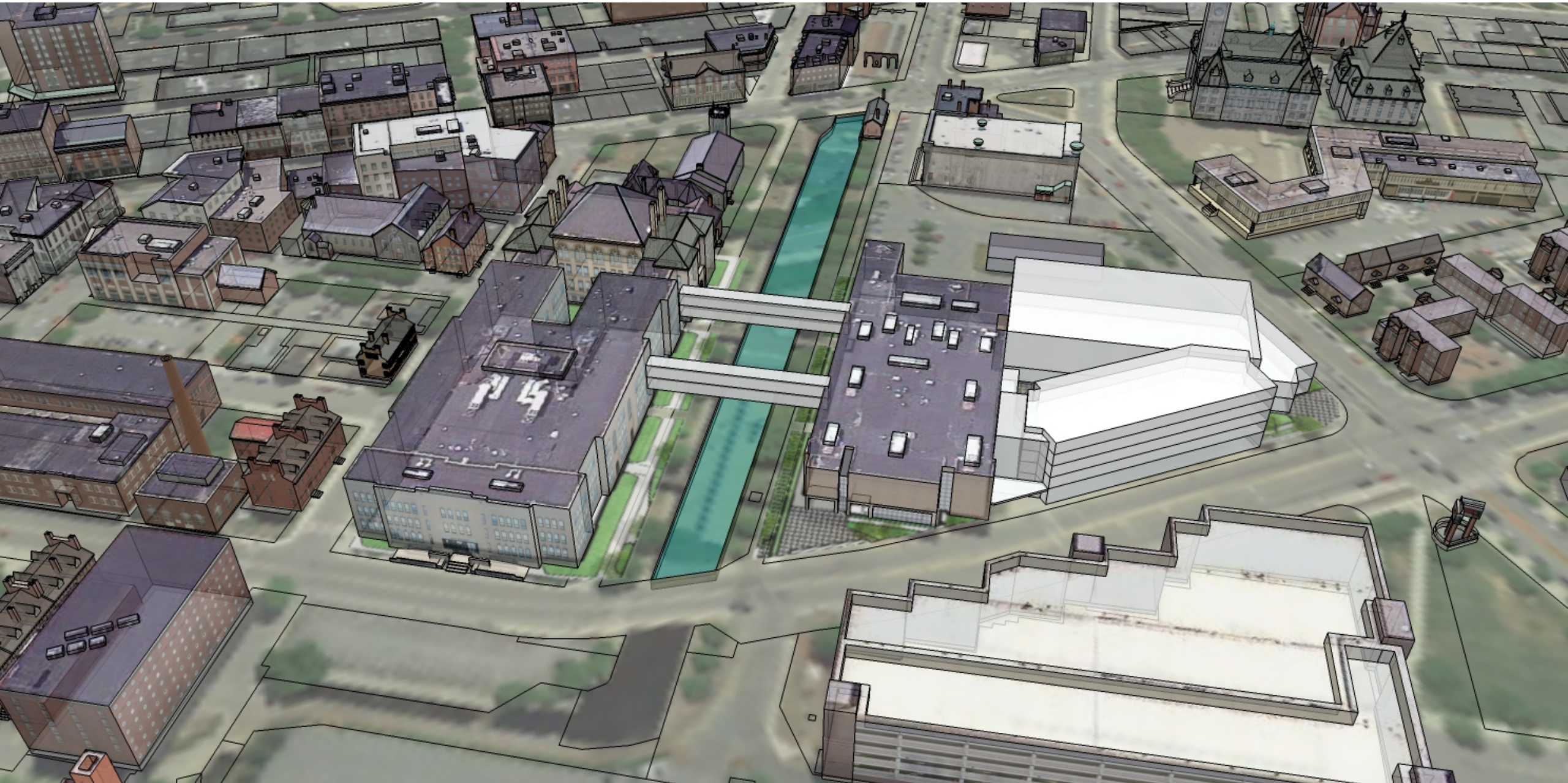
NEW GYMNASIUM WING 1980 BUILDING



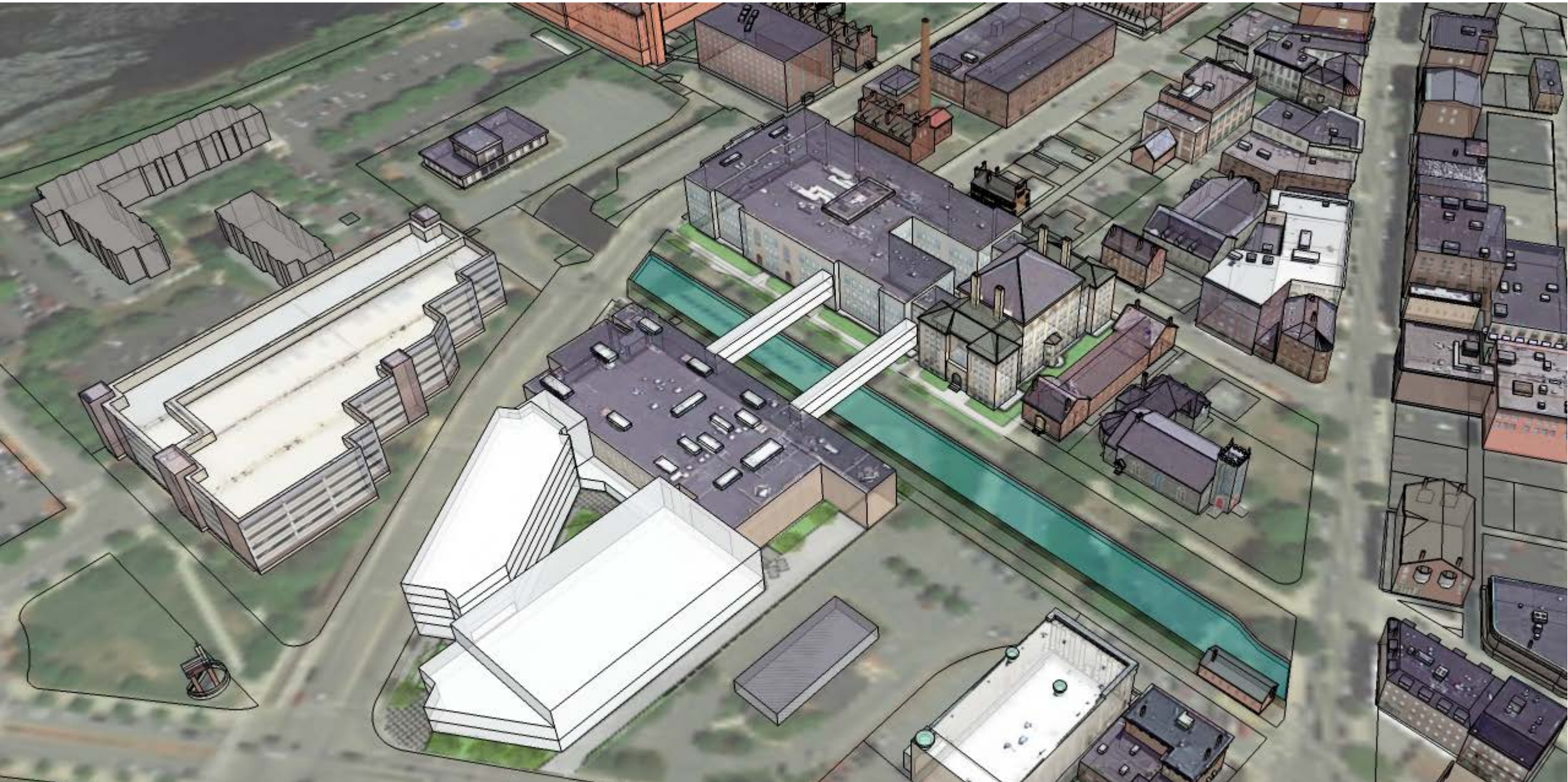
1922 BUILDING

MAIN FLOOR PLAN

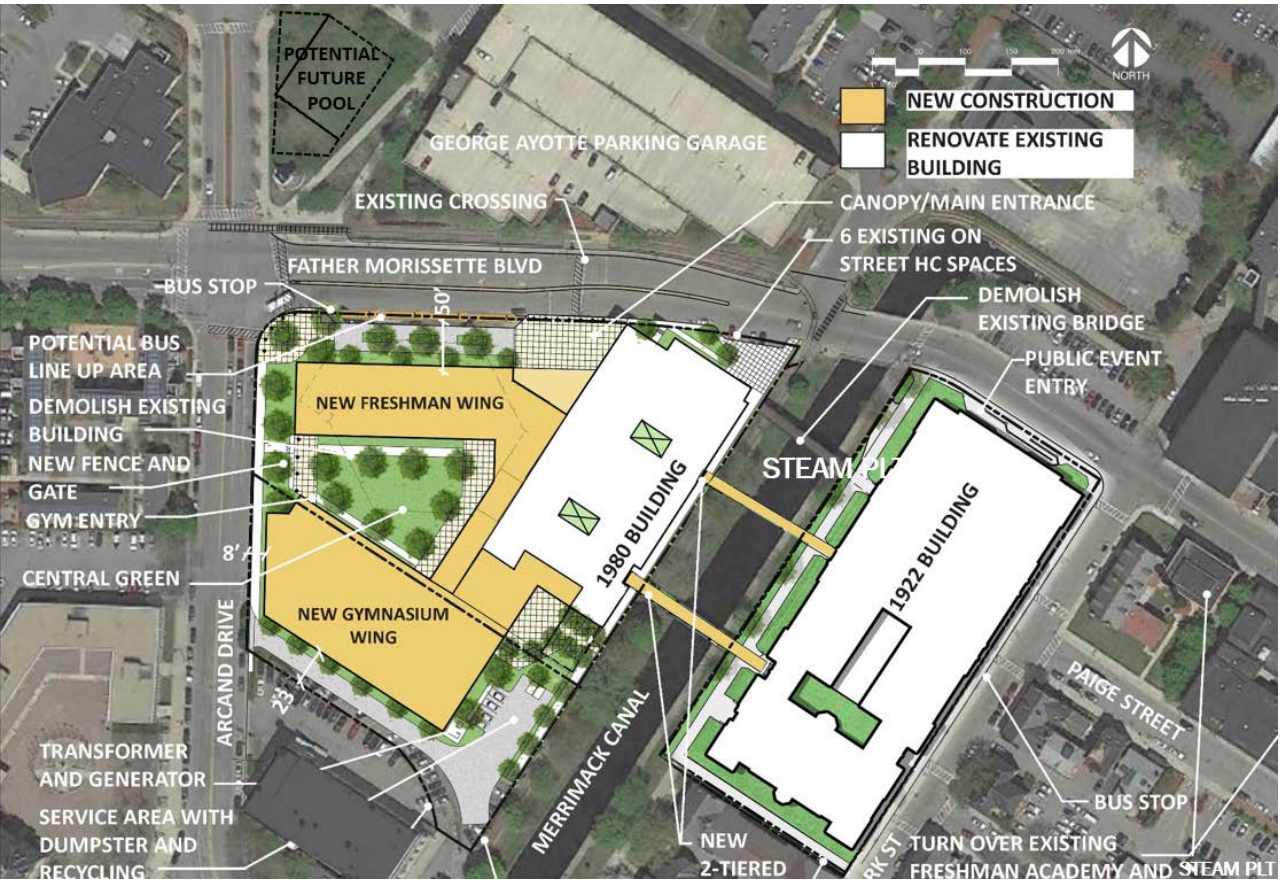
LOWELL HIGH SCHOOL: OPTION 2A MASSING



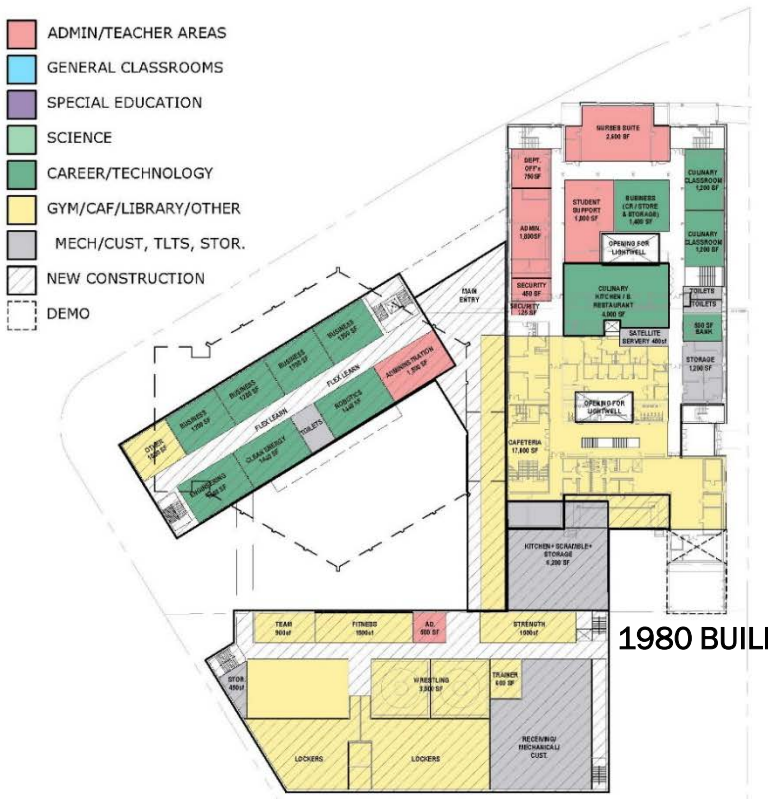
LOWELL HIGH SCHOOL: OPTION 2A MASSING

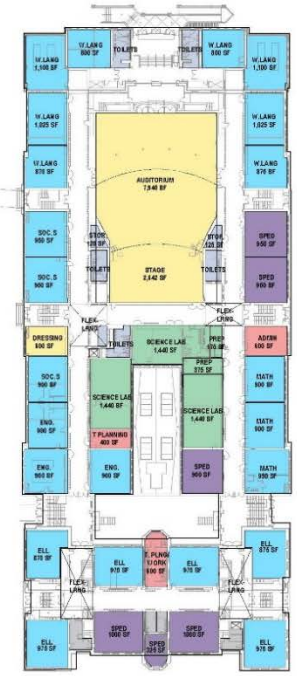


LOWELL HIGH SCHOOL: OPTION 3A – EXPANDED SITE



SITE PLAN





1980 BUILDING

1922 BUILDING

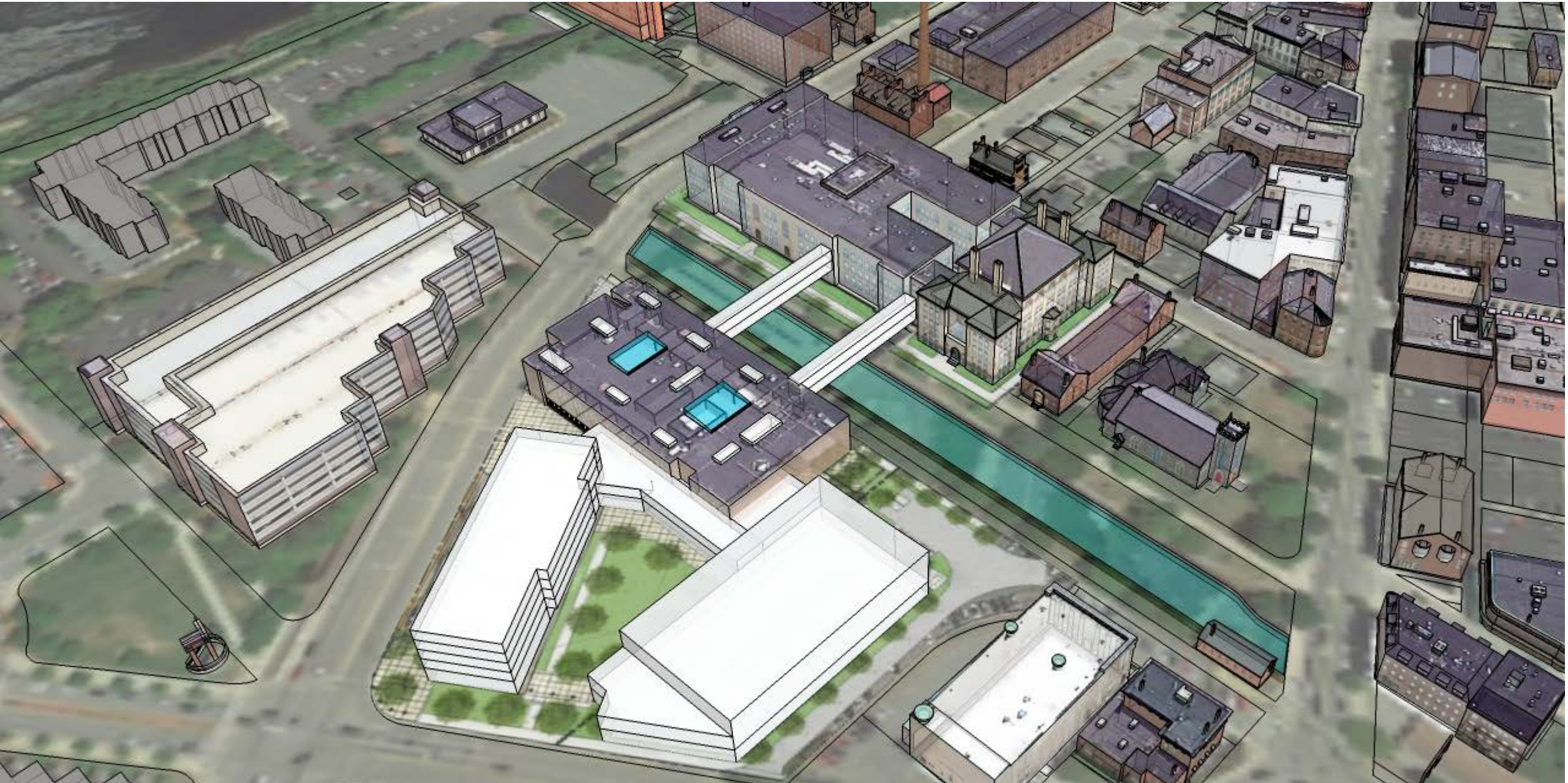
NEW GYMNASIUM WING

MAIN FLOOR PLAN

LOWELL HIGH SCHOOL: OPTION 3A – EXPANDED SITE MASSING



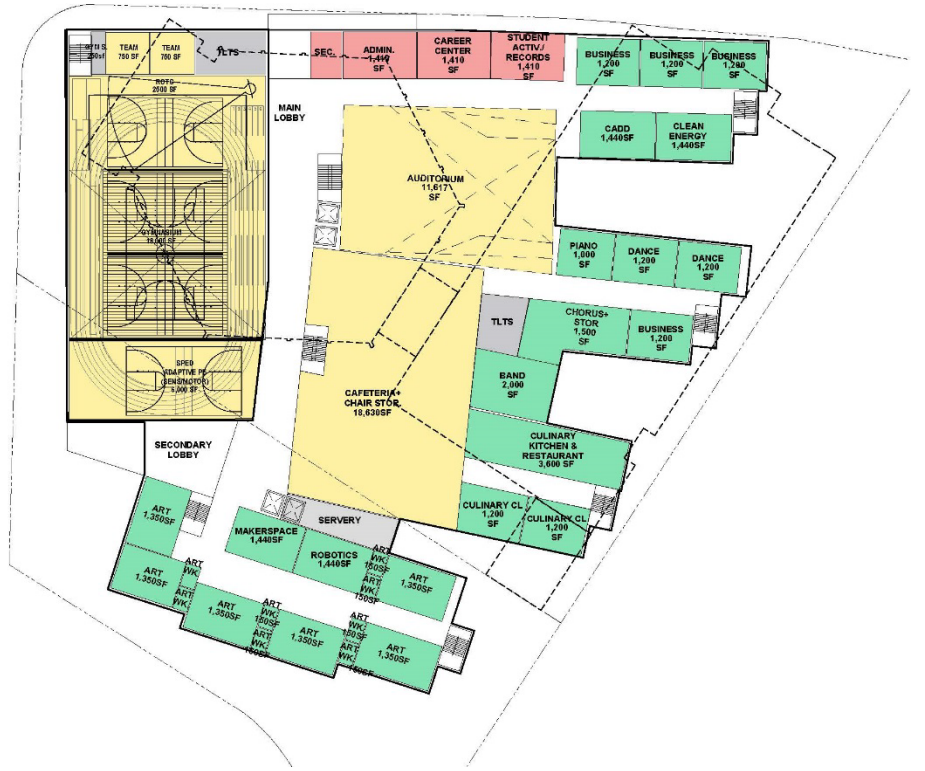
LOWELL HIGH SCHOOL: OPTION 3A – EXPANDED SITE MASSING



LOWELL HIGH SCHOOL: NEW OPTION A – EXPANDED SITE



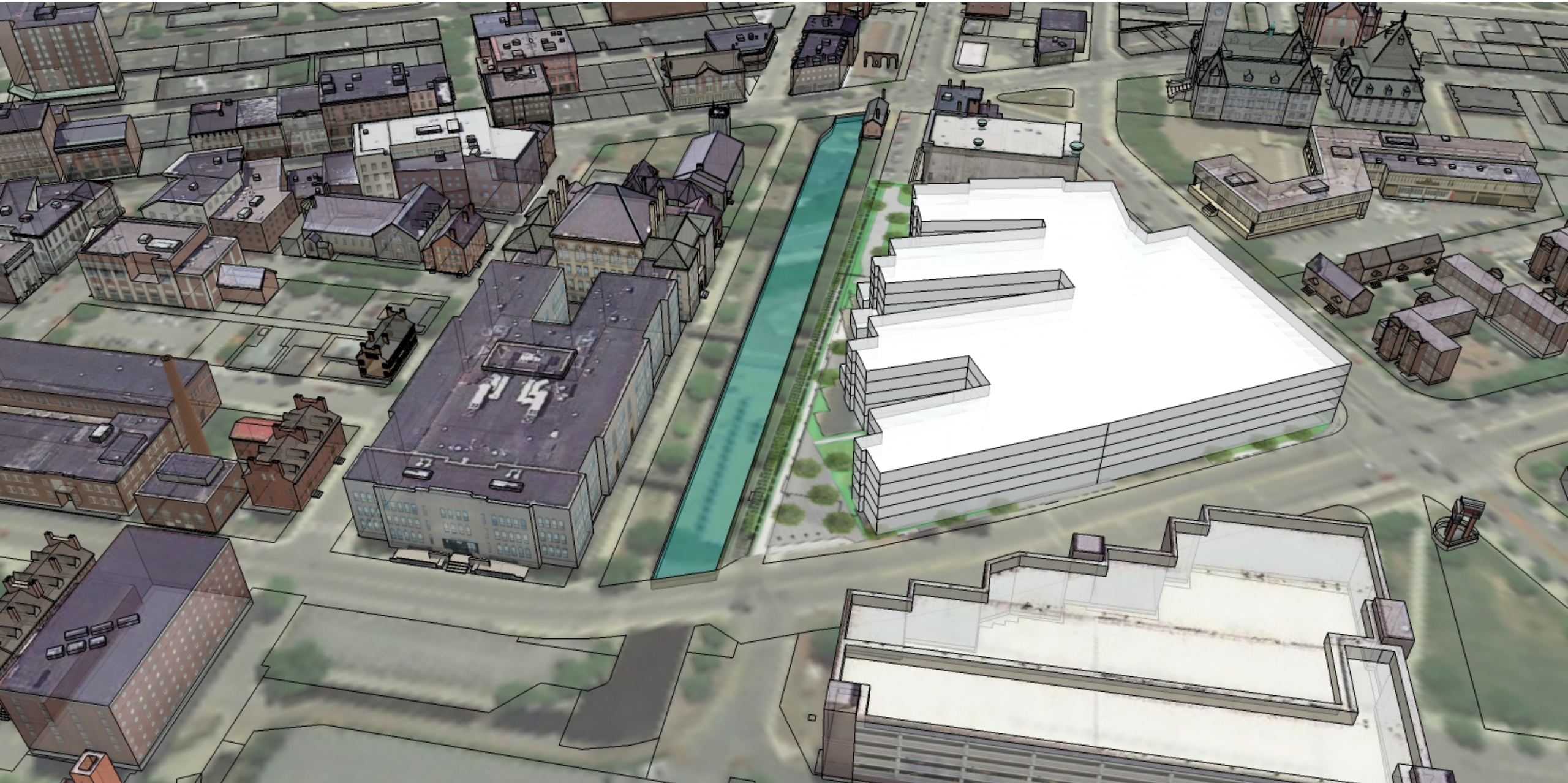
ADMIN/TEACHER AREAS
GENERAL CLASSROOMS
SPECIAL EDUCATION
SCIENCE
CAREER/TECHNOLOGY
GYM/CAF/LIBRARY/OTHER
MECH/CUST, TLTS, STOR.
NEW CONSTRUCTION
DEMO



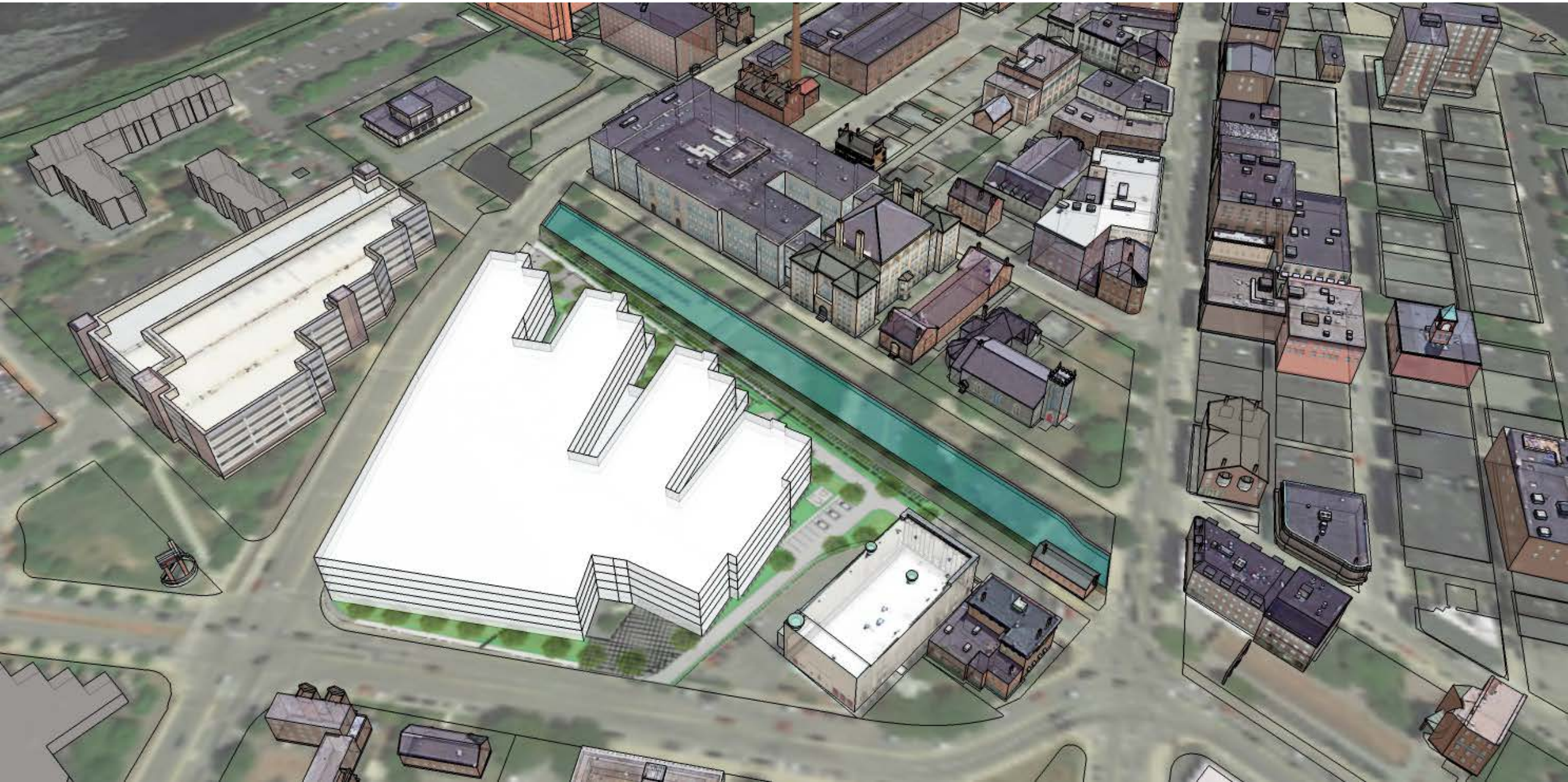
SITE PLAN

MAIN FLOOR PLAN

LOWELL HIGH SCHOOL: NEW OPTION A – EXPANDED SITE MASSING



LOWELL HIGH SCHOOL: NEW OPTION A – EXPANDED SITE MASSING



LOWELL HIGH SCHOOL

COST ESTIMATE UPDATE

✓ NEW COST ESTIMATORS

- Perkins Eastman (PM+C) and Skanska (In-house)
- New Estimators = Fresh set of eyes

✓ PROGRAM CHANGES

- Removal of Swimming Pool = Reduced Building Area

✓ REFINED PLAN OPTIONS

- Plan refinements = Condensing and tightening of spaces

✓ ESTIMATES RECONCILED WITHIN 1%

- Estimated Construction Cost $/SqFt is well within range of other current estimated MSBA projects



LOWELL HIGH SCHOOL

Reconciled Revised PSR Cost Estimate

Option		Perkins Eastman		Skanska		Delta
2A	Construction Cost	$262,135,000	424 $/sf	$259,340,000	419 $/sf	1.07%
	Project Budget	$333,040,000	538 $/sf	$329,630,000	533 $/sf	1.02%
3A	Construction Cost	$270,456,000	435 $/sf	$268,850,000	432 $/sf	0.59%
	Project Budget	$345,400,000	555 $/sf	$341,438,000	549 $/sf	1.15%
New	Construction Cost	$289,153,000	499 $/sf	$287,632,000	496 $/sf	0.53%
	Project Budget	$361,624,000	624 $/sf	$359,798,000	621 S/sf	0.50%

Note: all numbers are rounded.

	 ADD/RENO OPTION 2A	 ADD/RENO OPTION 3A	 NEW OPTION A
Building/Site •Acreage •Gross Size •Stories/Ht	6.0 acres 618.7k gsf (445.5k reno+173.2k add) Exist'g (63'), 5 Story (68'-8"FA) and 2 Story (58' Gym)	7.4 = 6.0 acres +1.4 exp. lot 622.2k gsf (432.6k reno +189.6k add) Exist'g (63'), 5 Story (68'-8"FA) and 2 Story (58' Gym)	7.4 = 6.0 +1.4 exp. lot 579.4k gsf 5 Story+ Basement (68'-8")
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Project Budget City Share	$333,040,000 $124,282,000	$345,400,000 $135,960,000	$361,624,000 $160,955,000

LOWELL HIGH SCHOOL

NEXT STEPS



- 5/1: City Council Vote SBC Recommendation Preferred Option
- 5/9: Submit PSR (Preferred Schematic Report)to MSBA
- 5/9: MSBA FAS (Facilities Assessment Sub-Com.)
- 6/27: MSBA Board Meeting PSR Approval
- 7/1: Schematic Design (SD) Start
  - Possible Existing Conditions Laser Scan Existing Buildings
  - Possible Geotechnical Borings 75 Arcand Drive

Office of the City Clerk
City Hall • 375 Merrimack Street • Lowell, MA 01852
P: 978.674.4161 • F: 978.970.4007
www.LowellMA.gov

Lowell City Council
Regular Meeting Minutes

Michael Q. Geary
City Clerk

Date: **January 2, 2018**
Time: **6:30 PM**
Location: **City Council Chamber, 375 Merrimack Street, 2nd Floor, Lowell, MA**

1. ROLL CALL

Roll Call showed 9 present.

Mayor Samaras presiding.

2. CITY CLERK
2.1. Minutes of Zoning SC December 12th; City Council Meeting December 12th, for acceptance.

In City Council, minutes read, **Motion** "To accept as amended and place on file" by C. Kennedy, seconded by C. Mercier. So voted.

3. COMMUNICATIONS FROM CITY MANAGER
3.1. Communication-Appoint Cormac Hondros-McCarthy to Sustainability Council.

In Council, **Motion** to adopt by C. Kennedy, seconded by C. Conway. Adopted per Roll Call vote 9 yeas. So voted. Mr. Hondros-McCarthy was present and thanked the Council.

4. ORDERS FROM THE CITY MANAGER
4.1. Order-60 day trial (various)

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Kennedy, seconded by C. Mercier. Adopted per Roll Call vote 9 yeas. So voted.

5. REPORTS (SUB/COMMITTEE, IF ANY)

None.

6. CITY COUNCIL - MOTIONS

6.1. C. Mercier - Req. City Mgr. allow people of Laotian descent to acquire a site at the JFK Plaza to construct their monument.

In City Council, seconded by C. Kennedy, referred to City Manager. Adopted per Roll Call vote 9 yeas. So voted. C. Mercier noted the need to make a formal motion and requested a roll call vote. C. Elliott noted the cultural importance with the motion.

6.2. C. Leahy - Req. City Council take a vote regarding the location of the preferred site of Lowell High School.

In City Council, C. Leahy requested the motion be withdrawn with no objections. So voted.

6.3. C. Elliott - Req. City Mgr. provide a report regarding the policy of City vehicles being taken home; the number of vehicles issued to employees; and the associated costs.

In City Council, seconded by C. Cirillo, referred to City Manager. So voted. C. Elliott noted the need to keep public updated about costs involved and the policy that is in effect.

6.4. C. Elliott - Req. City Mgr. provide a report on the expenditures to date regarding the feasibility study on Lowell High School and the amount reimbursed to the City from the MSBA.

In City Council, seconded by C. Mercier, referred to City Manager. So voted. C. Elliott commented on the need to have exact reimbursement figure from MSBA and to set that rate so has process moves along there would be a cleared picture of costs involved. C. Leahy noted the importance of costs in further feasibility studies.

6.5. C. Kennedy - Req. City Mgr. and the Mayor notify the Massachusetts School Building Authority that the City Council intends to explore changing Lowell's preferred project option for the Lowell High School building project.

In City Council, seconded by C. Conway, referred to City Manager. Adopted per Roll Call vote 9 yeas. So voted. C. Kennedy noted the MSBA meeting and correspondence with the City regarding future proceedings for change of location. C. Milinazzo questioned the wording of the motion. C. Kennedy outlined purpose of motion. C. Elliott commented on issues with delays in the project. C. Kennedy requested Roll Call vote.

6.6. C. Kennedy - Req. School Committee endorse City Council's intent to explore changing Lowell's preferred project option for the Lowell High School building project and direct the Superintendent to notify the Massachusetts School Building Authority of the School Committee's endorsement.

In City Council, seconded by C. Milinazzo, referred to City Manager. So voted. C. Kennedy commented on prior motion and the need for the School Committee to be involved in the same process.

7. ANNOUNCEMENTS

In City Council, **Motion** to suspend rules to discuss heating in public buildings by C. Elliott, seconded by C. Conway. So voted. M. Samaras commented heating issues in the high school. Manager Murphy noted the issues are present in high school and other public buildings. James Green (DPW – Head of Buildings) commented on the problems and the manner that they are being addressed. Manager Murphy noted that high school would be closed tomorrow to address heat issues. M. Samaras questioned procedures to protect citizens from the cold. Manager Murphy noted the safety operations in place to protect people from elements. C. Nuon questioned heating issue in public library. Mr. Green outlined those issues and their cause. C. Mercier noted the need to protect all citizens during these cold spells. C. Kennedy noted the unprecedented cold and its effect on all communities and commented on a long term solution to issues and that money may still be available in school budget to address quickly. C. Elliott questioned the closing of schools. C. Leahy questioned the arrival of parts for the equipment. Mr. Green noted the equipment was older and parts take a little longer to arrive. C. Leahy questioned if any reimbursement would be available for work being done. C. Milinazzo noted that they were doing a good job and questioned the status of the Amerisco contract. Manager Murphy noted he would update Council on contract.

8. ADJOURNMENT

In City Council, **Motion** to Adjourn by C. Kennedy, seconded by C. Mercier. So voted.

Meeting adjourned at 7:20 PM.

_____

Michael Geary, City Clerk

Office of the City Clerk
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Lowell City Council
Regular Meeting Minutes

Michael Q. Geary
City Clerk

Date: **January 23, 2018**
Time: **6:30 PM**
Location: **City Council Chamber, 375 Merrimack Street, 2nd Floor, Lowell, MA**

1. ROLL CALL

Roll Call showed 9 present.

Mayor Samaras presiding.

2. CITY CLERK
2.1. Minutes of City Council Meeting January 16th, for acceptance.

In City Council, minutes read, **Motion** "To accept and place on file" by C. Mercier, seconded by C. Conway. So voted.

3. GENERAL PUBLIC HEARINGS
3.1. Loan Order-Additional Bridge Repairs.

In City Council, Given 2nd Reading, hearing held. **Motion** to adopt and refer to Clerk's Office for twenty (20) days by C. Elliott, seconded by C. Conway. Adopted per Roll Call vote, 9 yeas. So voted. Referred to City Clerk for twenty (20) days. Speaking in favor was Conor Baldwin (CFO) who outlined order and reasoning behind it. No Remonstrants. C. Elliott commented on effect of future grants on this financing package. Mr. Baldwin noted possible reduction in loan amount.

4. COMMUNICATIONS FROM CITY MANAGER
4.1. Motion Responses.

In City Council, **Motion** "To accept and place on file" by C. Mercier, seconded by C. Kennedy. So voted.

A) LHS Feasibility Cost – C. Milinazzo commented on related costs associated with Article 97 procedures. C. Kennedy commented on anticipated additional funding.

Manager Murphy commented on added fund and how the Massachusetts School Building Authority (MSBA) will dictate future costs. C. Elliott noted report gave picture of current position of the City and that accuracy in future costs will be important. Mr. Baldwin noted there are encumbered costs as well. C. Elliott questioned the reimbursement rate of the MSBA. Mr. Baldwin commented on current rates. C. Kennedy noted that remaining money could cover upcoming costs.

B) LTC – None.

C) Laotian Monument – C. Mercier commented on the report and noted that community members were meeting to raise funds for a monument.

D) High Water Costs – C. Leahy commented on estimated water bills going out. Mark Young (Ex. Director Water Utility) noted there remained a small number of estimated bills going out and that complaints are way down. C. Elliott commented on meter replacement and the use of technology to track overuse and as a safety measure. Mr. Young noted that a software upgrade will enable that to happen. C. Milinazzo questioned procedures of other cities and towns using water facility. Mr. Young commented on inter-municipal contracts in place. C. Leahy noted the oversight ability with the new meters. Mr. Young noted that would improve with implementation of new software.

E) Process of Appealing Unusually High Water and Sewer Bills – C. Kennedy questioned review process for bills. Mr. Young outlined that process along with appeal process. C. Kennedy questioned time frame for such appeals. C. Mercier questioned procedure for paying disputed bills.

F) Canal Bridge Update – C. Nuon noted report and the importance of the project. Claire Ricker (DPD) provided summary of project which included design; funding scheme; partnerships and bid procedures. Ms. Ricker noted one bridge to be eliminated to adjust to high cost associated with the project and that bridge would be bid separately. Manager Murphy commented on partnerships and the financial contributions and noted that project is fully funded with upcoming loan order. C. Nuon commented on any funding gaps. Manager Murphy noted closing those gaps and commented on availability of revolving grants. C. Cirillo commented on compliance with Complete Streets Program and having bridges be walkable and bicycle ready. Ms. Ricker commented on plans and the use of the right of way. C. Elliott commented on funding, timing and traffic management of the project. Ms. Ricker commented on traffic management and the ability to do all bridges at the same time. C. Elliott noted the advantages of having one contractor for entire project. C. Kennedy questioned bidding strategy. Ms. Ricker outlined the bidding process noting State and Federal procedures.

C. Kennedy noted loan order and commented on secure funding. C. Milinazzo noted preference for bidding procedure in place and commented on super versus infra structure. C. Elliott noted that change orders in these types of projects would increase costs dramatically. C. Leahy made note of current state of the Suffolk Street Bridge.

4.2. Informational

Informational:

G) Letter to Secretary Pollack re Rourke Bridge – C. Noun recognized the efforts of the State Delegation.

H) SolSmart Designation – Katherine Moses (DPD) commented on the recent recognition for energy saving programs.

I) Warming Center – Chief Winward (LFD) commented on safety operations during stretch of hazardous weather. C. Mercier commented on the number of people who benefited from the actions of the City. C. Kennedy questioned the amount of homeless that were helped. Chief Winward noted that assistance with homeless helped ease burdens on other shelters.

4.3. Communication-Accept Resignation of Nick Speros Lowell Cultural Council.

In City Council, **Motion** "To accept and place on file" by C. Kennedy, seconded by C. Cirillo. So voted.

4.4. Communication-Accept resignation of Quinn Lawrence-Sustainability Council.

In City Council, **Motion** "To accept and place on file" by C. Kennedy, seconded by C. Nuon. So voted. C. Nuon requested that letters of thanks be provided to former members.

4.5. Communication-Appoint Donna Scannell Richards to Pollard Memorial Library Board of Trustees.

In City Council, read, **Motion** to adopt by C. Milinazzo, seconded by C. Mercier. Adopted per Roll Call vote 9 yeas. So voted. C. Milinazzo recognized the prior contributions of the appointment. Ms. Richards was present and addressed the Council.

4.6. Communication-Reappoint Jo-Ann Keegan to Board of Health.

In City Council, read, **Motion** to adopt by C. Mercier, seconded by C. Nuon. Adopted per Roll Call vote 9 yeas. So voted.

4.7. Communication - City Manager request Out of State Travel (3) LPD.

In City Council, read, **Motion** to adopt by C. Kennedy, seconded by C. Nuon. Adopted per Roll Call vote 9 yeas. So voted.

5. REPORTS (SUB/COMMITTEE, IF ANY)
5.1. Wire Insp. - National Grid/Verizon NE - Request permission to install stub pole at corner of West Jenness and Rexford Streets.

In City Council, read, **Motion** to adopt and accept the accompanying order by C. Kennedy, seconded by C. Mercier. So voted.

C. Leahy commented on Acre Neighborhood meeting.

6. PETITIONS
6.1. Claims - (5) Property Damage.

In Council, **Motion** to refer to Law Department for report and recommendation by C. Kennedy, seconded by C. Mercier. So voted.

6.2. Misc. - Stephen Malagodi request permission to address Council regarding support of immigrant families.

In City Council, **Motion** "To accept and place on file" and refer to Environmental SC by C. Kennedy, seconded by C. Nuon. So voted. Mr. Malagodi addressed the body.

6.3. Misc. - Guillermina Rivera request installation of (1) handicap parking sign at 28B Cork Street.

In Council, **Motion** to refer to Traffic Engineer for report and recommendation by C. Conway, seconded by C. Elliott. So voted.

7. CITY COUNCIL - MOTIONS
7.1. C. Mercier - Req. City Mgr. review and explore other parcels of land in the downtown that may be available for the extension of Lowell High School.

In City Council, seconded by C. Elliott, referred to City Manager. Adopted per Roll Call vote 5 yeas, 4 nays (C. Cirillo, C. Kennedy, C. Nuon, M. Samaras). So voted. C. Mercier commented on recent referendum and eminent domain and cited some examples of parcels in the City. C. Kennedy opposed motion as it would send a mixed message to MSBA and requested Roll Call on matter. C. Milinazzo supported motion as to fact gathering but noted he was fully in support of Option 3 (eminent domain) process. C. Elliott noted it was the MSBA request to explore all options. C. Nuon noted referendum was clear and that he would not support motion and supported Option 3. C. Cirillo stated referendum was clear and Option 3 has her support. C. Conway noted referendum and election noted Option 3 was supported but supports motion for information purposes. C. Leahy noted motion just request information and commented on changes that could affect Option 3 which would include installation of swimming pool at new school. M. Samaras relinquished Chair to Vice-Chair Nuon at 7:45 PM. M. Samaras noted opposition to motion as it does not send clear message to MSBA and that other land would be very difficult to identify, further indicating his support of Option 3. C. Mercier commented it was suggestion from MSBA to review all options and that is purpose of motion. C. Nuon returned Chair to M. Samaras at 7:52 PM.

7.2. C. Mercier - Req. City Council name the basketball court at the Butler/Shaughnessy School on Gorham Street in honor of Lawrence M. Cavanaugh, Sr.

In City Council, seconded by C. Leahy, referred to City Manager/Board of Parks. Adopted per Roll Call vote, 9 yeas. So voted. C. Mercier noted it was a request by the family and commented on the many accomplishments of Mr. Cavanaugh and further requested that it be referred to Board of Parks with a roll call. C. Elliott commented on the honoree. C. Nuon noted it was an appropriate request.

7.3. C. Conway - Req. City Mgr. meet with Supt. of Police, Supt. of Schools and other interested parties to re-establish the "Safety Task Force".

In City Council, seconded by C. Elliott, referred to City Manager. So voted. C. Conway noted should always be an attempt to better things and commented on task force formation and history. C. Nuon noted task force is a manner to share information. C. Elliott noted there should be a pro-active approach to safety measures. M. Samaras commented on history and success of task force.

7.4. C. Conway - Req. City Mgr. update the Council regarding the status of the "Crime Stoppers Hotline".

In City Council, seconded by C. Mercier, referred to City Manager. So voted. C. Conway commented on effectiveness of the hotline.

7.5. C. Nuon - Req. City Mgr. have City Solicitor meet in an Executive Session with Council to discuss all current or potential legal action to be taken against the City and any legal challenges anticipated by the administration against any entity.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Nuon noted the need to have clear picture of litigation in the City. Manager Murphy indicated that has been past practice and will continue.

7.6. C. Nuon - Req. City Council have appropriate subcommittee hold meeting to determine methods on how to best protect senior residents from being victims of fraud; said meeting should include interested entities such as Elderly Commission and the Massachusetts Attorney General Office.

In City Council, seconded by C. Conway, referred to City Manager. So voted. C. Nuon commented on established entities that protect a certain segment of society.

7.7. C. Kennedy - Req. City Mgr. consider installing water detection devices at strategic locations in all municipal buildings throughout the City.

In City Council, seconded by C. Cirillo, referred to City Manager. So voted. C. Kennedy noted the need and availability of this protective element. C. Kennedy informed Council that added funding may be available to restore Pollard Library through State channels.

7.8. C. Elliott - Req. City Mgr. and Building Department provide a report regarding all abandoned homes in the City.

In City Council, seconded by C. Mercier, referred to City Manager. So voted. C. Elliott commented it was a good opportunity to expand on the Attorney General's program and run concurrent one by the City. C. Kennedy requested inventory list of properties so they have a clear picture of what it entails. Manager Murphy noted he would provide list and engage Inspectional Services. C. Leahy noted burnt homes should be included as well. C. Elliott questioned if there was an ordinance to cover burnt buildings. Manager Murphy noted such an ordinance could be crafted to protect homeowner who is pro-active in resolving issue. C. Kennedy noted that property on Clark Road should be investigated. M. Samaras relinquished Chair to Vice-Chair Nuon at 8:21 PM.

7.9. M. Samaras - Req. City Council establish subcommittees to address any issues regarding senior citizens and non-profit organizations in the City.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. M. Samaras noted the important word done by subcommittees and one for seniors and non-profits would be most beneficial. C. Mercier noted that they are good areas to involve subcommittees.

8. ANNOUNCEMENTS

In City Council, C. Kennedy requested that parking rates be posted in garages as stated prior.

9. ADJOURNMENT

In City Council, **Motion** to Adjourn by C. Mercier, seconded by C. Cirillo. So voted.

Meeting adjourned at 8:30 PM.

_____

Michael Geary, City Clerk

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Lowell City Council
Regular Meeting Minutes

Michael Q. Geary
City Clerk

Date: **January 30, 2018**
Time: **6:30 PM**
Location: **City Council Chamber, 375 Merrimack Street, 2nd Floor, Lowell, MA**

1. ROLL CALL

Roll Call showed 9 present.

Mayor Samaras presiding.

C. Mercier requested moment of silence in darkened chamber for Louise Paquette and Karol J. Szafran.

2. MAYOR'S BUSINESS
2.1. Recognition - African Cultural Association's distinguished guest, Professor Plo Lumumba.

In City Council, **Motion** "To accept and place on file" by C. Kennedy, seconded by C. Cirillo. So voted. M. Samaras read biography of Professor Lumumba and presented Key to the City to him. Professor Lumumba addressed the body. C. Elliott noted that there would be a flag raising this week for the African community.

2.2. Recognition - Lowell Sustainability Council Green Award winners.

In City Council, **Motion** "To accept and place on file" by C. Milinazzo, seconded by C. Mercier. So voted. M. Samaras presented UMass-Lowell with the 2017 Green Design Award for the Pulichino Tong Business Center. Tom Dreyer accepted the award on behalf of the university and acknowledged his dedicated team. M. Samaras presented the Daley School Climate Change Club with the 2017 Community Leadership Award. Marisa Shea, teacher at school, introduced students in the club each of whom thanked the Council for the recognition.

3. CITY CLERK
3.1. Minutes Of City Council Meeting January 23rd, For Acceptance.

In City Council, minutes read, **Motion** "To accept and place on file" by C. Mercier, seconded by C. Nuon. So voted.

4. GENERAL PUBLIC HEARINGS
4.1. Order-Abandon Portion Of Newell Street. (Cont.)

In City Council, Given 2nd Reading, hearing continued from January 9th re-opened. Hearing held and closed. **Motion** to refer Clerk's Office for seven days and to City Manager for dispute resolution by C. Leahy, seconded by C. Elliott. So voted. Speaking in favor was Sarah Brown (DPD) and John Dowling. Speaking in opposition were Henry and Liz Tucker. C. Leahy questioned portion of abandonment as well as plowing. Manager Murphy noted that they could resolve plowing issues to move matter forward. C. Kennedy noted that only remaining issue is snow plowing.

5. COMMUNICATIONS FROM CITY MANAGER
5.1. Motion Responses:

In City Council, **Motion** "To accept and place on file" by C. Conway, seconded by C. Kennedy. So voted.

A) Deferred Maintenance Issues in All Municipal Buildings – **Motion** by C. Kennedy, seconded by C. Nuon to refer matter to Municipal Facilities SC. So voted. C. Cirillo noted the report. Conor Baldwin (CFO) outlined the expenses and funding for maintenance program. Manager Murphy commented on work being done to enhance preventive maintenance program. C. Elliott noted the need to stay on top of issues moving forward.

B) Pedestrian Crossing at School and Branch Streets – C. Leahy questioned if intersection was being redesigned. Manager Murphy noted that there were no redesign plans on property.

C) National Grid Tree Trimming – C. Nuon requested outline of the report. Tom Bellegarde (DPW) commented on the process and working with National Grid regarding tree trimming. Manager Murphy noted the pending retirement of Mr. Bellegarde. Each Councilor lauded the achievements and dedication of Mr. Bellegarde throughout the years. Mr. Bellegarde noted past and present City Councilors and Administrations recognizing their support and team work throughout his tenure.

D) 311 App – None.

E) Western Ave Studios Tax Assessments – **Motion** to refer to Finance SC by C. Milinazzo, seconded by C. Kennedy. So voted.

F) Stedman Street Sidewalk – None.

G) Traffic Signal at Intersection of Mammoth Road and 4th Ave – None.

H) East End Club Handicap Parking – C. Mercier confirmed that three spaces were in current 60 Day Trial Order. Nicolas Bosonetto (Traffic Engineer) noted that East End Club was provided the three spaces they requested. C. Mercier made reference to South Street request for signage. C. Leahy noted that parking issues with the Association for the Blind had been resolved.

I) Stop Sign at Intersection Havilah and Remington Streets – None.

J) Foch Street – C. Leahy requested updated list of streets to be accepted.

K) School Street and Laurel Street Traffic Signage – None.

L) Report of Abandoned Homes in the City – C. Elliott requested total number of abandoned homes in the City. C. Elliott commented on SWAT approach to identifying problem properties. Manager Murphy commented on the approach. C. Mercier commented on fire damaged properties in the City and that list should be upgraded as well. C. Elliott questioned why banks would not jump on a hot real estate market and transfer these properties. Manager Murphy noted that banks were not in the real estate business. Eric Slagle (Inspectional Services) commented on registration fees. C. Elliott noted that fees may be increased and that other communities should be polled to see how there fees are set.

M) Update on 29 Frothingham Street – C. Leahy questioned if property was a two or three-family. Manager noted that it was reverted to a two-family. C. Leahy noted the continued problem of number of vehicles on the street. C. Milinazzo questioned if assessment was for a three-family and was informed that it would be assessed in future as a two-family.

N) Plans to Revitalize Business Corridors – M. Samaras questioned the High Street corridor. Manager Murphy commented on the use of CBDG funds to help revitalize these areas.

5.2. Informational:
O) Inactive Voter List – **Motion** by C. Nuon, seconded by C. Milinazzo to refer to Ad Hoc Election Laws SC. So voted.

6. VOTES FROM THE CITY MANAGER
6.1. Vote-Appropriate $752,000 of Water Enterprise Fund Certified Retained Earnings.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Kennedy, seconded by C. Milinazzo. Adopted per Roll Call vote 9 yeas. So voted. C. Elliott requested information regarding vote. Mr. Baldwin outlined the vote and the purpose of the transfer. C. Milinazzo questioned if payments were going to interest or principal.

7. ORDERS FROM THE CITY MANAGER
7.1. Order-60 day trial (various).

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Kennedy, seconded by C. Mercier. Adopted per Roll Call vote 9 yeas. So voted.

8. ORDINANCES FROM THE CITY MANAGER
8.1. Ordinance-Amend C. 56 Personnel Ordinance.

In City Council, Given 1st Reading, **Motion** to refer to Public Hearing on February 13, 2018 at 7 PM by C. Elliott, seconded by C. Cirillo. So voted. C. Elliott questioned the purpose of the ordinance. Manager Murphy noted it was to protect employees of the City. C. Elliott questioned the need for coverage and requested more information be provided for the public hearing.

9. REPORTS (SUB/COMMITTEE, IF ANY)

None.

10. PETITIONS
10.1. Claims - (3) Property Damage.

In Council, **Motion** to refer to Law Department for report and recommendation by C. Mercier, seconded by C. Cirillo. So voted.

11. CITY COUNCIL - MOTIONS

11.1. C. Elliott - Req. City Mgr. apply for funding from Gateway Communities Program from the State for planting of trees program.

In City Council, seconded by C. Cirillo, referred to City Manager. So voted. C. Elliott noted the name was the Gateway Communities Program and it was important to quality of life in the City.

11.2. C. Elliott - Req. City Mgr. have proper department remove sign infrastructure at police garage on Middlesex Street.

In City Council, seconded by C. Mercier, referred to City Manager. So voted. C. Elliott noted the sign was an eyesore to the area.

11.3. C. Elliott - Req. City Mgr. initiate street/sidewalk/parking plan for Branch Street business corridor to coincide with Overpass construction.

In City Council, seconded by C. Conway, referred to City Manager. So voted. C. Elliott commented on the effectiveness of the business corridor.

11.4. C. Elliott/C. Leahy - Req. City Mgr. provide a report to the Finance SC regarding FY18 property valuation assessments; 3rd Quarter tax bills and abatement process; and budget impact on tax bills.

In City Council, no second needed, referred to City Manager. So voted. C. Elliott noted it was important to inform public and to have a discussion regarding impact on tax bills. C. Leahy noted the need to have an update on the process. C. Kennedy requested the Council be provided the information as well. Manager Murphy outlined abatement process to the public.

11.5. C. Leahy - Req. City Mgr. have DPD provide a report regarding the progress on finding a new location in the City for the Merrimack Valley Food Bank.

In City Council, seconded by C. Nuon, referred to City Manager. So voted. C. Leahy requested for report on any progress in finding new location.

11.6. C. Leahy - Req. City Mgr. work with Downtown Redevelopment SC to identify and enhance the types of businesses that DPD is attracting to the City.

In City Council, seconded by C. Nuon, referred to City Manager. So voted. C. Leahy noted the need to re-energize the efforts and to get an updated picture of the downtown as well as identifying the direction of the downtown.

11.7. C. Leahy - Req. City Mgr. work with DPD to establish and enhance marketing campaign for City of Lowell.

In City Council, seconded by C. Mercier, referred to City Manager. So voted. C. Leahy noted the importance to attract businesses and patrons to the City. C. Kennedy noted the need to make downtown a welcoming environment and as such requested report regarding cleaning and security measures in the parking garages. C. Elliott commented that there is no excuse for parking garages to be poorly cleaned and secured. C. Milinazzo commented on the security in the garages. C. Nuon noted it was an ongoing effort. C. Leahy noted that downtown is in good shape and that all efforts should be made to maintain that.

11.8. C. Mercier - Req. City Mgr. provide update regarding prior motion for Utopia Park including the status of it as well as the status of the Utopian Park Public Art Hydro Sculpture Project.

In City Council, seconded by C. Cirillo, referred to City Manager. So voted. C. Mercier provided overview of the park.

11.9. C. Milinazzo - Req. City Mgr. take all necessary steps to reinstate the Article 97 restrictions on the parks and open space land which had been removed during the Lowell High School/MSBA site selection process.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Milinazzo questioned how to unwind the restrictions removed from the property. C. Kennedy questioned the steps or legislation which must be used. Solicitor O'Connor commented on legislation being specific and also having a "sunset" clause in it and stated that a report would be provided.

11.10. C. Nuon - Req. City Mgr. provide a report regarding the scope of the project and parking proposal for the William Fidelity Investment dormitory project on Merrimack Street.

In City Council, seconded by C. Cirillo, referred to City Manager. So voted. Registered speaker, Patti Coffey (UML) addressed the body providing a statement from the University. C. Noun commented on the project in the Acre that would require Planning Board and Zoning Board of Appeal oversight and that there were some concerns on it.

C. Mercier commented on Planning Board oversight and her ability to oppose the proposal as a private citizen. Solicitor O'Connor acknowledged the right of a councilor to speak as an individual at meetings. C. Leahy noted project is not a good fit in the Acre. C. Cirillo noted neighborhood concerns.

11.11. C. Nuon - Req. City Mgr. provide a report regarding the status of the voting rights litigation against the City.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Nuon noted the importance of the issues and the public right to know. M. Samaras noted discussion should be had in Executive Session as it involves current litigation. C. Kennedy noted scheduled Executive Session.

11.12. C. Conway - Req. City Mgr. work with proper departments to ensure pedestrian safety and walk-ability at the intersection of Pawtucket Blvd. and the Rourke Bridge.

In City Council, seconded by C. Elliott, referred to City Manager. So voted. C. Conway noted residential concern and safety issue.

11.13. C. Kennedy/C. Cirillo - Req. City Mgr. meet with representatives from the OFO Bike Sharing Program and provide City Council with a report regarding the feasibility of establishing a bike sharing program in Lowell.

In City Council, no second needed, referred to City Manager. So voted. C. Kennedy noted the genesis of the motion and its tie into economic development. C. Kennedy noted Worcester's use of the program and outlined how it operated. C. Cirillo commented on the program and the company and further noted economic benefits that it could provide. C. Milinazzo noted Revere used similar program with much success. Manager Murphy noted he has communicated with the company and other similar ones and he would provide report to Council. Registered speakers, Geoffrey Koetsch and Lisa Arnold, addressed the Council.

12. CITY COUNCIL - EXECUTIVE SESSION

12.1. Executive Session - Update on matters of litigation public discussion of which could have a detrimental effect on the City's position.

In City Council, M. Samaras stated reason for Executive Session, **Motion** by C. Nuon, seconded by C. Kennedy to enter Executive Session for stated purpose (8:55 PM). Adopted per Roll Call vote, 9 yeas. So voted. M. Samaras stated that body would adjourn from the Executive Session.

13. ANNOUNCEMENTS

None.

14. ADJOURNMENT

In Executive Session, **Motion** to Adjourn by C. Mercier, seconded by C. Kennedy. So voted.

Meeting adjourned at 9:55 PM in Executive Session.

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Michael Geary, City Clerk

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Lowell City Council
Regular Meeting Minutes

Michael Q. Geary
City Clerk

Date: **February 6, 2018**
Time: **6:30 PM**
Location: **City Council Chamber, 375 Merrimack Street, 2nd Floor, Lowell, MA**

1. ROLL CALL

Roll Call showed 9 present.

Mayor Samaras presiding.

C. Leahy requested moment of silence in darkened chamber for Ronald "Stu" Mulligan.

2. CITY CLERK
2.1. Minutes of City Council Meeting January 30th, for acceptance.

In City Council, minutes read, **Motion** "To accept and place on file" by C. Mercier, seconded by C. Nuon. So voted.

3. COMMUNICATIONS FROM CITY MANAGER
3.1. Motion Responses.

In City Council, **Motion** "To accept and place on file" by C. Kennedy, seconded by C. Conway. So voted.

A) Pedestrian Safety at Intersection of Pawtucket Blvd. and Rourke Bridge – C. Conway noted report and the increase of safety in that area.

B) Utopian Park Hydro Sculpture – C. Mercier noted matter had been referred to Parks & Recreation SC for further review and further information.

C) Merrimack Valley Food Bank – C. Leahy questioned location of the building and if Tanner Street was a possible fit. Andrew Shapiro (DPD) commented on the challenges with the location and logistics of the building. Maria Dickinson (DPD) noted the challenge with Tanner Street is possible contamination and would not be a long term fit. C. Elliott noted the need to keep business in Lowell. Mr. Shapiro commented on Co-Star software that tracks inventory of properties in the City, including City owned ones.

C. Elliott recognized efforts of the department. C. Mercier noted the number of calls for property in the City and noted Ramalho's Gym was seeking a new location.

D) Enhance Types of Businesses Attracted to the City – Registered speaker, Steven Malagodi, addressed the Council. C. Leahy noted that the Downtown Redevelopment SC would be addressing the matter with interested parties. C. Milinazzo noted that subcommittee was proper forum. C. Mercier questioned if there were a downtown coordinator. Mr. Shapiro noted it was done as a team effort. C. Mercier noted the need to have constant relationship with business owners in the City. C. Kennedy noted the need to address vacancies on the second and third stories of buildings downtown. Manager Murphy noted issues with those floors are often sprinkler systems and elevators. C. Kennedy requested report on the status of those vacancies.

E) Traffic Control at Howe Bridge – C. Mercier questioned the partnership with the UML police force. Superintendent Taylor (LPD) outlined the partnership and the responsibilities of each department. Supt. Taylor commented on the issues at this intersection in terms of blocking and pedestrian safety. C. Leahy noted that the University should explore the hiring of crossing guards to ensure student safety.

3.2. Informational

F) Ameresco Contract Scope and Savings – **Motion** by C. Milinazzo, seconded by C. Mercier to refer matter to Finance SC. So voted. C. Elliott noted subcommittee should review the savings. Kathleen Moses (DPD) commented on rate changes and how they are built into savings projections. **Motion** by C. Cirillo, seconded by C. Kennedy to develop maintenance program to ensure further energy savings. On motion, C. Elliott wanted to be informed of costs associated with the request. M. Kennedy offered friendly amendment to motion to refer to Manager for a cost analysis report. No objections so voted as amended.

3.3. Communication-Appoint Lisa Patenaude to Animal Advisory Committee as Resident Dog Owner.

In City Council, read, **Motion** to adopt by C. Mercier, seconded by C. Leahy. Adopted per Roll Call vote 9 yeas. So voted. Ms. Patenaude was present and thanked Council.

3.4. Communication-Reappoint Dr. William J. Galvin III to Board of Health.

In City Council, read, **Motion** to adopt by C. Elliott, seconded by C. Cirillo. Adopted per Roll Call vote 9 yeas. So voted.

4. VOTES FROM THE CITY MANAGER

4.1. Vote-Auth CM and or Board of Trustees of LMA proceed under MGL c.30 for Mgmt Svcs-5 yr term w an option for an additional 3 yr ext.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Kennedy, seconded by C. Elliott. Adopted per Roll Call vote 9 yeas. So voted. C. Elliott requested copy of the RFP in order to understand the scope of the contract. C. Mercier requested explanation of the vote. Manager Murphy outlined the vote and how it is structured to attempt to bring more acts to the venue. C. Nuon noted the importance of increased bookings at the venue. Conor Baldwin (CFO) commented on the RFP language concerning increased bookings and maintenance of the facility. C. Kennedy requested time line for selection of the management team. C. Milinazzo commented on the lease with the theatre group. Manager Murphy noted he would furnish report to body. C. Elliott noted that there has been operating deficits associated with the building. Mr. Baldwin commented on spending done at the site. Manager Murphy noted the use of grant money to assist in the maintenance of the building. C. Kennedy noted a common complaint is that there are not enough shows booked.

4.2. Vote-Auth CM and or Treasurer proceed under MGL 30B for Banking Services-5 year term.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Milinazzo, seconded by C. Nuon. Adopted per Roll Call vote 9 yeas. So voted. C. Milinazzo questioned the use of procurement committee in the City. Mr. Baldwin outlined process for procurement in the City noting certification of employees for that purpose. C. Milinazzo questioned if there was an employee of the City who was certified in construction regarding procurement of contracts.

4.3. Vote-Transfer 5,000 to fund building inspector overtime.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Mercier, seconded by C. Cirillo. Adopted per Roll Call vote 9 yeas. So voted.

5. REPORTS (SUB/COMMITTEE, IF ANY)

None.

6. PETITIONS

6.1. Claims - (2) Property Damage.

In Council, **Motion** to refer to Law Department for report and recommendation by C. Kennedy, seconded by C. Nuon. So voted.

6.2. Misc. - National Grid request City Council grant easement on Franklin Street for electric distribution construction.

In Council, **Motion** to refer to Law Department for report and recommendation by C. Kennedy, seconded by C. Conway. So voted.

6.3. Misc. - Carol LaMarche request installation of (1) handicap parking sign at 16 Methuen Street.

In Council, **Motion** to refer to Traffic Engineer for report and recommendation by C. Kennedy, seconded by C. Cirillo. So voted.

6.4. Misc. - Diane Allen request installation of (1) handicap parking sign in front of 14 Mt. Washington Street.

In Council, **Motion** to refer to Traffic Engineer for report and recommendation by C. Kennedy, seconded by C. Nuon. So voted.

7. CITY COUNCIL - MOTIONS

7.1. C. Mercier - Req. City Council support naming the Parks Department building on Stedman Street in honor of Thomas R. Bellegarde for his many years of service.

In City Council, seconded by C. Nuon, referred to City Manager. Adopted per Roll Call vote, 9 yeas. So voted. C. Mercier commented about the accomplishments and dedication of Mr. Bellegarde.

7.2. C. Conway - Req. City Council create subcommittee on Municipal Health Insurance.

In City Council, seconded by C. Leahy, referred to City Manager/City Solicitor. Substitute **Motion** adopted per Roll Call vote, 9 yeas. So voted. C. Conway noted the need to provide information to employees on an important issue. M. Samaras relinquished Chair to Vice-Chair Nuon at 7:28 PM. C. Milinazzo noted that issue should be before Finance SC. **Substitute Motion** by M. Samaras, seconded by C. Milinazzo to refer matter to City Manager and City Solicitor for review in light of Plan E Charter. On substitute motion, C. Elliott noted it made sense to review and to provide information. C. Kennedy requested information from the City Solicitor. Solicitor

O'Connor noted she would conference with maker of motion and fashion a response. Vice-Chair Nuon returned Chair to M. Samaras at 7:35 PM.

7.3. C. Cirillo - Req. City Mgr. provide a report regarding cost analysis of recycling pick-up every week comparing it to current cost pick-up of every other week; in addition provide possible options for residents that bins overflow i.e. a second bin for people who request it.

In City Council, seconded by C. Nuon, referred to City Manager. So voted. Registered speaker, Peter Martin, addressed the Council. C. Cirillo outlined motion noting dedication to recycling. C. Elliott requested information on costs associated with proposal. Manager Murphy outlined the recycling system in the City. C. Leahy commented on contract and noted that a second drop-off location is needed in the City. C. Kennedy noted that some changes could be made to current procedures. C. Mercier noted report would be helpful in making decisions.

7.4. C. Cirillo - Req. City Mgr. provide a report regarding Lowell Memorial Auditorium; said report to include updates on proposals for a management company due February 22nd, money allotted in budget for use and upgrades including larger loading dock doors and restrooms, and efforts being made to increase its use.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Cirillo noted the interest and prior discussion regarding the auditorium and that there is an increased need to attract superior acts to the venue.

7.5. C. Leahy - Req. City Mgr. provide update regarding latest meeting with the Massachusetts School Building Authority.

In City Council, seconded by C. Mercier, referred to City Manager. So voted. C. Leahy requested information to clarify the meeting and to outline path moving forward. C. Kennedy noted that the media misrepresented the context of the meeting and outlined his perspective of it indicating a working meeting which touched on many issues. C. Milinazzo noted his frustration with the administration regarding this project and was not supportive of the administration and their approach. C. Elliott indicated that prior remarks were out of order and that the blame game will not get results. C. Elliott noted that it is the MSBA process and that needs to be followed so that a new high school becomes a reality. C. Mercier noted the delays and how they were caused throughout the process. C. Kennedy questioned why options were presented during that meeting. Manager Murphy noted that options were provide as per request. M. Samaras relinquished Chair to Vice-Chair Nuon at 8:00 PM. C. Kennedy commented on revised

plans and money needed to be spent moving forward at this phase. C. Conway noted media clouded the issue and that there is a clear indication that Option 3 is going to be used. C. Conway questioned status of the School Building Committee and their schedule. Manager Murphy noted schedule and notice of the meetings. M. Samaras noted that the editorial in the local paper was not accurate and in addition voiced his displeasure with Perkins/Eastman and Skanska work on the project. M. Samaras note the need to have resolution with those vendors. C. Leahy noted the need to identify path ahead in terms of all issues including pool and fieldhouse and that our consultants need better leadership. C. Leahy noted that during further negotiations with Perkins/Eastman and Skanska they would need to own their part of the delays in the project. C. Cirillo noted that consultants should have the team covering the project that was part of the original contract. Michael McGovern (Asst. City Manager) noted the team has not changed and indicated that they have been on other projects while this one was idle. C. Elliott noted Option 3 included a pool and that they were behind because option was changed. C. Kennedy noted that meetings should be held a night to ensure full opportunity for attendance. C. Kennedy noted that costs should be limited if all they are doing is eliminating the pool from Option 3. C. Milinazzo commented on pool and field house issues and that there was no need to start the whole process over. M. Samaras commented on issues with consultants' ability to convey information to the public and that they are the experts on this project. C. Cirillo questioned membership on the School Building Committee. Manager Murphy noted how membership was developed. Vice-Chair Nuon returned Chair to M. Samaras at 8:32 PM.

7.6. C. Conway - Req. City Mgr. work with DCR to install appropriate signage at the entrance to Trotting Park Road directing forest vistitors to the parking area.

In City Council, seconded by C. Leahy, referred to City Manager. So voted. C. Conway noted motion was evident.

8. ANNOUNCEMENTS

In City Council, C. Kennedy requested suspension of rules to place motion on floor. No objections. **Motion** by C. Kennedy, seconded by C. Elliott to request Educational Partnerships SC explore Lowell be designated as a global learning City. So voted.
In City Council, C. Mercier provided treasurer's report on the Friends of the Council on Aging Committee outlining the work they have done to ease costs in that department.
In City Council, C. Leahy recognized Mr. George Duncan and the Enterprise Bank on their 30th Year Anniversary. Manager Murphy noted he would send formal recognition.

9. ADJOURNMENT

In City Council, **Motion** to Adjourn by C. Kennedy, seconded by C. Nuon. So voted.

Meeting adjourned at 8:45 PM.

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Michael Geary, City Clerk

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Lowell City Council
Regular Meeting Minutes

Michael Q. Geary
City Clerk

Date: **February 27, 2018**
Time: **6:30 PM**
Location: **City Council Chamber, 375 Merrimack Street, 2nd Floor, Lowell, MA**

1. ROLL CALL

Roll Call showed 8 present, 1 absent (C. Conway).

M. Samaras presiding.

C. Mercier requested moment of silence in darkened chamber for Rita Burke and Atty. James Flood.

M. Samaras requested that Item #2.2 be taken out of order with no objections. So voted.

M. Samaras recognized Women's Week.

2. MAYOR'S BUSINESS
2.1. Discussion - Process and Procedure for selection of City Manager.

In City Council, M. Samaras opened the discussion regarding the process. Mary Callery (HR Director) outlined the prior procedure for selection of City Manager. **Motion** to proceed in the same manner as prior selection by C. Kennedy, seconded by C. Cirillo. C. Kennedy noted that there could possibly be less advertising for the position but process should be followed. Amended **Motion** by C. Mercier, seconded by C. Leahy to post only in-house and offer position to interested party to be interviewed. Defeated per Roll Call vote, 2 yeas, 6 nays (C. Cirillo, C. Elliott, C. Kennedy, C. Milinazzo, C. Nuon, M. Samaras), 1 absent (C. Conway). So voted. On amended motion C. Mercier noted that it was not proper or fair to proceed with a full process when it is apparent that there is a person who will fill the positon. C. Cirillo noted that there is a need for a process. C. Leahy noted that interested parties would be a good fit for the position and that the need does not exist for an exhaustive search. C. Milinazzo noted support of motion and questioned if there was a legal impediment to such a selection. C. Nuon noted preference for an open process noting there may be

additional candidates suited for the position. C. Kennedy noted if there are to be interviews there must be candidates that would only come through posting the position and that would be a fair and complete process. C. Elliott noted the need for the process and prior process was fair and that it should be done in a timely manner. C. Mercier noted that a candidate seems to assured of the position so resources should not be done in furtherance of filling that position. C. Cirillo noted that each applicant would be given equal measure. C. Milinazzo noted the need for a fair process. Substitute **Motion** by C. Kennedy, seconded by C. Cirillo to post position until March 14, 2018 on City website and Mass Municipal Association website; resumes sent to Council out of which top 3 selections will be sent to Ms. Callery by March 20, 2018; interviews scheduled by Ms. Callery for the week of March 25, 2018. Adopted per Roll Call vote 7 yeas, 1 nay (C. Mercier), 1 absent (C. Conway). So voted.

2.2. Recognition - Lowell High School 2018 Boys Track Team.

In City Council, C. Elliott recognized the team for their State Championship and other noted accomplishments. Coach Ouellette and other senior team members commented on the accomplishments and the support that they have received.

3. CITY CLERK

3.1. Minutes of Parks & Recreation SC February 13th; City Council Meeting February 13th, For Acceptance.

In City Council, minutes read, **Motion** "To accept and place on file" by C. Kennedy, seconded by C. Milinazzo. So voted.

4. COMMUNICATIONS FROM CITY MANAGER

4.1. Motion Responses.

In City Council, **Motion** "To accept and place on file" by C. Elliott, seconded by C. Mercier. So voted.

A) Class Action Suit Regarding Opioids – C. Elliott requested item be delayed one week as the law firm which will be representing the City would be present.

4.2. Informational

B) Downtown Business Meeting – Manager Murphy noted that a meeting was scheduled for March 5th at Enterprise Bank. C. Milinazzo noted that the Downtown Redevelopment SC would meet sometime after that meeting.

C) NIBRS Five Year Comparison – Manager Murphy noted the favorable statistics with

the crime rate. Supt. Taylor (LPD) commented on the report and the progress that has been made over the past five years. Supt. Taylor commented on the recent shootings in the City. C. Elliott questioned the status of gun buy-back programs. Supt. Taylor noted the success of the program in getting guns off the street. C. Leahy questioned Lowell High School safety awareness and protection of students. Supt. Taylor outlined current active shooter program. C. Noun commented on recent shootings. M. Samaras noted that the stats show progress and that mental health issues need to be addressed as well. Supt. Taylor noted that grant money would be sought after to assist with mental health issues and its relationship with crime.

4.3. Communication-Accept Resignation of Zachary Ware from Sustainability Council.

In City Council, **Motion** "To accept and place on file" by C. Mercier, seconded by C. Nuon. So voted.

4.4. Communication-Reappoint George Villaras to Historic Board.

In City Council, read, **Motion** to adopt by C. Kennedy, seconded by C. Cirillo. Adopted per Roll Call vote 8 yeas, 1 absent (C. Conway). So voted.

4.5. Communication - City Manager request Out of State Travel (4) LPD.

In City Council, read, **Motion** to adopt by C. Mercier, seconded by C. Cirillo. Adopted per Roll Call vote 8 yeas, 1 absent (C. Conway). So voted.

5. REPORTS (SUB/COMMITTEE, IF ANY)
5.1. Educational Partnerships SC February 27, 2018.

In City Council, C. Kennedy provided report regarding designating Lowell as global learning city. C. Kennedy noted process would be beginning with a learning festival in the City in April. **Motion** to accept the report as a report of progress and to refer to City Manager for organization of the festival by C. Kennedy, seconded by C. Cirillo. So voted.

C. Leahy requested suspension of rules to take Item #7.7 out of order and to allow speakers on the matter. No objections. So voted.

6. PETITIONS
6.1. Claims - (2) Property Damage.

In Council, **Motion** to refer to Law Department for report and recommendation by C. Nuon, seconded by C. Mercier. So voted. C. Mercier noted claims came out of condition of Swan Street which should have been addressed earlier. Manager Murphy commented he would supply Council with plans for accepted streets.

6.2. Misc. - Colonial Gas d/b/a National Grid request license for storage of flammables (19,600 gals. 50/50 water/glycol Cl. IIIB; AST) at 333 School Street.

In City Council, Given 1st Reading, **Motion** to refer to Public Hearing on March 13, 2018 at 7 PM by C. Mercier, seconded by C. Nuon. So voted.

6.3. National Grid - Request installation of heavy duty handhole and electric conduit in front of 43 Market Street.

In City Council, Given 1st Reading, **Motion** to refer to Public Hearing on March 20, 2018 at 7 PM by C. Nuon, seconded by C. Cirillo. So voted.

7. CITY COUNCIL - MOTIONS

7.1. C. Cirillo - Req. City Mgr. explore feasibility of implementing "Paws to Read" program at the Pollard Memorial Library.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Cirillo outlined the program that is used throughout the Country and that does not exist in Massachusetts.

7.2. C. Cirillo - Req. City Mgr. provide a report regarding road and sidewalk upgrades in Acre; in and around Mt. Washington St., Merrimack St. (Sizzling Kitchen) and Market St.

In City Council, seconded by C. Nuon, referred to City Manager. So voted. C. Cirillo noted motion originated from Acre Neighborhood meeting. C. Leahy commented on work being done on sidewalks in the City.

7.3. C. Cirillo - Req. City Mgr. provide a report regarding Spring cleaning procedures throughout the City.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Cirillo requested procedures and noted that businesses should be involved with clean-up as well.

7.4. C. Elliott - Req. City Mgr. provide a status report regarding inspection of multi-family units per City ordinance.

In City Council, seconded by C. Nuon, referred to City Manager. So voted. C. Elliott requested update of the process and that appears to be going well and that it is important to keep housing stock in good condition.

7.5. C. Kennedy - Req. City Mgr. instruct Perkins Eastman include an active shooter detection system (similar to Methuen High School system) as part of the plans for the new high school and recommend that the Superintendent of Schools consider similar systems for other schools within the City.

In City Council, seconded by C. Mercier, referred to City Manager. So voted. C. Kennedy noted need for safety and the sign of the times and that there should be an exploration of the costs and best system. C. Kennedy noted it should be explored district wide and that the MSBA may be able to reimburse. C. Mercier commented on the system in Methuen noting it was costly and that other safety measures should be examined as well. C. Cirillo noted expenses should not hinder safety. C. Elliott noted the need to take measures and questioned current status of Safety Task Force.

7.6. C. Kennedy - Req. City Mgr. instruct the Law Department to begin procedures and preparation necessary for the eminent domain taking of 75 Arcand Drive.

In City Council, seconded by C. Cirillo, **Motion** to delay for one week by C. Kennedy, seconded by C. Cirillo. So voted. C. Kennedy noted the need to layout process so that City may be prepared before next MSBA meeting in June. C. Mercier questioned costs and the need to know before any votes are taken. C. Milinazzo noted that motion address the need to know the costs before vote. C. Elliott requested more information via a report for cleared instructions and suggested a friendly amendment to the motion. C. Kennedy noted motion was satisfactory as to such information. Manager Murphy indicated a report is forthcoming from Law Department. C. Kennedy noted that such a report would be furnished quickly and noted he was in favor of delaying matter for one week.

7.7. C. Leahy - Req. City Mgr. place Duren Avenue on paving list for 2018.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Leahy noted need for repairs. Residents of the street spoke on matter and provided pictures and petition for the Council. C. Elliott noted ability to increase funding for repairs pursuant to “Complete Streets Program”. Manager Murphy noted program does

help with such funding and that street would be added to paving lists. C. Kennedy requested complete paving lists for review.

7.8. C. Leahy - Req. Neighborhoods SC begin discussion regarding residential parking program throughout the City.

In City Council, seconded by C. Cirillo, referred to Neighborhoods SC. So voted. C. Leahy noted issue needs updated discussion.

8. ANNOUNCEMENTS

In City Council, Manager Murphy noted that the Pollard Memorial Library would open on February 28th; that the VFW Highway would be closed for repairs; and Thorndike Street work would be done at night to ease congestion.

9. ADJOURNMENT

In City Council, **Motion** to Adjourn by C. Mercier, seconded by C. Cirillo. So voted.

Meeting adjourned at 8:11 PM.

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Michael Geary, City Clerk

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Lowell City Council
Regular Meeting Minutes

Michael Q. Geary
City Clerk

Date: **March 6, 2018**
Time: **6:30 PM**
Location: **City Council Chamber, 375 Merrimack Street, 2nd Floor, Lowell, MA**

1. ROLL CALL

Roll Call showed 9 present.

M. Samaras presiding.

2. CITY CLERK
2.1. Minutes Of Education Partnerships SC February 27th; City Council Meeting February 27th, For Acceptance.

In City Council, minutes read, **Motion** "To accept and place on file" by C. Cirillo, seconded by C. Elliott. So voted.

3. UNFINISHED BUSINESS
3.1. C. Kennedy - Req. City Mgr. instruct the Law Department to begin procedures and preparation necessary for the eminent domain taking of 75 Arcand Drive.

In City Council, seconded by C. Conway, referred to City Manager. Adopted per Roll Call vote 8 yeas, 1 nay (C. Mercier). So voted. C. Kennedy noted report provided and that matter was first taken up one week prior. C. Elliott noted the need for the report to fully understand the process and that it cleared up many matters. C. Nuon noted the report provided information and that is was very detailed. C. Mercier noted she would not support the process but information including estimated costs for relocation should be made available.

4. COMMUNICATIONS FROM CITY MANAGER
4.1. Motion Responses.

In City Council, **Motion** "To accept and place on file" by C. Mercier, seconded by C. Nuon. So voted.

A) Lowell Memorial Auditorium – C. Cirillo noted report and requested an update. Conor Baldwin (CFO) outlined the report along with future funding on the facility. Manager Murphy commented on language of the RFP to include ability to attract more and larger acts. C. Elliott noted the different approach in selection of a management company. Mr. Baldwin commented on striving to attract more to the venue. C. Conway questioned members of the review committee. Manager Murphy noted it was being developed and welcomed suggestions. C. Kennedy noted individuals who have been involved with the operations of the facility. C. Leahy commented on allocation of risk with the management contract. Manager Murphy noted the importance of having a financially stable management company in place.

B) Lowell Car Wash – C. Mercier noted the progress being made and the involvement of the owners.

C) Union Lowell, LLC Private Dormitory – Registered speaker, Armand Hebert, addressed the body. C. Nuon noted the report adding that the Planning Board is a separate entity and independent and the decision was based on parking issues for the project. C. Mercier noted that unions were welcomed on the job but the project was not a good fit in that neighborhood as it did not fit many zoning requirements. C. Mercier noted that many development conditions would be placed on any projects of this nature.

D) Timeline for the Eminent Domain Process - Registered speaker, Armand Hebert, addressed the body. M. Samaras questioned veracity of the statements from the speaker. C. Kennedy commented on prior vote and the report provided.

E) Spring Cleaning Procedures – C. Cirillo noted report and requested update. Jim Troup (DPW) outlined the cleaning procedures and the schedule. C. Kennedy commented on efforts of outside groups in assisting with cleanup. Mr. Troup noted there would be contact with these groups.

F) Cost Analysis Recycling – C. Cirillo commented on the report. Gunther Wellenstein (Recycling Dir.) noted the process for extra items to be recycled. Manager Murphy noted that an audit would help educate public regarding suitable items to be recycled. C. Mercier commented on the costs involved with recycling. C. Elliott noted need to establish a drop area downtown. Mr. Wellenstein noted challenges with downtown drop area. C. Leahy commented on added site along with costs associated with same. Mr. Wellenstein noted challenges and how information is dispersed to the public.

G) Greening Communities Program – C. Elliott noted the response and the availability of free money. C. Mercier commented on prior cutting and replacement program.

Yovani Baez-Rose (DPD) commented on tree removal in the City. C. Conway questioned costs for removing trees and if there were a maintenance plan to keep trees healthy. Manager noted he would provide such information. C. Leahy commented on tree removal and replacement especially along Merrimack Street.

H) Meters for Homeless – C. Cirillo recognized the complexities of the program. Manager Murphy laid out legal challenges of the program.

4.2. Communication-Appoint Nathan Freehling to Veterans Commission.

In City Council, read, **Motion** to adopt by C. Elliott, seconded by C. Nuon. Adopted per Roll Call vote 8 yeas, I absent (C. Conway). So voted. Mr. Freehling was present and thanked the Council.

5. VOTES FROM THE CITY MANAGER

5.1. Vote-Apply, Accept, Expend Grant from Mass. Div. of Energy Resources Green Communities Div. for 250,000.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Cirillo, seconded by C. Mercier. Adopted per Roll Call vote 8 yeas, 1 absent (C. Conway). So voted. C. Mercier commented on the deadline and the fact that the City did not have to match the grant. Katherine Moses (DPD) outlined the vote, the application process and the use of the money.

5.2. Vote-Auth. Mgr. Ex. License Agreement with Top Donut 2018-2021.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Mercier, seconded by C. Leahy. Adopted per Roll Call vote 9 yeas. So voted. C. Leahy questioned the number of spaces leased. Manager Murphy noted it was extending and existing lease with no added spaces and the City would have the ability to end lease at any time.

5.3. Vote-Authorize Mgr. Ex. Temporary License Agreement with Mark Van Der Hyde for a public art project.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Cirillo, seconded by C. Elliott. Adopted per Roll Call vote 9 yeas. So voted. C. Cirillo commented on the work of the artist. C. Elliott noted the artist as well. Mr. Van Der Hyde was present and thanked the Council.

5.4. Vote-Transfer 15,000 to fund appraisals for 75 Arcand Drive.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Kennedy, seconded by C. Conway. Adopted per Roll Call vote 9 yeas. So voted. M. Samaras requested information on the process. Manager Murphy outlined procedure for soliciting quotes and that they would be open to all vendors.

5.5. Vote-Transfer 36,000 to fund appraisals for Rt. 38 widening project.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Elliott, seconded by C. Kennedy. Adopted per Roll Call vote 9 yeas. So voted.

5.6. Vote-Transfer 54,000 for additional expenses at Lowell Police Dept.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Conway, seconded by C. Nuon. Adopted per Roll Call vote 9 yeas. So voted. C. Elliott questioned reasons for the transfer. Mr. Baldwin noted the items that were needed in the department.

6. ORDERS FROM THE CITY MANAGER
6.1. Order-60 day trial (various).

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Conway, seconded by C. Milinazzo. Adopted per Roll Call vote 9 yeas. So voted.

6.2. Bond Sale Premium Application Order.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Kennedy, seconded by C. Elliott. Adopted per Roll Call vote 9 yeas. So voted.

7. ORDINANCES FROM THE CITY MANAGER
7.1. Ordinance-Create one new grant position Resource Room Navigator and establish salary in the Career Center of Lowell.

In City Council, Given 1st Reading, **Motion** to refer to Public Hearing on March 20, 2018 at 7 PM by C. Conway, seconded by C. Kennedy. So voted.

7.2. Ordinance-Create one Systems and Project Specialist position and establish salary in the Police Dept.

In City Council, Given 1st Reading, **Motion** to refer to Public Hearing on March 20, 2018 at 7 PM by C. Nuon, seconded by C. Cirillo. So voted. C. Elliott questioned proposed

position. Manager Murphy noted that move would be additional police officer on the street. Mr. Baldwin noted it would be included in next year's budget.

8. REPORTS (SUB/COMMITTEE, IF ANY)
8.1. Neighborhoods SC March 6, 2018.

In City Council, C. Cirillo provided report noting the attendance and the discussion with neighborhood leaders, parking programs and rooming houses in the City. C. Leahy noted the use of City lots for parking in the Back Central neighborhood. C. Leahy commented on strengthening the rooming house ordinance. David Koch, representative of Back Central Neighborhood Group addressed the body. **Motion** to accept the report as a report of progress by C. Kennedy, seconded by C. Mercier. So voted.

9. PETITIONS
9.1. Claims - (4) Property Damage.

In Council, **Motion** to refer to Law Department for report and recommendation by C. Mercier, seconded by C. Cirillo. So voted.

9.2. Misc. - CH LH CrossPoint Owners, LLC request license for additional storage of flammables (7,500 gals. AST Fuel Oil #2/Diesel II) at 900 Chelmsford Street.

In City Council, Given 1st Reading, **Motion** to refer to Public Hearing on March 20, 2018 at 7 PM by C. Nuon, seconded by C. Milinazzo. So voted.

10. CITY COUNCIL - MOTIONS
10.1. C. Cirillo - Req. City Mgr. Distribute To All Condominium Associations Multiple Copies Of The Parking Rates To Be Given To Residents Who Pay For Garage Parking. This Is So Each Individual Residence Will Be Given A Copy To Make It Clear To Them What Rate/Senior Discount Rate They Are Responsible For. Also, Direct The Parking Director To Post The Rates Each Parking Garage In A Very Easily Accessible Viewing Area.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Cirillo noted the need to provide the information. C. Kennedy commented on sending notices out with other City forms. Manager Murphy noted each listed user of the garages will receive the rates as well.

M. Samaras requested Items #10.6 and 10.12 be taken out of order as they pertain to similar issue. No objections. So voted.

10.2. C. Cirillo - Req. City Mgr. Provide A Report For Budgeted Cost And Implementation Regarding These Options For Bicycle Safety: 1. Painting And Upkeep Of Bicycle Lanes Throughout The City. 2. Bike Lanes Being Segregated By A Barrier For Added Safety.

In City Council, seconded by C. Kennedy, referred to City Manager. Adopted per Roll Call vote 8 yeas, 1 nay (C. Mercier). So voted. Registered speakers, Mindy Dopler Nelson and Kevin Soleil (per letter read into record by Charles Arnold), addressed the Council. C. Cirillo noted the remarks of the speakers and the need for safety precautions. C. Mercier noted the need to stripe but was not in favor of barriers throughout the City and requested Roll Call on matter. C. Kennedy noted that there are different types of barriers that could be used. C. Elliott noted it was only a request for information.

10.3. C. Cirillo - Req. City Mgr. Provide A Report Updating The City Council Regarding The Lowell Complete Streets Policy Enacted on August 11, 2015 And What Goals For Travel Mode Distribution, i.e. Bicycle Routes, Have Been Developed And/Or Achieved In Accordance With The Policy Within The Stated Incremental Five Year Time Period Which Will End On August 11, 2020.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. Registered speaker, Mindy Dopler Nelson, addressed the Council. C. Cirillo noted the need for such a report.

10.4. C. Elliott - Req. City Mgr. appoint a public safety personnel/security professional to the School Building Committee to ensure safety issues are addressed at high school.

In City Council, seconded by C. Mercier, referred to City Manager. So voted. C. Elliott C. Elliott noted need to be diligent regarding security at the high school. C. Leahy questioned inner working of the School Building Committee.

10.5. C. Elliott/C. Nuon - Req. Board of Parks consider re-naming Clemente Park to Palin Park and ensure stone is re-located to the new Roberto Clemente Field at Komanzelis Park.

In City Council, C. Elliott withdrew the motion with no objections.

10.6. C. Mercier - Req. City Mgr. have proper department post parking garage fees; especially for seniors (62 and up) monthly rate of $26; and in addition if

there are remaining excise tax bills to be delivered include said rate list in the billing envelope.

In City Council, seconded by C. Leahy, referred to City Manager. So voted. C. Mercier noted the need to get information posted, including the rates for the elderly. C. Kennedy noted posting should be in a highly visible public place. C. Elliott questioned parking during snow emergency.

10.7. C. Mercier - Req. City Mgr. provide an update regarding the need for a supervisor for the CO-OP Team.

In City Council, seconded by C. Nuon, referred to City Manager. So voted. C. Mercier commented on the team and the effort put forth to combat the issues. Manager Murphy noted ordinance would be drafted to create the position.

10.8. C. Nuon - Req. City Mgr. have DPD organize a business group representing entities along the Branch and Middlesex Street business corridors.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Nuon noted it was Branch Street and that need to organize is critical. C. Leahy noted that City would be assisting with organization and would not be running the group. C. Kennedy noted the City could help to organize and let them run it themselves. C. Elliott noted need for business leaders to gather.

10.9. C. Nuon - Req. City Mgr. have Elections Department and any other department work with UML and the Lowell Plan regarding developing a plan to increase civic engagement in the City.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Nuon noted that civic engagement is important and that it goes beyond voting. Registered speaker, Mary Turaff, addressed the Council.

10.10. C. Nuon - Req. City Mgr. have LPD provide a report regarding any incidents occurring at the Edge Dormitory Project.

In City Council, seconded by C. Kennedy, referred to City Manager. Adopted per Roll Call vote, 8 yeas, 1 nay (C. Leahy). So voted. C. Nuon requested report since the facility opened. C. Leahy questioned the reasoning behind the motion and could not support it. C. Nuon noted the need for information on a private dormitory. C. Kennedy noted the need to see if there are concerns. C. Conway questioned if request was prudent. City Solicitor O'Connor noted there would be no legal issue with the request.

C. Elliott questioned if issues exist. C. Kennedy noted the request is to see if information exist.

10.11. C. Nuon - Req. City Mgr. have proper department improve sidewalk conditions along the Branch and Middlesex Street business corridors.

In City Council, seconded by C. Cirillo, referred to City Manager. So voted. C. Nuon noted the need for accessibility in a business corridor.

10.12. M. Samaras - Req. City Mgr. instruct the proper department make all city parking garage rates (including any senior or other applicable discounts) readily available to constituents in both digital and printed formats that can be shared.

In City Council, seconded by C. Mercier, referred to City Manager. So voted. M. Samaras noted motion has been addressed.

11. CITY COUNCIL - EXECUTIVE SESSION
11.1. Executive Session - Hear a complaint pursuant to Exemption (a)(1).

In City Council, M. Samaras stated the need for the session no longer is needed and withdrew matter from agenda. No objection. M. Samaras stated that an Ad Hoc Subcommittee would be established to review our current rules regarding the order and decorum of City Council meetings. C. Mercier offered thanks for altered seating.

12. ANNOUNCEMENTS

In City Council, C. Mercier noted recent meeting of business leaders in downtown at Enterprise Bank and commented on the positive results. C. Leahy questioned when information would be forthcoming regarding St. Patrick Day events.

13. ADJOURNMENT

In City Council, **Motion** to Adjourn by C. Kennedy, seconded by C. Nuon. So voted.

Meeting adjourned at 8:21 PM.

_____
Michael Geary, City Clerk

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Lowell City Council
Regular Meeting Minutes

Michael Q. Geary
City Clerk

DRAFT

Date: **May 1, 2018**
Time: **6:30 PM**
Location: **City Council Chamber, 375 Merrimack Street, 2nd Floor, Lowell, MA**

1. **ROLL CALL**

Roll Call showed 9 present.

M. Samaras presiding.

C. Mercier requested moment of silence in darkened chamber for John Levicki.

2. CITY CLERK
2.1. Minutes of Finance SC April 24th; City Council Meeting April 24th, for acceptance.

In City Council, minutes read, **Motion** "To accept and place on file" by C. Leahy, seconded by C. Mercier. So voted.

3. COMMUNICATIONS FROM CITY MANAGER
3.1. Communication from City Manager - Motion Responses

In City Council, **Motion** "To accept and place on file" by C. Mercier, seconded by C. Kennedy. So voted.

A) Motion Response - EV Charging Stations – C. Cirillo noted the report. Nick Navin (Parking Director) spoke to the report noting charging ports costs were covered by grants. C. Cirillo noted that Tesla would provide free stations for the City. C. Leahy questioned if best use for the garages. C. Mercier noted that there should be a cost to use these stations as well. C. Conway questioned the costs to run these stations each year. Mr. Navin noted the cost estimates. C. Conway noted that the usage should be audited. Mr. Navin commented on the use of the stations. C. Kennedy noted that more stations made available would increase use.

B) Motion Response - Bike Sharing – C. Kennedy commented on the report noting that any plans to implement programs should be accelerated. C. Cirillo noted the need to move quicker on the program. Manager Donoghue noted that they would move quicker with the partners they have in the program. C. Kennedy noted the benefit of having pilot program.

C) Motion Response - Emergency Management Plans – Motion by C. Nuon, seconded by C. Milinazzo to refer report to Public Safety SC for further discussion. So voted. C. Leahy noted the plan and the people involved with same. Fire Chief Winward (LFD) noted that training on emergency plans has begun.

D) Motion Response - Condition of Fire Stations 2018 – C. Nuon noted the detailed report commenting on the needed repairs. Fire Chief Winward commented on plans to facilitate the repairs. **Motion** by C. Leahy, seconded by C. Nuon to refer report to Municipal Facilities SC. So voted. C. Elliott commented on the use of capital money for repairs. Conor Baldwin (CFO) noted FY19 Capital Budget money for repairs. C. Elliott questioned use of in-house labor for repairs. Mr. Baldwin noted they were used if the scope of the work was not extensive.

E) Motion Response - Civic Engagement – C. Nuon commented on the report. Eda Matchak (Elections) commented on Flagship Partnerships and outlined process for hiring poll workers. C. Elliott noted the importance of outreach from the Elections Department.

F) Motion Response - Arts Funding – C. Cirillo commented regarding investments by the City in the Arts. Mr. Baldwin noted the support of events through the operating budget.

3.2. Communication from the City Manager
School Building Committee Recommendation Vote Relative To The Preferred Option For The Lowell High School Project.

In City Council, **Motion** "To accept and place on file" by C. Kennedy, seconded by C. Cirillo. So voted. C. Kennedy requested that Item #4.1 be taken up at this time. No objections. So voted. Manager Donoghue provided a report regarding the meeting outlining the attendance and the presentation made. Robert Bell (Perkins/Eastman) presented the three options along with costs regarding proposed location of the new high school. Joe Drown (Perkins/Eastman) noted the costs for each option. Manager Donoghue stated that the School Building Committee recommended Option 3A to the body. C. Elliott noted his support of Option 3A. Registered speaker, Mike Dillon, Jr.

addressed the body. C. Mercier noted her choice had been passed over and that she continued to not support the eminent domain taking on Arcand Drive. **Motion** by C. Mercier, seconded by C. Elliott to "lock in" costs has established and presented by consultants for the selected option. Defeated per Roll Call vote, 2 yeas, 7 nays (C. Cirillo, C. Conway, C. Kennedy, C. Leahy, C. Milinazzo, C. Nuon, M. Samaras). So voted. C. Cirillo commented on the phasing of construction. C. Kennedy noted motion was premature as to costs. C. Leahy noted that costs have been projected into the future. C. Milinazzo noted it was too early to lock into costs. C. Nuon noted final number would come with final design. Manager Donoghue noted estimates done were projections into the schematic design phase of the project. C. Conway noted it was too early and that the number could be decreased by the end of all design. C. Kennedy requested roll call on the matter. C. Mercier questioned time frame for eminent domain taking. Manager Donoghue outlined the process noting the need to appraise site and produce relocation costs for the site and noting the process would be complete before funding phase of the project. C. Elliott commented on fluctuating number involved from the beginning of the process and the oversight of costs is important for this project. Manager Donoghue commented on the MSBA formula and the restraints that it presents with financial limits that are used. C. Milinazzo requested that reviews should be made regarding when and what adjustments to the cap have been made by the MSBA. **Motion** to proceed to vote on preferred location of the high school C. Kennedy, seconded by C. Nuon. So voted. On first ballot roll call 8 in favor of Option 3A; 1 in favor of Option 2A (C. Mercier). Option 3A declared preferred option. So voted.

3.3. Communication-Accept Resignation of Geoffrey McDonough-Conservation Commission.

In City Council, **Motion** "To accept and place on file" by C. Kennedy, seconded by C. Conway. So voted.

3.4. Communication-Appoint Aurora Erickson to Historic Board as Historical Society Representative.

In City Council, read, **Motion** to adopt by C. Mercier, seconded by C. Nuon. Adopted per Roll Call vote 9 yeas. So voted.

3.5. Communication-Appoint Troy Depeiza to Historic Board as Architect Rep.

In City Council, read, **Motion** to adopt by C. Kennedy, seconded by C. Mercier. Adopted per Roll Call vote 9 yeas. So voted.

3.6. Communication - City Manager request Out of State Travel (1) LPD.

In City Council, read, **Motion** to adopt by C. Mercier, seconded by C. Cirillo. Adopted per Roll Call vote 9 yeas. So voted.

4. VOTES FROM THE CITY MANAGER

4.1. Vote-Approve a preferred site for Lowell High School.

In City Council, **Motion** to proceed to vote on preferred location of the high school C. Kennedy, seconded by C. Nuon. So voted. On first ballot roll call 8 in favor of Option 3A; 1 in favor of Option 2A (C. Mercier). Option 3A declared preferred option. So voted. See prior discussion under Item #3.2.

4.2. Vote-Transfer 45,000 to fund school priority projects.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Kennedy, seconded by C. Nuon. Adopted per Roll Call vote 9 yeas. So voted. C. Mercier questioned which projects money would be used on. Jim Donison (DPW) noted the identified projects mostly centered on the high school. C. Milinazzo commented on the funding source. Mr. Baldwin noted funding was from a salary account that had available funds due to current vacancies. C. Mercier noted the need for Manager to meet with department heads after each Council meeting.

4.3. Vote-Transfer 50,000 to provide design engineering services.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Kennedy, seconded by C. Milinazzo. Adopted per Roll Call vote 7 yeas, 1 nay (C. Leahy), 1 absent (C. Elliott). So voted. C. Leahy requested information from the Manager. Manager Murphy noted funding needed to conclude schematic design portion of the high school project. Mr. Baldwin noted amendments needed to contract to conclude scope of work. Michael McGovern (Asst. City Manager) commented on additional work needed by the consultants. C. Leahy noted he would not support the transfer. C. Mercier questioned if funds were coming from Manager's Contingency Fund. Mr. Baldwin noted that it was from that fund and that would exhaust fund for budget year.

4.4. Vote-Transfer 53,525 provide new police vehicle.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Leahy, seconded by C. Nuon. Adopted per Roll Call vote 9 yeas. So voted. C. Leahy requested information regarding transfer. Deputy Supt. Richardson (LPD) commented on the funds noting the cost savings for such a transfer. C. Leahy noted the need to use vehicles once they are no longer in service.

5. ORDINANCES FROM THE CITY MANAGER

5.1. Ordinance-Amend Ch. 290 Entitled Zoning by extending existing INST zoning district to include all of 39 Plymouth Street.

In City Council, Given 1st Reading, **Motion** to refer to Planning Board for report and recommendation on May 21, 2018 and to Public Hearing before City Council on May 29, 2018 at 7 PM by C. Kennedy, seconded by C. Nuon. So voted.

6. CONSTABLE BONDS

6.1. Communication - City Mgr. request approval of Constable Bond for Jason Burke.

In City Council, read, **Motion** to adopt by C. Elliott, seconded by C. Nuon. Adopted per Roll Call vote 9 yeas. So voted.

7. REPORTS (SUB/COMMITTEE, IF ANY)

7.1. Technology & Utilities SC May 1, 2018.

In City Council, M. Samaras noted meeting had been cancelled. C. Elliott reported out on Animal Advisory Committee noting the attendance and the establishment of a task force to assist with the regulation of animals in the City.

8. PETITIONS

8.1. Claim - (1) Property Damage.

In Council, **Motion** to refer to Law Department for report and recommendation by C. Mercier, seconded by C. Nuon. So voted.

8.2. Comcast Cable request to amend license for additional storage of flammables 7,380 gals. Diesel (3,690 gals. Class II, AST; 3,690 gals. Class II, AST) at 12 Washer Street.

In City Council, Given 1st Reading, **Motion** to refer to Public Hearing on May 15, 2018 at 7 PM by C. Kennedy, seconded by C. Cirillo. So voted. C. Leahy questioned petition.

8.3. National Grid - Req. permission to install 1,720 feet of new gas main from 1852 Middlesex Street to Chelmsford town line.

In City Council, Given 1st Reading, **Motion** to refer to Public Hearing on May 22, 2018 at 7 PM by C. Kennedy, seconded by C. Milinazzo. So voted. C. Cirillo questioned the location.

8.4. National Grid - Req. permission to relay existing 2,100 feet of gas main on Chelmsford Street between Howard and Liberty Street.

In City Council, Given 1st Reading, **Motion** to refer to Public Hearing on May 22, 2018 at 7 PM by C. Elliott, seconded by C. Cirillo. So voted. C. Milinazzo disclosed relative lived on indicated street.

8.5. Misc. - Broadway Street Holdings, Inc. (Atty. George Theodorou) request zoning amendment to extend Urban Mixed Use (UMU) district into parcels located at 232 and 234 Mt. Vernon Street; also change of zoning to Light Industrial (LI) at parcels located at 268 and 294 Mt. Vernon Street and 5 Farnham Street.

In Council, **Motion** to refer to Law Department to draft proper ordinance by C. Conway, seconded by C. Nuon. So voted.

9. CITY COUNCIL - MOTIONS

9.1. C. Elliott - Req. City Mgr. have proper department explore repair of Constance Drive and placing same on paving list.

In City Council, seconded by C. Nuon, referred to City Manager. So voted. C. Elliott noted street needed attention.

9.2. C. Elliott - Req. City Mgr. report on status regarding training and procedures in the Lowell Police Department.

In City Council, seconded by C. Nuon, referred to City Manager. So voted. C. Milinazzo requested his motion Item #9.9 be taken out of order as they are similar. No objections. So voted. C. Elliott noted serious incidents have happened and a report on training is needed. Manager Donoghue noted there would be a discussion upon the return of Supt. Taylor (LPD).

9.3. C. Nuon - Req. City Mgr. and Human Resource Dept. work with Supt. of Schools and School H/R department to explore means to attract a diverse pool of candidates for future employment openings.

In City Council, seconded by C. Milinazzo, referred to City Manager. So voted. C. Nuon noted need to be diverse and commented on efforts of school administration. C. Kennedy commented on prior efforts of the School Committee and suggested a formula of using high school for recruitment purposes. M. Samaras commented on possible initiatives. C. Leahy noted the existing programs in the City. C. Conway commented that there may need to be a more creative approach to the issue.

9.4. C. Nuon - Req. City Mgr. have Human Resource Department develop a recruitment policy and procedure for hiring purposes.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Nuon noted request was in line with prior motion. C. Leahy questioned development of an existing policy. C. Nuon noted need to do a better job. Manager Donoghue noted she would report on motion.

9.5. C. Nuon - Req. City Mgr. take necessary means to repair potholes on Marlborough Street.

In City Council, seconded by C. Mercier, referred to City Manager. So voted. C. Nuon noted the request speaks for self.

9.6. C. Nuon - Req. City Mgr. work with various departments (i.e. Elections Dept.) to begin listening sessions through the Ad Hoc Election Laws SC regarding Voting Rights litigation.

In City Council, seconded by C. Cirillo, referred to City Manager. So voted. C. Nuon noted it was a delicate issue as litigation is pending but he was interested in setting up listening session throughout City.

9.7. C. Leahy - Req. City Mgr. have proper department review the work being done regarding gas repairs throughout Belvidere.

In City Council, seconded by C. Mercier, referred to City Manager. So voted. C. Leahy requested scheduling update as well as oversight of repairs being done by the entity after work completed. C. Elliott noted frustration in the community when repair is not done properly. C. Mercier questioned if performance bond could be tied with the projects. C. Conway questioned what department is charged with oversight of

contractors. Manager Donoghue noted Engineer Department oversees these projects. C. Kennedy noted the need to research what the public utility future schedule entails. Mr. McGovern commented on future work being done by the utilities. C. Leahy noted all work being done should be consistent with each contractor.

9.8. C. Mercier - Req. City Mgr. honor the commitment by the City to replace sidewalks on Humphrey Street.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Mercier commented that work done was satisfactory but sidewalks were not completed as promised to the neighborhood. C. Kennedy noted the need for replacement or repair of the area.

9.9. C. Milinazzo - Req. City Mgr. provide a report regarding the 2016 incident in the police detention center as well as all training received by civilian employees since 2013.

In City Council, seconded by C. Nuon, referred to City Manager. So voted. C. Milinazzo noted that there may be a need for an Executive Session on the matter due to circumstances present. C. Kennedy requested updated report regarding State accreditation of the Police Department. C. Nuon noted the importance of training in the department.

10. ANNOUNCEMENTS

In City Council, C. Mercier requested suspension of rules to discuss Manning/Ventura Park. No objection. **Motion** by C. Mercier, seconded by C. Elliott to refer discussion of above to Parks & Recreation SC for review. So voted. C. Noun noted event for Center of Hope and Healing. C. Elliott noted upcoming fundraisers for Lowell High School ROTC.

11. ADJOURNMENT

In City Council, **Motion** to Adjourn by C. Kennedy, seconded by C. Leahy. So voted.

Meeting adjourned at 8:30 PM.

A TRUE COPY ATTEST

Michael Geary, City Clerk

Michael Q. Geary
City Clerk, Lowell, MA

LOWELL SCHOOL COMMITTEE

REGULAR MEETING MINUTES

Date: March 21, 2018
Time: 6:30PM
Location: City Council Chamber, 375 Merrimack Street, 2nd Floor, Lowell, MA 01852

1. SALUTE TO FLAG

2. ROLL CALL

On a roll call at 6:33 p.m., all members were present, namely: Mr. Nutter, Mayor Samaras, Mr. Descoteaux, Ms. Doherty, Mr. Hoey, Mr. Lay and Ms. Martin.

Sophia Marsden, LHS Student Representative was also present.

3. SPECIAL ORDER OF BUSINESS

3.I. Spotlight On Excellence: Stoklosa SoarMA Program

The Spotlight on Excellence featured the Stoklosa SoarMA Program. Mr. James Cardaci, Principal of the Stoklosa School informed the Committee that the SoarMA program is a two (2) year program designed to help low-income children and families save for postsecondary education and training. The program is currently open to all eligible seventh graders at the Stoklosa School. The initiative, funded through public-private partnerships, will provide a matched savings program and a financial education curriculum.

4. MINUTES

4.I. Minutes: Approval of the Minutes of the regularly scheduled Lowell School Committee Meeting of Wednesday, February 28, 2018

Mr. Hoey made a motion to accept the minutes and to place them on file; seconded by Mr. Descoteaux. 7 yeas APPROVED

Ms. Doherty made a motion to take the following Reports of the Superintendent: 10.I, 10.II and 10.III out of order; seconded by Ms. Martin. 7 yeas APPROVED

5. PERMISSION TO ENTER

5.I. Permission To Enter: March 7, 2018

Mr. Descoteaux made a motion to approve the Permission to Enter; seconded by Mr. Hoey. 7 yeas APPROVED

6. UNFINISHED BUSINESS

6.I. Head of Lowell High School Update

Superintendent Khelfaoui provided a timeline of the Head of School search process and interview schedule. He then informed the Committee that Ms. Marianne Busteed has been appointed as the Lowell High School Head of School. She is currently in contract negotiations.

Mr. Nutter made a motion to accept the Head of Lowell High School Update and to place it on file; seconded by Ms. Martin. 7 yeas APPROVED

7. MEMORIALS

7.I. Memorial - Bolianites

Bessie Bolianites, mother of Lowell High School teacher Charles Bolianites

7.II. Memorial – Pen

Panha Pen, Lowell High School Student.

8. MOTIONS

8.I. [By Gerard Nutter]: School Committee look into creating a mandatory citywide recess policy for all elementary and middle school students.

Mr. Nutter made a motion to approve; seconded by Ms. Doherty.

The following people spoke in support of creating a mandatory citywide recess policy for all elementary and middle school students:

Mickie Dumont
Chhavy Sinuon
Ashley Pizzuti
Paul Georges

Mr. Nutter made a motion to refer item #8.I "School Committee look into creating a mandatory citywide recess policy for all elementary and middle school students" to a Policy Subcommittee for further discussion; seconded by Mr. Hoey. 7 yeas APPROVED

8.II. [By Gerard Nutter]: Administration Provide a report of how many students per Lowell schools enter into Lowell High Lyceum and how many test for entry.

Ms. Doherty asked for the report to include the following:

- How many students take the test and pass and where are they coming from?
- What are the dropout rates from the program?
- What are the trends for the last 3 – 5 years and who is staying with the program?

Mr. Nutter made a motion to approve; seconded by Ms. Doherty. 7 yeas APPROVED

8.III. [By Gerard Nutter]: Administration set up meeting with the Policy Subcommittee to establish a reasonable policy for responding to School Committee votes and motions.

Mr. Nutter made a motion to approve; seconded by Ms. Doherty. 7 yeas APPROVED

8.IV. [By Gerard Nutter]: School Committee consider the following additional items to be added to Agenda OLD Business and Announcements.

Mr. Nutter asked if the Quarterly Reports could be added as well. Superintendent Khelfaoui stated that moving forward he will have the Quarterly Reports in each School Committee meeting packet.

Mr. Nutter made a motion to approve; seconded by Ms. Doherty. 7 yeas APPROVED

8.V. [By Jackie Doherty]: Request the Superintendent provide the committee with a report that breaks down the number of Special Education Students, ELL, and homeless students by school along with staffing ratios currently in place to meet those needs.

Ms. Doherty made a motion to approve; seconded by Ms. Martin. 7 yeas APPROVED

8.VI. [By Gerard Nutter]: Lowell School Committee work with Asst. Superintendent of Curriculum to explore creating remote learning programs or blizzard bags to be used after 5 snow days.

Superintendent Khelfaoui informed the Committee that the district would have to have a 90% response. If a student does not do the work then that student will be marked absent.

Mr. Nutter made a motion to approve; seconded by Mr. Descoteaux. 7 yeas APPROVED

8.VII. [By Gerard Nutter]: Lowell explore permanently changing Good Friday to an Early Release Day rather than a no school day.

Superintendent Khelfaoui stated that the district is looking into many alternatives.

Mr. Nutter made a motion to approve; seconded by Mr. Hoey. 7 yeas APPROVED

8.VIII. [By Connie Martin]: Request that the Administration provide the Lowell School Committee with written recommendations at the April 4th, 2018 meeting, to engage an outside firm to conduct a Human Resources Compliance Audit with a deadline of June 30, 2018 for completion of said audit.

Ms. Martin made a motion to approve; seconded by Ms. Doherty. 7 yeas APPROVED

8.IX. [By Gerard Nutter]: Request Superintendent supply explanation why according to Outside Auditors Powers & Sullivan during the 2016/ 2017 school year, approximately $807,000 of grant proceeds were turned back unused. Report should include copies of each grant, what the total grant received was, what portion of the grant was spent and why the remainder wasn't use along with total dollars of each grant returned.

Mr. Nutter made a motion to approve; seconded by Ms. Martin. 7 yeas APPROVED

9. SUBCOMMITTEES

9.I. Finance: Finance Subcommittee Meeting: Report of the Meeting of March 21, 2018 [Gerard Nutter, Chairperson]

Mr. Nutter, Chairperson of the Finance Subcommittee informed the Committee that the School Committee approved a budget of $162,942,846 that included an additional $610,000 from the Senate that the School Department believed at that time they would be receiving and $250,000 from the City. On May 30, 2017, the City Council adopted the School Department budget for $162,073,324 with a verbal commitment from City Manager Murphy for $250,000 once free cash is certified. On June 22, 2017, Mayor Kennedy and the City Council received a letter from the City Manager informing them that the City will approve the school department's bottom line figure of $162,073,324 with the additional $250,000 that was promised and any additional increases from Chapter 70. There is no record that the School Committee received a copy of this letter. On June 27, 2017, Assistant Superintendent Frisch sent the City Auditor a budget submittal of $162,073,324. The bottom line figure was approved by the City Council. On August 21, 2017, the School Committee voted on a series of budgetary reductions that totaled $610,000. At this time, the budget's bottom line figure changed and the School Committee should have voted on a new bottom line figure. The district is waiting for additional funds received from School Choice and ERATE and when those funds are received the School Committee will vote on a new bottom line figure.

Mr. Nutter made a motion to accept this report as a report of progress; seconded by Ms. Doherty. 7 yeas APPROVED

10. REPORTS OF THE SUPERINTENDENT

10.I. Drop Out Prevention and Recovery Report

Jeannine Durkin, Deputy Superintendent for Student Support Services provided the Committee with a report that showed the substantial decrease that the dropout rate shows over the last thirteen (13) years. This year, the district's overall dropout rate decreased from 1.8% to 1.2%, which includes a population increase of 120 additional students in the total school enrollment. Overall, the total count of dropouts was forty (40) in 2016-2107, which is eighteen (18) fewer dropouts from 2015-2016.

Heather Ganley, Attendance Supervisor for the Lowell Public Schools and Marianne Busteed, Lowell High School Head of School had PowerPoint presentations to share with the Committee that showed the following:

- History of Lowell Public School's Chronic Absence Rate
- SY 2016-2017 Chronic Absence Rate in Comparable School Districts
- History of Lowell Public School's Annual Dropout Rate
- SY 201-2016 Dropout Rate Comparable School
- Lowell High School 2017 4 Year Graduation Rate
- 2017 4 Year Cohort Graduation Rate Comparable Districts

They also spoke about the Graduation Mentor Program as well as all the hard work done by the staff.

Ms. Doherty made a motion to accept the following Reports of the Superintendent 10.I, 10.IV, 10.V, 10.VI, 10.VII, 10.VIII,10,IX, 10.X and 10.XI as reports of progress; seconded by Mr. Descoteaux. 7 yeas APPROVED

10.II. Mental Health Supports and Needs

Ms. Doherty asked for the number of social workers and their caseloads to be included in the Subcommittee report.

Ms. Doherty made a motion to refer item # 10.II Mental Health Supports and Needs to a Student Support Services Subcommittee for further discussion; seconded by Mr. Descoteaux. 7 yeas APPROVED

10.III. Revised MSBA Education Plan

Robert Bell, Architect from Perkins Eastman provided the Committee with an update on the Education Program and companion Space Summary intended for submission to the Massachusetts School Building Authority (MSBA) in the revised Preferred Schematic Report (PSR) on May 9, 2018. Changes to the Program warrant approval by the School Committee and a record of the vote must be included in the submission to the MSBA. The changes since the last School Committee's approval of the Educational Program and Space Summary include the site (changed from the Cawley to the existing location) and removal of the swimming pool. Since the last submission, the MSBA conducted a review and provided comments along with several determinations on spaces. The MSBA has thus far accepted all spaces with exceptions as noted below:

- Special Education – all spaces are subject to the DESE's review and approval
- Vocations/Tech – 200sf School Store, 400sf Bank and 4,000sf TV Studio are under continued review
- Health & Physical Education – 450sf of Athletic Secretary, Bursar & Conference spaces are subject to further review, along with co-location of other spaces with the gymnasium
- Auditorium & Drama – proposed Auditorium (in prior new construction) exceeds MSBA upper limits and must be reduced by 2, 216sf; now as renovation, TBD
- Administrative & Guidance – spaces are under continued review
- Custodial & Maintenance – spaces are under continued review
- Other – all spaces have been accepted, except the 1,500sf Lowell Community Health Center & 700sf Catie's Closet.

Mr. Nutter made a motion to approve and submit the changes to the Educational Program and companion Space Summary to the Massachusetts School Building Authority (MSBA); seconded by Ms. Martin. 7 yeas APPROVED

10.IV. Day School Update

Jennifer McCrystal, Director of Special Education provided the Committee with an update on the Day School location. She stated that the city has put forward an RFP for a three (3) year lease for a building in or near the city limits. The goal of the RFP is to find a location that is move-in ready for the beginning of the 2018-2019 school year, while adding two (2) additional classroom and two (2) additional rooms that address sensory needs. This expansion could result in additional cost savings in the out-of-district budget as well as allowing the students and families to remain in their community. The second year of the lease would add additional classroom space allowing for expansion of the program to ensure that students can receive services there through the age of 22, again resulting in an additional cost savings. The optional third year of the lease would allow for additional classroom expansion which could ultimately provide the district additional space to begin to tuition students into the day school from surrounding communities. The RFP will be opened on April 4, 2018.

Ms. Doherty made a motion to accept the following Reports of the Superintendent 10.I, 10.IV, 10.V, 10.VI, 10.VII, 10.VIII,10,IX, 10.X and 10.XI as reports of progress; seconded by Mr. Descoteaux. 7 yeas APPROVED

10.V. State And Local Aid for FY2019

Gary Frisch, Assistant Superintendent of Finance provided a report that informed the Committee that the Chapter 70 state aid was announced on January 24, 2018 for the Lowell Public Schools in the amount of $149,264,111. On February 27, 2018, the City informed the Superintendent that the City Manager would propose a cash contribution of $25,736,053 inclusive of $9,543,080 for transportation and adult education. The report also included a copy of the letter from the City Manager informing the Superintendent of the proposed cash contribution as well as a response from the Superintendent to the City Manager.

Ms. Doherty made a motion to accept the following Reports of the Superintendent 10.I, 10.IV, 10.V, 10.VI, 10.VII, 10.VIII,10,IX, 10.X and 10.XI as reports of progress; seconded by Mr. Descoteaux. 7 yeas APPROVED

10.VI. Enrollment Figures

The district enrollment report provided to the Committee showed the breakdown by school and grade through March 14, 2018.

Ms. Doherty made a motion to accept the following Reports of the Superintendent 10.I, 10.IV, 10.V, 10.VI, 10.VII, 10.VIII,10,IX, 10.X and 10.XI as reports of progress; seconded by Mr. Descoteaux. 7 yeas APPROVED

10.VII. Response to Andy Descoteaux's Motion Of 11/15/17 Regarding a Link on the LPS Website for all K – 12 Events

John Overton, District Webmaster provided a report that informed the Committee that a page has been created on the district website that includes links to each individual school calendar as an easier way to access individual school calendars. The page can be access via our district calendar page at: https:/www.lowell.k12.ma.us/Page/2.

Ms. Doherty made a motion to accept the following Reports of the Superintendent 10.I, 10.IV, 10.V, 10.VI, 10.VII, 10.VIII,10,IX, 10.X and 10.XI as reports of progress; seconded by Mr. Descoteaux. 7 yeas APPROVED

10.VIII. Response to Connie Martin's Motion Of 02/28/18 Regarding IDEA Camp

Robin Desmond, Assistant Superintendent for Curriculum & Instruction and Assessment provided a report to the Committee that informed them that it is projected that IDEA Camp, as originally designed, will require a district contribution of over $42,000 for the summer of 2018. A team meeting was held to determine whether IDEA Camp courses may be offered to great numbers of Lowell Public School students through 21st Century Summer School programming. The team is working on assessing the feasibility of integrating Crime Science Investigations, Flight School, Robotics and Got Dirt courses into summer school sites located at the Robinson and Stoklosa middle schools for the summer of 2018. The team is also investigating how to offer the remainder of IDEA Camp courses using a smaller, more affordable programming model.

Ms. Doherty made a motion to accept the following Reports of the Superintendent 10.I, 10.IV, 10.V, 10.VI, 10.VII, 10.VIII,10,IX, 10.X and 10.XI as reports of progress; seconded by Mr. Descoteaux. 7 yeas APPROVED

10.IX. Knowledge Bowl 2018

Carolyn Rocheleau, Coordinator of Special Programs provided the following revised schedule to the School Committee. The Kathryn Philbin Stoklosa Knowledge Bowl taking place at the Butler School will hold its Preliminary Matches on March 5th, March 6th and March 12th.

The Elimination Rounds will take place on March 15th, March 19th and March 20th. The Final Competition will be held on March 22nd.

Ms. Doherty made a motion to accept the following Reports of the Superintendent 10.I, 10.IV, 10.V, 10.VI, 10.VII, 10.VIII,10,IX, 10.X and 10.XI as reports of progress; seconded by Mr. Descoteaux. 7 yeas APPROVED

10.X. Response to Gerry Nutter's Motion Of 02.28.18 Regarding Safety Measures in place at all Lowell Schools

Superintendent Khelfaoui informed the Committee that due to the fact that a Joint Student Support Services Subcommittee will be taking place with the City Council, Chief William Taylor, Lowell Police Department will not be attending tonight's meeting, but will be attending the Subcommittee to discuss safety measures in our schools.

Mr. Nutter made a motion to have a Joint School Committee and City Council Finance Subcommittee to discuss safety within our facilities; seconded by Mr. Descoteaux. 7 yeas APPROVED

Ms. Doherty made a motion to accept the following Reports of the Superintendent 10.I, 10.IV, 10.V, 10.VI, 10.VII, 10.VIII,10,IX, 10.X and 10.XI as reports of progress; seconded by Mr. Descoteaux. 7 yeas APPROVED

10.XI. Breakfast and Lunch Participation

The breakfast and lunch participation report that was provided to the Committee showed breakfast and lunch percentages by school from January 25, 2018 through February 21, 2018.

Ms. Doherty made a motion to accept the following Reports of the Superintendent 10.I, 10.IV, 10.V, 10.VI, 10.VII, 10.VIII,10,IX, 10.X and 10.XI as reports of progress; seconded by Mr. Descoteaux. 7 yeas APPROVED

10.XII. Home Education

Superintendent Khelfaoui recommended that the following parents/guardians be allowed to home educate their child:

Steven and Heidi Perez
219 Jackson Street, Apt. 432

Mr. Descoteaux made a motion to approve; seconded by Mr. Hoey. 7 yeas APPROVED

11. NEW BUSINESS

11.I. 2nd Reading and Vote on School Assignments Policy

Mr. Hoey made a motion to approve the School Assignments Policy; seconded by Mr. Nutter. 7 yeas APPROVED

11.II. Budget Transfer

Department:	**SCHOOLS**				
TRANSFER TO:					
Account #				**Description**	**Amount**
Org.	**Object**	**Project**	**DESE Function**		
91941102	530002		**2200**	Laura Lee SA - Other Exp	$ 3,490.00
92010124	541000		**2450**	Lincoln SA - Technology Exp	$ 3,000.00
92010112	544400		**2300**	Lincoln SA - General Supplies	$ 1,000.00
95010112	544400		**2300**	Shaughnessy SA - General Supplies	$ 8,000.00
98537031	530002		**2350**	Daley SA - Prof Dev	$ 3,836.00
				TOTAL	$ 19,326.00
TRANSFER FROM:					
Account #				**Description**	**Amount**
Org.	**Object**	**Project**	**DESE Function**		
91920109	544400		**2300**	Laura Lee SA - General Supplies	$ 3,490.00
92010115	541600		**2400**	Lincoln SA - Textbooks	$ 4,000.00
95010124	541000		**2450**	Shaughnessy SA - Tech. Exp.	$ 8,000.00
98510612	544400		**2300**	Daley SA - General Supplies	$ 3,836.00
				TOTAL	$ 19,326.00

Reason for Transfer: Adjustments to expend the budget.

Mr. Descoteaux made a motion to approve the budget transfer; seconded by Mr. Hoey. 7 yeas APPROVED

12. <u>CONVENTION/CONFERENCE REQUESTS</u>

12.I. LHS - AFJROTC

The Lowell High School ROTC cadets, Lt. Col Eileen Ironfield and MSgt Kevin Casilli and MSgt Susan Antolini, to travel from Thursday, March 31st through Sunday, June 3, 2018, with approximately 80-100 cadet students to Fort Devens facility to attend the MA-771's annual Cadet Leadership Course.. All costs will be paid by AFJROTC funds, student fundraising and student contributions. The total cost is approximately $7,000 and three [3] substitutes will be needed for two days. The cost of the substitutes in the amount of $600 will be paid by LHS individual school budget.

Mr. Nutter made a motion to take and approve all seven (7) convention/conference requests together; seconded by Ms. Doherty. 7 yeas APPROVED

12.II. LHS - Trip to Hyannis

Rose Mendonca, Guidance Counselor at the Freshman Academy, to attend the Massachusetts School Counselors Association Conference in Hyannis, MA from Monday, April 30, 2018 through Tuesday, May 1, 2018. There will be no cost to the Lowell high School or the School Department. No substitute teacher is needed.

Mr. Nutter made a motion to take and approve all seven (7) convention/conference requests together; seconded by Ms. Doherty. 7 yeas APPROVED

12.III. Trip to Huntsville, Alabama

Kerien Driscoll, Stem Academy Math resource Teacher, to attend the Honeywell Space Educators Camp from Wednesday, June 13th through Tuesday, June 19, 2018 in Huntsville, Alabama. There is no cost to the School Department budget. All expenses will be funded by the Honeywell Institute. No substitute teacher is needed.

Mr. Nutter made a motion to take and approve all seven (7) convention/conference requests together; seconded by Ms. Doherty. 7 yeas APPROVED

12.IV. Trip to Rhode Island - Student Support Staff

<u>Pre-approved:</u> Mary Payne and Rosa Segarra-Morales, District Support Specialists, Jane Mosher-Canty, Staff Counsel for Student Support Services, and Damary Montoya, Parent Liaison at LHS to attend the 2018 School Redesign Conference in Providence, Rhode Island from Monday, March 12, 2018 through Tuesday, March 13, 2018. The cost associated with lodging and registration will be funded by Project Learn. The cost for mileage and meals will be reimbursed through Title 1 and shall not exceed $800. No substitute teacher is needed.

Mr. Nutter made a motion to take and approve all seven (7) convention/conference requests together; seconded by Ms. Doherty. 7 yeas APPROVED

12.V. LHS- Trip to Dominican Republic

Head of School Marianne Busteed, request permission for up to 24 students and four chaperones, Wayne Taylor, Jill Taylor, JoAnne LaBranche and Alexis Martinez to travel to Dominican Republic from Friday, February 15 through Sunday, February 24, 2019. The students will miss 1 day of school. All costs associated with this trip will be funded by each student and staff traveling. The only cost will be $210 for two substitute teachers for 1 day and will be paid by Lowell High School Individual School account.

Mr. Nutter made a motion to take and approve all seven (7) convention/conference requests together; seconded by Ms. Doherty. 7 yeas APPROVED

12.VI. LHS- Trip To Greece

Pre-Approved: Lowell High School staff Jill McNamara, Wayne Taylor and Danielle Lessard, along with chaperone Jo Ann LaBranche who is CORI and 24 students, to travel to Greece, Athens, and Islands during April 2018 school vacation. The total cost of $3,335 will be paid by each student traveling. The cost of $200 for two substitute teacher will be paid by the LHS Individual School Budget.

Change requested: Increase the number of travelers, students to 42 and chaperones to 7. The additional chaperones are LHS teachers: Michael Arwe, Ann Bienvenue, Kara Pigeon and Rachel Ruchsbaum, wife of Michael Arwe, who has been CORIED.

Mr. Nutter made a motion to take and approve all seven (7) convention/conference requests together; seconded by Ms. Doherty. 7 yeas APPROVED

12.VII. LHS - Trip to Ireland

Pre-Approved: Head of School Brian Martin, requests permission for eighteen [18] to twenty four [24] students and four [4] chaperones, Thomas Thornton, and the other three to be named at a later date, to travel to Ireland during the April school vacation 2018. Students will miss one day of school, Friday, April 13, 2018 and three [3] substitutes will be needed for one day. The cost of two substitutes in the amount of $200 will be paid by LHS individual school budget and the third substitute will be paid by EF Tours. Each student traveling will incur the total cost of between of $2,948.00.
Change requested: There will be one chaperone, Thomas Thornton insteadOf 4 and he will be traveling with 8 LHS students instead of 24. Due to this change there will be no cost to the Lowell School Department or LHS.

Mr. Nutter made a motion to take and approve all seven (7) convention/conference requests together; seconded by Ms. Doherty. 7 yeas APPROVED

13. PROFESSIONAL PERSONNEL

13.I. UTL Donated Sick Days - Lannon

The Members of the United Teachers of Lowell hereby donate twenty three [23] sick leave days to Lauren Lannon, Morey School Paraprofessional.

Mr. Hoey made a motion to approve; seconded by Mr. Descoteaux. 7 yeas APPROVED

14. ADJOURNMENT

Mr. Nutter made a motion to adjourn at 9:43 p.m.; seconded by Mr. Hoey. 7 yeas APPROVED

Respectfully submitted,

Dr. Salah E. Khelfaoui, Superintendent and
Secretary to the Lowell School Committee

SEK/mes

PERKINS EASTMAN

LOWELL SCHOOL COMMITTEE – MARCH 21, 2018

LOWELL HS PROJECT



EXISTING IMAGERY COURTESY OF GOOGLE EARTH

AGENDA

Revised Preferred Schematic Report (PSR)

- Scope & Timeline

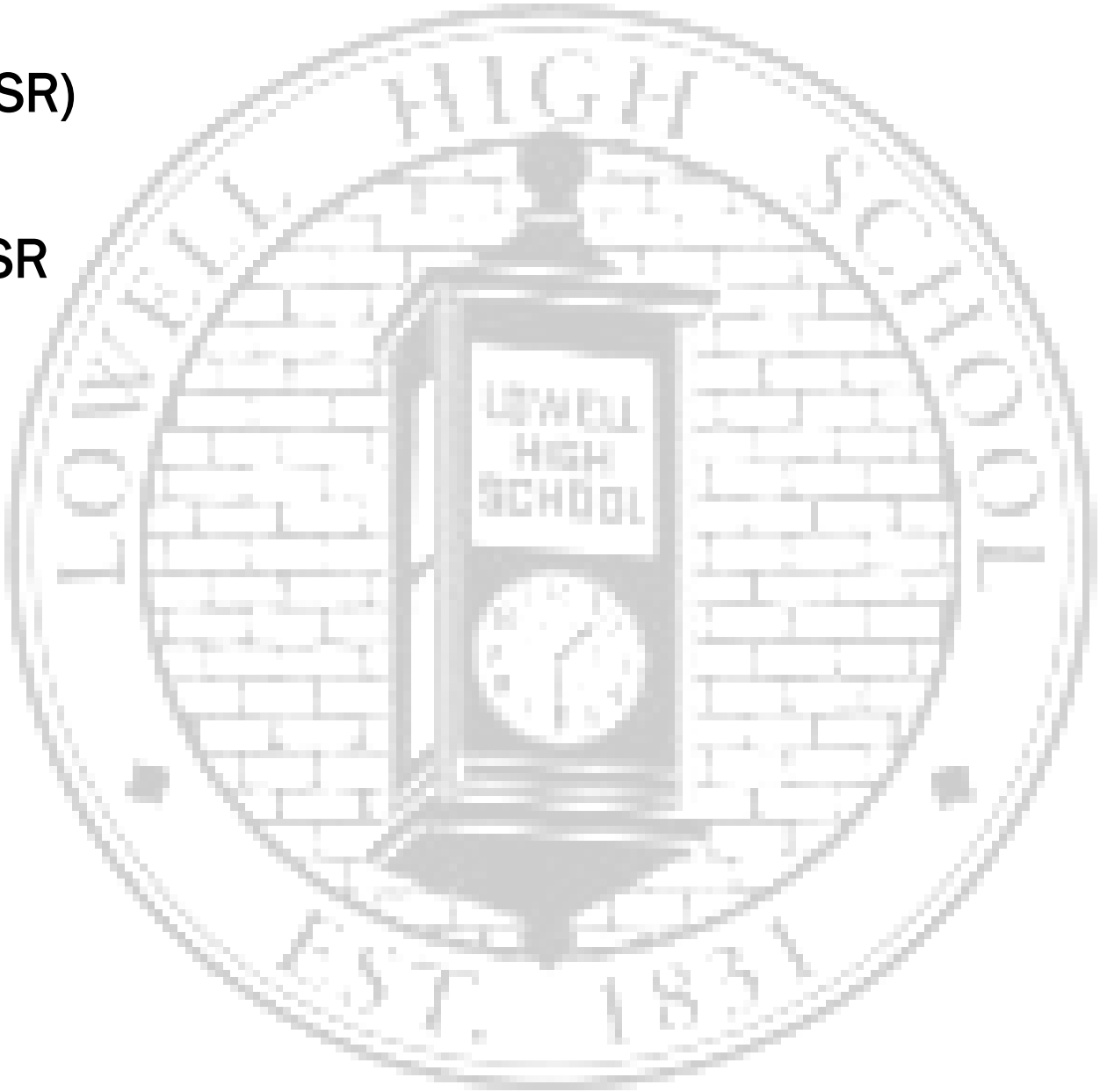
MSBA Comments Since the Previous PSR

- Accepted, Rejected or Under Review
- Gymnasium + Co-Located Programs

Educational Program Updates

Space Summary Updates

School Committee Discussion/Vote



PREFERRED SCHEMATIC REPORT (PSR)

Revised PSR Scope

- Changed Location to Existing Site
- Pool Removed from Program
- Options Under Review ----------

Revised Timeline (2018)

- March 21st SC Vote on Revised Program
- March 29th SBC & City Council Updates
- April 26th SBC & City Council Updates
- May 1st City Council Vote - Preferred Option
- May 9th PSR Submission to the MSBA
- May 23rd or June 6th MSBA FAS (Review Meeting)
- June 27th MSBA Board Approval to Schematics







MSBA COMMENTS SINCE PRIOR PSR

Spaces Accepted

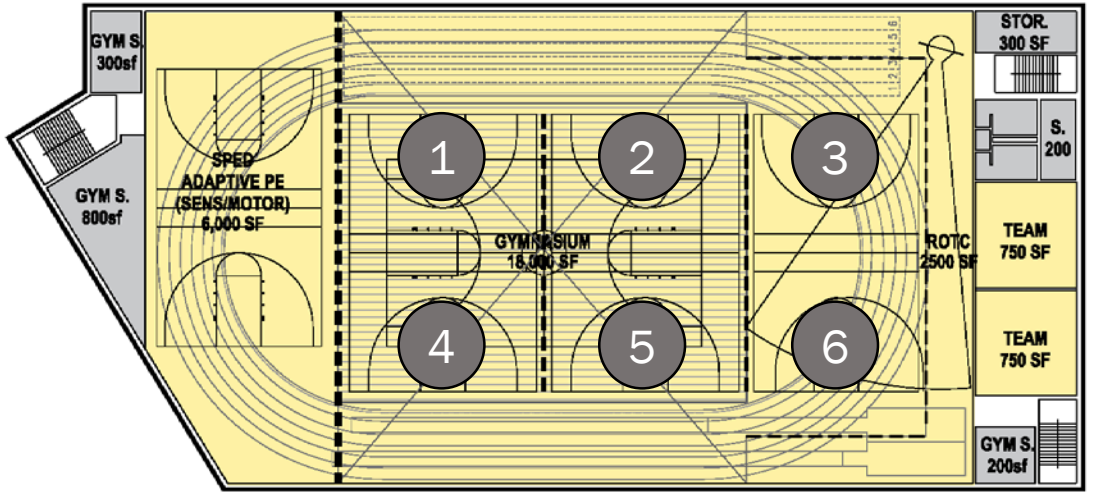
- Core Academics
- Art & Music
- Vocations & Tech (except as noted below)
- Health & Phys-Ed (except as noted below)
- Media Center
- Food Service
- Other Category (except as noted below)

Spaces Under Review (as noted above), and:

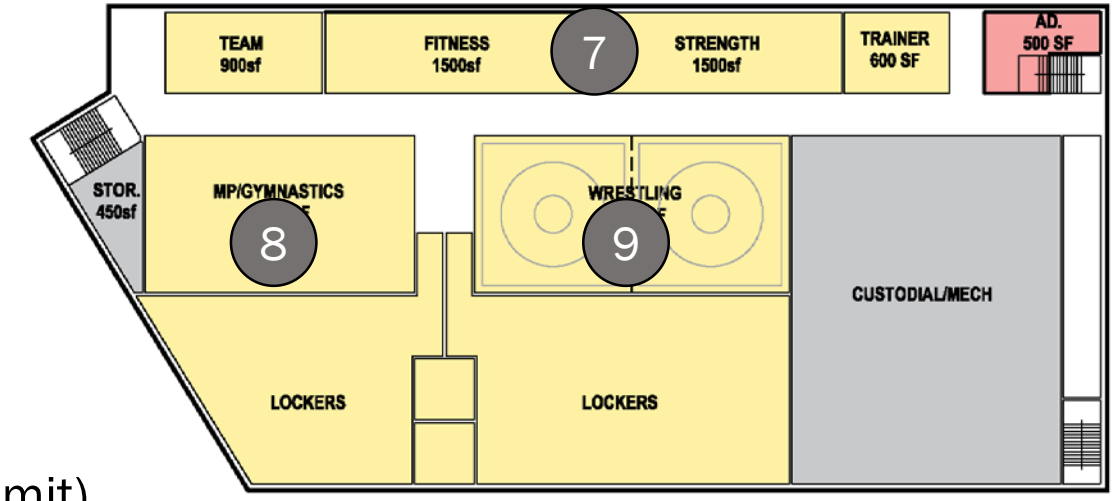
- Special Education (subject to DESE review)
- Admin. & Guidance (under review)
- Custodial & Maintenance (under review)
- Store, Bank, TV Studio, Athl. Secr/Bursar/Conf)
- Catie's Closet & Community Health Center
- Co-Location of Gym & Other Programs

Spaces Rejected (other than the Pool):

- Auditorium Delta (2,126sf above MSBA upper limit)



Gym Areas – 2nd Floor

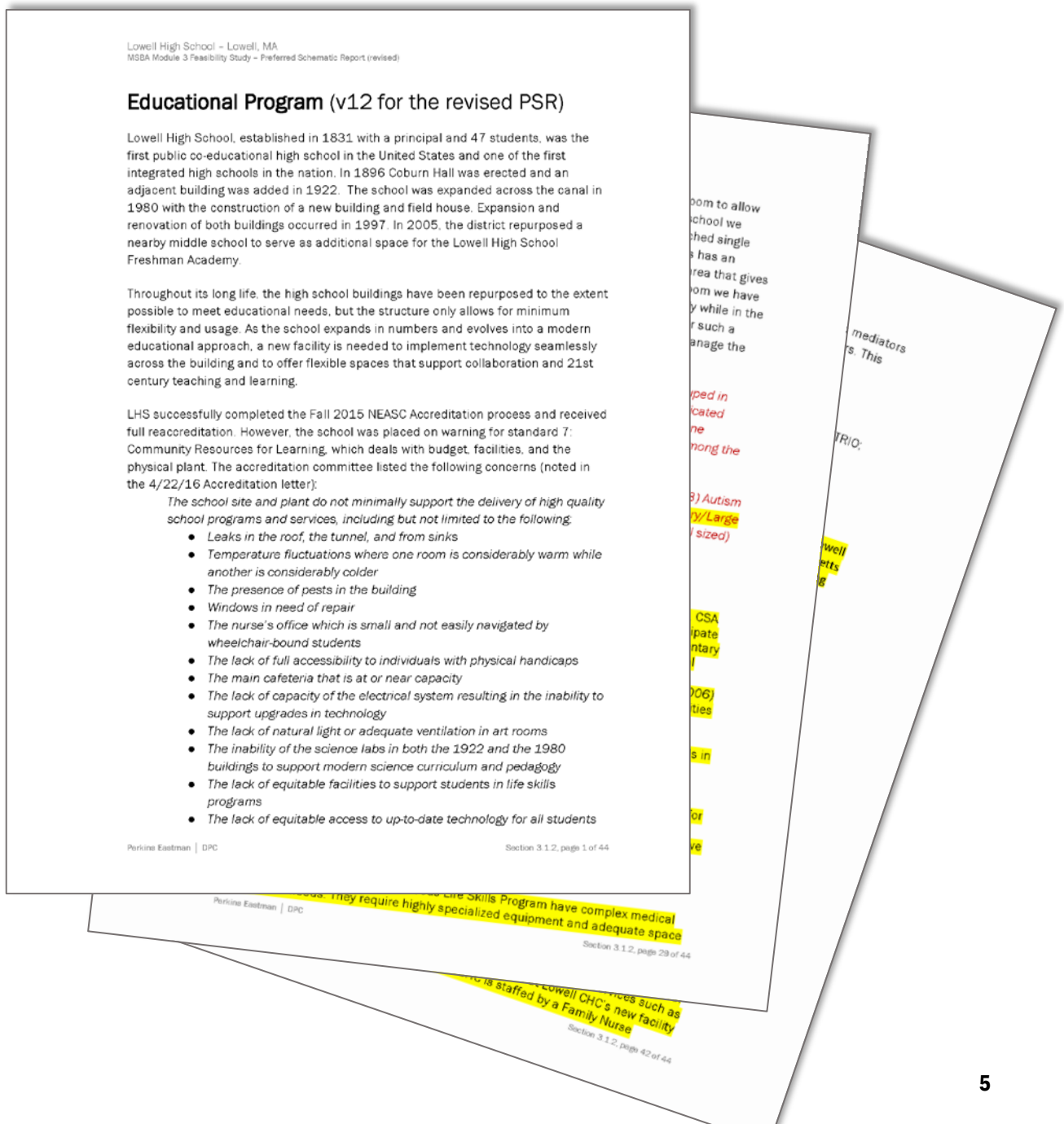


Gym Areas – 1st Floor

EDUCATIONAL PROGRAM

Updates Since Prior Approval

- **Removed References to Pool** (pg. 26-27 & 41)
- Additional Description for **Adaptive PE/Sensory-Motor** (pg. 29-30)
- **ROTC Classroom Clarification** – Classroom Count Includes PT (pg. 33)
- Additional Descriptions for **Catie's Closet & Comm. Health** (pg. 42-43)



SPACE SUMMARY UPDATES

guidelines that scale

unscaled, typically ok

unscaled, but should

Core Academics - unchanged

Special Educ. – unchanged

LOWELL HIGH SCHOOL	Existing Conditions			Proposed Total				MSBA Guidelines (refer to MSBA Educational Program & Space Standard Guidelines)			
ROOM TYPE	ROOM NFA[1]	# OF RMS	area totals	ROOM NFA[1]	# OF RMS	area totals		ROOM NFA[1]	# OF RMS	area totals	Comments
CORE ACADEMIC SPACES			136,088			161,620	-7K OFFSET BY SPED/ART/TECH			169,040	
Classroom - Freshman (incl Health)	849	27		900	24	21,600					
Classroom - Gr. 10-12 (incl. Health & ELL)	825	95		900	88	79,200					
Classroom - General		122			112		UTILIZ+CL SIZE=LES	850	120	102,000	825 SF min - 950 SF max
Teacher Planning - Freshman	493	1	493	450	4	1,800					
Tchr Plng (Tch-Out, Lng, Ktch, Comp, Copy)	604	8	4,834	450	13	5,850					
Dept Off's (Eng, SS, Mth, Sci, WL/ELL, Instr)	112	6	671	125	6	750					
Teacher Develop/Training (Little Thtr + Cntrl)	3,568	1	3,568	3,600	1	3,600					
Teacher Planning		16			24			100	120	12,000	
Small Group Seminar (20-30 seats)				450	6	2,700		500	8	4,000	
Science Classroom / Lab - Freshman	978	7	6,849	1,440	8	11,520					
Science Classroom / Lab - Gr.10-12	900	19	17,100	1,440	20	28,800					
Science Classroom / Lab (incl. 3 ELL Sci)		26			28		UTILIZ+CL SIZE=LES	1,440	31	44,640	3 x85% ut=20 Seats-1 per /day/student
Prep Room	156	7	1,091	200	28	5,600		200	31	6,200	
Central Chemical Storage Rm				200	1	200		200	1	200	reasonable not to scale (typically)
Unassigned Green House/Growing Room	196	1	196	200	0	0	INCL. VIA PREP				
Clean Room (w/ Micro/Bio Tech Lab)				400	0	0	INCL. VIA SCI CR				
SPECIAL EDUCATION			21,950			38,950	-4K OFFSET BY SCI CR's/ART/TECH			34,240	
LIFE SKILLS (69 stu's =78 prorated)											
Life Skills CRs (2 ages +Kitch/Laund/Mail)	968	4	3,870	1,200	4	4,800					
Life Skills Hygene (Wash/Changing Room)				450	1	450					
Life Skills Intensive CR +Tlt (2 age grps)	872	2	1,744	950	2	1,900					
Life Skills Sensory Room	344	1	344	450	1	450					
Life Skills (CSA) Autism CR + Tlt & Quiet	816	2	1,632	950	8	7,600					
Life Skills - AdaptivePE / Sensory-Motor				3,000	2	6,000					
ADJUSTMENTS (40 stu's =46 prorated)											
Adjustments CR	738	7	5,169	900	8	7,200					
Adjust Social Worker	165	1	165	150	1	150					
Counseling Room				200	1	200					
Storage				100	1	100					
FUNDAMNTL (190 stu's =214 prorated)											
Fundamentals - Freshman	810	2	1,619	450	2	900					
Fundamentals - Gr.10-12	545	7	3,812	450	8	3,600	+1 PER SPED DEPT				
Fundamentals Instruct. Support CR (for 24+)				1,900	1	1,900					
OTHER SPECIAL NEEDS											
OT/PT (part-time)				therapy occurs in CRs							
Deaf/Hearing Impared Suite	1,066	1	1,066	450	1	450					
Speech & OT/PT (Office for 3 + mtgs for 6)	178	3	534	450	1	450					
Psych + Evaluators/Testing	299	2	598	150	4	600					
Social Worker	189	1	189	150	1	150					
PALS Mentoring Office/Conf	161	2	321	part of soc worker							
SPED Dept Chair	241	1	241	250	1	250					
SPED Eval Team Chair	237	1	237	150	2	300					
SPED Office (Clerk/Waiting/Files)	304	1	304	300	1	300					
Conference (1 for 12, 1 for 20)				600	2	1,200					

SUBJECT TO DESE REVIEW

SPACE SUMMARY UPDATES

guidelines that scale

unscaled, typically ok

unscaled, but should

Core Academics - unchanged

Special Educ. – unchanged

Art & Music - unchanged

Voc. & Tech. - unchanged

Proposed Space Summary v12 (for revised PSR)

	Spaces Existing			Spaces Proposed			Spaces per Guidelines			
	3125stu/25class/.71util.=176rms 177			3520stu/24class/.85util.=172rms 172			3520stu/23class/.85util.=181rms 183			
LOWELL HIGH SCHOOL	Existing Conditions			Proposed Total			MSBA Guidelines (refer to MSBA Educational Program & Space Standard Guidelines)			
ROOM TYPE	ROOM NFA[1]	# OF RMS	area totals	ROOM NFA[1]	# OF RMS	area totals	ROOM NFA[1]	# OF RMS	area totals	Comments
ART & MUSIC			19,851			17,700	+5K OFFSET BY CR's/SPED/TECH		13,075	
Art CR (incl. Photo/Anim, Graph, TV Prod)	1,301	6	7,803	1,350	6	8,100	1,200	6	7,200	Assumed use - 25% Population - 5 times/week
Art Workroom w/ Storage & kiln	370	4	1,482	150	6	900	150	6	900	
Band - 50 - 100 seats	2,791	1	2,791	2,000	1	2,000	1,500	1	1,500	BROKEN FORMULA (+ see note below)
Chorus - 50 - 100 seats (incl. Drama)	2,652	1	2,652	1,500	1	1,500 PER TEST PLAN	1,500	1	1,500	reasonable if combined count w/ tech
Dance (also uses stage)	866	1	866	1,200	2	2,400				
Ensemble						0	200	1	200	reasonable if combined count w/ tech
Piano/Digital Lab	1,186	1	1,186	1,000	1	1,000				
Music Practice (incl. Guitar)	81	3	244	75	5	375	75	17	1,275	
Music Storage	256	7	1,789	500	2	1,000	500	1	500	reasonable not to scale (typically)
Fine Arts Dept Office	155	1	155	125	1	125				
Music Admin - Conf/ Off	183	4	731	300	1	300				
Dark Room	152	1	152			0				
VOCATIONS & TECHNOLOGY			28,533			35,615	3K OFFSET BY CR's/SPED/ART		38,400	
ROTC Classroom/PT (385 stu = 434 prorated)	955	4	3,819	900	5	4,500				
Culinary Arts Classroom	1,163	2	2,325	1,200	2	2,400				
Business (Accounting/Pers-Finance/Law)	869	2	1,738	1,200	2	2,400				
Business (Mktg/Sports Mktg) CH.74	994	2	1,987		incl. below		Ch.74 calc's NOT in MSBA totals			Exist 281stu in 14.5sect 5x/wk of 35p cyc at 85% =2.4rms of 20
Business (Retail Mktg - CR) CH.74	812	1	812	1,200	3	3,600	FTE	SF/stu.	SF Reg's	Adjust to 3.16 in 15.5sect x5/wk of 35p cyc at 85% =2.6 rms of 20
Business (Retail Mktg - Store) CH.74	532	1	532		incl. above		60	110	6,600	20:1 stu/tchr ratio (2200sf min, 12' clear), 3 rm capacity = 60
Tech Clrm. - (E.G. Drafting, Business)		12			12		1,200	12	14,400	Assumed use - 50% Population - 5 times/week
ROTC MP/Gym w/ Stor (Drills/Band)	755	1	755	2,500	1	2,500				
Culinary Arts Kitch + Restaurant (for 25-30)	2,494	1	2,494	2,975	1	2,975				
Costume Shop w/ Sewing, Storage	727	1	727	1,440	1	1,440				
Scene Shop	future conversion of storage above			1,440	1	1,440				
TV Studio (w/ cntrl, edit/scrn, off/wait, equip)	3,882	1	3,882	4,000	1	4,000				
Robotics/CADD (w/ Engnr)	1,577	1	1,577	1,440	2	2,880				
Clean Enegry Lab (w/ Engnr)	1,577	1	1,577	1,440	1	1,440				
Maker Space (w/ Freshman Integr. Sci)	1,512	1	1,512	1,440	1	1,440				
Business (Bank/Credit Union)	287	1	287	400	1	400				
Tech Shop - (E.G. Consumer, Wood)		8			10		2,000	12	24,000	Assumed use - 50% Population - 5 times/week
ROTC Off/ Conf.	788	2	1,576	800	2	1,600				
ROTC Storage (4sf/cadet + mock weapons)	254	7	1,779	600	3	1,800 434 x4 =1736 + 64				
Culinary Arts Storage	216	2	432	300	2	600				
Scene and Costume Storage	722	1	722	0		0 IN ROOM STOR.				
Retail/Store Storage				200	1	200				

EXCEPT STORE & BANK + TV AREA UNDER REVIEW

PERKINS EASTMAN

SPACE SUMMARY UPDATES

guidelines that scale

unscaled, typically ok

unscaled, but should

Core Academics - unchanged

Special Educ. – unchanged

Art & Music - unchanged

Voc. & Tech. - unchanged

Health & PE - unchanged

Media Center - unchanged

Aud. & Drama - unchanged

Food Service - unchanged

Proposed Space Summary v12 (for revised PSR)

LOWELL HIGH SCHOOL	Existing Conditions			Proposed Total				MSBA Guidelines (refer to MSBA Educational Program & Space Standard Guidelines)			
	Spaces Existing 3125stu/25class/.71util.=176rms 177			Spaces Proposed 3520stu/24class/.85util.=172rms 172				Spaces per Guidelines 3520stu/23class/.85util.=181rms 183			
ROOM TYPE	ROOM NFA[1]	# OF RMS	area totals	ROOM NFA[1]	# OF RMS	area totals		ROOM NFA[1]	# OF RMS	area totals	Comments
HEALTH & PHYSICAL EDUCATION			46,121			41,700	+6K (MORE STA)			35,912	
Gymnasium (6 lane 134.1m trck, LJ, TJ, SP)	28,408	1	28,408	3,000	6	18,000	REDUCE LN OFFSET w/ LCKRS	12,000	1	12,000	DOESN'T SCALE, BUT TIED TO ENROLL.
PE Alternatives (Wrestling 42x84 req'd)	1,960	1	1,960	3,500	1	3,500		3,000	1	3,000	DOESN'T SCALE, BUT TIED TO ENROLL.
Fitness & Functional Strngth	1,474	2	2,948	3,000	1	3,000					
Multi-Purpose (Gymnastics/Yoga/Cheering)	currently off-site			3,000	1	3,000					
Gym Storeroom (incl. Gymnastics w/ MP)	1,133	1	1,133	1,400	1	1,400		300	1	300	DOESN'T SCALE, BUT TIED TO SIZE
Locker Rooms - Boys / Girls w/ Toilets	3,245	2	6,490	3,600	2	7,200		19,712	1	19,712	5.6 sf/student total
Varsity Lockers - Boys/ Girls w/ Toilets	870	2	1,740	1,200	2	2,400					
Phys. Ed. Storage (incl. Equipment)	258	5	1,292	250	6	1,500		500	1	500	DOESN'T SCALE, BUT TIED TO SIZE
Athletic Director's Office (Lord 1st fl -South)	185	1	185	150	1	150		150	1	150	reasonable not to scale (typically)
AD Secr, Bursor, Conf (Lord 1st fl - South)	155	3	464	150	3	450					
Health Instructor's Office w/ Shower & Toilet	170	5	852	125	4	500		250	1	250	DOESN'T SCALE, BUT TIED TO ENROLL.
Trainers Room	216	3	649	600	1	600					not recognized, but common in HS's
MEDIA CENTER			13,164			21,900				21,900	
Media Center / Reading Room	9,137	1	9,137	21,900	1	21,900		21,900	1	21,900	
Computer Lab											
Tech Ctr, Stor + Training Lab (incl instr sp.)	666	3	1,998		included above						
Data Processing + Scheduler	1,036	1	1,036		included above						
MCAS/Testing Stor (incl instr specialist)	993	1	993		included above						
AUDITORIUM / DRAMA			20,233			15,516	+5K FOR MODEST 1/3 SEATING REQUEST			10,400	
Auditorium	11,627	1	11,627	11,616	1	11,616		7,500	1	7,500	2/3 Enrollment @ 10 SF/Seat - 750 seats MAX
Stage	2,614	1	2,614	2,600	1	2,600		1,600	1	1,600	reasonable not to scale, but small
Auditorium Storage (incl Prop Storage)	598	2	1,196	500	1	500		500	1	500	
Make-up / Dressing Rooms				300	2	600		300	2	600	reasonable not to scale (typically)
Controls / Lighting / Projection	233	1	233	200	1	200		200	1	200	
Theater - Freshman	3,438	1	3,438								
Stage - Freshman	691	1	691								
Dressing/Storage	217	2	434								
DINING & FOOD SERVICE			21,955			25,180				25,180	
Cafeteria - Freshman	4,215	1	4,215	5,000	1	5,000					
Cafeteria / Student Lounge / Break-out	10,408	1	10,408	12,600	1	12,600		17,600	1	17,600	3 seatings - 15SF per seat
Chair / Table Storage	156	1	156	1,030	1	1,030		1,030	1	1,030	
Scramble Serving Area	2,486	1	2,486	600	1	600		600	1	600	reasonable not to scale (typically)
Kitchen - Freshman	466	1	466	1,000	1	1,000					
Kitchen	3,553	1	3,553	3,820	1	3,820		4,820	1	4,820	1600 SF for first 300 + 1 SF/student Add'l
Staff Lunch Room	671	1	671	1,130	1	1,130		1,130	1	1,130	20 SF/Occupant

✓ EXCEPT EXTRA 450 AD + PLANS UNDER REVIEW

✓

✓ EXCEPT REDUCE 2,216sf (IF NEW?)

✓

✓

SPACE SUMMARY UPDATES

guidelines that scale

unscaled, typically ok

unscaled, but should

Core Academics - unchanged

Special Educ. – unchanged

Art & Music - unchanged

Voc. & Tech. - unchanged

Health & PE - unchanged

Media Center - unchanged

Aud. & Drama - unchanged

Food Service - unchanged

Medical - unchanged

Admin & Guid - unchanged

Proposed Space Summary v12 (for revised PSR)

LOWELL HIGH SCHOOL	Spaces Existing: 3125stu/25class/.71util.=176rms 177 — Existing Conditions			Spaces Proposed: 3520stu/24class/.85util.=172rms 172 — Proposed Total				Spaces per Guidelines: 3520stu/23class/.85util.=181rms 183 — MSBA Guidelines (refer to MSBA Educational Program & Space Standard Guidelines)			
ROOM TYPE	ROOM NFA[1]	# OF RMS	area totals	ROOM NFA[1]	# OF RMS	area totals		ROOM NFA[1]	# OF RMS	area totals	Comments
MEDICAL			2,215			2,610	✓			2,610	
Medical Suite Toilet	62	2	124	60	4	240		60	1	60	reasonable not to scale, but needs 2
Nurses' Office / Waiting Room	217	2	434	450	1	450		250	1	250	DOESN'T SCALE, BUT TIED TO ENROLL.
Interview Room				100	8	800		100	8	800	
Examination Room / Resting	103	8	820	100	10	1,000		100	15	1,500	
Medical Suite Toilet - Freshman	47	1	47								
Nurses' Office - Freshman	126	1	126								
Exam / Resting - Freshman	332	2	664								
Lactation Room				60	2	120					
ADMINISTRATION & GUIDANCE			15,423			13,055	+3.5K PER REAL NEED ? MSBA CONT'D REVIEW			9,785	
General Office / Waiting Room / Toilet	231	1	231	300	1	300		1,760	1	1,760	
Freshman Office / Waiting Rm / Tlt	793	1	793	200	1	200					
House Office / Waiting Rm / Tlt (B, C, D, E)	509	3	1,527	200	4	800					
Teachers' Mail and Time Room	138	1	138	250	1	250		100	1	100	DOESN'T SCALE, BUT TIED TO SIZE
Duplicating Room - C, D Houses	178	2	355	200	1	200		200	1	200	reasonable not to scale (typically)
Records Room - Main, E House	58	2	115	200	1	200		200	1	200	reasonable not to scale (typically)
Principal's Office w/ Conference Area	305	1	305	375	1	375		375	1	375	DOESN'T SCALE, BUT TIED TO SIZE
Principal's Office w/ Conf Area - Freshman	206	1	206	150	1	150					⇩
Principal's Secretary / Waiting	268	1	268	125	1	125		125	1	125	reasonable not to scale (typically)
Asst Principal's Office - AP1 (Discipl/Oper)	280	1	280	200	1	200		150	1	150	reasonable not scaled if other off's do
Asst Principal's Office - AP2 (Dir.ofCurric)	541	1	541	200	1	200		150	1	150	DOESN'T SCALE, BUT TIED TO SIZE
Asst Principal's Office (B,C,D,E)	265	4	1,058	150	4	600					⇩
Supervisory / Spare Office (Accts Payable)	137	1	137	120	1	120		120	1	120	reasonable not scaled if other off's do
Conference Room (Administration)	386	2	772	450	1	450		450	1	450	DOESN'T SCALE, BUT TIED TO SIZE
Conference Room - Freshman	175	1	175	200	1	200					⇩
Conference Room - B House	81	1	81								
Guidance Office				150	10	1,500		150	18	2,700	
Guidance Office - Freshman	187	3	562	included above							
Guidance Office - B, C, D, E House	152	8	1,219	included above							
Social Worker Office - Freshman	129	1	129	150	1	150					
Social Worker Office - B, C, D, E House	169	4	676	150	4	600					
Guidance Waiting Room - C House	292	1	292	100	5	500		100	1	100	DOESN'T SCALE, BUT TIED TO SIZE
Guidance Waiting Room - Freshman	559	1	559	included above							
Guidance Storeroom				100	5	500		100	1	100	DOESN'T SCALE, BUT TIED TO SIZE
Guidance Storeroom - Freshman	124	1	124	included above							
Career Center	677	2	1,354	1,030	1	1,030		1,030	1	1,030	not recognized, but common in HS's
Records Room - Freshman	77	1	77	465	1	465		465	1	465	DOESN'T SCALE, BUT TIED TO SIZE
Kitchenette - Freshman	200	1	200	100	1	100					⇩
Student Support Offices - Freshman	115	2	229	150	1	150					OFTEN w/ SPED, BUT SMALLER SCALE
Student Support Conf. - Freshman	230	1	230	200	1	200					⇩
Sudent Support Suite (incl. Safe Harbors)	1,183	1	1,183	1,200	1	1,200					
Student Support Offices - Gr.10-12	85	3	256	150	3	450					
Student Support Conf. Gr.10-12	140	1	140	150	1	150					
Dir of Students	278	1	278	200	1	200					
ELL Dept Head + Testing	81	2	161	120	2	240					

SPACE SUMMARY UPDATES

guidelines that scale

unscaled, typically ok

unscaled, but should

Core Academics - unchanged

Special Educ. – unchanged

Art & Music - unchanged

Voc. & Tech. - unchanged

Health & PE - unchanged

Media Center - unchanged

Aud. & Drama - unchanged

Food Service - unchanged

Medical - unchanged

Admin & Guid - unchanged

Cust. & Maint. - unchanged

Other – pool removed -7,150sf

Proposed Space Summary v12 (for revised PSR)

LOWELL HIGH SCHOOL	Spaces Existing: 3125stu/25class/.71util.=176rms 177 — Existing Conditions			Spaces Proposed: 3520stu/24class/.85util.=172rms 172 — Proposed Total				Spaces per Guidelines: 3520stu/23class/.85util.=181rms 183 — MSBA Guidelines (refer to MSBA Educational Program & Space Standard Guidelines)			
ROOM TYPE	ROOM NFA[1]	# OF RMS	area totals	ROOM NFA[1]	# OF RMS	area totals		ROOM NFA[1]	# OF RMS	area totals	Comments
Teachers' Work Room - Freshman	386	2	772	250	5	1,250		1,760	1	1,760	
CUSTODIAL & MAINTENANCE			6,775			5,440	+1K PER LDG SCALE			4,265	
Custodian's Office + Lockers	77	3	232	150	2	300		150	1	150	
Custodian's Workshop	525	1	525	500	1	500		250	1	250	
Custodian's Storage	72	26	1,884	375	2	750		375	1	375	
Recycling Room / Trash	85	1	85	400	1	400		400	1	400	
Receiving and General Supply	84	1	84	1,030	1	1,030		1,030	1	1,030	
Storeroom + Books	220	11	2,417	1,860	1	1,860		1,860	1	1,860	
Network / Telecom Room	86	18	1,548	75	8	600		200	1	200	
OTHER			19,764			6,800	+7K SQFTS REQUESTED			0	
Unassigned Computer Lab - Freshman	868	2	1,736								
Unassigned Computer Lab - Gr.10-12	960	7	6,721								
Unassigned Science Lab - Freshman	1,385	1	1,385								
Unassigned Green House/Growing Room	207	2	413								
Spare Off, Wait, Conf (220A,B,C)	185	3	556								
Lowell Comm Hlth Center	608	1	608	1,500	1	1,500					
Lowell Comm Hlth Center - Exam	80	3	241	included above							
Lowell Comm Hlth Center - Office	103	2	205	included above							
Lowell Comm Hlth Center - File and Storage	146	3	437	included above							
Lowell Comm Hlth Center - Toilet	72	1	72	included above							
Catie's Closet - Freshman	225	1	225	350	2	700					
Catie's Closet - Gr.10-12	364	1	364	included above							
Trio - Gear Up/Talent/Upward - Freshman	473	1	473	500	3	1,500					
Trio - Upward	579	1	579	included above							
Trio - Suite (recept, wait, 2 offices, conf)	197	5	984	included above							
In School Suspension - Freshman	809	1	809	450	1	600					
In House Detention Gr.10-12	969	1	969	900	1	900					
Score Mediation (Office, Entry, Stor)	132	3	395	150	2	300					
Interactive Learning Center + Storage	995	1	995	use typ CRs/laptops							
Latino Connection	228	1	228	250	1	250					
Student Activities (Lord 1st fl - North)	284	1	284	300	1	300					
Substitute Teacher's Office	127	1	127	150	1	150					
Conseling Services	occurs in available space			use typ CRs/other space							
DARE Office & Security	233	3	700	150	2	300					
SRO Office & Entry (Lord 1st fl - North)	129	2	258	150	2	300					
Total Building Net Floor Area (NFA)			352,071			386,086	+21.5K(7K OTH +6K PE+5K AUD +3.5K ADMIN)			364,807	
Proposed Student Capacity / Enrollment			3,125			3,520				3,520	157
Total Building Gross Floor Area (GFA)[2]			628,558			579,129				552,640	Note: MSBA does not incl. Ch.74 calc's
Grossing factor (GFA/NFA)			1.79			1.50				1.51	

? MSBA CONT'D REVIEW

✓ EXCEPT HEALTH CTR & CATIE'S

AGENDA

Revised Preferred Schematic Report (PSR)

- Scope & Timeline

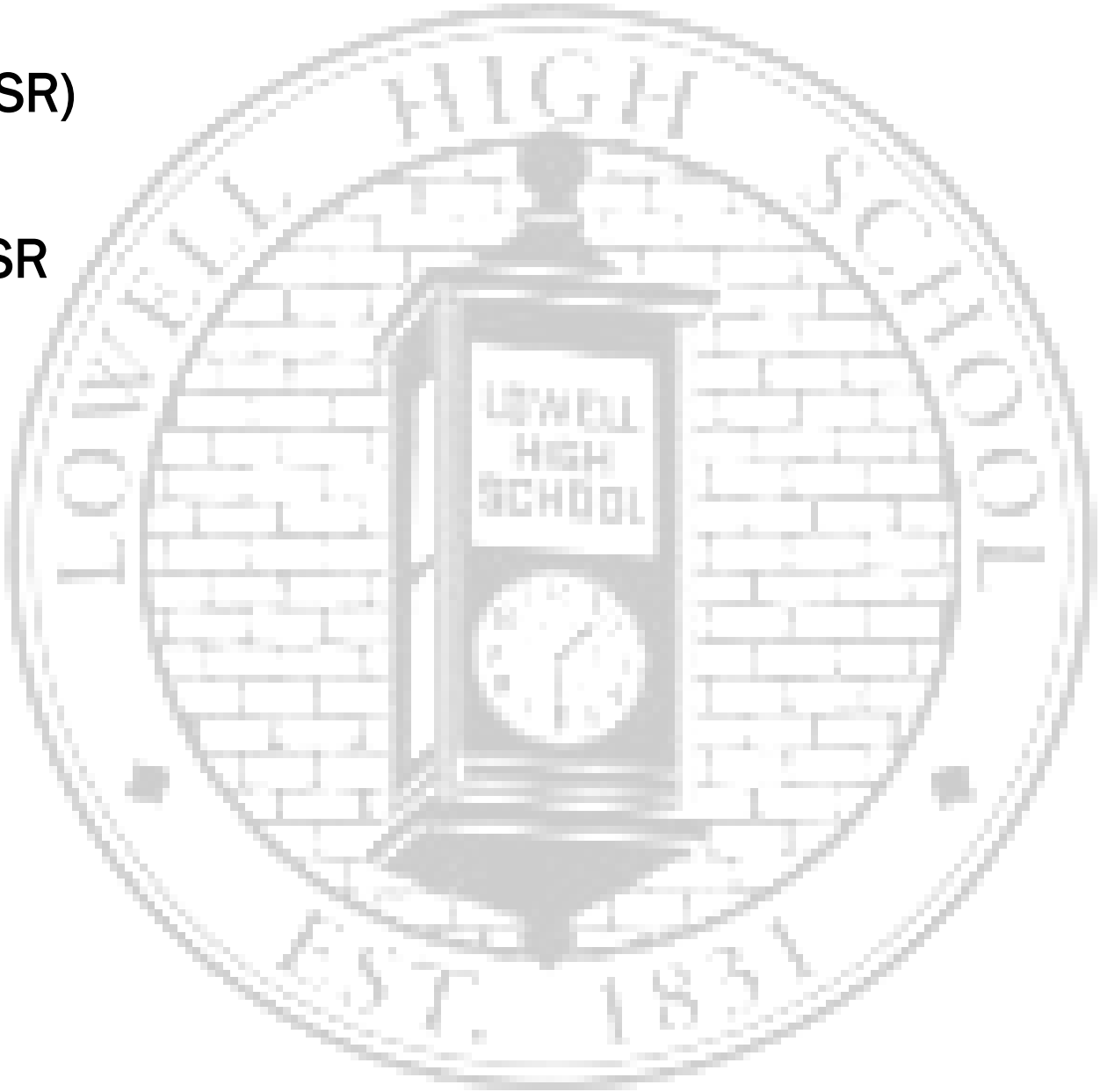
MSBA Comments Since the Previous PSR

- Accepted, Rejected or Under Review
- Gymnasium + Co-Located Programs

Educational Program Updates

Space Summary Updates

School Committee Discussion/Vote



PERKINS EASTMAN

LOWELL SCHOOL COMMITTEE – MARCH 7, 2018

LOWELL HS PROJECT



EXISTING IMAGERY COURTESY OF GOOGLE EARTH

PERKINS EASTMAN

MEETING RECORD

Perkins Eastman Architects
International PLLC

Date Prepared	2/26/2018	
Project Name	Lowell High School	
Project Number	67150.00.0	
Subject	**ELT Meeting**	
Meeting Location	LHS, Head of School Conference	
Meeting Date	2/26/2018	
Prepared By	Dawn Guarriello	d.guarriello@perkinseastman.com
	T: 617-712-2192	F: 617-449-4049
Participants	LHS ELT Group, PE DPC – Robert Bell, Dawn Guarriello Alicia Caritano	

OLD BUSINESS (AGENDA ITEMS)		NOTES	ACTION BY / DATE REQ'D
1.1			
1.2			
1.3			

NEW BUSINESS (AGENDA ITEMS)		NOTES	ACTION BY / DATE REQ'D
2.1	Review Program Updates	Removal of the Pool from the Program was discussed per MSBA feedback. More clarification on Community Health and Catie's Closet	
2.2	ROTC Spaces/Drills	ROTC Drills & PT on same day Drills ok in "U" shape Fitness Area ok to share with ROTC ROTC Storage- 600sf	
2.3	Adaptive PE/Gross Motor Room	Space is called Sensory/Motor Room- to deal with sensory or gross motor skills needs. 92 kids/12 classes/8 sessions 5x/week Sensory/Motor gets more kids- currently done in Classrooms 13 Autism Classes @ PS level- only 2 planned in new school 4 swings + punching bags	

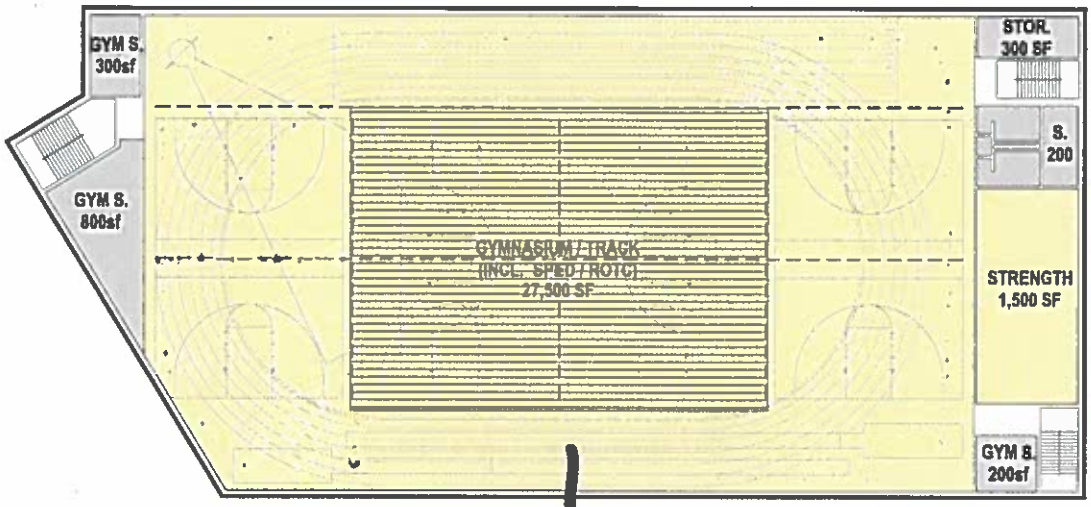
		Sensory needs darker corner/noise machines	
	Gymnasium Spaces	50x84 @ Middle courts- make end courts narrower (44'? AD to check) What will the spectator capacity be? AD would like to see bleacher options. 6 lane jogging track- only for practice? Will the gym be big enough to hold the entire school in one room?	
	Follow-up meeting	Follow-up conducted on March 5, 2018 to review the outcomes of co-locating adaptive PE and ROTC/PE.	

Next Meeting: TBD in Schematic Design

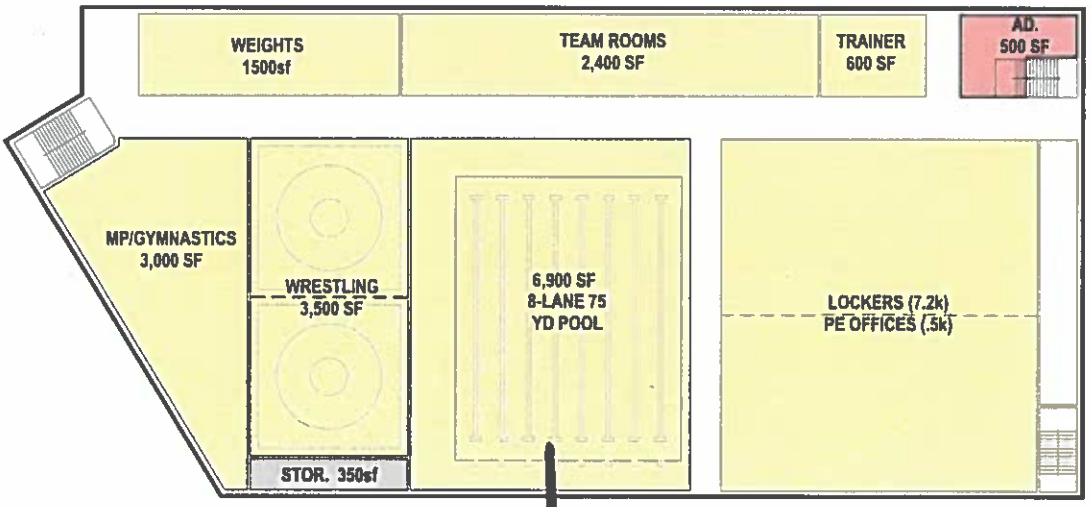
cc:

Attachments: Draft FAS Presentation

CURRENT DIAGRAM



NO MORE THAN
18K GYM AREA



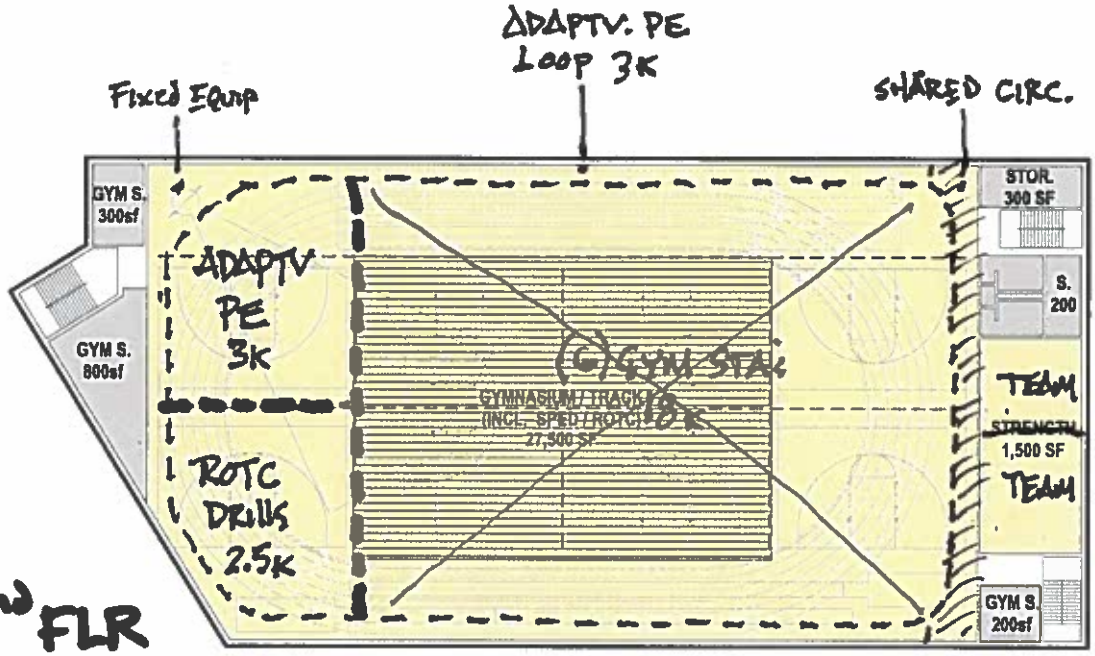
POOL TO BE
REMOVED

NOTE: PE 1359 enroll / 26 class = 53 x 5/wk = 265 sessions ÷ 35 per cycle = 7.6 / 85% use = (9) stas

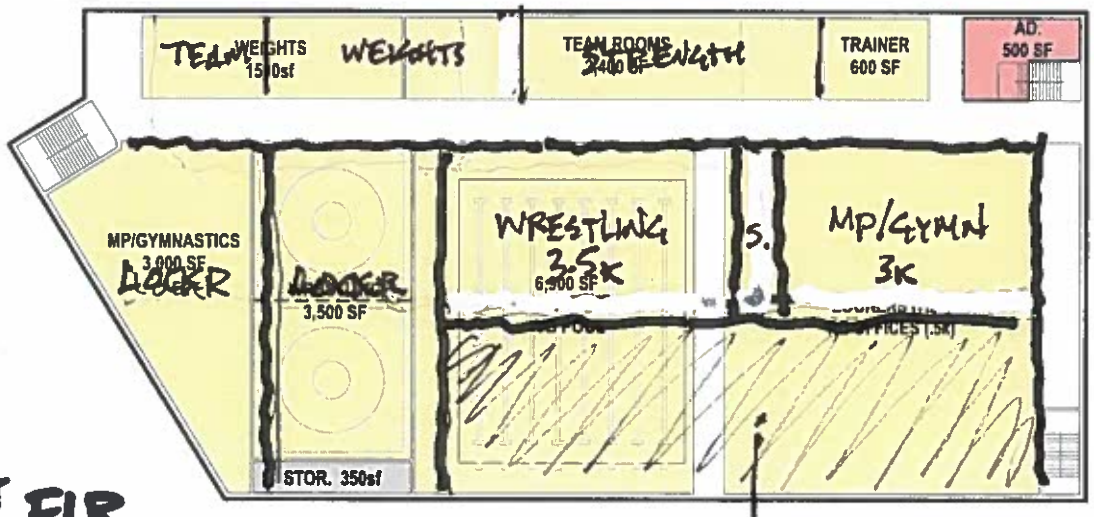
ADAPT PE 92 stu SCHED. INTO 40 sessions (can't occur in 1 space for 35 period cycle); 2 stations = 57% use

ROTC DRILLS · pull out throughout DAY... current in Hallways (DISRUPTIVE)

PE/ADAPTIVE/ROTC
option 2



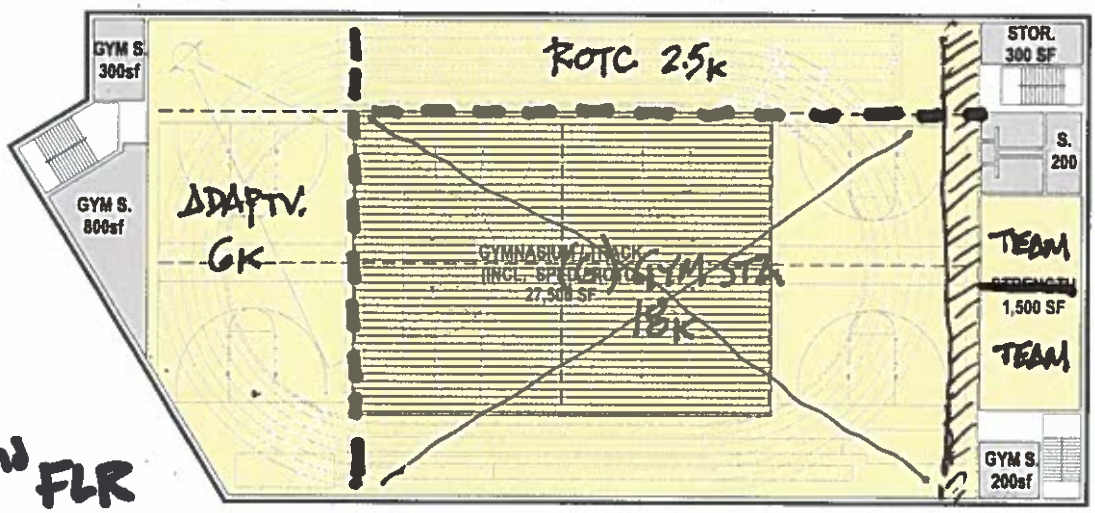
2ND FLR



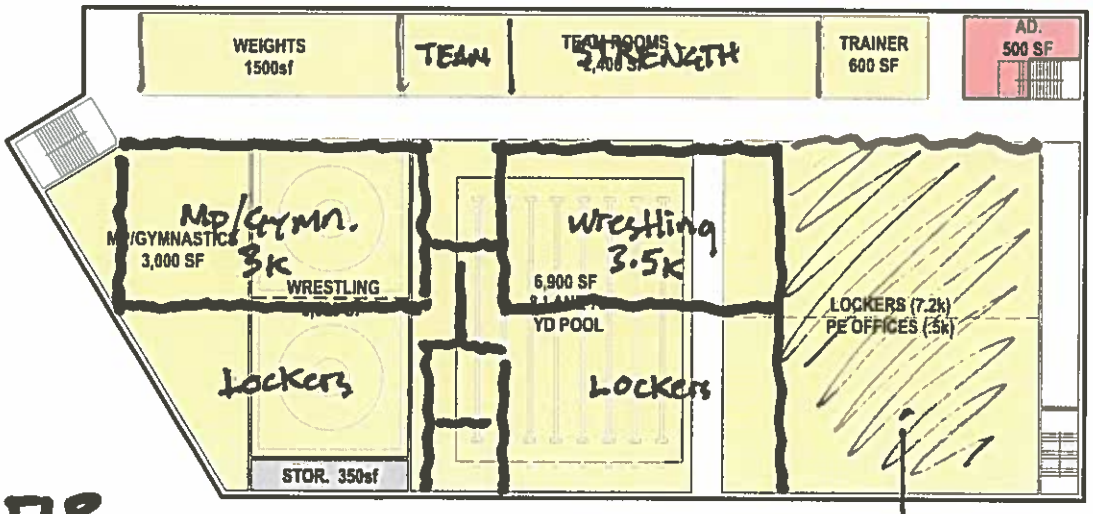
1ST FLR

CUST/MECH
and/or Kitch

PE/ADAPTIVE/ROTC
option-1



2ND FLR

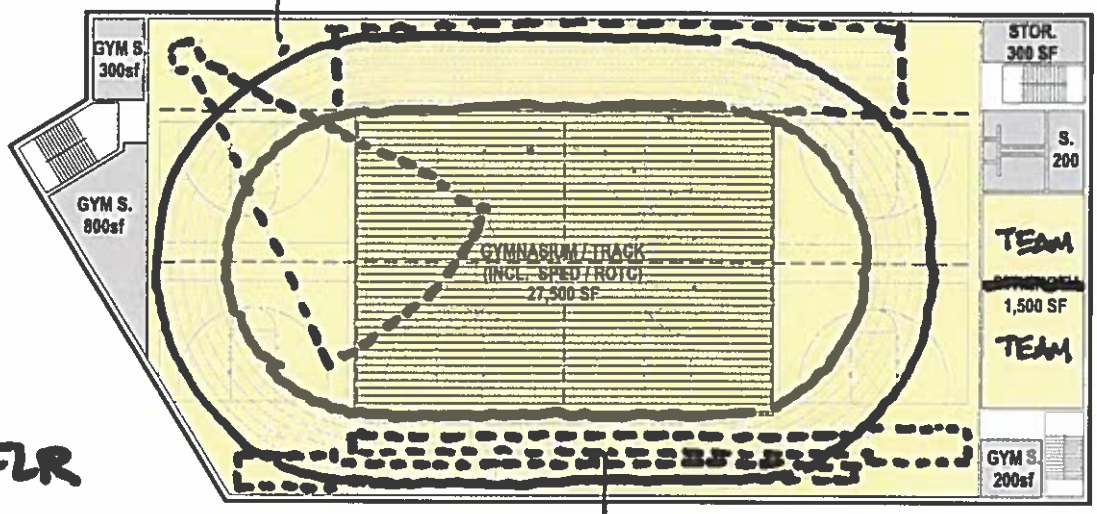


1ST FLR

CUST/MECH
and/or Kitch

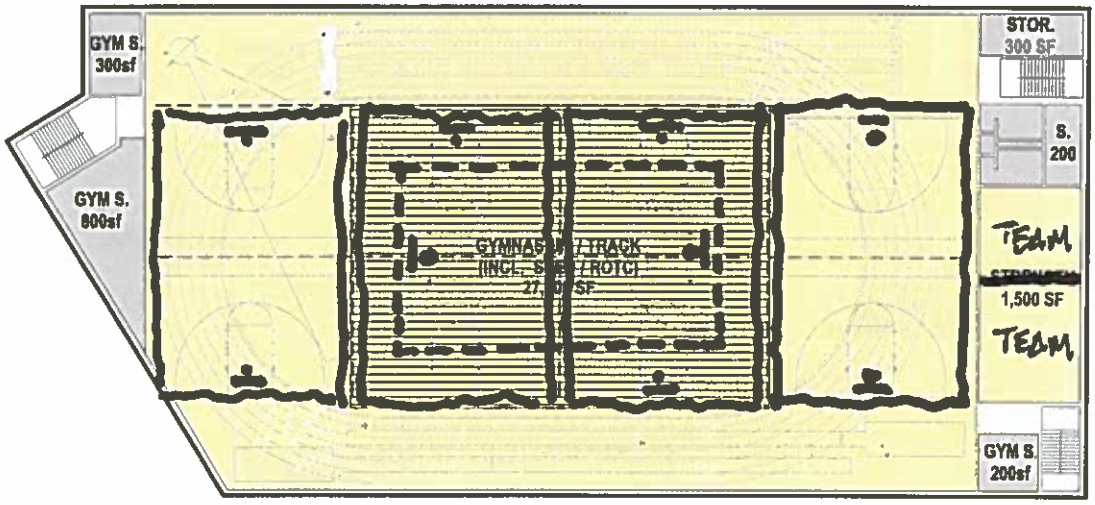
ATHLETIC/AFTER SCHOOL

6 Ln. 133.3 m Track (12 laps = 1600m)

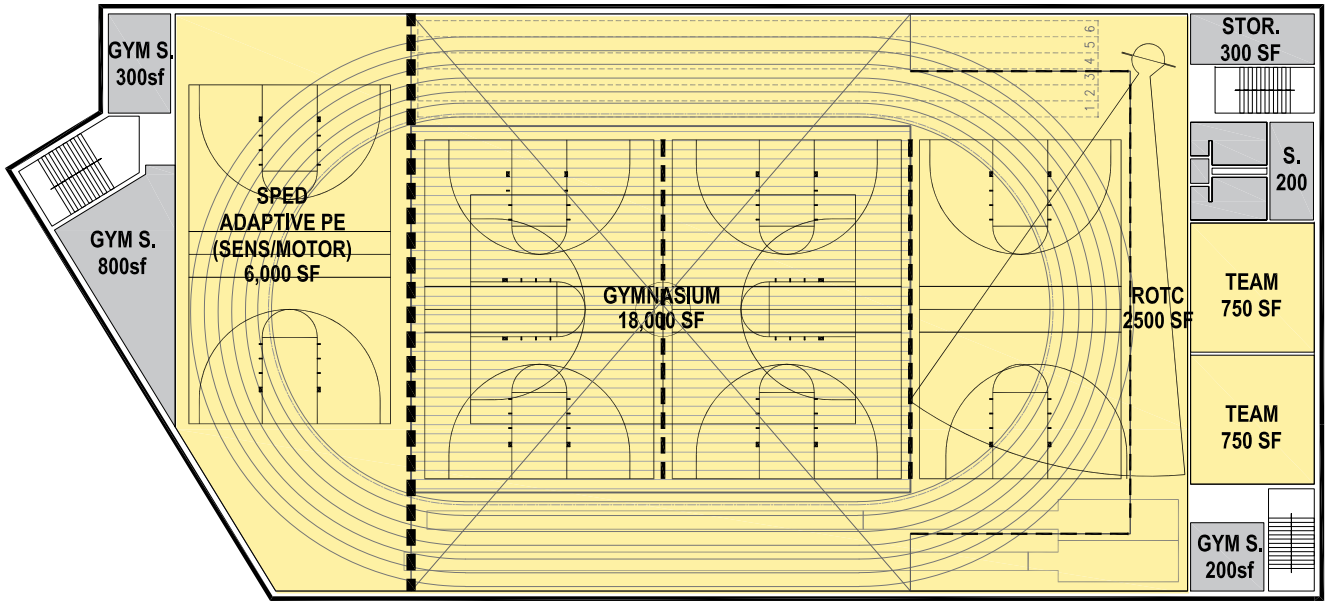


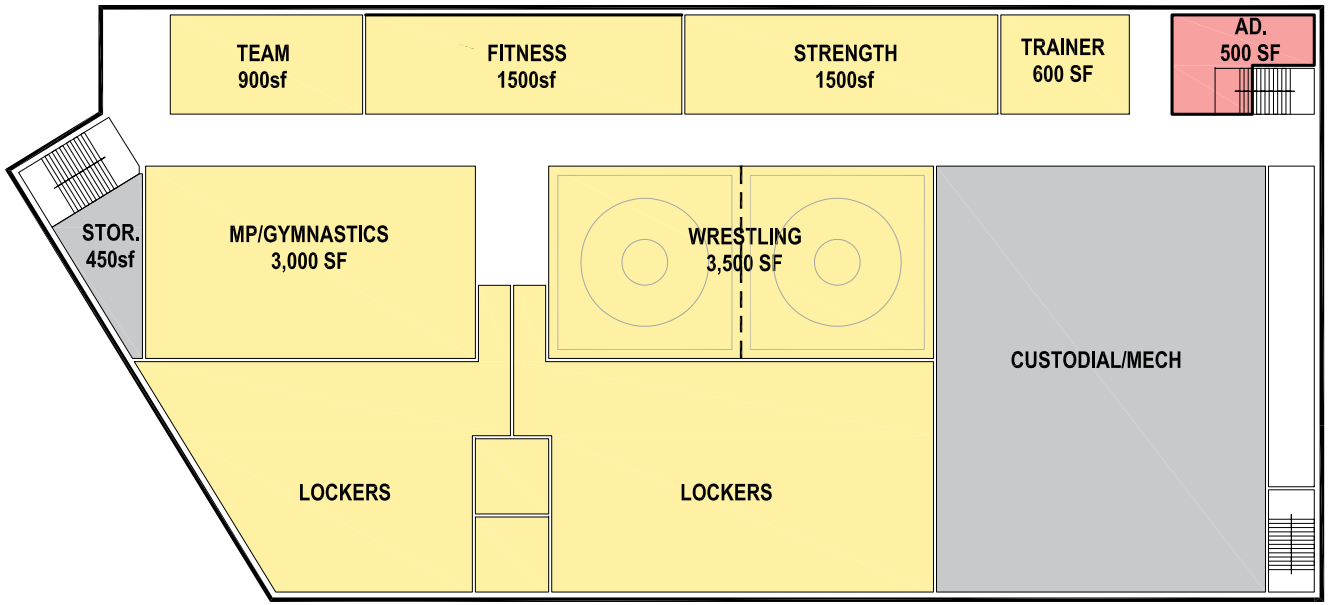
2ND FLR

LONG & TRIPLE JUMP



2ND FLR


GYM S.
300sf
GYM S.
800sf
SPED
ADAPTIVE PE
(SENS/MOTOR)
6,000 SF
GYMNASIUM
18,000 SF
ROTC
2500 SF
STOR.
300 SF
S.
200
TEAM
750 SF
TEAM
750 SF
GYM S.
200sf


TEAM
900sf
FITNESS
1500sf
STRENGTH
1500sf
TRAINER
600 SF
AD.
500 SF
STOR.
450sf
MP/GYMNASTICS
3,000 SF
WRESTLING
3,500 SF
CUSTODIAL/MECH
LOCKERS
LOCKERS

PERKINS EASTMAN

MEETING RECORD

Perkins Eastman Architects
International PLLC

Date Prepared	4/24/2018	
Project Name	Lowell High School	
Project Number	67150.00.0	
Subject	**ELT Meeting**	
Meeting Location	LHS, Head of School Conference	
Meeting Date	4/24/2018	
Prepared By	Dawn Guarriello	d.guarriello@perkinseastman.com
	T: 617-712-2192	F: 617-449-4049
Participants	LHS ELT Group, PE DPC – Robert Bell	

OLD BUSINESS (AGENDA ITEMS)		NOTES	ACTION BY / DATE REQ'D
1.1	MSBA Process	Recap of MSBA Process, Educational Program Development and Programming calculations with new Head of School, Maryann Busteed.	
1.2	Visioning Process	Discussed visioning process, goals established. Heart of the School and Classroom Clusters for Teacher Planning.	
1.3			

NEW BUSINESS (AGENDA ITEMS)		NOTES	ACTION BY / DATE REQ'D
2.1	Construction Phasing	Discussion about Construction Phasing, particularly ability to free up space within the existing building which included higher utilization of rooms and eliminating Computer Labs (which will require new computer carts at the start of construction.)	
2.2	Program Adjacencies	Discussion included talk of Program adjacencies including House Administration Suites as well as distributed Media Center.	
2.3	FAS	Discussed upcoming Facility Assessment Subcommittee meeting and talking points.	

Next Meeting: TBD in Schematic Design

cc:

Attachments: Draft FAS Presentation

PERKINS EASTMAN

MSBA – FACILITIES ASSESSMENT SUBCOMMITTEE PRESENTATION

LOWELL HS PROJECT

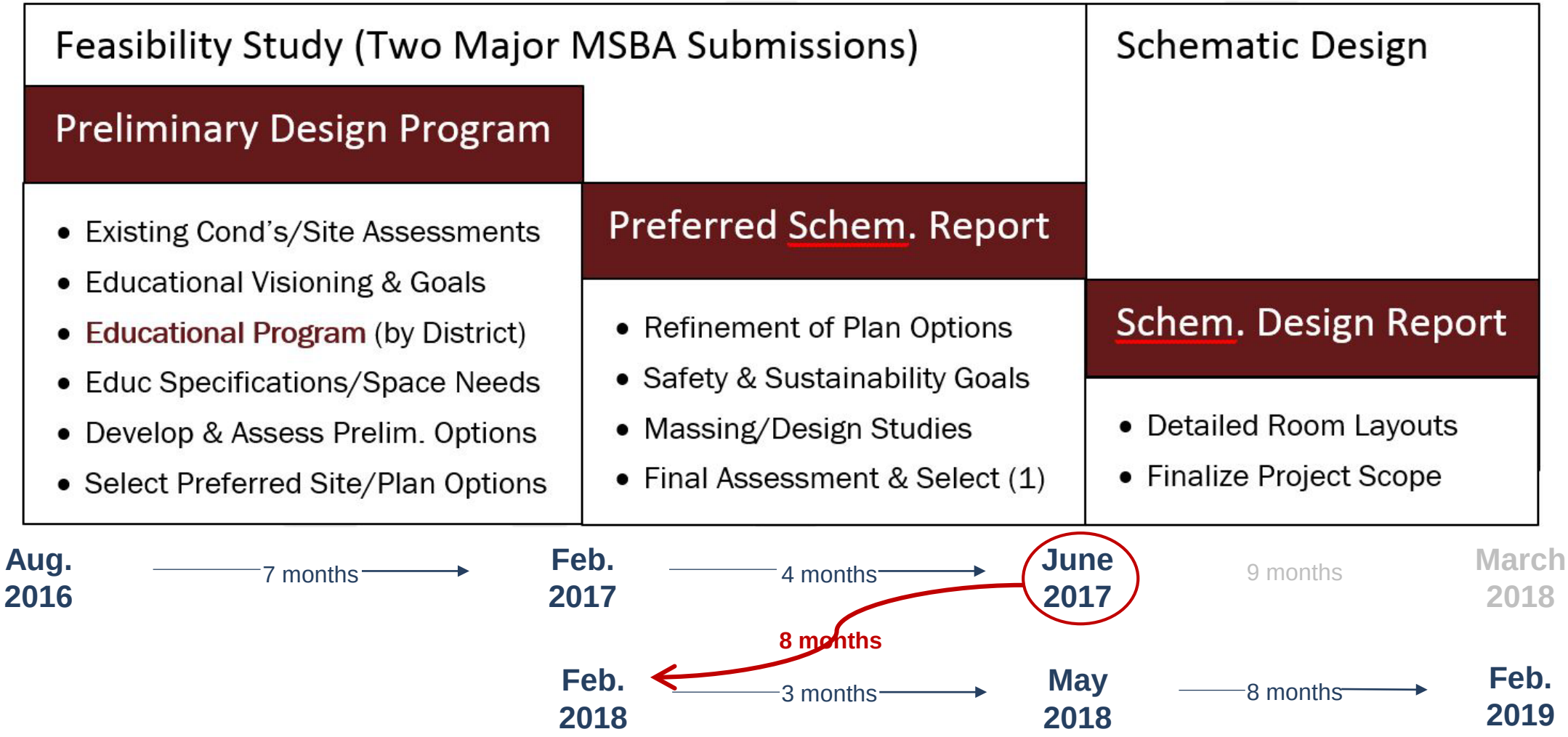


EXISTING IMAGERY COURTESY OF GOOGLE EARTH

9TH MAY 2018

OVERVIEW OF PROCESS

The current phase within the MSBA program occurs in 3 major submissions over a 20 month period



EDUCATIONAL VISION

- Joyful Environment*
- Safe and Comfortable
- Flexible and Adaptable*
- Meets Needs of Whole Child*
- 21st C. Learning Spaces
- Foster Collab. + Community
- Real-World, Project Based and Integrated Instruction
- Integrate Evolving Techn.
- Comm. Access Integration*
- Historical Context

*Also Part of the Guiding Principles

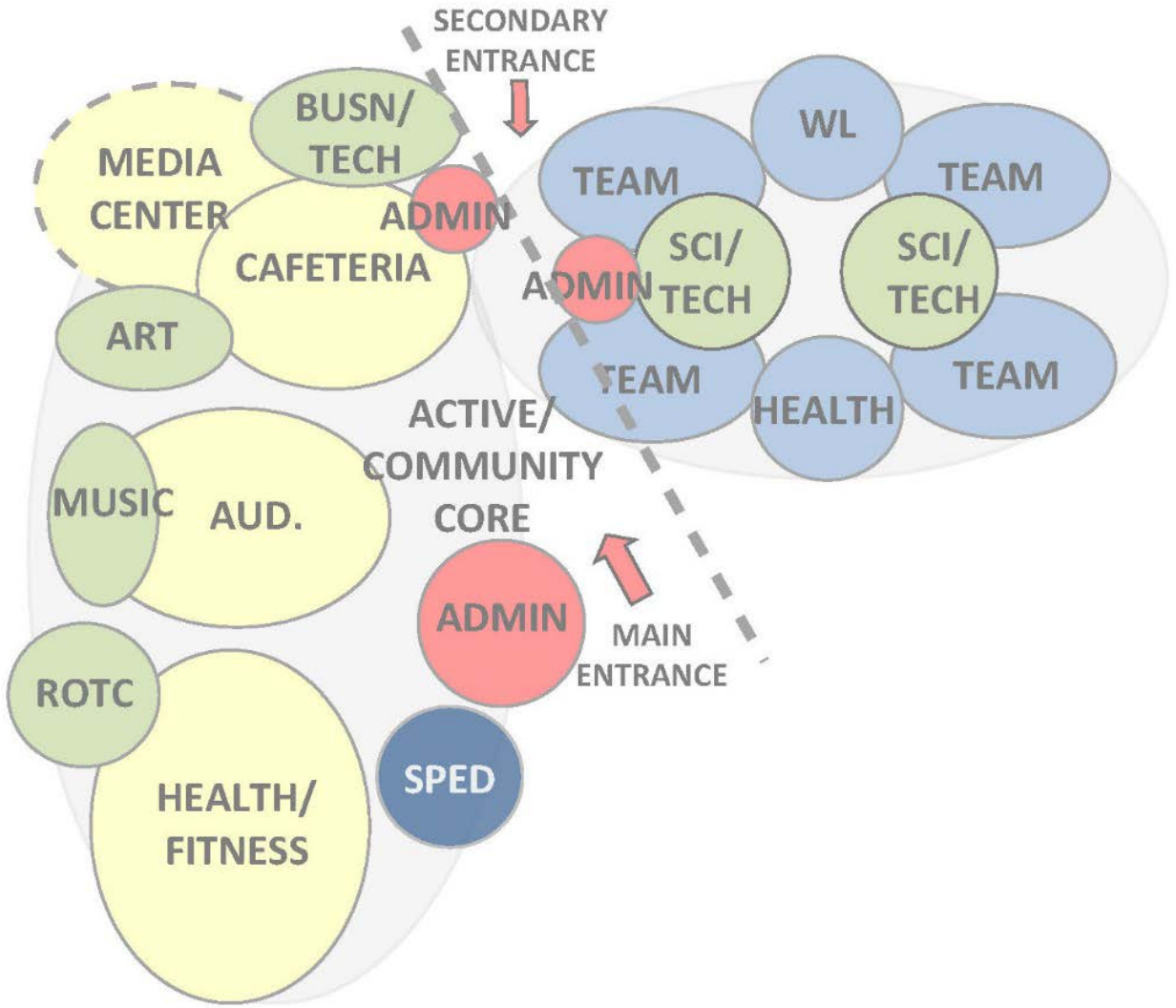


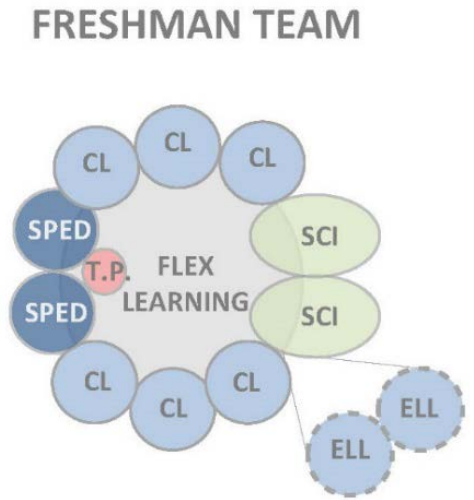
EDUCATIONAL PROGRAM

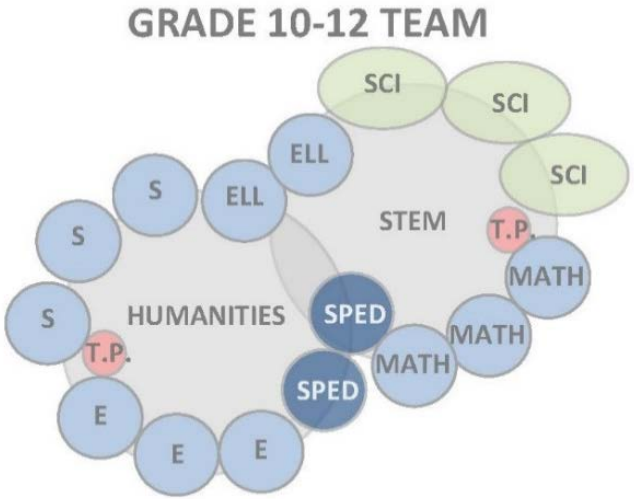


- **Connected Freshmen Academy**
- **Zone for Community Use / Lock-Off**
  - Access to Media Center & Food Service
  - Daytime Public Access
- **Create Hub/Heart to the School**
- **Organize for Interdisciplinary Collaboration**
  - 9th Grade Core Academic Teams
  - STEM & Humanities Planning Clusters
  - Integrated SPED, ELL, Health & Flexible Learning Spaces
  - Clustered Fine Arts, Digital Media, ROTC & World Language
- **Accessible House Model for Admin/Support**
- **Daylight/Orientation**
- **Minimize Educational Disruption**

ORGANIZATIONAL OBJECTIVES







SPACE SUMMARY

Space Types	Proposed	Guidelines	Difference	
• Core Academics	161,620 sf	169,040 sf	- 7.4k sf	(-11 rooms)
• Special Education	38,950 sf	34,240 sf	+ 4.7k sf	
• Art & Music	17,700 sf	13,075 sf	+ 4.6k sf	
• Voc/Technology	35,615 sf	38,400 sf	- 2.8k sf	
• Health & PE	41,700 sf	35,912 sf	+ 5.8k sf	
• Media Center	21,900 sf	21,900 sf	0	
• Auditorium/Drama	15,516 sf	10,400 sf	+ 5.1k sf	
• Dining/Food Serv.	25,180 sf	25,180 sf	0	
• Medical	2,610 sf	2,610 sf	0	
• Admin & Guidance	13,205 sf	9,785 sf	+ 3.4k sf	
• Custodial & Maint.	5,440 sf	4,265 sf	+ 1.2k sf	
• Other	13,950 sf	-	+14.0k sf	
	393,386 sf	364,807 sf	+28.6k sf	

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SPACE SUMMARY

- Proposed Core Classroom/Lab Count (-11 rooms)

  3520 students/23 class size/85% utilization =180.1 places to be
  3520 students/24 class size/85% utilization =172.5 (8 less places)

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- Additional PE Stations (guidelines stop at 5, although 7 allowed)

  1359 enroll./26 class = 53 sect's x5 = 265 sessions/35 periods = 7.6 PE Stations @ 100% use /85% utilization = 9 Stations Req'd

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- Big Picture: of the Proposed +28.5k nsf;

  + 14.0k (half) is 'Other' Spaces (incl. desired 7k pool)
  + 6.0k Additional PE Space (+4 stations offset w/ less lockers)
  + 5.0k in Reasoned Auditorium Size (modest 1/3 enrollment)
  + 3.5k is in Admin/Support (based on actual needs)

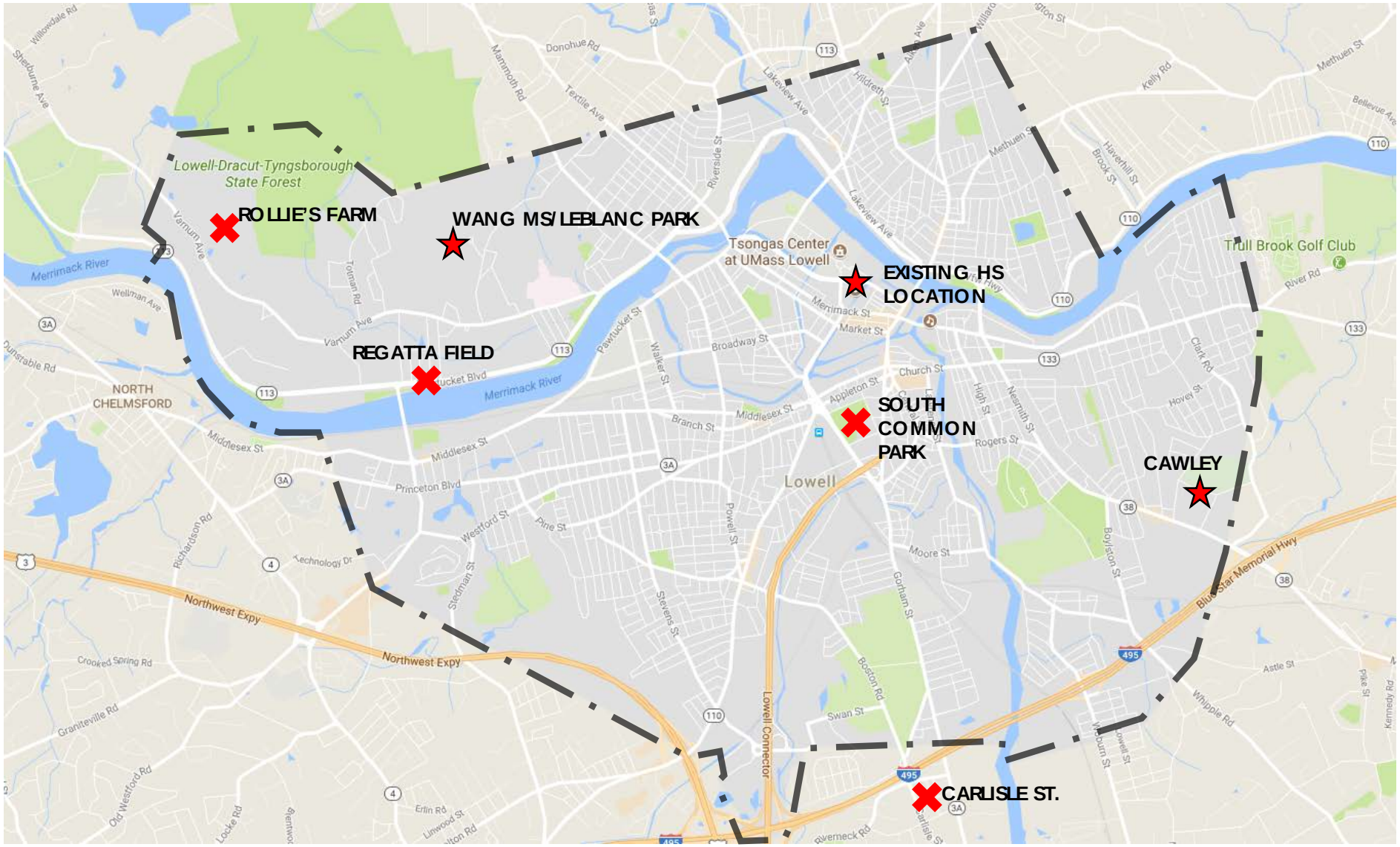
  28.5k

SITES ASSESSED (7 OF 76)

Most Favorable | Favorable | Less Favorable | Unfavorable | Y=Yes | N=No

Site	Acreage +/-	Usable Acreage +/-	Proximity to Public Transportation	Proximity to Parking and/or Garage	Eminent Domain Required	Utilities Available Y/N	Entirely Within Lowell City Limits	Proximity to Public Services in Miles (50 Arcand Dr.)	Sidewalks	Potential Environmental Issues	Land Use Restrictions	Historical Significance	Wetlands Y/N	Flood Plain	Zoning
Existing HS Location 50 Father Morissette Blvd.	6.6	6	Central Bus Hub	Ayotte Garage, John St. Garage	N	Y	Y	0	Y	Y	None known	Y	Y	N	Downtown Mixed Use (DMU)
Carlisle St. 0 Carlisle St. Chelmsford	14	10	Local Bus Routes	N	N	Y	Entire lot in Chelmsford	2.5	N	Potential Endangered Species	None known	N	Y	N	Public Educational & Municipal (P)
South Common Park 171 South St.	20	2.3	Bus Routes, Train Terminal	Central & Early Garages, On Site	N	Y	Y	0.9	Y	None known	Article 97 Open Spaces	Y (Public Park)	N	N	Traditional Multi-Family (TMF)
Regatta Field 381 Pawtucket Blvd.	23	19	Local Bus Routes	N	Owned by MassDOT	Y	Y	2.4	Y	None known	None known	Y (Public Greenspace)	Y	Y	Single Family (SSF)
Rollie's Farm 1415 Varnum Ave.	11.18	11.18	Local Bus Routes	N	Y	Y	Y	3.8	Y	Potential Endangered Species	Ch. 61A Farmland Restrict.	N	Y	N	Single Family (SSF)
Wang MS/LeBlanc Park 475 West Meadow Rd.	56	14.7	Local Bus Routes	Limited existing	N	Y	Y	2.3	Y	Former Hospital Site	None known	N	Y	Y	Single Family (SSF)
Cawley Stadium 364 Douglas Rd.	34 +/-	20	Local Bus Routes	On Site	N	Y	Portions at Clark Rd. in Tewksbury	2.6	Rogers St.-Yes, Douglas Rd.-No	Potential Endangered Species	Title Review Req'd	Y	Y	Y	Regional Retail & Single Family (RR & SSF)

MOST VIABLE SITES (3 OF 7)



12 PLAN OPTIONS (ON 3 SITES)



FULL RENOVATION

BUILDABLE ACREAGE = 6.4
BUILDING (GSF) = 641,600
RENOVATION AREA (GSF) = 623,700
ADDITION/ NEW AREA (GSF) = 17,900
EXISTING 2, 3 & 5 STORY + 2 STORY ADDTN

PARKING (GARAGE) = 1200 CAR CAPACITY



ADD/ RENO OPTION 1A

BUILDABLE ACREAGE = 6.0
BUILDING (GSF) = 617,400
RENOVATION AREA (GSF) = 529,100
ADDITION/ NEW AREA (GSF) = 88,300
NEW 2 & 3 STORY ADDITIONS, INCLUDING 2 STORY BRIDGES

PARKING (GARAGE) = 1200 CAR CAPACITY

+ORIG. OPTION 1



ADD/ RENO OPTION 2

BUILDABLE ACREAGE = 6.0
BUILDING (GSF) = 624,100
RENOVATION AREA (GSF) = 454,100
ADDITION/ NEW AREA (GSF) = 170,000
NEW 2 STORY FIELD HS, 5 STORY FA WING +2 STORY BRIDGES

PARKING (GARAGE) = 1200 CAR CAPACITY



ADD/ RENO OPTION 3 – EXPANDED SITE

BUILDABLE ACREAGE = 7.4
BUILDING (GSF) = 638,700
RENOVATION AREA (GSF) = 447,500
ADDITION/ NEW AREA (GSF) = 191,200
NEW 2 STORY FIELD HS, 5 STORY FA WING + 2 STORY BRIDGES

PARKING (GARAGE) = 1200 CAR CAPACITY



ADD/ RENO OPTION 4

BUILDABLE ACREAGE = 6.0
BUILDING (GSF) = 619,000
RENOVATION AREA (GSF) = 312,800
ADDITION/ NEW AREA (GSF) = 306,200
NEW 2 STORY FIELD HS, 5 STORY OTHERS + 2 STORY BRIDGES

PARKING (GARAGE) = 1200 CAR CAPACITY



ADD/ RENO OPTION 5

BUILDABLE ACREAGE = 7.4
BUILDING (GSF) = 620,900
RENOVATION AREA (GSF) = 312,800
ADDITION/ NEW AREA (GSF) = 308,100
NEW 2 STORY FIELD HS, 5 STORY OTHERS + 2 STORY BRIDGES

PARKING (GARAGE) = 1200 CAR CAPACITY



NEW SCHOOL - EXISTING SITE

BUILDABLE ACREAGE = 3.3
BUILDING (GSF) = 594,000
NEW 6 STORY BLDG + NO BRIDGES

PARKING (GARAGE) = 1200 CAR CAPACITY



NEW SCHOOL - EXPANDED SITE

BUILDABLE ACREAGE = 4.7
BUILDING (GSF) = 576,500
NEW 5 STORY BLDG + NO BRIDGES

PARKING (GARAGE) = 1200 CAR CAPACITY



NEW SCHOOL - WANG SITE

BUILDABLE ACREAGE = 14.7
TOTAL SITE ACREAGE = 56.0
BUILDING (GSF) = 571,500
4 STORY BLDG

PARKING (ON-SITE) = 430 CAR CAPACITY

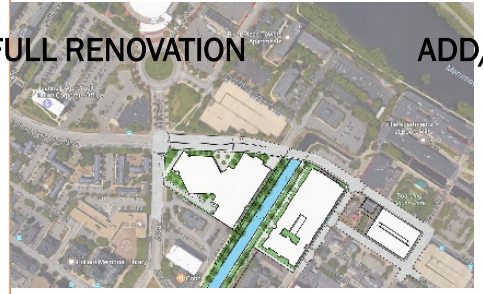


NEW SCHOOL - CAWLEY SITE

BUILDABLE ACREAGE = 20.0
(16.4 FOR NEW SCHOOL + 3.6 NEW FIELDS)
TOTAL ACREAGE = 34.0 (4 IN TEWKSBURY)
BUILDING (GSF) = 571,500
4 STORY BLDG

PARKING (ON-SITE) = 608 CAR CAPACITY

+5 FLR VARIANT

	FULL RENOVATION	ADD/RENO OPTION 2	ADD/RENO OPTION 3 (EXP)	NEW 4-STORY AT CAWLEY	NEW 5-STORY AT CAWLEY
					
Building/Site •Acreage •Gross Size •Stories/Ht. •Parking •Cars/Buses	**6.4** of 6.6 acres **650.1**k gsf (614.3k reno +35.8k add) New **3** Story at 48'(63' Existing) **725** per Survey (629 of Ayotte's 1200) On Street + Use of City Transit	**6.0** of 6.6 acres **636.7**k gsf (445.5k reno+191.2k add) New **2-3-5**-Story at 48-68'(63' Existing) **725** per Survey (629 of Ayotte's 1200) On Street + Use of City Transit	**7.4** = 6.0 of 6.6 acres +1.4 exp. lot **632.1**k gsf (440.1k reno +192k add) New **2-3-5**-Story at 48-68'(63' Existing) **725** per Survey (629 of Ayotte's 1200) On Street + Use of City Transit	**23.5** of 43.24 acres **590.3**k gsf new construction New **4**-Story at 58' **750** of 850 Estimated Need On-Site **46+** Car Queue/46 Buses Dbl-Stack	**23.5** of 43.24 acres **590.8**k gsf new construction New **5**-Story at 68' **850** Estimated Need Fits On-Site **38+** Car Queue/46 Buses Dbl-Stack
Location •Transportation •City Services •Parking •Deliveries •Outdoor Space •Addtn'l Busing	Existing Down-Town Site(s) + **Proximity/Frequency of City Buses** + **Proximity To City/Social Services** + **Adjacent Pkg Garages (Covered)** ± **Existing Service Access Remains** – **Limited Access To Green Space** – **Busing Req'd for Some Athletics**	Existing Down-Town Site + **Proximity/Frequency of City Buses** + **Proximity To City/Social Services** + **Adjacent Pkg Garages (Covered)** ± **Existing Service Access Remains** – **Limited Access To Green Space** – **Busing Req'd for Some Athletics**	Existing Down-Town Site + Adjacent Lot + **Proximity/Frequency of City Buses** + **Proximity To City/Social Services** + **Adjacent Pkg Garages (Covered)** + **Improved Service/Access** ± **Modest Green Space Created** – **Busing Req'd for Some Athletics**	Cawley Stadium Site – **Proximity/Frequency To City Buses** – **Proximity To City/Social Services** – **100 Spaces Estimated Off-Site** + **Full Service/Perimeter Access** + **Ample Access to Green Space** – **Busing Req'd for Arrival/Departure**	Cawley Stadium Site – **Proximity/Frequency To City Buses** – **Proximity To City/Social Services** + **All Parking Provided On-Site** + **Full Service/Perimeter Access** + **Ample Access to Green Space** – **Busing Req'd for Arrival/Departure**
Educ-Program •Freshman Loc •Heart/Hub •Organization •Space Needs	Meets Objectives Except as Noted: – **Freshman Academy Is Remote** ± **Public/Activity Areas Spread & Split** + **F.A. Teams + STEM/Hum. Clusters** + **Meets New Standards (Count/Size)**	Meets Objectives Except as Noted: + **Freshman Academy Connected** ± **Public/Activity Areas Spread & Split** + **F.A. Teams + STEM/Hum. Clusters** + **Meets New Standards (Count/Size)** + **More Efficient/Effective Field House**	Meets Objectives Except as Noted: + **Freshman Academy Connected** ± **Public/Activity Areas Spread & Split** + **F.A. Teams + STEM/Hum. Clusters** + **Meets New Standards (Count/Size)** + **More Efficient/Effective Field House**	Meets Objectives Except as Noted: + **Freshman Academy Connected** + **Public/Activity Areas Clustered** + **F.A. Teams + STEM/Hum. Clusters** + **Meets New Standards (Count/Size)** + **More Efficient/Effective Field House**	Meets Objectives Except as Noted: + **Freshman Academy Connected** + **Public/Activity Areas Clustered** + **F.A. Teams + STEM/Hum. Clusters** + **Meets New Standards (Count/Size)** + **More Efficient/Effective Field House**
Sustainability •Daylight/Solar •View Windows •Energy Effic.	Extent of Exist. Ext. Wall Upgrades -TBD – **Orientation Is Problematic** – **Windowless Classrooms/Labs Exist** – **Higher Operating Costs (Multi-Bldgs)**	Extent of Exist. Ext. Wall Upgrades -TBD ± **Existing Is Problematic/New FA Ideal** – **Windowless Classrooms/Labs Exist** – **Higher Operating Costs (Multi-Bldgs)**	Extent of Exist. Ext. Wall Upgrades -TBD ± **Existing Is Problematic/New FA Ideal** + **Light Wells = No Windowless Labs** – **Higher Operating Costs (Multi-Bldgs)**	New Construction and Exterior Shell ± **Good for Most All Teaching Spaces** + **No Windowless CRs + Ideal Daylight** + **Lower Operating Costs**	New Construction and Exterior Shell ± **Good for Most All Teaching Spaces** + **No Windowless CRs + Ideal Daylight** + **Lower Operating Costs**
Construction	5 Year (+ summer) Phased Project + **Kitchen/Boiler Built in First Phase** – **Temporary Gym Facilities Required** – **Extensive Modular Classrooms**	4 Year (+ summer) Phased Project + **Kitchen/Boiler Built in First Phase** – **Temporary Gym Facilities Required**	4.5 Year (+ summer) Phased Project + **Kitchen/Boiler Built in First Phase** + **No Modulars or Temporary Gym** ± **Only 3 Years of 4.5 On School Site** – **Land Acquisition/Eminent Domain**	3 Year Project + **No School/Services Disruption** ± **Article 97=Field Replication Off-Site** (Fr+JV Practice F.Ball+S.Ball Infield)	3 Year Project + **No School/Services Disruption** ± **Article 97=Field Replication Off-Site** (Fr+JV Practice F.Ball+S.Ball Infield)
PSR Proj. Cost •City's Share	~~$343,585,338~~ ~~$130,022,882~~	~~$343,948,823~~ ~~$135,320,524~~	~~$352,559,455~~ ~~$143,232,657~~	~~$339,152,182~~ ~~$152,160,821~~	~~$336,138,724~~ ~~$149,439,672~~

Preliminary Evaluation of Options

Assesment Highlights:

+ No Windowless Labs
+ Min. Construction Impact
+ Zero Modulars Required
+ Green Space Enhancement
+ Improved Service/Access

	FULL RENOVATION	ADD/RENO OPTION 2	ADD/RENO OPTION 3 (EXP)
			 NEW 4-STORY AT CAWLEY
Building/Site •Acreage •Gross Size •Stories/Ht •Parking •Cars/Buses	6.6 of 6.6 acres 650.1k gsf (614.3k reno +35.8k add) New 3-Story at 48'(63' Existing) 725 per Survey (629 of Ayotte's 1200) On Street + Use of City Transit	6.6 of 6.6 acres 636.7k gsf (445.5k reno+191.2k add) New 2-3-5-Story at 48-68'(63' Existing) 725 per Survey (629 of Ayotte's 1200) On Street + Use of City Transit	7.4 = 6.0 of 6.6 acres +1.4 exp. lot 632.1k gsf (440.1k reno +192k add) New 2-3-5-Story at 48-68'(63' Existing) 725 per Survey (629 of Ayotte's 1200) On Street + Use of City Transit
Location •Transportation •City Services •Parking •Deliveries •Outdoor Space •Addtn'l Busing	Existing Down-Town Site + Proximity/Frequency of City Buses + Proximity To City/Social Services + Adjacent Pkg Garages (Covered) ± Existing Service Access Remains – Limited Access To Green Space – Busing Req'd for Some Athletics	Existing Down-Town Site + Proximity/Frequency of City Buses + Proximity To City/Social Services + Adjacent Pkg Garages (Covered) ± Existing Service Access Remains – Limited Access To Green Space – Busing Req'd for Some Athletics	Existing Down-Town Site + Adjacent Lot + Proximity/Frequency of City Buses + Proximity To City/Social Services + Adjacent Pkg Garages (Covered) + Improved Service/Access ± Modest Green Space Created – Busing Req'd for Some Athletics
Educ-Program •Freshman Loc •Heart/Hub •Organization •Space Needs	Meets Objectives Except as Noted: – Freshman Academy Is Remote ± Public/Activity Areas Spread & Split + F.A. Teams + STEM/Hum. Clusters + Meets New Standards (Count/Size)	Meets Objectives Except as Noted: + Freshman Academy Connected ± Public/Activity Areas Spread & Split + F.A. Teams + STEM/Hum. Clusters + Meets New Standards (Count/Size) + More Efficient/Effective Field House	Meets Objectives Except as Noted: + Freshman Academy Connected ± Public/Activity Areas Spread & Split + F.A. Teams + STEM/Hum. Clusters + Meets New Standards (Count/Size) + More Efficient/Effective Field House
Sustainability •Daylight/Solar •View Windows •Energy Effic.	Extent of Exist. Ext. Wall Upgrades -TBD – Orientation Is Problematic – Windowless Classrooms/Labs Exist – Higher Operating Costs (Multi-Bldgs)	Extent of Exist. Ext. Wall Upgrades -TBD ± Existing Is Problematic/New FA Ideal – Windowless Classrooms/Labs Exist – Higher Operating Costs (Multi-Bldgs)	Extent of Exist. Ext. Wall Upgrades -TBD ± Existing Is Problematic/New FA Ideal + Light Wells = No Windowless Labs – Higher Operating Costs (Multi-Bldgs)
Construction	5 Year (+ summer) Phased Project + Kitchen/Boiler Built in First Phase – Temporary Gym Facilities Required – Extensive Modular Classrooms	4 Year (+ summer) Phased Project + Kitchen/Boiler Built in First Phase – Temporary Gym Facilities Required	4.5 Year (+ summer) Phased Project + Kitchen/Boiler Built in First Phase + No Modulars or Temporary Gym ± Only 3 Years of 4.5 On School Site – Land Acquisition/Eminent Domain
PSR Proj. Cost •City's Share	$343,585,338 $130,022,882	$343,948,823 $135,320,524	$352,559,455 $143,232,657

	NEW 5-STORY AT CAWLEY
	
Building/Site •Acreage •Gross Size •Stories/Ht •Parking •Cars/Buses	23.5 of 43.24 acres 590.3k gsf new construction New 4-Story at 58' 750 of 850 Estimated Need On-Site 46+ Car Queue/46 Buses Dbl-Stack
Location •Transportation •City Services •Parking •Deliveries •Outdoor Space •Addtn'l Busing	Cawley Stadium Site – Proximity/Frequency To City Buses – Proximity To City/Social Services – 100 Spaces Estimated Off-Site + Full Service/Perimeter Access + Ample Access to Green Space – Busing Req'd for Arrival/Departure
Educ-Program •Freshman Loc •Heart/Hub •Organization •Space Needs	Meets Objectives Except as Noted: + Freshman Academy Connected + Public/Activity Areas Clustered + F.A. Teams + STEM/Hum. Clusters + Meets New Standards (Count/Size) + More Efficient/Effective Field House
Sustainability •Daylight/Solar •View Windows •Energy Effic.	New Construction and Exterior Shell ± Good for Most All Teaching Spaces + No Windowless CRs + Ideal Daylight + Lower Operating Costs
Construction	3 Year Project + No School/Services Disruption ± Article 97=Field Replication Off-Site (Fr+JV Practice F.Ball+S.Ball Infield)
PSR Proj. Cost •City's Share	$339,152,182 $152,160,821

	NEW 5-STORY AT CAWLEY
	
Building/Site •Acreage •Gross Size •Stories/Ht •Parking •Cars/Buses	23.5 of 43.24 acres 590.8k gsf new construction New 5-Story at 68' 850 Estimated Need Fits On-Site 38+ Car Queue/46 Buses Dbl-Stack
Location •Transportation •City Services •Parking •Deliveries •Outdoor Space •Addtn'l Busing	Cawley Stadium Site – Proximity/Frequency To City Buses – Proximity To City/Social Services + All Parking Provided On-Site + Full Service/Perimeter Access + Ample Access to Green Space – Busing Req'd for Arrival/Departure
Educ-Program •Freshman Loc •Heart/Hub •Organization •Space Needs	Meets Objectives Except as Noted: + Freshman Academy Connected + Public/Activity Areas Clustered + F.A. Teams + STEM/Hum. Clusters + Meets New Standards (Count/Size) + More Efficient/Effective Field House
Sustainability •Daylight/Solar •View Windows •Energy Effic.	New Construction and Exterior Shell ± Good for Most All Teaching Spaces + No Windowless CRs + Ideal Daylight + Lower Operating Costs
Construction	3 Year Project + No School/Services Disruption ± Article 97=Field Replication Off-Site (Fr+JV Practice F.Ball+S.Ball Infield)
PSR Proj. Cost •City's Share	$336,138,724 $149,439,672

Final Evaluation of Planning Options

Assesment Highlights:

+ No Windowless Labs
+ Min. Construction Impact
+ Zero Modulars Required
+ Green Space Enhancement
+ Improved Service/Access
+ Meets Full Parking Needs
+/- Location/Bussing Debate (city/services vs campus/fields)

	FULL RENOVATION	ADD/RENO OPTION 2	ADD/RENO OPTION 3 (EXP)	NEW 4-STORY AT CAWLEY	NEW 5-STORY AT CAWLEY
					
Building/Site •Acreage •Gross Size •Stories/Ht •Parking •Cars/Buses	6.6 of 6.6 acres 650.1k gsf (614.3k reno +35.8k add) New 3-Story at 48'(63' Existing) 725 per Survey (629 of Ayotte's 1200) On Street + Use of City Transit	6.6 of 6.6 acres 636.7k gsf (445.5k reno+191.2k add) New 2-3-5-Story at 48-68'(63' Existing) 725 per Survey (629 of Ayotte's 1200) On Street + Use of City Transit	7.4 = 6.0 of 6.6 acres +1.4 exp. lot 632.1k gsf (440.1k reno +192k add) New 2-3-5-Story at 48-68'(63' Existing) 725 per Survey (629 of Ayotte's 1200) On Street + Use of City Transit	23.5 of 43.24 acres 590.3k gsf new construction New 4-Story at 58' 750 of 850 Estimated Need On-Site 46+ Car Queue/46 Buses Dbl-Stack	23.5 of 43.24 acres 590.8k gsf new construction New 5-Story at 68' 850 Estimated Need Fits On-Site 38+ Car Queue/46 Buses Dbl-Stack
Location •Transportation •City Services •Parking •Deliveries •Outdoor Space •Addtn'l Busing	Existing Down-Town Site + Proximity/Frequency of City Buses + Proximity To City/Social Services + Adjacent Pkg Garages (Covered) ± Existing Service Access Remains — Limited Access To Green Space — Busing Req'd for Some Athletics	Existing Down-Town Site + Proximity/Frequency of City Buses + Proximity To City/Social Services + Adjacent Pkg Garages (Covered) ± Existing Service Access Remains — Limited Access To Green Space — Busing Req'd for Some Athletics	Existing Down-Town Site + Adjacent Lot + Proximity/Frequency of City Buses + Proximity To City/Social Services + Adjacent Pkg Garages (Covered) + Improved Service/Access ± Modest Green Space Created — Busing Req'd for Some Athletics	Cawley Stadium Site — Proximity/Frequency To City Buses — Proximity To City/Social Services — 100 Spaces Estimated Off-Site + Full Service/Perimeter Access + Ample Access to Green Space — Busing Req'd for Arrival/Departure	Cawley Stadium Site — Proximity/Frequency To City Buses — Proximity To City/Social Services + All Parking Provided On-Site + Full Service/Perimeter Access + Ample Access to Green Space — Busing Req'd for Arrival/Departure
Educ Program •Freshman Loc •Hearth/Hub •Organization •Space Needs	Meets Objectives Except as Noted: — Freshman Academy Is Remote ± Public/Activity Areas Spread & Split + F.A. Teams + STEM/Hum. Clusters + Meets New Standards (Count/Size)	Meets Objectives Except as Noted: + Freshman Academy Connected ± Public/Activity Areas Spread & Split + F.A. Teams + STEM/Hum. Clusters + Meets New Standards (Count/Size) + More Efficient/Effective Field House	Meets Objectives Except as Noted: + Freshman Academy Connected ± Public/Activity Areas Spread & Split + F.A. Teams + STEM/Hum. Clusters + Meets New Standards (Count/Size) + More Efficient/Effective Field House	Meets Objectives Except as Noted: + Freshman Academy Connected + Public/Activity Areas Clustered + F.A. Teams + STEM/Hum. Clusters + Meets New Standards (Count/Size) + More Efficient/Effective Field House	Meets Objectives Except as Noted: + Freshman Academy Connected + Public/Activity Areas Clustered + F.A. Teams + STEM/Hum. Clusters + Meets New Standards (Count/Size) + More Efficient/Effective Field House
Sustainability •Daylight/Solar •View Windows •Energy Effic.	Extent of Exist. Ext. Wall Upgrades -TBD — Orientation Is Problematic — Windowless Classrooms/Labs Exist — Higher Operating Costs (Multi-Bldgs)	Extent of Exist. Ext. Wall Upgrades -TBD ± Existing Is Problematic/New FA Ideal — Windowless Classrooms/Labs Exist — Higher Operating Costs (Multi-Bldgs)	Extent of Exist. Ext. Wall Upgrades -TBD ± Existing Is Problematic/New FA Ideal + Light Wells = No Windowless Labs — Higher Operating Costs (Multi-Bldgs)	New Construction and Exterior Shell ± Good for Most All Teaching Spaces + No Windowless CRs + Ideal Daylight + Lower Operating Costs	New Construction and Exterior Shell ± Good for Most All Teaching Spaces + No Windowless CRs + Ideal Daylight + Lower Operating Costs
Construction	5 Year (+ summer) Phased Project + Kitchen/Boiler Built in First Phase — Temporary Gym Facilities Required — Extensive Modular Classrooms	4 Year (+ summer) Phased Project + Kitchen/Boiler Built in First Phase — Temporary Gym Facilities Required	4.5 Year (+ summer) Phased Project + Kitchen/Boiler Built in First Phase + No Modulars or Temporary Gym ± Only 3 Years of 4.5 On School Site — Land Acquisition/Eminent Domain	3 Year Project + No School/Services Disruption ± Article 97=Field Replication Off-Site (Fr+JV Practice F.Ball+S.Ball Infield)	3 Year Project + No School/Services Disruption ± Article 97=Field Replication Off-Site (Fr+JV Practice F.Ball+S.Ball Infield)
PSR Proj. Cost •City's Share	$343,585,338 $130,022,882	$343,948,823 $135,320,524	$352,559,455 $143,232,657	$339,152,182 $152,160,821	$336,138,724 $149,439,672

Final Evaluation of Planning Options

Assesment Highlights:

+ No Windowless Labs
+ Min. Construction Impact
+ Zero Modulars Required
+ Green Space Enhancement
+ Improved Service/Access
+ Meets Full Parking Needs
+/- Location/Bussing Debate (city/services vs campus/fields)
+ Ideal Solar Orientation
+ More Efficient Construction & Plan/Layout Opportunities

	FULL RENOVATION	ADD/RENO OPTION 2	ADD/RENO OPTION 3 (EXP)	NEW 4-STORY AT CAWLEY	NEW 5-STORY AT CAWLEY
					
Building/Site •Acreage •Gross Size •Stories/Ht •Parking •Cars/Buses	6.6 of 6.6 acres 650.1k gsf (614.5k reno +35.8k add) New 3-Story at 48'(63' Existing) 725 per Survey (629 of Ayotte's 1200) On Street + Use of City Transit	6.6 of 6.6 acres 636.7k gsf (445.5k reno+191.2k add) New 2-3-5-Story at 48-68'(63' Existing) 725 per Survey (629 of Ayotte's 1200) On Street + Use of City Transit	7.4 = 6.0 of 6.6 acres +1.4 exp. lot 632.1k gsf (440.1k reno +192k add) New 2-3-5-Story at 48-68'(63' Existing) 725 per Survey (629 of Ayotte's 1200) On Street + Use of City Transit	23.5 of 43.24 acres 590.3k gsf new construction New 4-Story at 58' 750 of 850 Estimated Need On-Site 46+ Car Queue/46 Buses Dbl-Stack	23.5 of 43.24 acres 590.8k gsf new construction New 5-Story at 68' 850 Estimated Need Fits On-Site 38+ Car Queue/46 Buses Dbl-Stack
Location •Transportation •City Services •Parking •Deliveries •Outdoor Space •Addtn'l Busing	Existing Down-Town Site + Proximity/Frequency of City Buses + Proximity To City/Social Services + Adjacent Pkg Garages (Covered) ± Existing Service Access Remains — Limited Access To Green Space — Busing Req'd for Some Athletics	Existing Down-Town Site + Proximity/Frequency of City Buses + Proximity To City/Social Services + Adjacent Pkg Garages (Covered) ± Existing Service Access Remains — Limited Access To Green Space — Busing Req'd for Some Athletics	Existing Down-Town Site + Adjacent Lot + Proximity/Frequency of City Buses + Proximity To City/Social Services + Adjacent Pkg Garages (Covered) + Improved Service/Access ± Modest Green Space Created — Busing Req'd for Some Athletics	Cawley Stadium Site — Proximity/Frequency To City Buses — Proximity To City/Social Services — 100 Spaces Estimated Off-Site + Full Service/Perimeter Access + Ample Access to Green Space — Busing Req'd for Arrival/Departure	Cawley Stadium Site — Proximity/Frequency To City Buses — Proximity To City/Social Services + All Parking Provided On-Site + Full Service/Perimeter Access + Ample Access to Green Space — Busing Req'd for Arrival/Departure
Educ Program •Freshman Loc •Heart/Hub •Organization •Space Needs	Meets Objectives Except as Noted: — Freshman Academy Is Remote ± Public/Activity Areas Spread & Split + F.A. Teams + STEM/Hum. Clusters + Meets New Standards (Count/Size)	Meets Objectives Except as Noted: + Freshman Academy Connected ± Public/Activity Areas Spread & Split + F.A. Teams + STEM/Hum. Clusters + Meets New Standards (Count/Size) + More Efficient/Effective Field House	Meets Objectives Except as Noted: + Freshman Academy Connected ± Public/Activity Areas Spread & Split + F.A. Teams + STEM/Hum. Clusters + Meets New Standards (Count/Size) + More Efficient/Effective Field House	Meets Objectives Except as Noted: + Freshman Academy Connected + Public/Activity Areas Clustered + F.A. Teams + STEM/Hum. Clusters + Meets New Standards (Count/Size) + More Efficient/Effective Field House	Meets Objectives Except as Noted: + Freshman Academy Connected + Public/Activity Areas Clustered + F.A. Teams + STEM/Hum. Clusters + Meets New Standards (Count/Size) + More Efficient/Effective Field House
Sustainability •Daylight/Solar •View Windows •Energy Eff	Extent of Exist. Ext. Wall Upgrades -TBD — Orientation Is Problematic — Windowless Classrooms/Labs Exist — Higher Operating Costs (Multi-Bldgs)	Extent of Exist. Ext. Wall Upgrades -TBD ± Existing Is Problematic/New FA Ideal — Windowless Classrooms/Labs Exist — Higher Operating Costs (Multi-Bldgs)	Extent of Exist. Ext. Wall Upgrades -TBD ± Existing Is Problematic/New FA Ideal + Light Wells = No Windowless Labs — Higher Operating Costs (Multi-Bldgs)	New Construction and Exterior Shell ± Good for Most All Teaching Spaces + No Windowless CRs + Ideal Daylight + Lower Operating Costs	New Construction and Exterior Shell ± Good for Most All Teaching Spaces + No Windowless CRs + Ideal Daylight + Lower Operating Costs
Construction	5 Year (+ summer) Phased Project — Kitchen/Boilers in First Phase — Temporary Gym Facilities Required — Extensive Portable Classrooms	4 Year (+ summer) Phased Project + Kitchen/Boiler Built in First Phase — Temporary Gym Facilities Required	4.5 Year (+ summer) Phased Project + Kitchen/Boiler Built in First Phase + No Modulars or Temporary Gym ± Only 3 Years of 4.5 On School Site — Land Acquisition/Eminent Domain	3 Year Project + No School/Services Disruption ± Article 97=Field Replication Off-Site (Fr+JV Practice F.Ball+S.Ball Infield)	3 Year Project + No School/Services Disruption ± Article 97=Field Replication Off-Site (Fr+JV Practice F.Ball+S.Ball Infield)
PSR Proj. Cost •City's Share	$343,585,338 $130,022,882	$343,948,823 $135,320,524	$352,559,455 $143,232,657	$339,152,182 $152,160,821	$336,138,724 $149,439,672

Final Evaluation of Planning Options



NEW OPTION A EXPANDED SITE

1922 BLDG UNUSED

Updated Educ Program

(pool removed)

PRELIM. PROS/CONS:

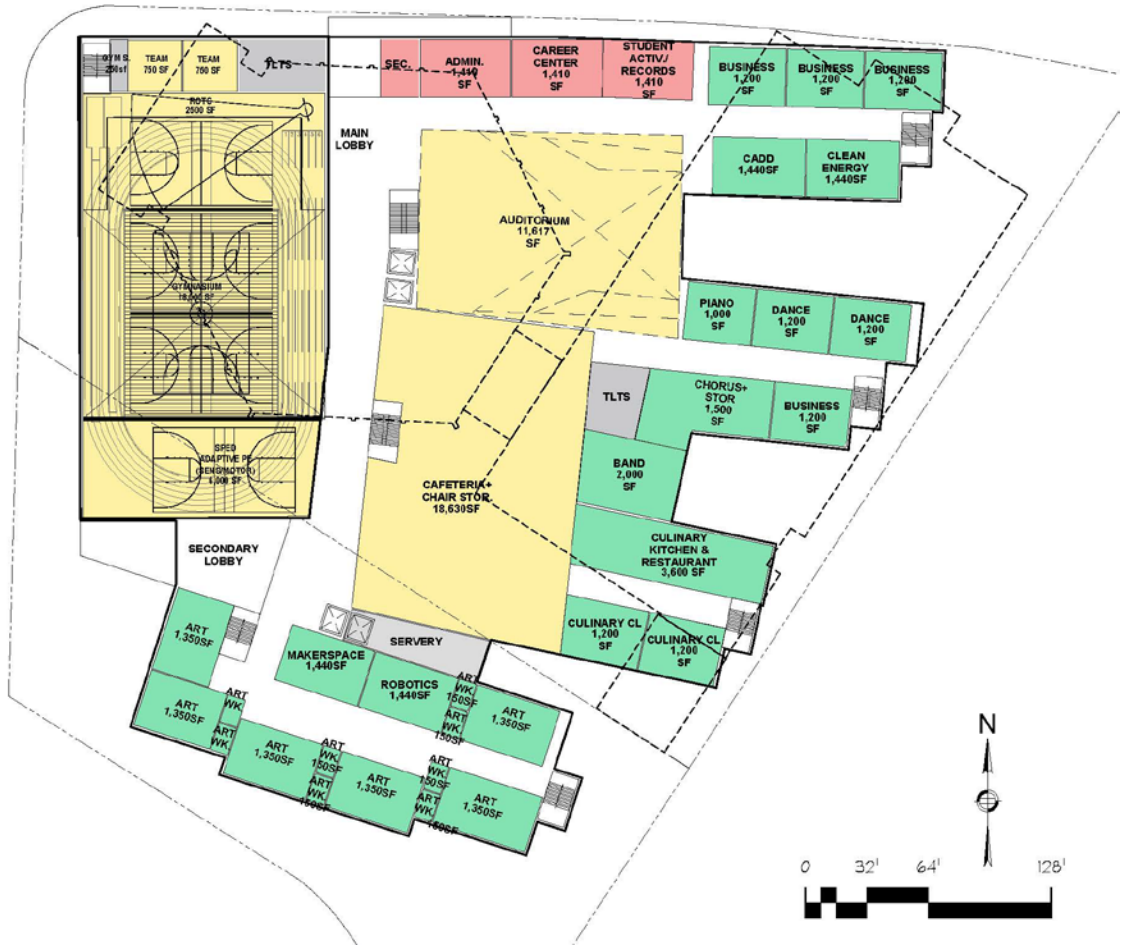
+ **Consolidated Campus**
  (via 5 story + basement)
+ **Good Classrm Orientation**
- **24 Temporary Classrms & Temporary Gym Required**
- **Limited Green Space**
- **Eminent Domain**

Phasing Est 4yrs + Summer
(but only 2 years on school site)

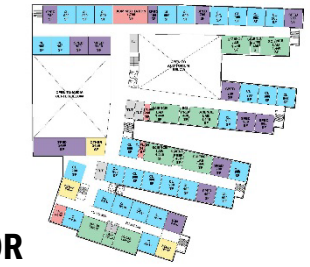
Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.

NEW OPTION A FLOOR PLANS

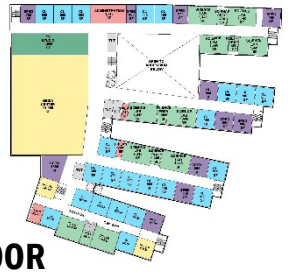
- ADMIN/TEACHER AREAS
- GENERAL CLASSROOMS
- SPECIAL EDUCATION
- SCIENCE
- CAREER/TECHNOLOGY
- GYM/CAF/LIBRARY/OTHER
- MECH/CUST, TLTS, STOR.
- NEW CONSTRUCTION
- DEMO



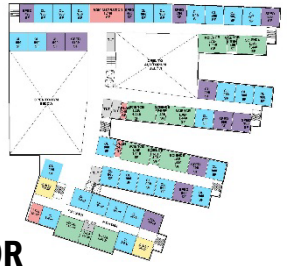
MAIN FLOOR PLAN



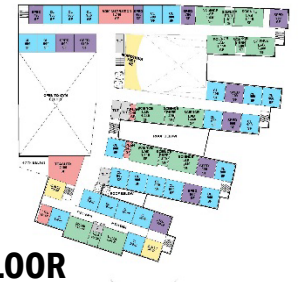
FIFTH FLOOR



FOURTH FLOOR



THIRD FLOOR

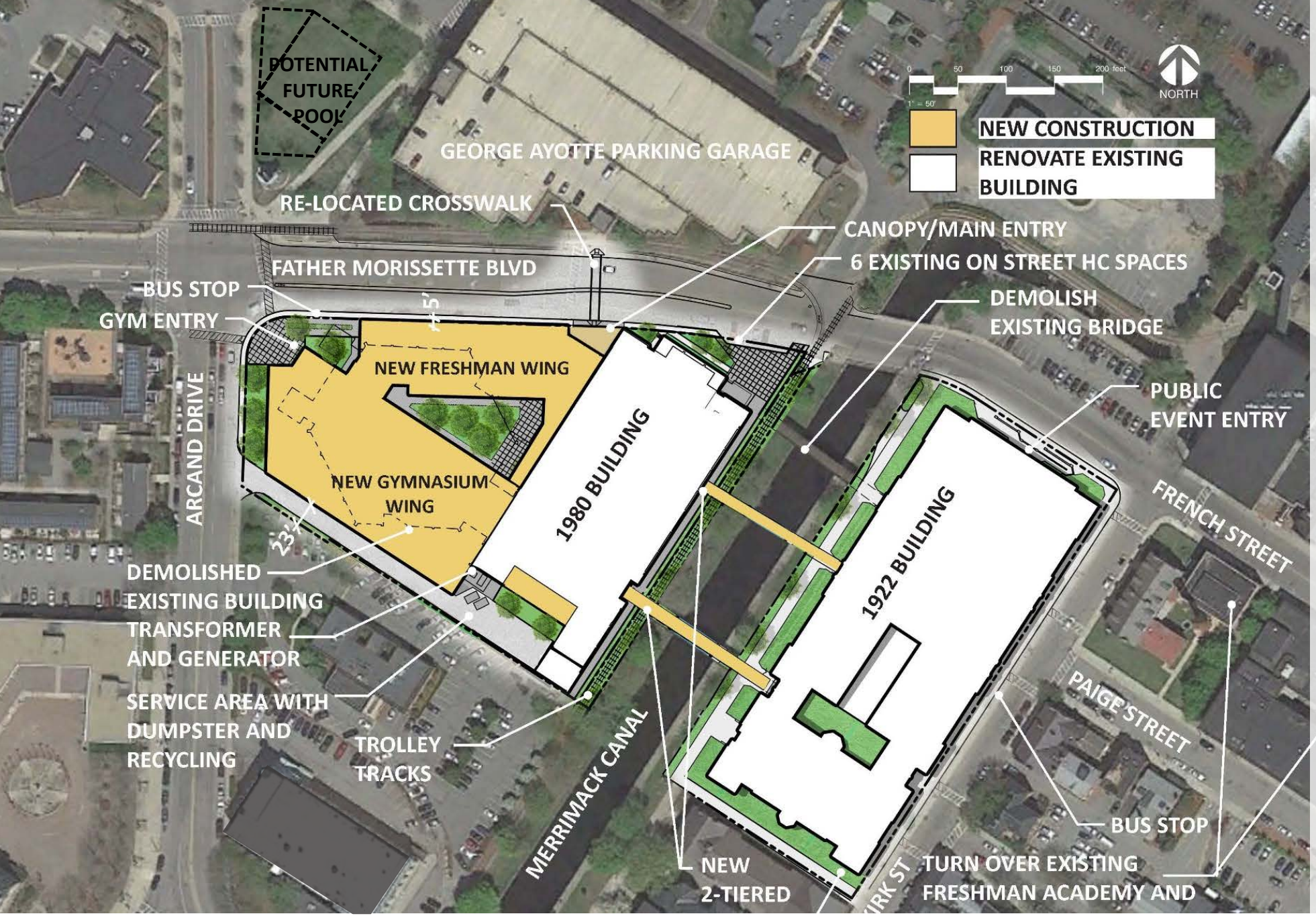


SECOND FLOOR



BASEMENT

ADD/RENO 2A EXISTING SITE



Updated Educ Program
(pool removed)

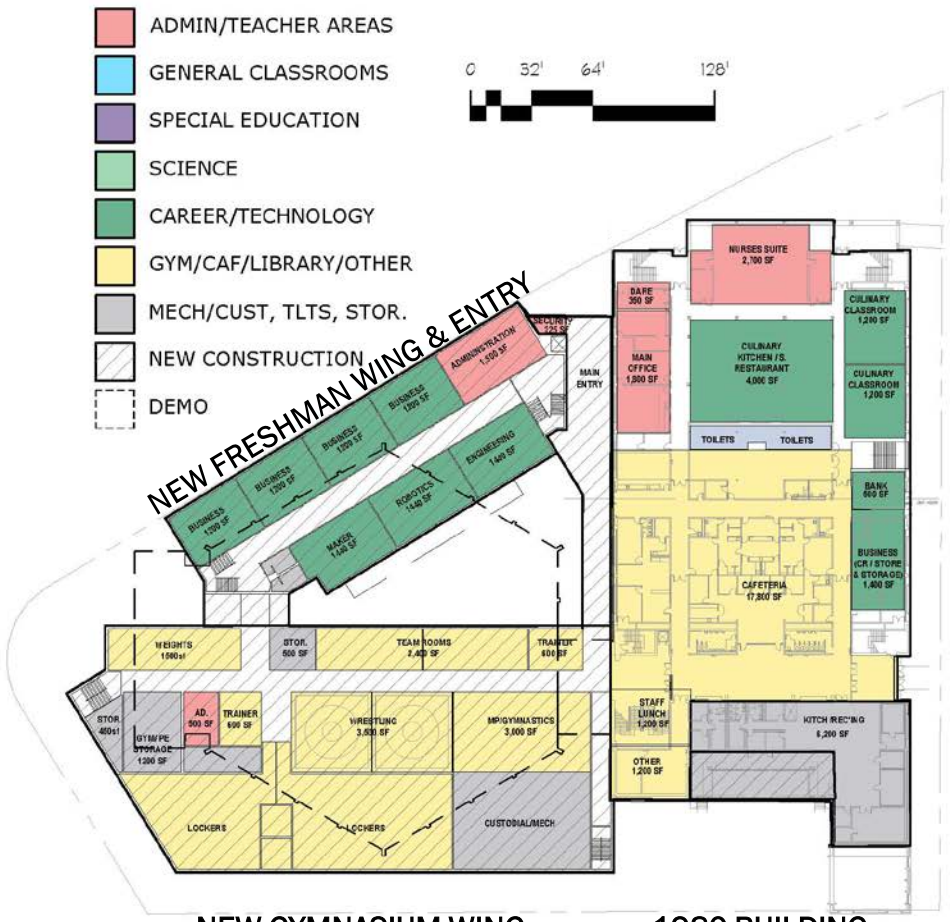
PRELIM. PROS/CONS:

+ **Consolidated Campus**
  (new freshman academy)
- **Temporary Gym Required**
- **Windowless Labs Remain**
- **Limited Green + Loading**

Phasing Est 4yrs + Summer

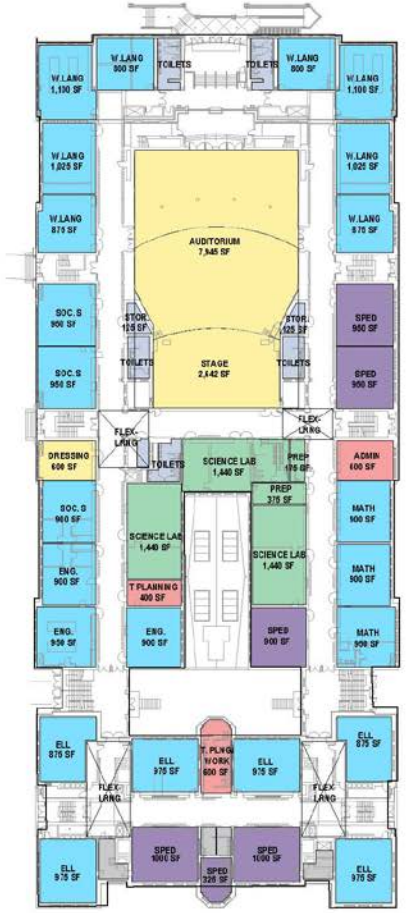
Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.

OPTION 2A FLOOR PLANS



NEW GYMNASIUM WING

1980 BUILDING



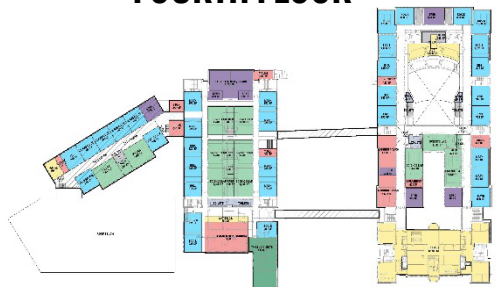
1922 BUILDING

MAIN FLOOR PLAN

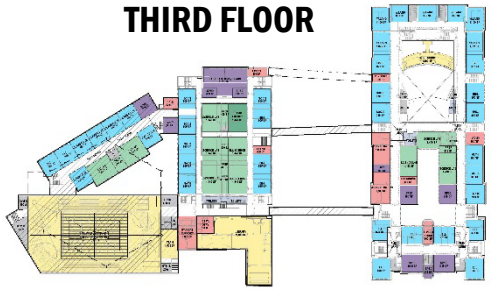


FIFTH FLOOR

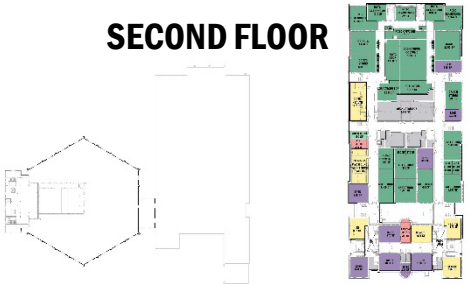
FOURTH FLOOR



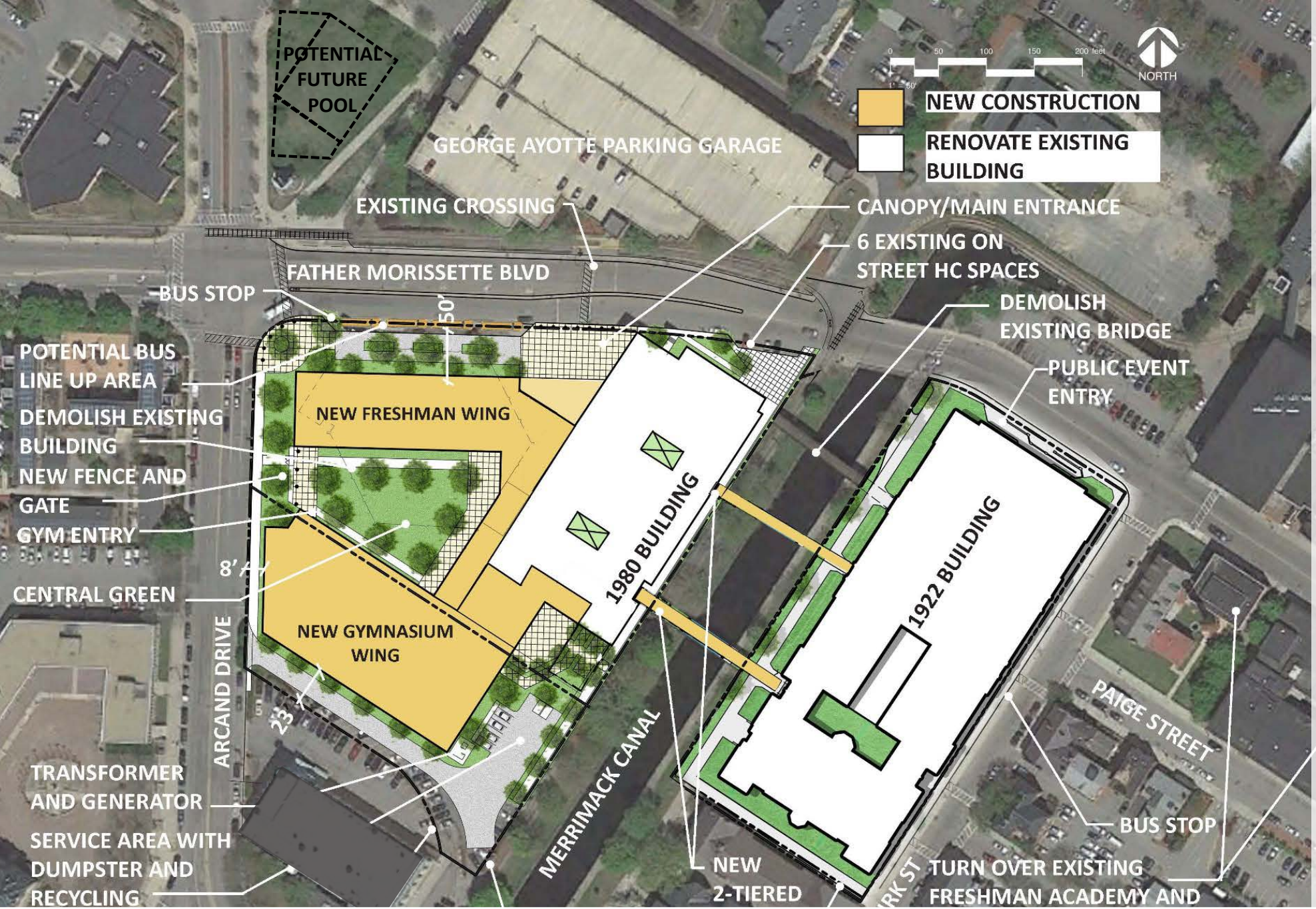
THIRD FLOOR



SECOND FLOOR



BASEMENT



ADD/RENO 3A EXPANDED SITE

Updated Educ Program
(pool removed)

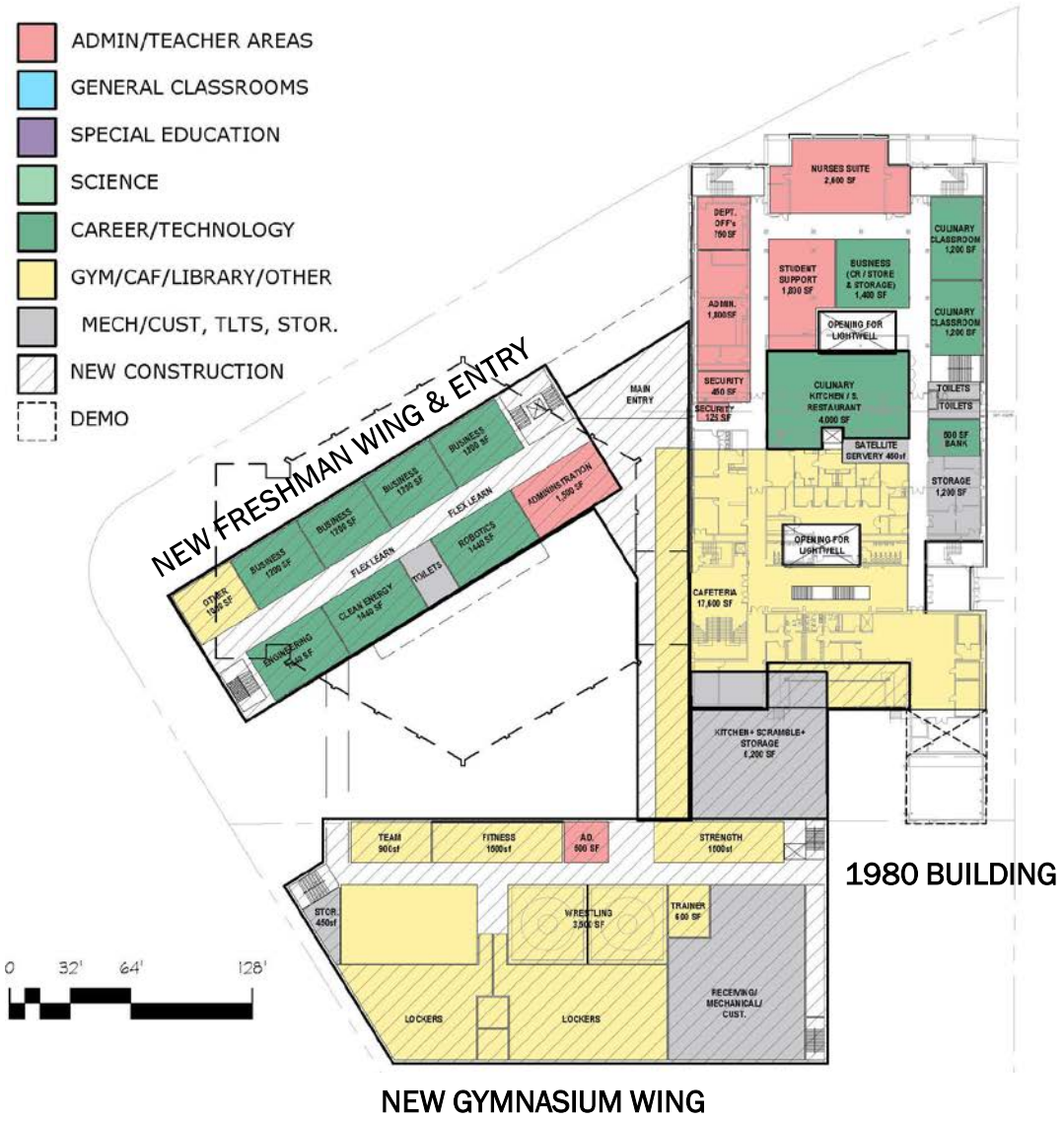
PRELIM. PROS/CONS:

+ **Consolidated Campus**
  (new freshman academy)
+ **No Windowless Labs**
+ **Added Green + Loading**
— **Gym Areas More Remote**
— **Eminent Domain**

Phasing Est 5yrs
(but only 3 years on school site)

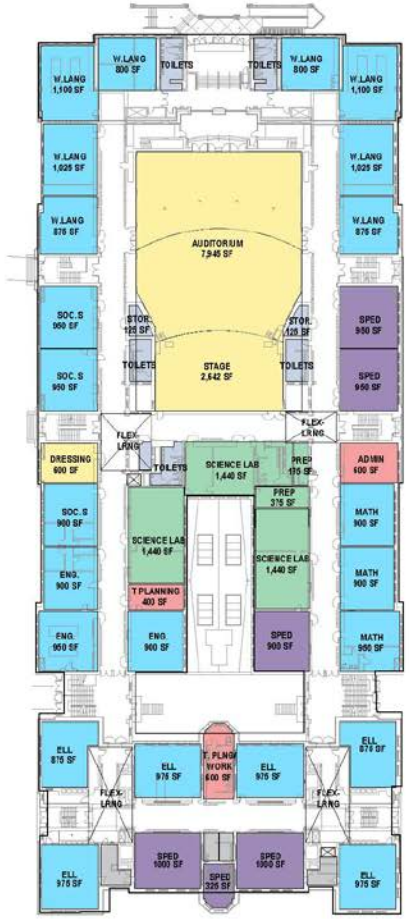
Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.

OPTION 3A FLOOR PLANS



1980 BUILDING

NEW GYMNASIUM WING



1922 BUILDING

MAIN FLOOR PLAN

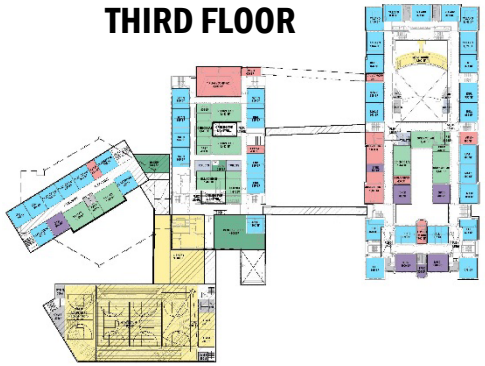


FIFTH FLOOR

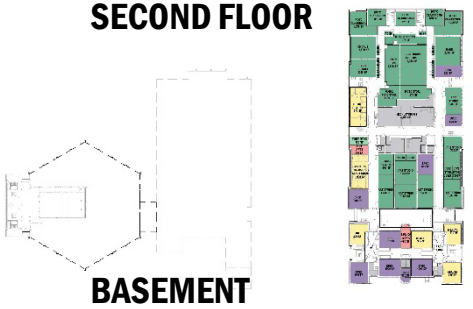
FOURTH FLOOR



THIRD FLOOR



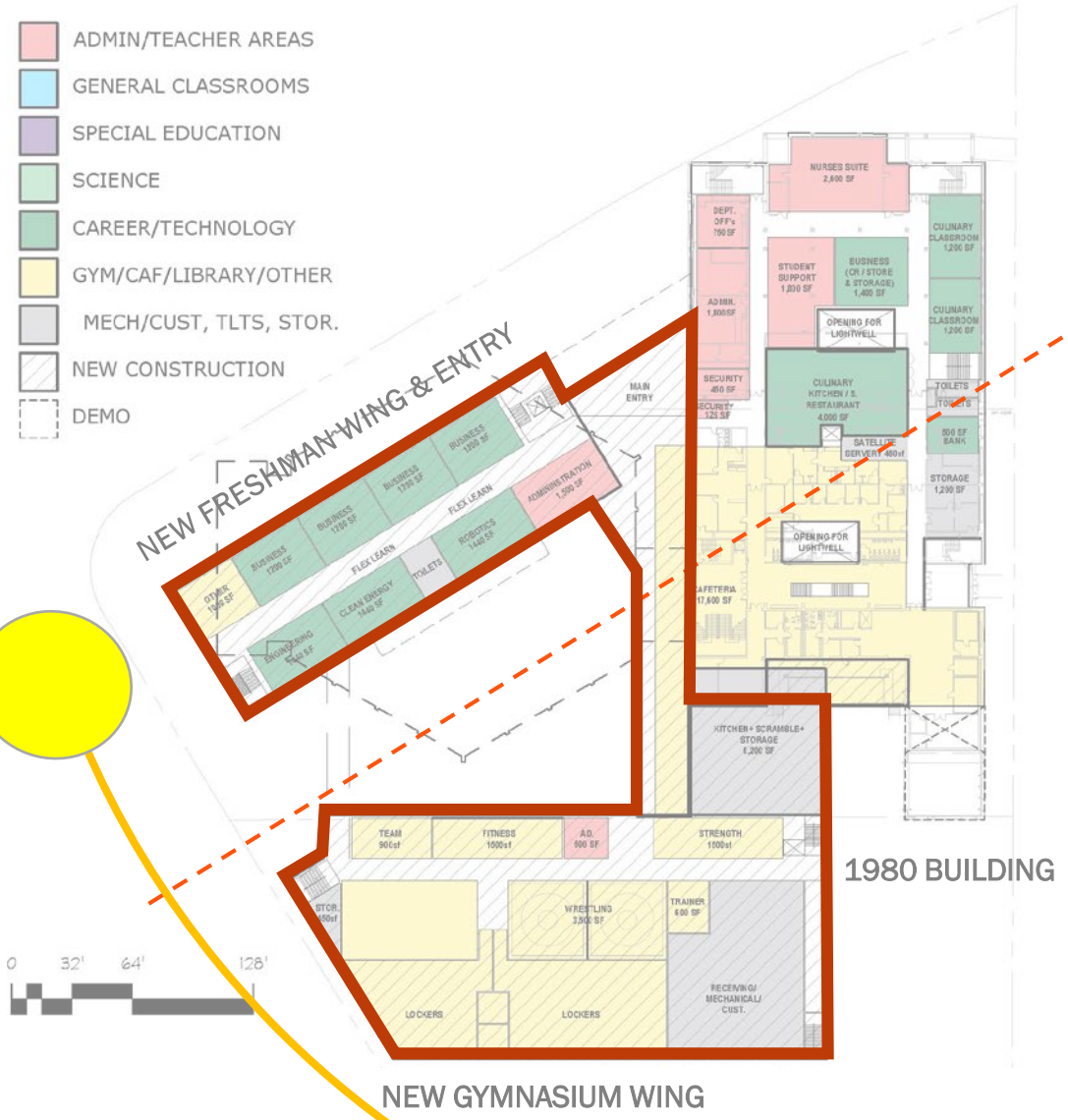
SECOND FLOOR



BASEMENT

OPTION 3A FLOOR PLANS

- ADMIN/TEACHER AREAS
- GENERAL CLASSROOMS
- SPECIAL EDUCATION
- SCIENCE
- CAREER/TECHNOLOGY
- GYM/CAF/LIBRARY/OTHER
- MECH/CUST, TLTS, STOR.
- NEW CONSTRUCTION
- DEMO

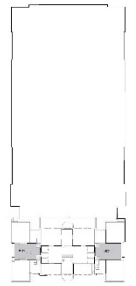




MAIN FLOOR PLAN



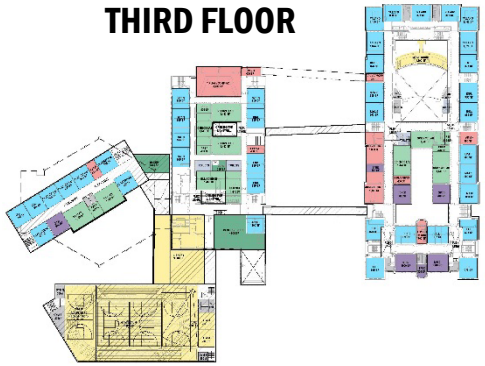
FIFTH FLOOR



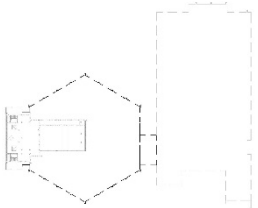
FOURTH FLOOR



THIRD FLOOR



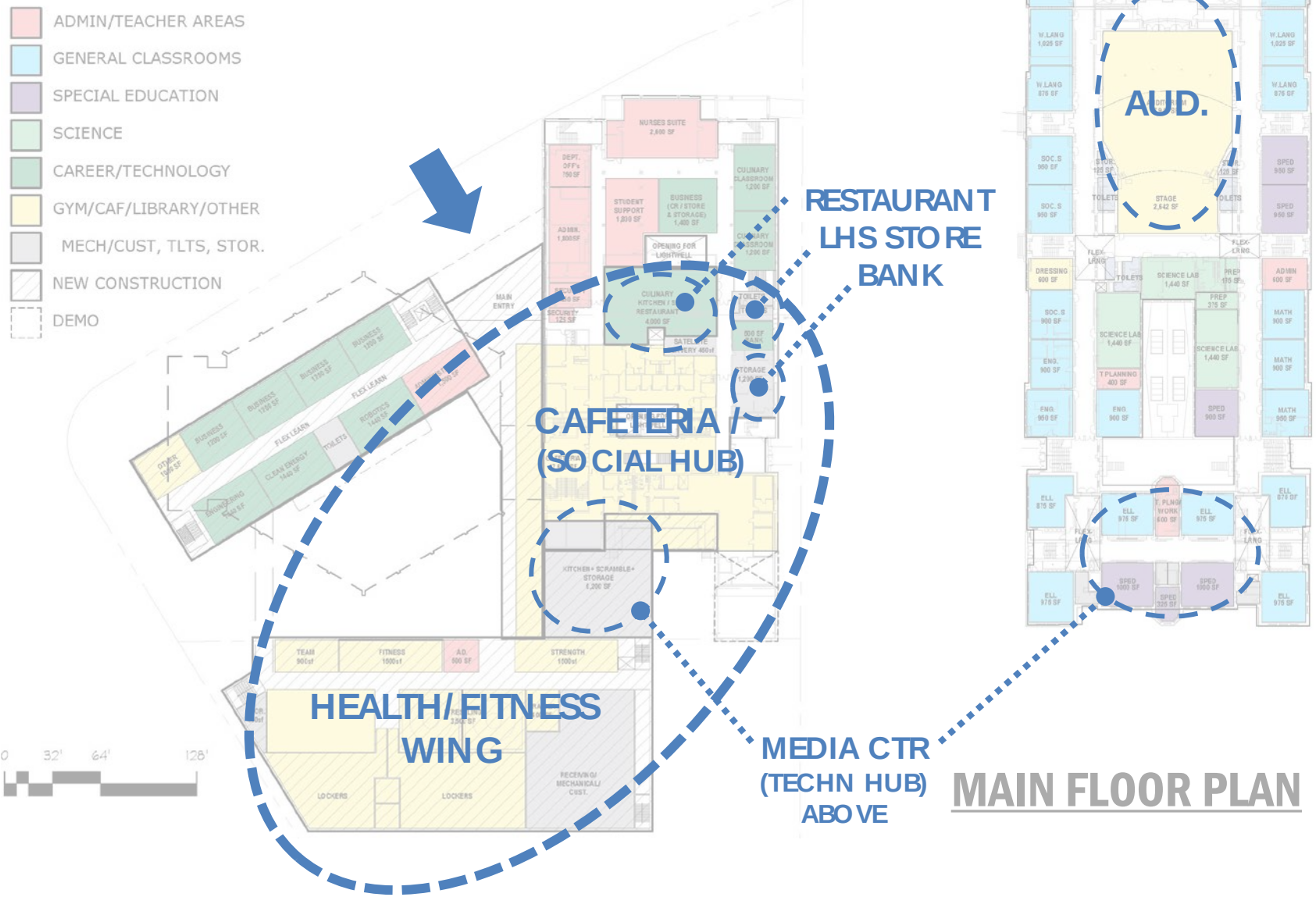
SECOND FLOOR



BASEMENT



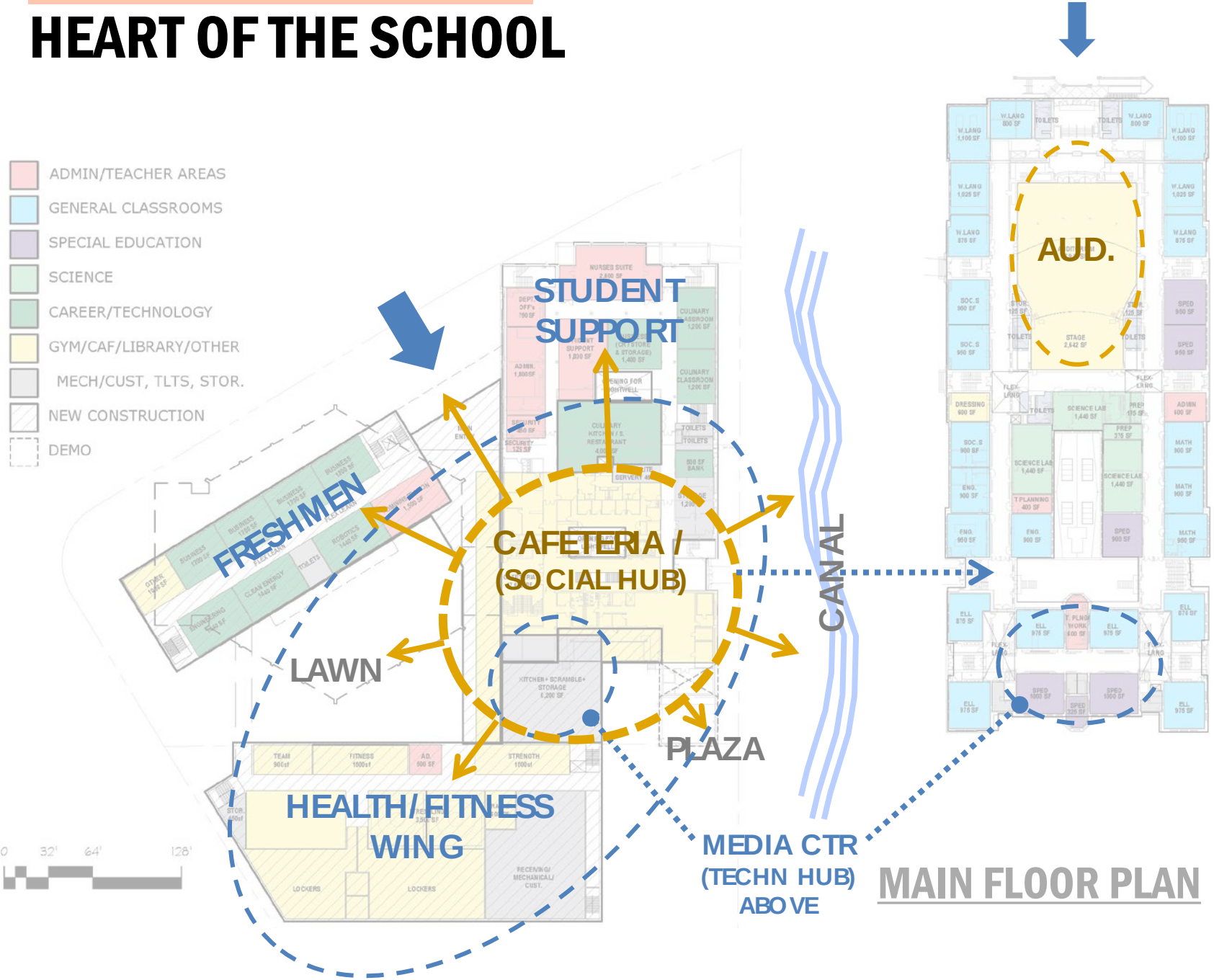
COMMUNITY/ACTIVITY ZONE



MAIN FLOOR PLAN



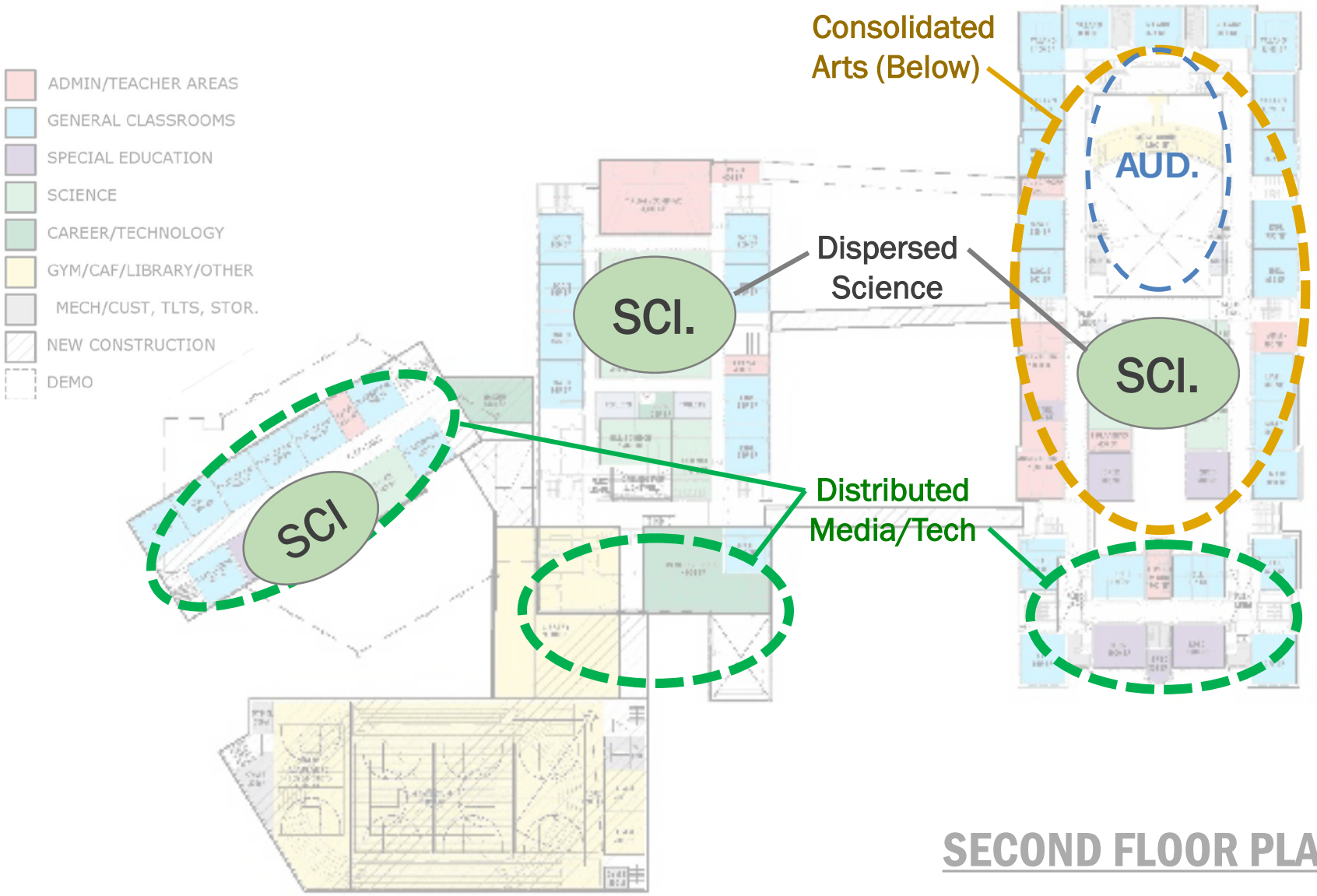
HEART OF THE SCHOOL



MAIN FLOOR PLAN



ACADEMICS, ARTS & TECH



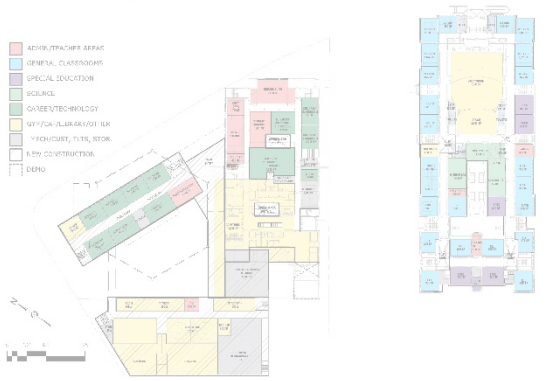
SECOND FLOOR PLAN



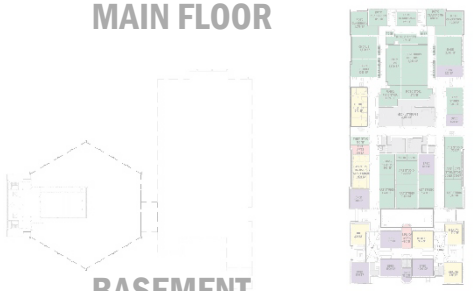
FIFTH FLOOR

FOURTH FLOOR



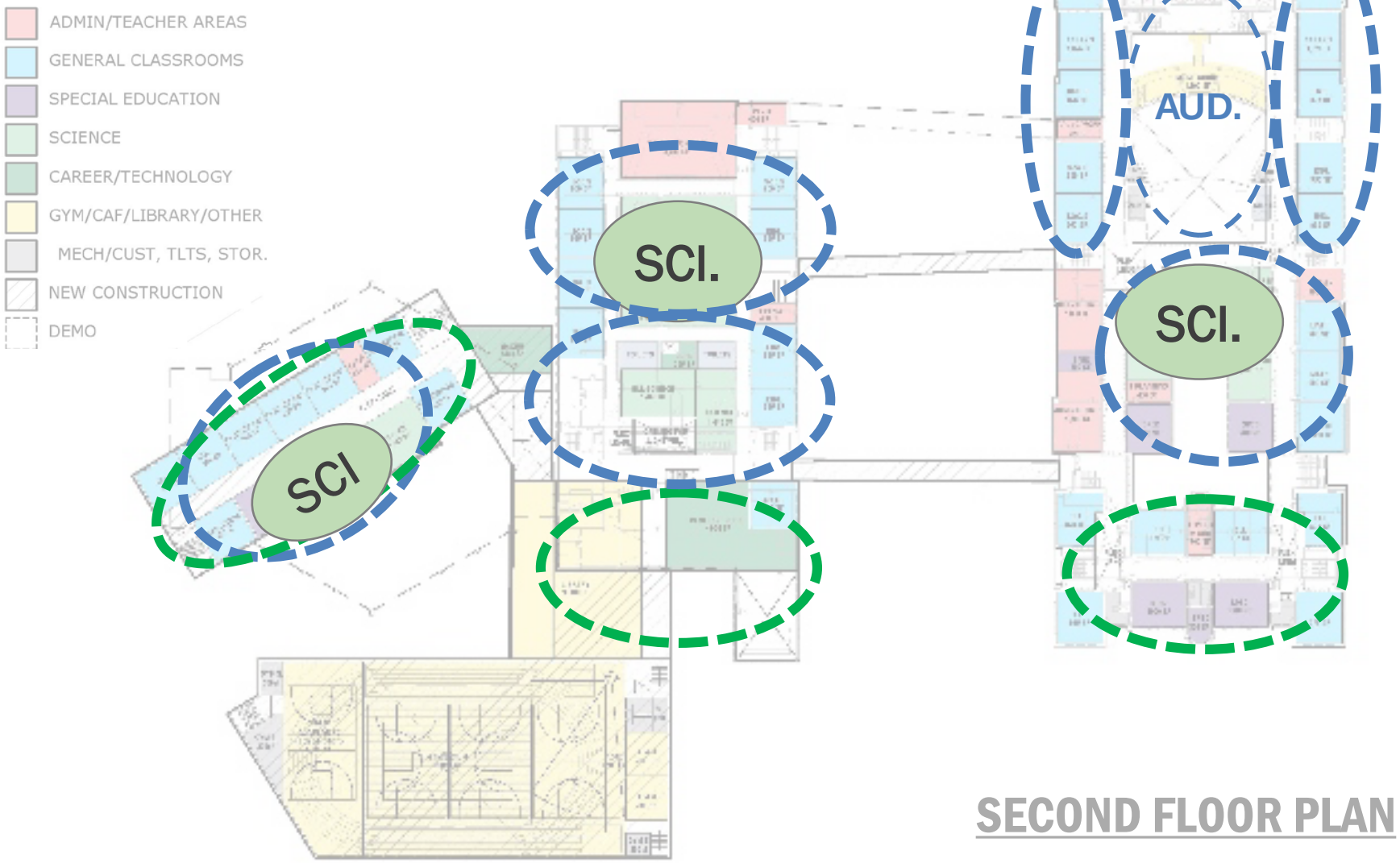


MAIN FLOOR



BASEMENT

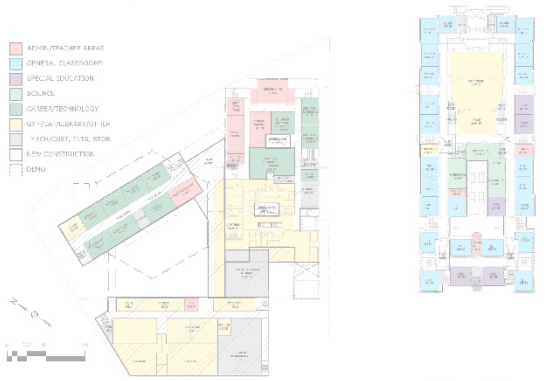
STEM/HUMANITIES CLUSTERS

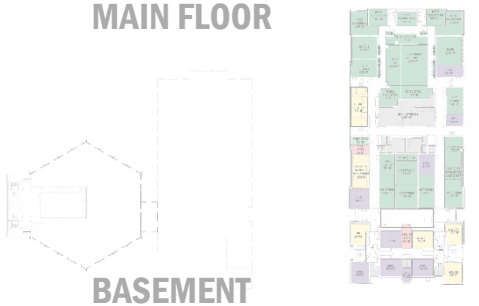


SECOND FLOOR PLAN

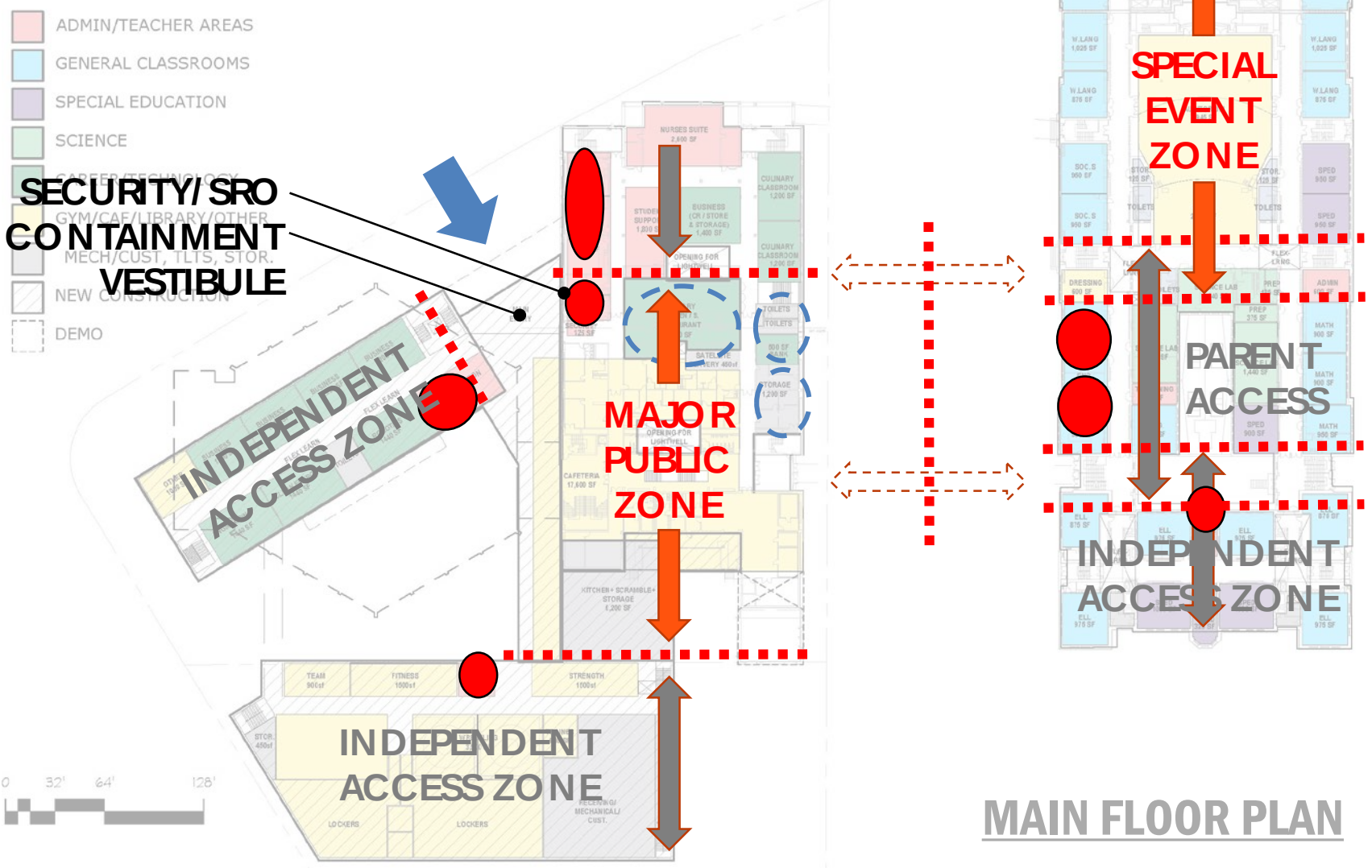








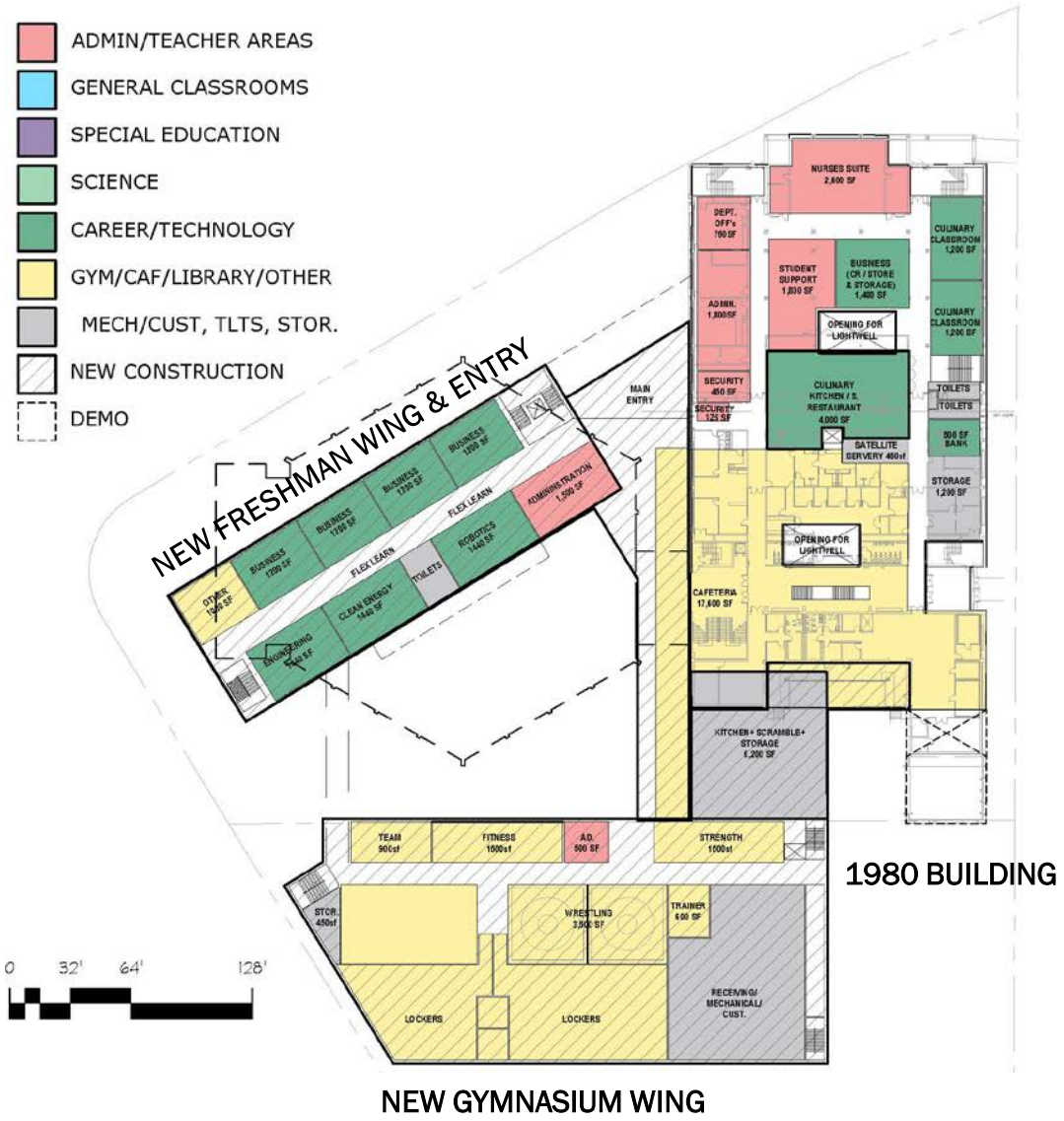
LOCK-OFF/CONTROL



MAIN FLOOR PLAN

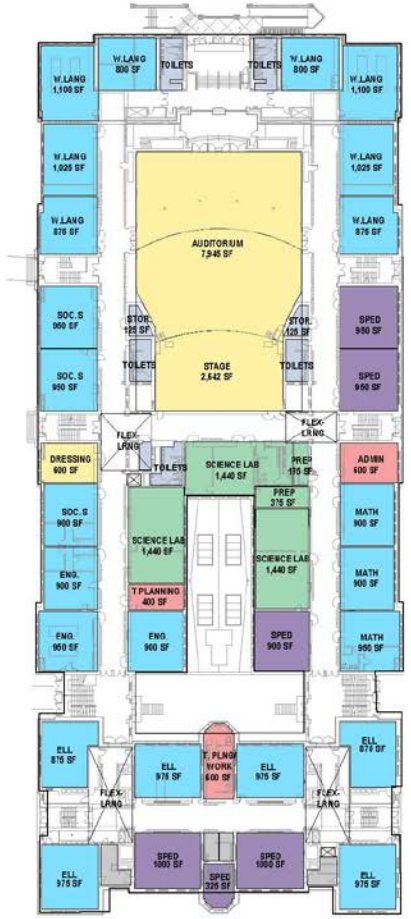


OPTION 3A FLOOR PLANS



1980 BUILDING

NEW GYMNASIUM WING



1922 BUILDING

MAIN FLOOR PLAN

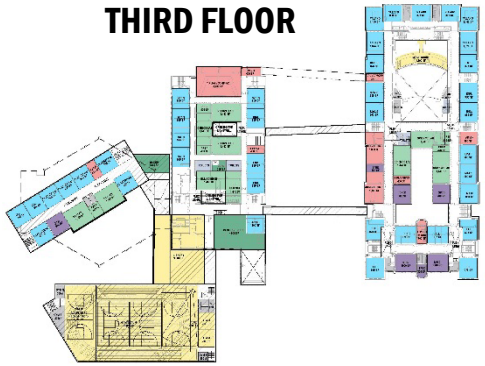


FIFTH FLOOR

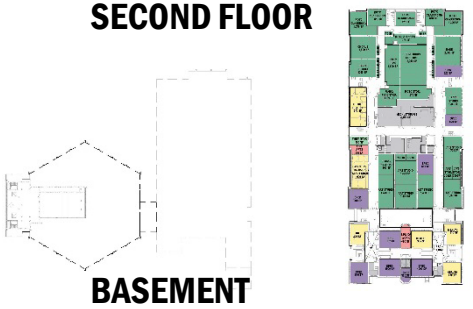
FOURTH FLOOR



THIRD FLOOR



SECOND FLOOR

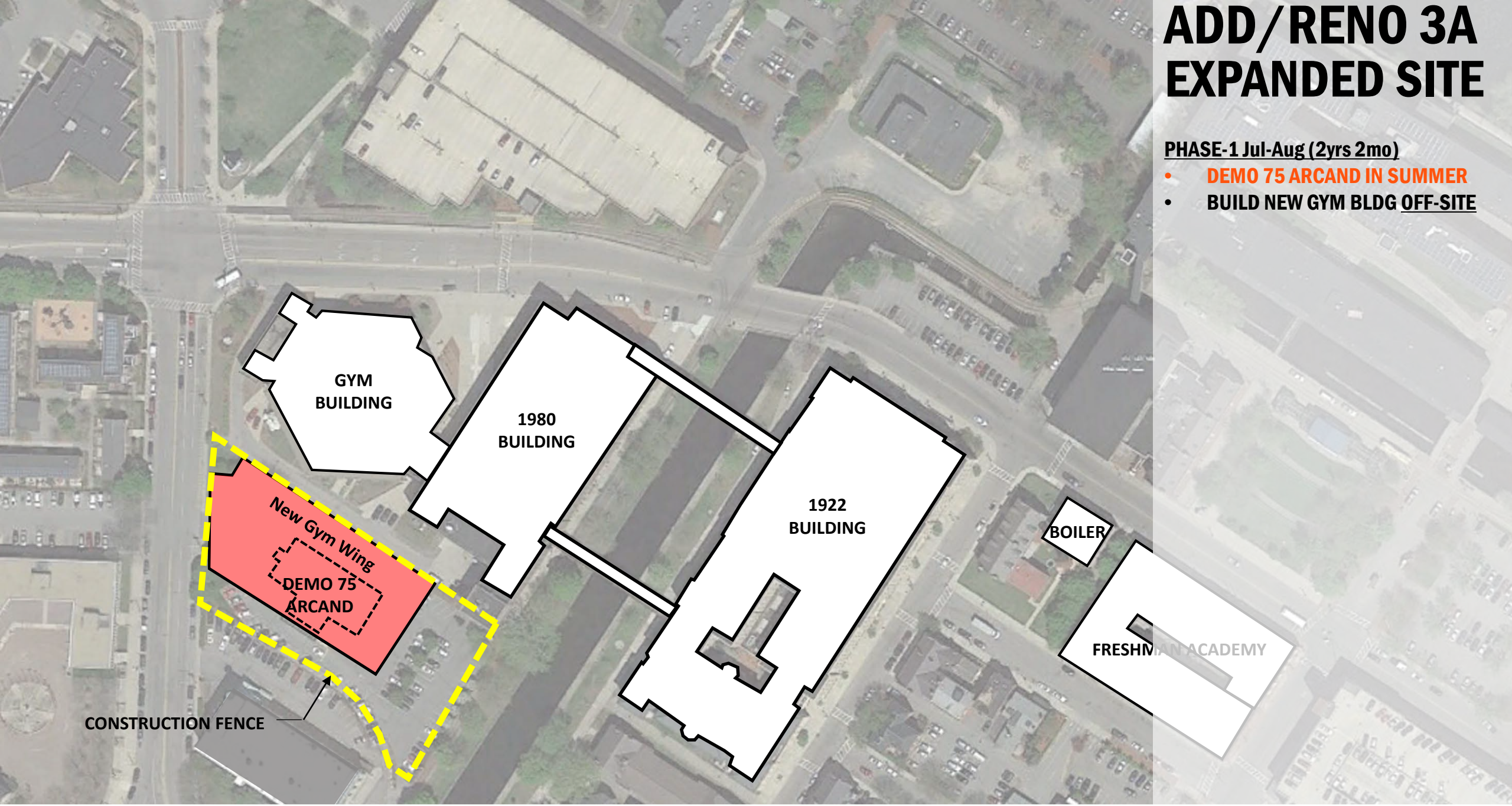


BASEMENT

ADD/RENO 3A EXPANDED SITE

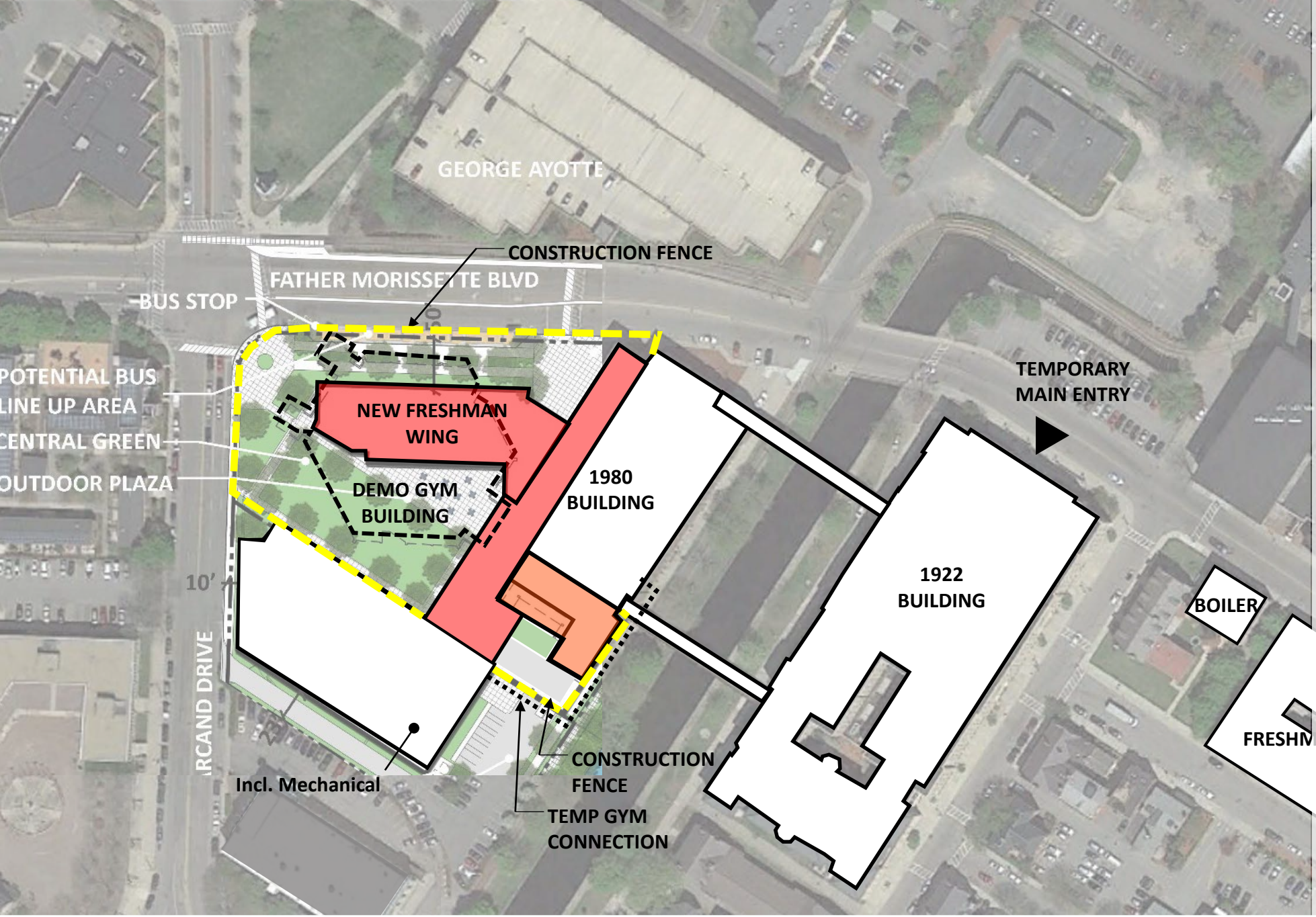
PHASE-1 Jul-Aug (2yrs 2mo)

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW GYM BLDG OFF-SITE



Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

ADD/RENO 3A EXPANDED SITE



PHASE-1 Jul-Aug (2yrs 2mo)

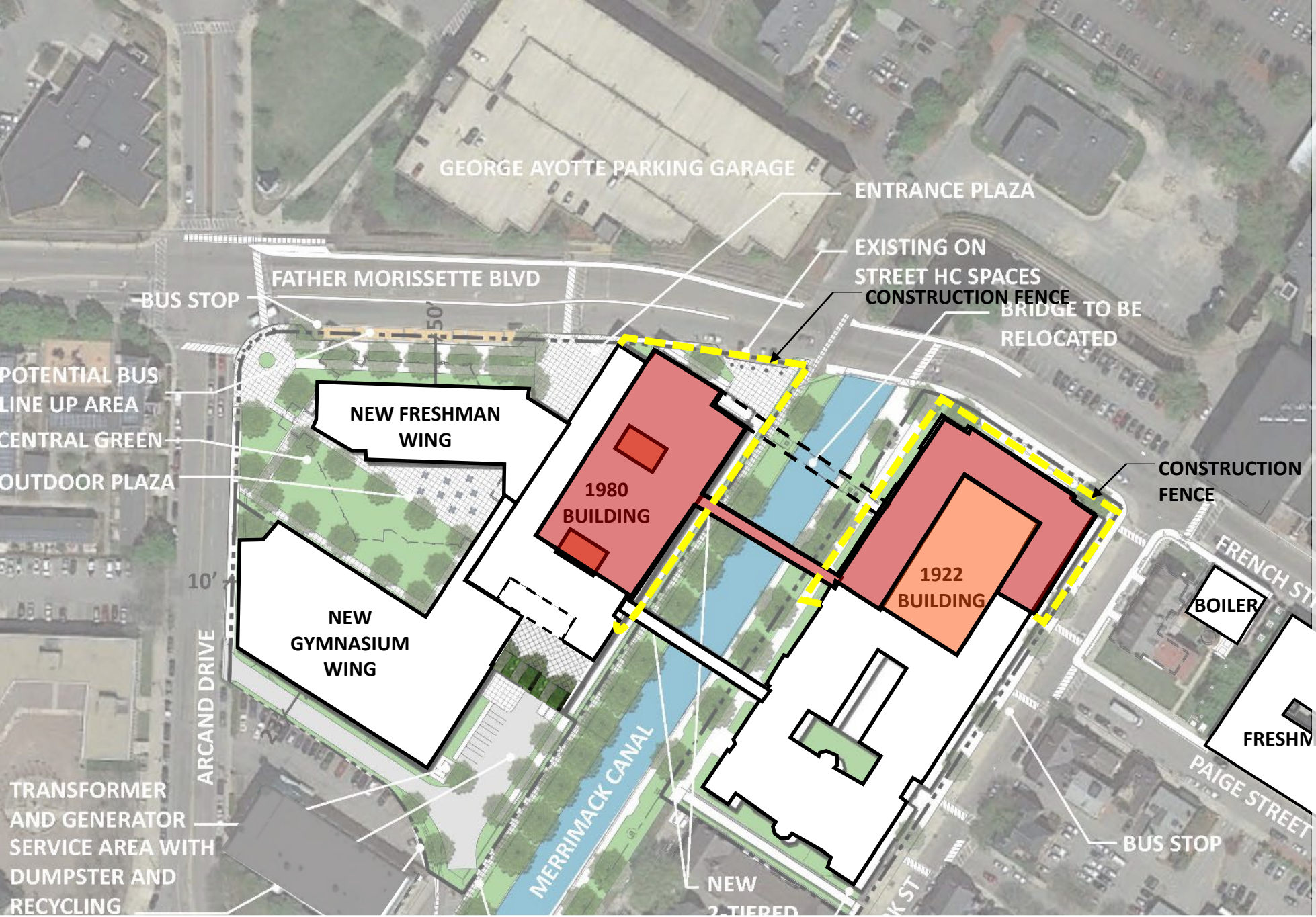
- DEMO 75 ARCAND IN SUMMER
- BUILD NEW GYM BLDG OFF-SITE

PHASE-2 Jul-Dec 1yr 6mo (2mo overlap)

- DEMO FIELD HOUSE IN SUMMER
- VACATE INTERIOR CLASSRMS
- BUILD NEW FRESHMAN ACADEMY
- RENOVATE WEST SIDE OF LORD (SOUTH END RENO IN SUMMERS)

Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.

ADD/RENO 3A EXPANDED SITE



PHASE-1 Jul-Aug (2yrs 2mo)

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW GYM BLDG OFF-SITE

PHASE-2 Jul-Dec 1yr 6mo (2mo overlap)

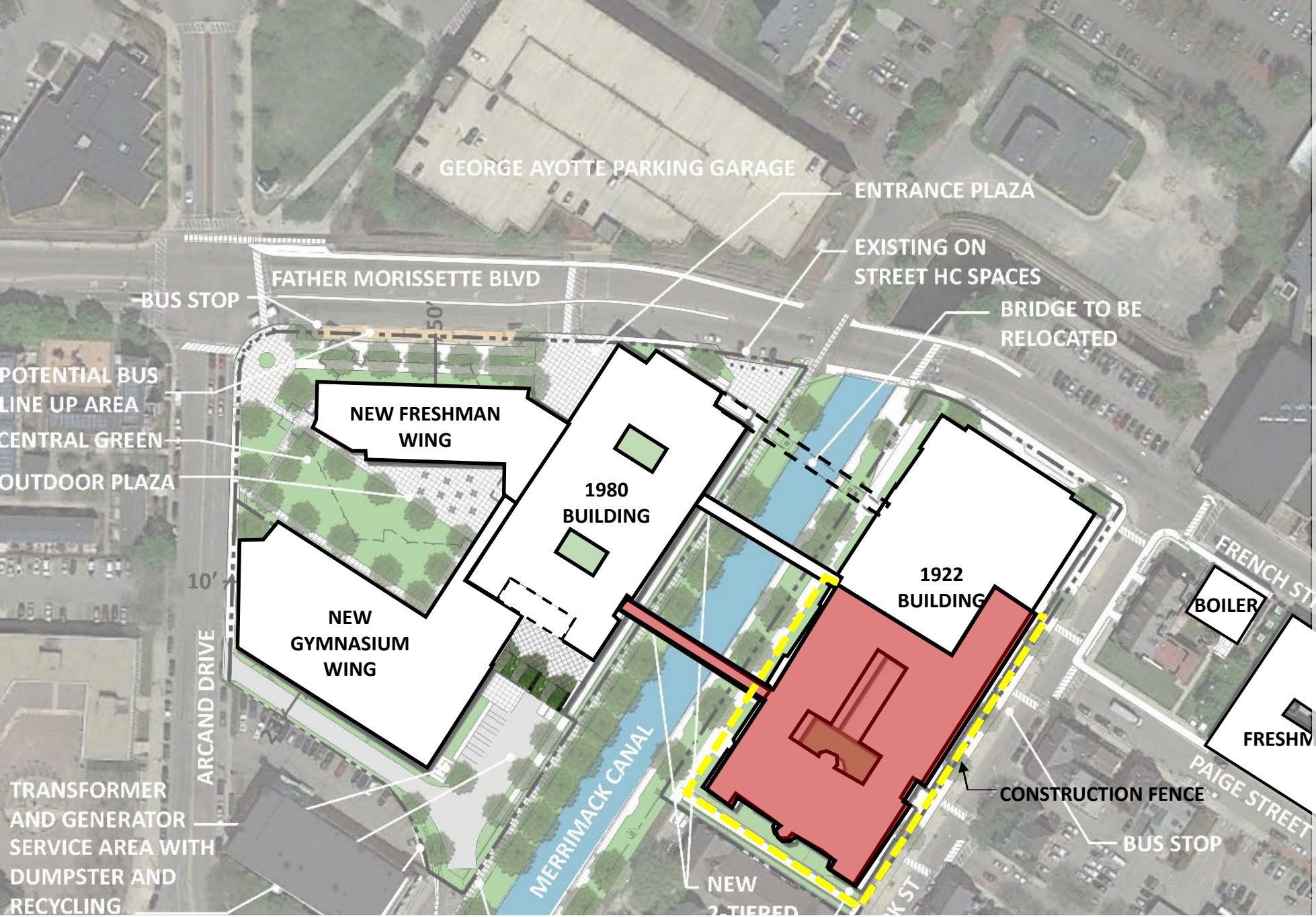
- DEMO FIELD HOUSE IN SUMMER
- VACATE INTERIOR CLASSRMS
- BUILD NEW FRESHMAN ACADEMY
- RENOVATE WEST SIDE OF LORD (SOUTH END RENO IN SUMMERS)

PHASE-3 Jul-Aug 1yr 2mo (2mo overlap)

- RENOVATE REMAINDER OF LORD
- RENOVATE NORTH END OF 1922 (AUDITORIUM IN SUMMERS)
- BUILD NEW NORTH BRIDGE

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

ADD/RENO 3A EXPANDED SITE



PHASE-1 Jul-Aug (2yrs 2mo)

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW GYM BLDG OFF-SITE

PHASE-2 Jul-Dec 1yr 6mo (2mo overlap)

- DEMO FIELD HOUSE IN SUMMER
- VACATE INTERIOR CLASSRMS
- BUILD NEW FRESHMAN ACADEMY
- RENOVATE WEST SIDE OF LORD (SOUTH END RENO IN SUMMERS)

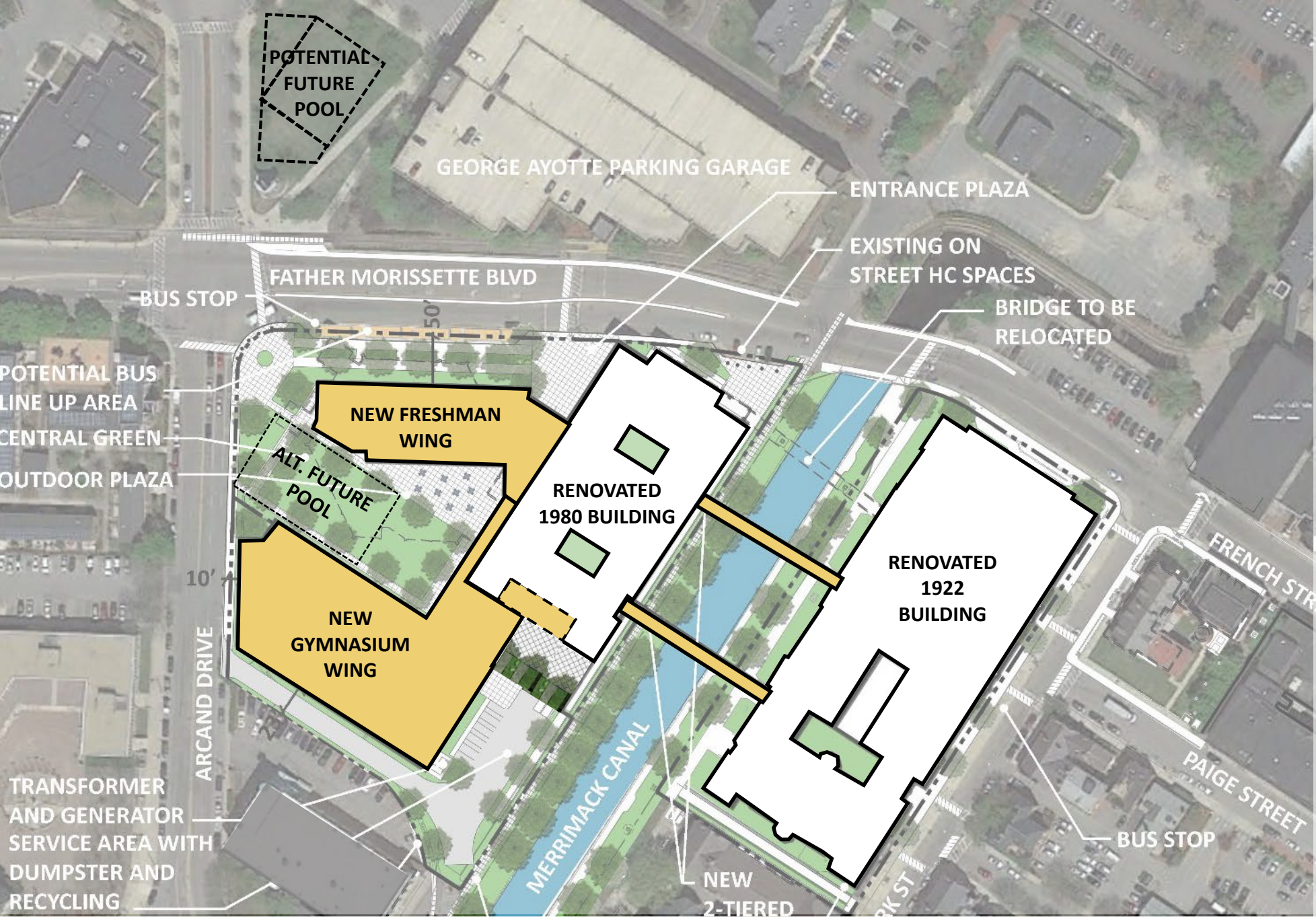
PHASE-3 Jul-Aug 1yr 2mo (2mo overlap)

- RENOVATE REMAINDER OF LORD
- RENOVATE NORTH END OF 1922 (AUDITORIUM IN SUMMERS)
- BUILD NEW NORTH BRIDGE

PHASE-4 Jul-Aug 1yr 2mo (2mo overlap)

- RENOVATE REMAINDER OF 1922
- BUILD NEW SOUTH BRIDGE

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager



ADD/RENO 3A EXPANDED SITE

PHASE-1 Jul-Aug (2yrs 2mo)

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW GYM BLDG OFF-SITE

PHASE-2 Jul-Dec 1yr 6mo (2mo overlap)

- DEMO FIELD HOUSE IN SUMMER
- VACATE INTERIOR CLASSRMS
- BUILD NEW FRESHMAN ACADEMY
- RENOVATE WEST SIDE OF LORD (SOUTH END RENO IN SUMMERS)

PHASE-3 Jul-Aug 1yr 2mo (2mo overlap)

- RENOVATE REMAINDER OF LORD
- RENOVATE NORTH END OF 1922 (AUDITORIUM IN SUMMERS)
- BUILD NEW NORTH BRIDGE

PHASE-4 Jul-Aug 1yr 2mo (2mo overlap)

- RENOVATE REMAINDER OF 1922
- BUILD NEW SOUTH BRIDGE

FINISHED FACILITY
Total Duration = 5 years (4 on site)

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

SUSTAINABILITY MEETING MINUTES – REVISED PSR
April 4, 2018

Attendees:
City of Lowell: Mike McGovern, Yovani Baez-Rose, Sarah Brown, Jay Mason, Katherine Moses,
LHS: Marianne Busteed, Roxane Howe, Rick Underwood, Stephanie Selvaggio
Skanska – Mary Ann Williams
Perkins Eastman: Joseph Drown, Robert Bell, Alicia Caritano, Dawn Guarriello,
Soden Sustainability: Colleen Soden, Patrica Burke
Traverse Landscape Architects: Ashley Iannuccilli
GGD (Electrical, Mechanical, Technology): Carlos DeSousa, Dominick Puniello
Nitsch Engineering (Civil): William Maher
Thornton Tomasetti (Building Analytics): Vamshi Gooje
VAV International (Plumbing/Fire Protection): Frank Stramaglia

Project Overview- Provided by Perkins Eastman (PE) with a walk through for all 3 options: Add/Reno Option 2A, Add/Reno Option 3A – Expanded Site, New Option A – Expanded Site. The pool has been deleted from all options per MSBA. PE noted that this is a visioning session to establish big picture goals and strategies. The Sustainability group will reconvene in Schematic Design once a Preferred Option is selected. All Sustainability Strategies will be evaluated relative to Client goals and project Budgets.

Review Team Ideas-

Site Design Opportunities-

- Pedestrian and bicycle connections-Biking- currently ~40 students bike. No bike network right now around school. Explore potential to talk to city about network.
- Creating plazas and high quality open space
- Increasing green space and shade trees, pervious paving
- Low Impact Development – discussion about berms/ gardens as a security and educational feature
- Public transportation- is a great resource for students
- Rainwater Management- utilizing stormwater for flushing. Opportunities for bioswales in selective locations.
- Green Roof or living wall- discussion of pros/cons. Limitations because of existing/historic bldg., 3A option green roof in the 2-story connector (students can view)
- LEED pilot credit for vegetable gardens. Science and culinary program teachers on board. Great synergy with culinary program. Provide interior space for gardening.

Water Use Reduction Opportunities-

- Water reuse from stormwater – VAV: This is a possibility however, space constraints and upfront cost need to be considered.
- High efficiency fixtures & water metering - Waterless urinals were discussed. CS/GGD explained why pint urinal is better from an operations perspective, as they require reduced maintenance versus waterless urinals. VAV agrees with this approach and noted that low-flow plumbing fixtures will be utilized throughout.
- Outdoor Water Use Reduction-using drought tolerant plants and minimizing irrigation.
- Use of water from canal- Canals are owned by ENEL & air rights by the Department of Conservation & Recreation (DCR) which may make use of water from the canals an unrealistic option.
- Instantaneous point of use hot water instead of circulating hot water: GGD noted that this has been demonstrated in recent project analysis to be cost effective. One reason why is that the system demand doesn't even usually register for kw consumption. VAV agrees with the approach of using instantaneous point of use water heaters. I think this works well for bathroom cores, hand sinks etc. However, for science labs with emergency eyewash/shower fixtures, the KW would be approx. 100 KW and even though it may never be used, the electrical service would still have to be sized for this electrical load. To further complicate matters, you would also need 1 instantaneous hot water heater per

eyewash/shower to avoid having a recirculation line per the plumbing code which prevents stagnation. You would have similar problems serving shower rooms based on the higher KW draw. Team to study further in SD.

Energy Use Opportunities -

- Building-Level Energy Metering & Advanced Energy Metering, possible calibrated simulation of the energy model
- Ductless fume hoods to reduce exhaust and associated make-up air ventilation rates
- Partnering with the local utilities for incentive programs to help offset costs, look at DOE Zero Energy Schools Program & Toolkit, Roadmap to Zero Energy,
- PV on roof or possibly building elevations. Limitations of existing structure must be considered, PE more likely on new construction, and in areas that are visible and could be a teaching tool, i.e. main entry canopy.
- Question was raised about eliminating combustion gases. Lowell has a mandate to be all renewables by 2035. GGD: This would likely require a geothermal water source or air source heat pump system design with supplemental electric heating. Increased Electric loads would typically be offset by PV array design or renewable energy purchase agreements. This can be studied further as part of lifecycle cost analysis.
- GGD: Discussed a Trigen system installed on a past project. The CoGen system would produce electricity from a gas fired turbine, chilled water via an Absorption chiller, and heating hot water from exhaust flue gas stack heat transfer. Code allows the Cogen unit to be considered the emergency power generator source, so school would not have to purchase a separate generator. One drawback is that the Cogen system cannot tie into grid.
- Energy Model- Need to consider source energy use in whole picture, GGD: Requests to see EUI column on energy model inputs.
- Need to consider resilience and flooding – elevating HVAC and Electrical equipment due to flood plain.
- GGD: Ductless fume hoods with HEPA filters typically have higher up-front cost versus traditional fume hoods, but overall system cost is typically lower due to eliminated duct work and roof fans.
- Aircuity systems to promote indoor air quality especially in lab classrooms and is a good energy savings strategy. Aircuity uses pneumatic tubing able to monitor a variety of inputs, such as relative humidity (RH), CO2 levels, VOC, particulates. The Aircuity system can be integrated with the building temperature control system. Q: How much space needed? GGD: Small closet space is required for panels and air pump. Pneumatic tubing typically located similar to ATC control wiring.
- Commissioning and Operations Turnover- Q: What will O&M plan be? Discussed potential 1-1.5% reimbursement for O&M. GGD: Contractor typically provides a compiled Owner's Manual. GGD recommended specifying that the Contractors fill in required equipment information in format compatible with SchoolDude. In addition, Owner training sessions should be recorded for c`urrent and future employees/maintenance staff. Skanska: reimbursement is based on inputs to MSBA system
- Jay Mason suggested a target of Net Zero Energy, with a focus also on reducing combustion gasses on-site. GGD expressed the potential cost increase from moving to an all-electric site. PE noted that on-site NZE is not easily achievable on buildings greater than 2 stories with limited site area, Team response that the focus will be on significant energy reduction while exploring opportunities for renewables and evaluating these against the budget and ROI . Early Modeling, once the option is selected, will help set performance benchmarks.

Materials & Indoor Environmental Quality goals – (from 5/22/17 Sustainability meeting)

- Choosing simple materials that are durable and don't require a finish, i.e. polished concrete (added benefit of avoiding slab moisture issues and delays during construction)
- Choosing rapidly renewable and local materials, i.e. terrazzo flooring is durable and doesn't need to be replaced
- Reducing waste in operations and construction, promoting composting, waste to energy
- Providing quality daylighting
- Choosing low emitting materials

Education –

- Celebrate the uniqueness of the canal (adjacent to the site) possible sustainable features and learning element pending restrictions by ENEL
- Importance of training staff and keeping up with maintenance of systems including chillers
- Composting and gardens for food production and integration of curriculum and community

- School as a teaching tool – digital interface
- Possibility of creating outdoor classrooms for active learning
- Students to monitor how building works, integrated in the STEM program
- Behavior based initiatives to help students own energy conservation and renewables

<u>Group Discussion-</u>(from 5/22/17 Sustainability meeting)

- Building Use- The building will be used all year and through evening hours and weekends
- Air Conditioning – members of the School Administration and Facilities discussed that there are currently thermal comfort issues at the current high school during the warm spring, fall and summer months. GGD noted that current PSR HVAC System narratives for all building options indicate full air conditioning for the majority of the building areas, including the classrooms, administration areas, auditorium, cafeteria, gymnasium; and that the Pool and lockers rooms are indicated in the narratives to be partially air conditioned/dehumidified.
- Schematic Design Lifecycle Cost Analysis (LCCA) - GGD discussed that during the Schematic Design a lifecycle cost analysis would be performed for the HVAC systems. As part of the LCCA, other HVAC system options besides Full AC displacement, such as VAV (variable air volume) systems, chilled beams AC and partial AC/dehumidification displacement would be studied in order to estimate the first cost, operating costs and maintenance costs of each option.
- Metering Data- there is extensive utility data on current operations from the facility. Thornton Tomasetti has access to this and will use it in helping create a performance baseline
- Exterior lighting- Important to meet safety needs and concerns as current lighting has failed safety evaluations
- LED Lighting- LED will be used throughout the new design and efforts are in place to replace existing exterior lighting with LEDs
- Computers- the High school would like to move to mostly laptops (specialty programs may still require desktops)

Next Steps –

- Team will regroup in the fall early in Schematic Design once the Preferred Option has been selected. PE noted that Sustainability and Integrated Design are an important part of PE's design process they want the Sustainability group to continually challenge the Design Team to make the new Lowell High School Project as sustainable as possible within the limits of the budget and the existing conditions constraints such as the existing envelope for any portions of the buildings that remain.

PERKINS EASTMAN

SUSTAINABILITY MEETING

LOWELL HS PROJECT



Sustainability Updated Preferred Schematic Report

April 4, 2018

Team Introductions

City of Lowell: Mike McGovern, Yovani Baez-Rose, Katherine Moses, Jay Mason, Sarah Brown, Heather Varney

LHS: Roxane Howe, Amy McLeod, Marianne Busteed, Rick Underwood

Skanska: Mary Ann Williams, James Dowd

Perkins Eastman: Robert Bell, Alicia Caritano, Dawn Guarriello, Joe Drown

Soden Sustainability: Colleen Soden, Patricia Burke

Birchwood Design Group (Landscape): Ashley Iannuccilli

GGD (Electrical, Mechanical, Technology): Carlos DeSousa, Dominic Puniello

Nitsch Engineering (Civil): William Maher

Thornton Tomasetti (Building Analytics): Vamshi Gooje, Elsa Mullin

VAV International (Plumbing/Fire Protection): Frank Stramaglia

Project Overview & Update

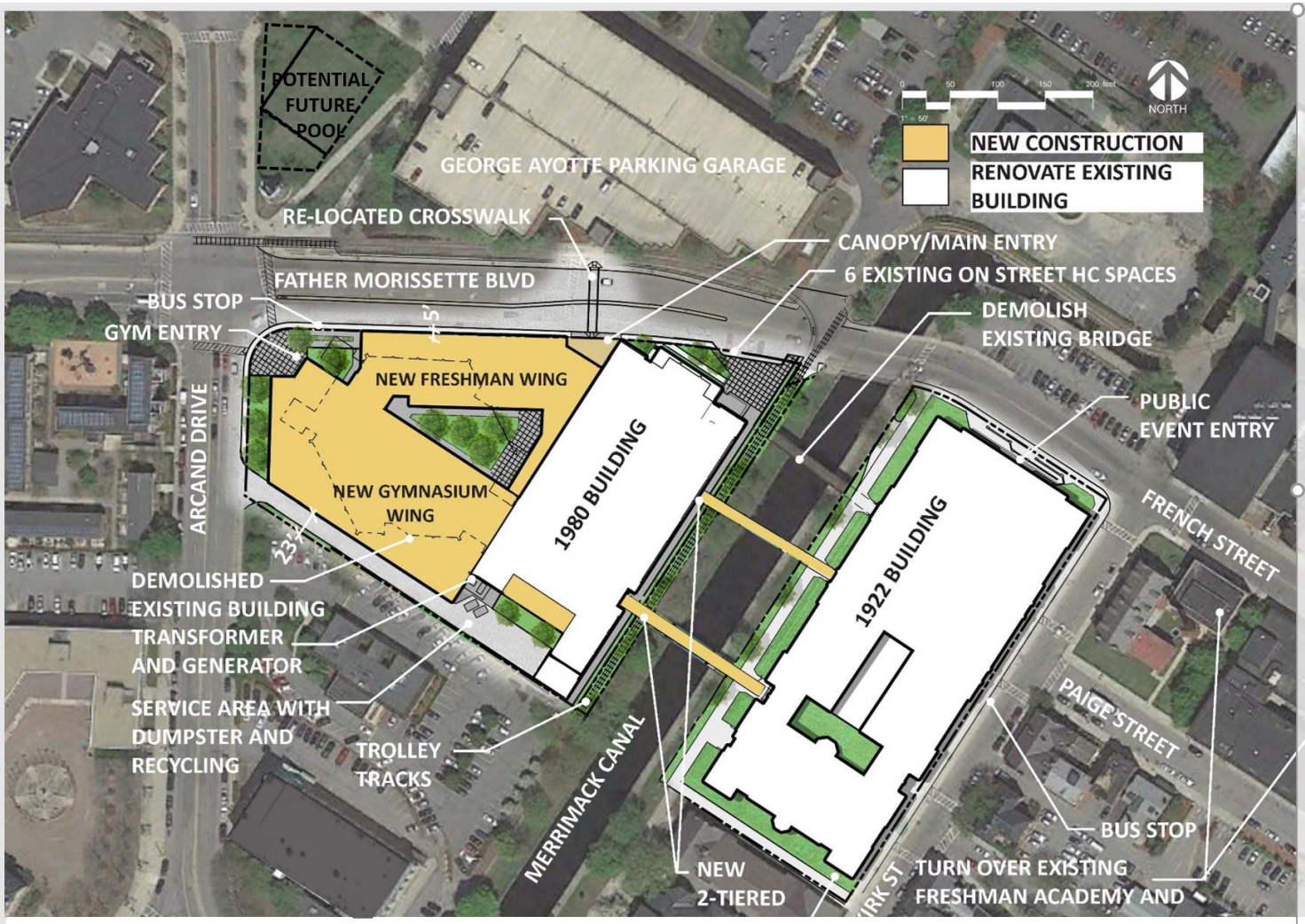
LOWELL HIGH SCHOOL

AGENDA

- Review Options/Phasing PSR Update:
  - Add/Reno Option 2A
  - Add/Reno Option 3A - Expanded Site
  - New Option A - Expanded Site



ADD/RENO 2A



ADD/RENO 2A EXISTING SITE

Updated Educ Program
(pool removed)

PRELIM. PROS/CONS:

+ Consolidated Campus
(new freshman academy)

—Temporary Gym Required

—Windowless Labs Remain

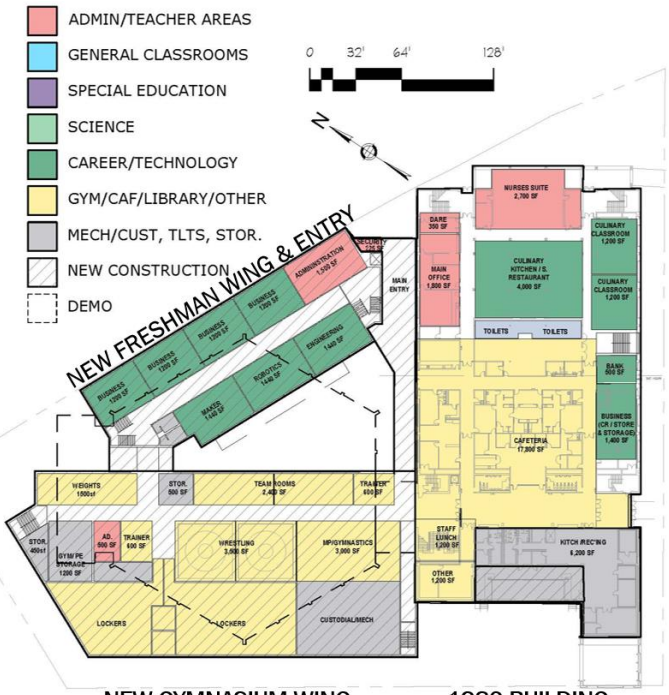
—Limited Green + Loading

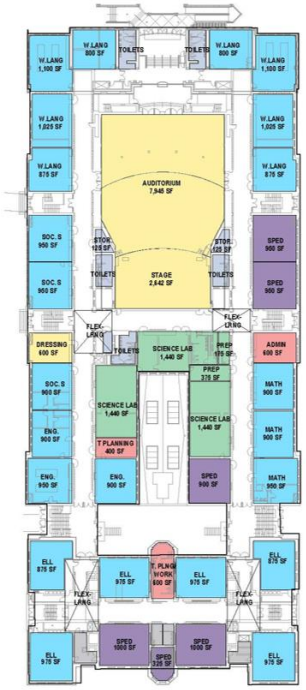
Phasing Est 4yrs + Summer

Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.

Option 2A Floor Plans

LOWELL HIGH SCHOOL: OPTION 2A FLOOR PLANS

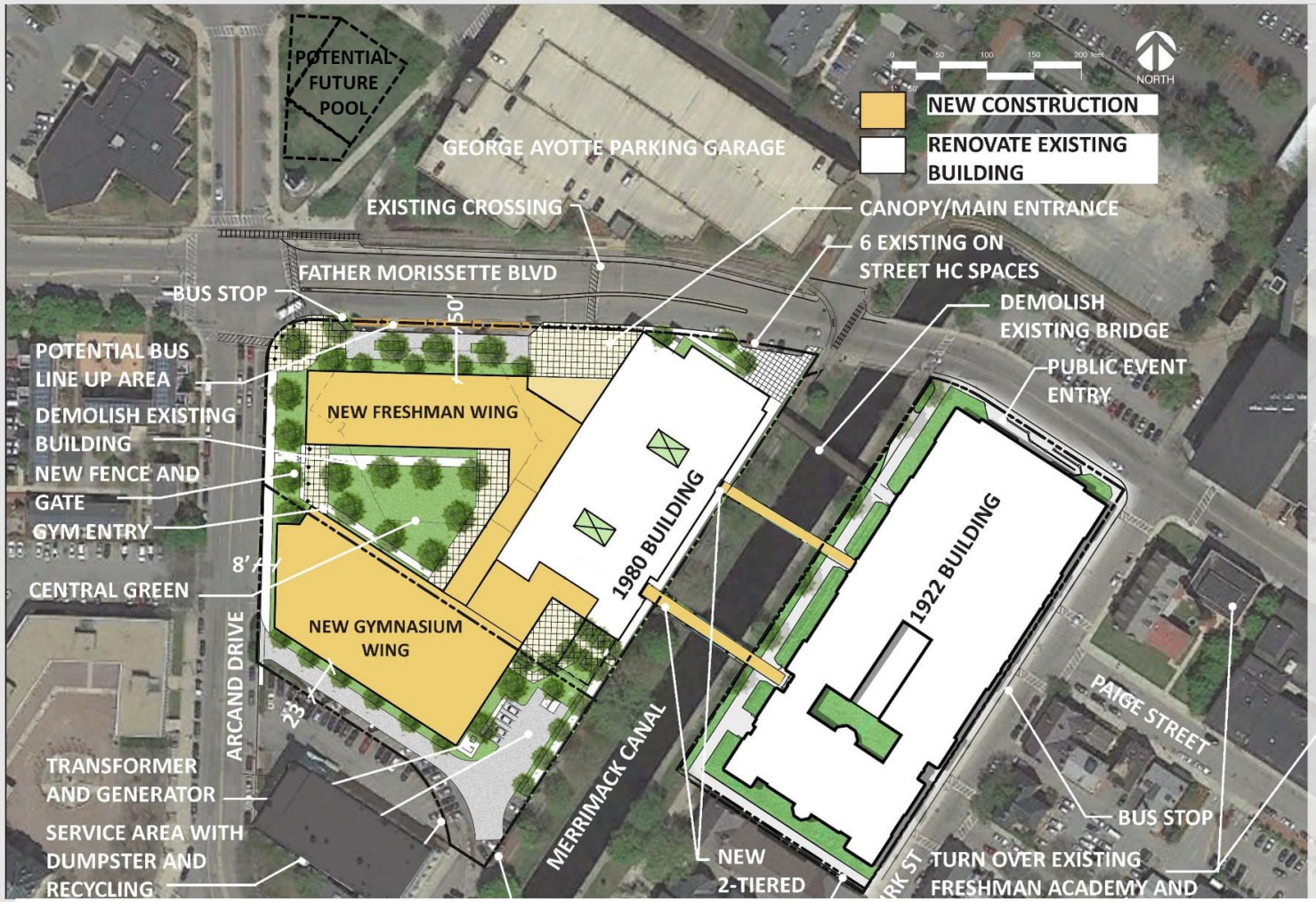




MAIN FLOOR PLAN



ADD/RENO 3A



ADD/RENO 3A EXPANDED SITE

Updated Educ Program
(pool removed)

PRELIM. PROS/CONS:

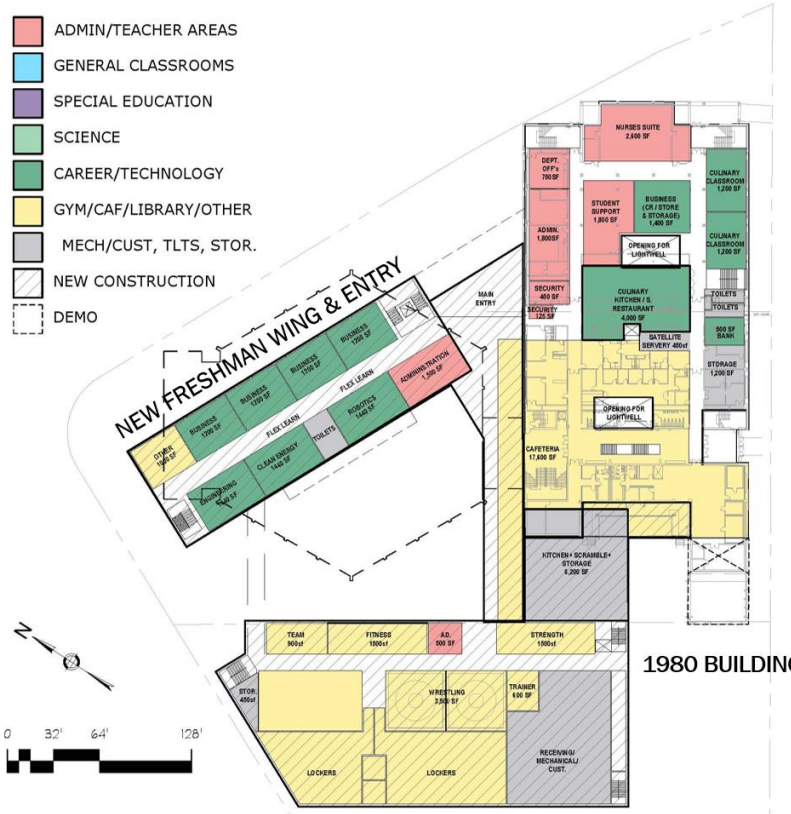
+ Consolidated Campus
  (new freshman academy)
+ No Windowless Labs
+ Added Green + Loading
— Gym Areas More Remote
— Eminent Domain

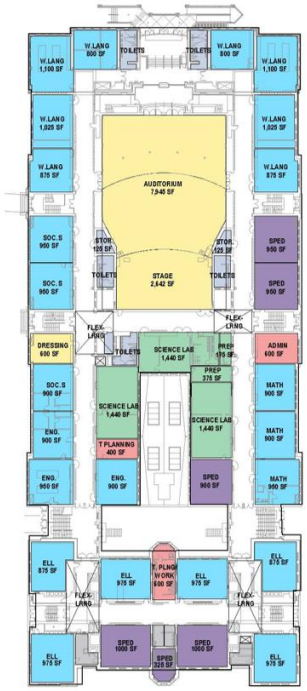
Phasing Est 5yrs
(but only 3 years on school site)

Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.

OPTION 3A FLOOR PLANS

LOWELL HIGH SCHOOL: OPTION 3A FLOOR PLANS

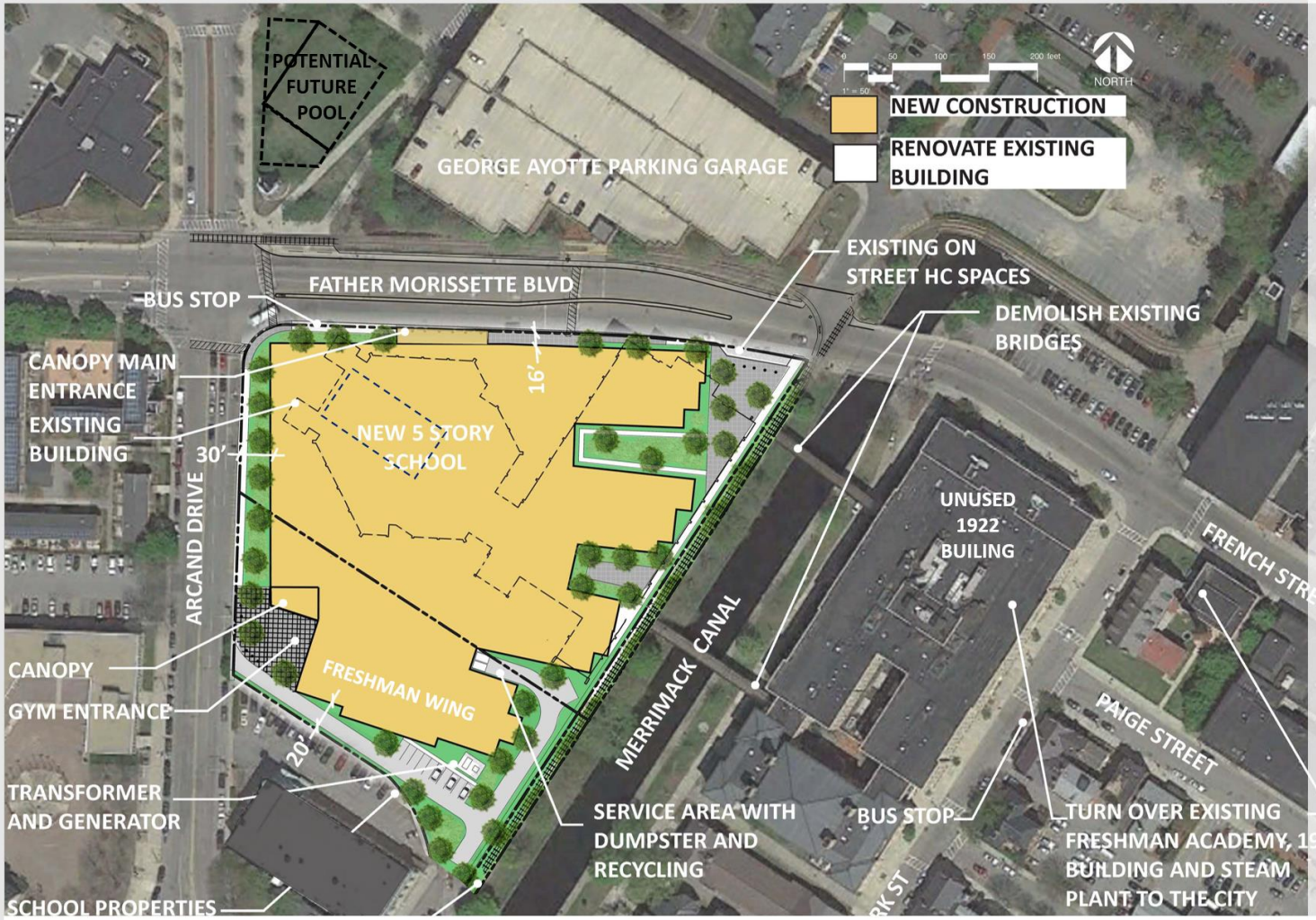




MAIN FLOOR PLAN



NEW OPTION A EXPANDED SITE



NEW OPTION A EXPANDED SITE

1922 BLDG UNUSED

Updated Educ Program
(pool removed)

PRELIM. PROS/CONS:

+ Consolidated Campus
(via 5 story + basement)

+ Good Classrm Orientation

—24 Temporary Classrms & Temporary Gym Required

—Limited Green Space

—Eminent Domain

Phasing Est 4yrs + Summer
(but only 2 years on school site)

Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.

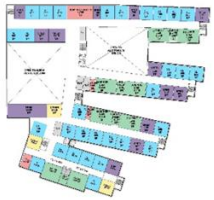
NEW OPTION A FLOOR PLANS

LOWELL HIGH SCHOOL: NEW OPTION A FLOOR PLANS

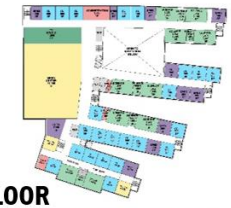
- ADMIN/TEACHER AREAS
- GENERAL CLASSROOMS
- SPECIAL EDUCATION
- SCIENCE
- CAREER/TECHNOLOGY
- GYM/CAF/LIBRARY/OTHER
- MECH/CUST, TLTS, STOR.
- NEW CONSTRUCTION
- DEMO



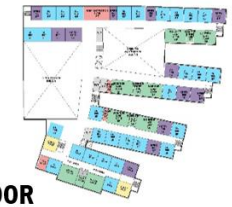
MAIN FLOOR PLAN



FIFTH FLOOR



FOURTH FLOOR



THIRD FLOOR



SECOND FLOOR



BASEMENT

Sustainability Goals & Commitment

Stretch Code Compliance-

•As a **Green Community,** Lowell requires the project to meet the **Stretch Code**

•As of January 2017 the Stretch Code requires projects to exceed **ASHRAE 90.1-2013 by 10%**

MSBA Requirements

•A minimum requirement - **All projects must be LEED certified** or NE-CHPS verified (Standard)

•Minimum requirement – Project Energy efficiency must **exceed Massachusetts Energy Code by 10%**”

•**Potential Additional reimbursement** available if the energy efficiency is **20% above the Massachusetts Building Code**

•MSBA establishes a base reimbursement rate for each district with an overall maximum rate of 80% reimbursement for ELIGIBLE costs.

Sustainability MSBA



Massachusetts School Building Authority

Funding Affordable, Sustainable, and Efficient Schools in Partnership with Local Communities

The MSBA Provides Significant Reimbursement

The MSBA establishes a base reimbursement rate for each District with potential additional incentive points available, but an overall max rate of 80% (Lowell's base is near 80%)

Reimbursement rates apply only to eligible costs

The MSBA caps costs overall and within individual scopes (caps are not intended to represent market/industry trends, but serve to provide consistent & equitable funds state-wide)

LOWELL **LOWELL HIGH SCHOOL PROJECT** SKANSKA Perkins Eastman | DPC

Sustainability MSBA Project Advisory 41

The update to the Sustainable Building Design Policy is as follows:

Minimum Requirements

Current 2015 Policy	New 2017 Policy
Using LEED-S V4, for no additional reimbursement, achieve a minimum of "Certified" (40 points), including a minimum of 3 points in EA Credit "Optimize Energy Performance." OR; Using NE-CHPS 3.0, for no additional reimbursement, achieve a minimum of "Verified" (110 points for new construction or 85 points for addition / renovation), including 6 points in EE Prerequisite #1.0.	Using LEED-S, for no additional reimbursement, achieve a minimum of "Certified", OR; Using NE-CHPS, for no additional reimbursement, achieve a minimum of "Verified". AND; Exceed the level of energy efficiency required in the current Massachusetts (base) energy code by 10%, using the LEED-S EA "Optimize Energy Performance" credit submittal or the NE-CHPS "Energy Efficiency" credit submittal to demonstrate that performance.

Additional Reimbursement

Current 2015 Policy	New 2017 Policy
Using LEED-S V4, for 2% additional reimbursement points, achieve a minimum of "Silver" (50 points), including a minimum of 6 points in EA Credit "Optimize Energy Performance." OR; Using NE-CHPS 3.0, for 2% additional reimbursement, achieve a minimum of "Verified" (110 points for new construction or 85 points for addition / renovation), including a minimum of 9 points in EE Credit #1.1.	In addition to the minimum requirements described above, projects must exceed the level of energy efficiency required in the current Massachusetts (base) energy code by 20%, using the LEED-S EA "Optimize Energy Performance" credit submittal or the NE-CHPS "Energy Efficiency" credit submittal to demonstrate that performance.

Project Brainstorming



Reduce contribution to **global climate change**



Enhance individual **human health**



Protect and restore **water resources**



Protect and enhance **biodiversity and ecosystem services**



Promote **sustainable and regenerative** material cycles



Build a **green economy**



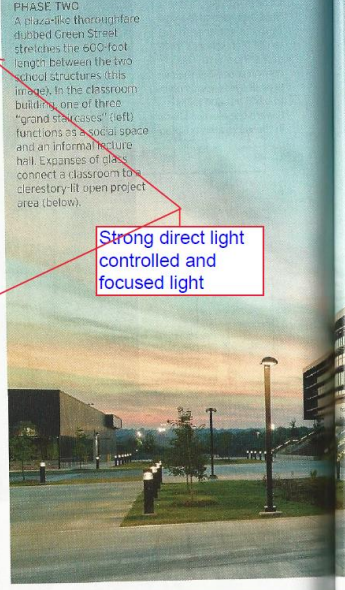
Enhance **community quality of life**

Natural light- passive side, recessed for diffuse effect



PHASE TWO
A plaza-like thoroughfare dubbed Green Street stretches the 600-foot length between the two school structures (this image), in the classroom building, one of three "grand staircases" (left) functions as a social space and an informal lecture hall. Expanses of glass connect a classroom to a clerestory-lit open project area (below).

Strong direct light controlled and focused light



Slide submitted to Perkins Eastman- Lowell High School Sustainability Kick-off May 10, 2017- Daylighting example



Similar sized high school- 535,000sf.





rooms within the heart of the second-phase building, are flooded with daylight. Additionally, clerestory windows in the sports arenas and common spaces combine with bands of south-facing glazing to illuminate key public spaces. These and other sustainable features, including the use of recycled building materials and energy-efficient environmental-control systems contributed to LEED Gold certification for the second building and LEED Silver for the first.

Between classes, students pour into the central courtyard and enliven the three grand staircases in the classroom building, where they socialize or get a bite to eat. Sophomores Michael Lynn McNeill and Evie Ritter often have lunch on one of these daylit stairs. Both students found the transition to the large campus from middle school a bit overwhelming. But would they prefer a smaller school? McNeill replies, "No, I like the diversity of people in a big school, and the fact that it has the feel of a college campus." ■

Michael Cockram is a freelance writer and the director of Bowerbird Design in Fayetteville, Arkansas.

credits

ARCHITECTS: DLR Group – Jim French, principal; Hight Jackson Associates – Hight Jackson, principal; Marlon Blackwell Associates – Marlon Blackwell, Meryati Johari Blackwell, principals

ENGINEERS: DLR Group, Tatum-Smith (structural); DLR Group (m/e/p/fp); McClelland Consulting Engineers (civil)

CONSULTANTS: McClelland Consulting Engineers (landscape architect); Viridian (LEED); THEER (acoustical and a/v); Andy Gibbs (theater)

GENERAL CONTRACTOR: Nabholz

CLIENT: Fayetteville Public Schools

SIZE: 535,000 square feet

COST: $84 million

COMPLETION DATE: August 2015

SOURCES

STEEL: Jacksonville Steel (structural system)

CLADDING: Schwartz Stone (masonry); Morin & Firestone (metal panels)

CURTAIN WALL: Kawneer

GLAZING: Tri-Star Glass

CEILINGS AND RESILIENT FLOORS: Armstrong

Project Brainstorming

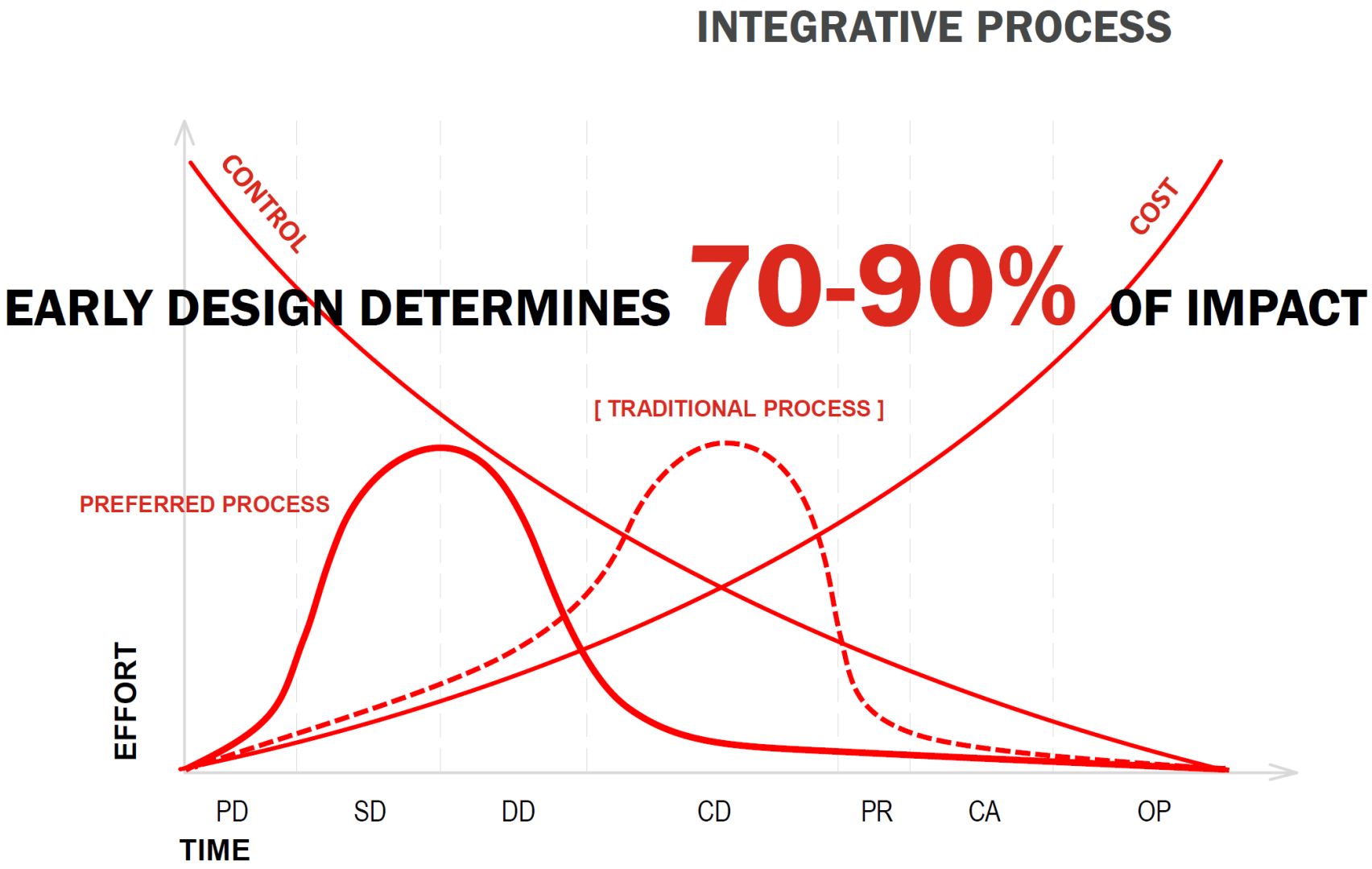
What does Sustainability mean for the team?

- Efficiency in building operations
- Healthy workspace
- ROI – Life Cycle Costing of energy efficiency strategies (5 payback)
- Showcase sustainability
- Sustainable materials (Low VOC/recycled)
- Tested technology – has to work
- Monthly energy bills stay low
- Green energy purchase
- Employee & Occupant Well-being
- Environmental Stewardship
- Lower Operating Cost
- Budget/Low Cost Options

Nature

- Efficient MEP
- Sustainable Materials
- Flexibility/Adaptability
- Visible Sustainability
- Public Relations & Marketing
- Zoning Negotiations
- Community Relations
- Asset Value
- Risk Management
- Resource Efficiency
- Simple/enhanced Operations & Maintenance
- Renewable Energy Systems
- Schedule & Constructability

Integrative Design



LEED Categories

LOCATION AND TRANSPORTATION

SUSTAINABLE SITES

WATER EFFICIENCY

ENERGY AND ATMOSPHERE

MATERIALS AND RESOURCES

INDOOR ENVIRONMENTAL QUALITY



LOCATION & TRANSPORTATION

Site Design Project Brainstorming

Site Design Opportunities-

- Pedestrian and bicycle connections
- Creating plazas and high quality open space
- Increasing green space and shade trees, pervious paving
- Public transportation- is a great resource for students
- Rainwater Management- utilizing stormwater for flushing
- Opportunities for bio swales in important locations, NPDES requirements for entire site
- Green Roof or living wall

Location & Transportation

- Sensitive Land Protection
- High Priority Site
- Surrounding Density and Diverse Use
- Access to Quality Transit
- Bicycle Facilities
- Reduced Parking Footprint
- Green Vehicles



SUSTAINABLE SITES

Site prerequisites and credits

- Construction Activity Pollution Prevention
- Environmental Site Assessment
- Site Development - Protect or Restore Habitat
- Open Space
- Rainwater Management
- Heat Island Reduction
- Light Pollution Reduction
- Site Master Plan
- Joint Use of Facilities



WATER EFFICIENCY

Water Use Reduction Project Brainstorming

Water Use Reduction Opportunities-

- Water reuse from stormwater
- High efficiency fixtures & water metering
- Outdoor Water Use Reduction-using drought tolerant plants and minimizing irrigation

Water prerequisites and credits

- Outdoor Water Use Reduction
- Indoor Water Use Reduction
- Building-Level Water Metering
- Cooling Tower Water Use





Water Use Reduction





Projects can achieve up to 30% water use reduction without occupants even noticing they are using “high efficiency” fixtures.

Specify fixtures to meet the following criteria:

- Lavatories – 0.1 GPC or .09 GPC
- Urinals –0.125 GPF
- Water Closets 1.28 GPF
- Showers 1.5 GPM(possible 1.25 GPM)
- Kitchen Sink 1.0 GPM



ENERGY AND ATMOSPHERE

Energy Reduction Project Brainstorming

Energy Use-

- Building-Level Energy Metering & Advanced Energy Metering, possible calibrated simulation of the energy model
- Cogeneration opportunities with swimming pool, and use of waste heat for electricity
- Ductless fume hoods to reduce exhaust rates
- Aircuity systems to promote indoor air quality especially in lab classrooms
- Partnering with the local utilities for incentive programs to help offset costs, look at DOE Zero Energy Schools Program & Toolkit, Roadmap to Zero Energy,

Energy prerequisites and credits

- Fundamental & Enhanced Commissioning
- Energy Performance
- Building-Level Energy Metering
- Fundamental & Enhanced Refrigerant Management
- Optimize Energy Performance
- Advanced Energy Metering
- Demand Response (All electric site)
- Renewable Energy Production
- Green Power and Carbon Offsets

Energy Use

POTENTIAL ECM'S

Envelope

•Optimize insulation

•Triple pane windows (potentially eliminate perimeter heating)

•Avoiding thermal bridging details

•Minimize infiltration

Internal Loads

•Daylight optimization

•Maximize visible transmittance + optimize solar heat gain coefficient

•LED fixtures (interior + site)

•Vacancy/occupancy sensors

• Plug load management

Systems

•Hydronic based systems: Chilled Beams, radiant floor, fan coils

•Displacement ventilation in high volume spaces

•Demand Control Ventilation

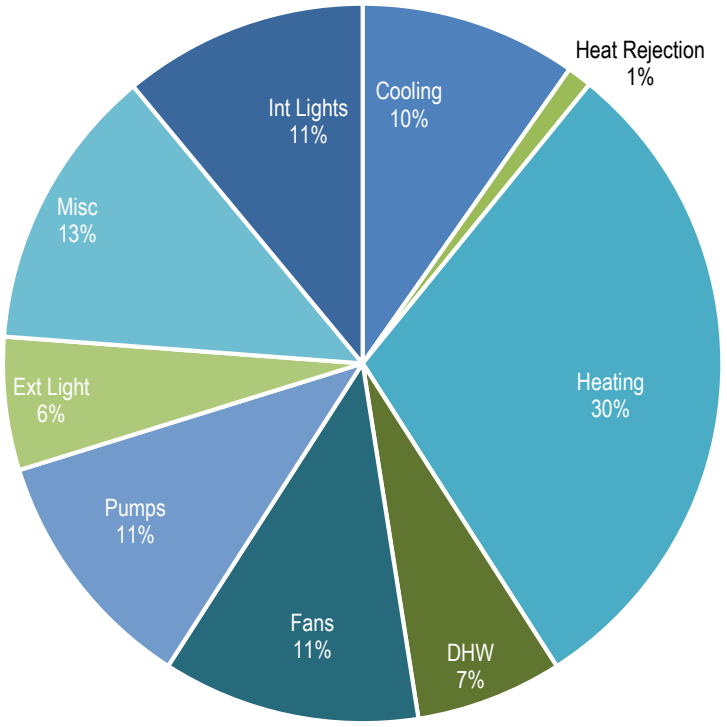
•Combined Heat and Power (constant pool heat load)

•Displacement systems for classrooms and high volume spaces

ENERGY REDUCTION TARGETS

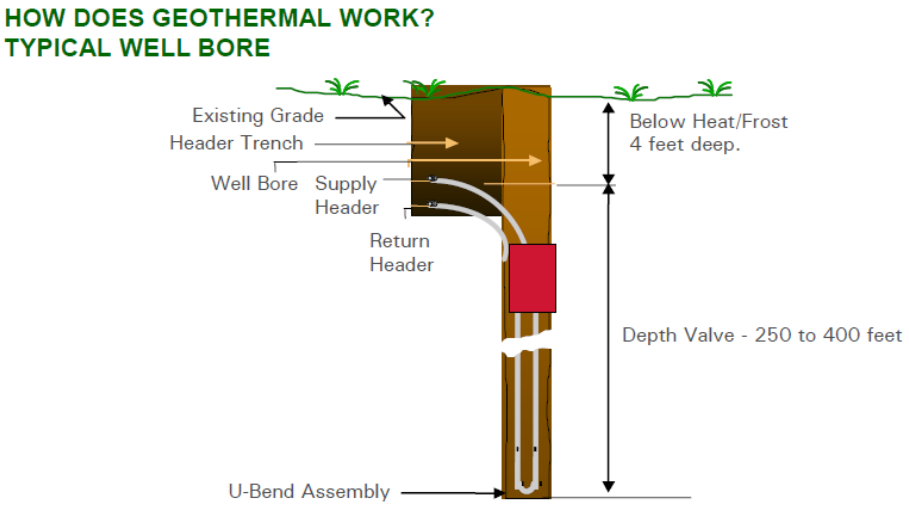
- Minimum Requirements: 10% EUI reduction from Massachusetts Base Code (ASHRAE 90.1 2013)
- Additional Reimbursement: 20% EUI reduction from Massachusetts Base Code(ASHRAE 90.1 2013)
- Project energy performance target: TBD with the team

ESTIMATED ENERGY USE BREAKDOWN



On-Site Renewable/Geothermal Energy







Energy Opportunities

DEMAND RESPONSE



PARTICIPATE IN DEMAND RESPONSE PROGRAMS THROUGH LOAD SHEDDING OR SHIFTING

BUILDING-LEVEL ENERGY METERING



TRACK AND PROVIDE BUILDING-LEVEL DATA REPRESENTING TOTAL BUILDING ENERGY CONSUMPTION



MATERIALS AND RESOURCES

Materials Project Brainstorming

- Choosing simple materials that are durable and don’t require a finish, i.e. polished concrete (added benefit of avoiding slab moisture issues and delays during construction)
- Choosing rapidly renewable and local materials, i.e. terrazzo flooring is durable and doesn’t need to be replaced
- Reducing waste in operations and construction, promoting composting, waste to energy
- Providing quality daylighting
- Example of two story bridges, creating circulation spaces that can be used as gathering space by students
- Choosing low emitting materials

Materials prerequisites and credits

- Storage and Collection of Recyclables
- Construction and Demolition Waste Management
- Building Life-Cycle Impact Reduction
- Building Product Disclosure and Optimization - Environmental Product Declarations"
- Building Product Disclosure and Optimization - Sourcing of Raw Materials
- Building Product Disclosure and Optimization - Material Ingredients

Material Selection

STEP-BY-STEP

- **Step 1:** Establish overall strategy for materials
- **Step 2:** Transparency
- **Step 3:** Optimize product purchasing
- **Step 4:** Track purchases



INDOOR ENVIRONMENTAL QUALITY

IAQ Project Brainstorming

- Providing quality daylighting
- Example of two story bridges, creating circulation spaces that can be used as gathering space by students
- Choosing low emitting materials

IAQ Goals



IAQ prerequisites and credits

- Minimum Indoor Air Quality Performance
- Environmental Tobacco Smoke Control
- Minimum Acoustic Performance
- Enhanced Indoor Air Quality Strategies
- Low-Emitting Materials
- Construction Indoor Air Quality Management Plan
- Indoor Air Quality Assessment
- Thermal Comfort
- Interior Lighting
- Daylight
- Quality Views
- Acoustic Performance

Education & Outreach Project Brainstorming

Education

- Celebrate the uniqueness of the canal (adjacent to the site) possible sustainable features and learning element
- Importance of training staff and keeping up with maintenance of systems including chillers
- Composting and gardens for food production and integration of curriculum and community
- School as a teaching tool – digital interface
- Possibility of creating outdoor classrooms for active learning
- Students to monitor how building works, integrated in the STEM program
- Behavior based initiatives to help students own energy conservation and renewables

Group Discussion

- Building Use- The building will be used all year and through evening hours and weekends
- Air Conditioning – members of the School Administration and Facilities discussed that there are currently thermal comfort issues at the current high school during the warm spring, fall and summer months. GGD noted that current PSR HVAC System narratives for all building options indicate full air conditioning for the majority of the building areas, including the classrooms, administration areas, auditorium, cafeteria, gymnasium; and that the Pool and locker rooms are indicated in the narratives to be partially air conditioned/dehumidified.
- Schematic Design Lifecycle Cost Analysis (LCCA) - GGD discussed that during the Schematic Design process a lifecycle cost analysis would be performed for the HVAC systems. As part of the LCCA, other HVAC system options besides Full AC displacement, such as VAV (variable air volume) systems, chilled beams AC and partial AC/dehumidification displacement would be studied in order to estimate the first cost, operating costs and maintenance costs of each option.

Group Discussion

- Metering Data- there is extensive utility data on current operations from the facility. Thornton Tomasetti has access to this and will use it in helping create a performance baseline
- Exterior lighting- Important to meet safety needs and concerns as current lighting has failed safety evaluations
- LED Lighting- LED will be used throughout the new design and efforts are in place to replace existing exterior lighting with LEDs
- Green Roof- City of Lowell Wastewater Department Building has a green roof- possible team tour
- Computers- the High school would like to move to mostly laptops (specialty programs may still require desktops)

LEED Categories

LOCATION AND TRANSPORTATION

SUSTAINABLE SITES

WATER EFFICIENCY

ENERGY AND ATMOSPHERE

MATERIALS AND RESOURCES

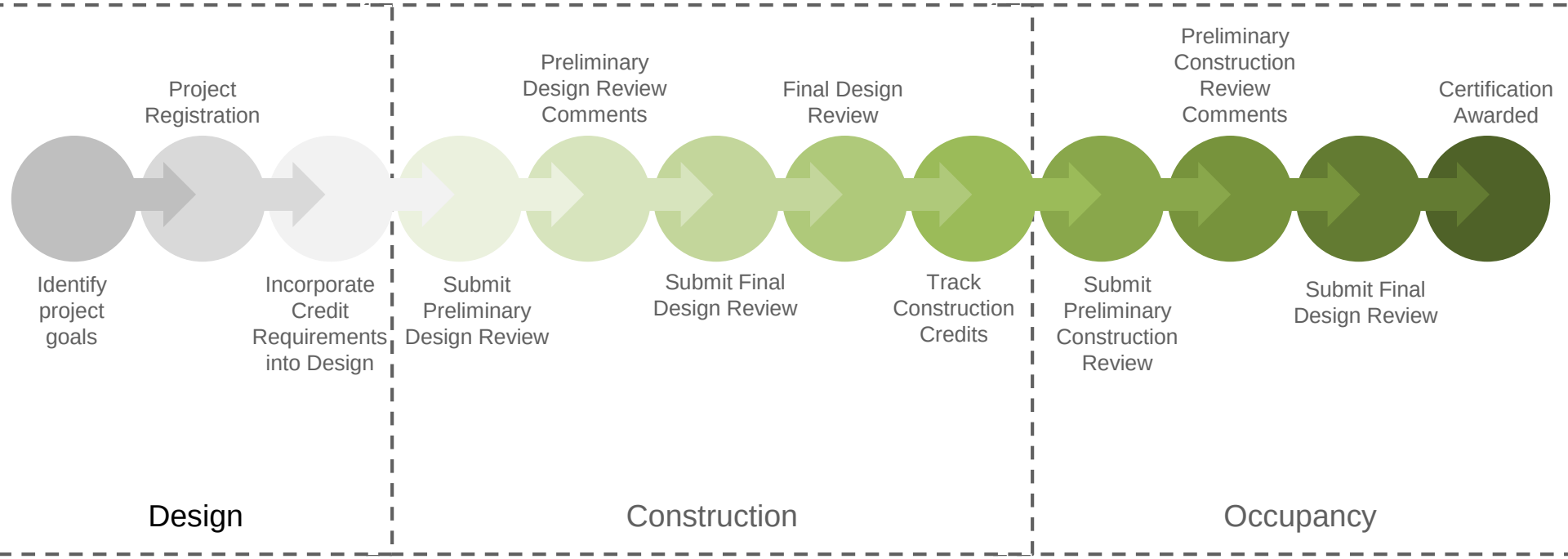
INDOOR ENVIRONMENTAL QUALITY

LEED



40-49 Points | 50-59 Points | 60-69 Points | 80-110 Points

LEED Process



Additional areas to study

- Team review on additional strategies to consider/study

Perkins Eastman | DPC

MEETING RECORD

Date Prepared	4/11/2018	
Project Name	Lowell High School	
Project Number	67150.01	
Subject	**City of Lowell Department Meeting**	
Meeting Location	City Hall – Mayor's Conference Room	
Meeting Date	**4/4/2018**	
Prepared By	Alicia Caritano & William Maher	a.caritano@perkinseastman.com
	T: 617-449-4001	F: 617-449-4049
Participants	City of Lowell: Interim City Manager - Michael Geary Assistant City Manager - Mike McGovern Chief Financial Officer - Conor Baldwin Treasurer - Rodney Conley Heather Varney – Deputy CFO Environmental Officer - Sarah Brown Fire Chief - Jeff Winward Police Department - Kelly Richardson 1st Assistant City Solicitor - Richard Brown 2nd Assistant City Solicitor - Elliott Veloso Building Commissioner - Shaun Shanahan Director of Development Services - Eric Slagle Assistant CM Director of Planning and Development - Diane Tradd DPD Senior Planner - Christine McCall Historic Board Administrator - Stephen Stowell Lowell Public Health Director - Kerran Vigroux Lowell Wastewater - Aaron Fox Lowell Water - Paul Pires OPM: Skanska- MaryAnn Williams Design Team: Perkins Eastman - Joe Drown, Robert Bell, Alicia Caritano, Dawn Guarriello Traverse Landscape Architects - Ashley Iannuccilli Bryant Associates - Elizabeth Lavoie Building Conservation Associates - Lisa Harrington Garcia Galuska Desousa - Carlos DeSousa Nitsch Engineering - William Maher Nobis Engineering - Jeff Brunelle Universal Environmental Consultants – Ammar Dieb VAV International - Frank Stramaglia	

New Business (Agenda Items)		Notes	Action by / Date Req'd
1.1	**Overview**	Mike McGovern explained that the team is updating the previous PSR (Preferred Schematic Report dated 6/27/17) which identified a Preferred Option for a New High School at the Cawley Site, and is now exploring 3 options for a High School Project at the Downtown Site: • Addition/Renovation Option 2A	

This Meeting Record is our understanding of the items as they were discussed. Please report any discrepancies to Perkins Eastman. If no discrepancies are reported in five working days, this Meeting Record will stand as published.

		(similar to previous Option 2 w/out a pool) • Addition / Renovation Option 3A – Expanded Site (similar to previous Option 3 w/out a pool). Mike noted that at this time the City is likely leaning towards Option 3A, but the study and cost updates are still in process. • New Option A – Expanded Site (New build Option required by MSBA for comparison) Bob Bell provided an overview of each option and noted that at this early stage, the plans are still diagrammatic layouts that will continue to evolve throughout the design process, and that the Phasing is also diagrammatic and will be solidified by the Construction Manager. The diagrammatic plans with pros and cons, and phasing w/ temporary facilities, are summarized in the attached Power Point Presentation. All options will 69' high to avoid Hi-Rise construction. The SBC will vote to recommend a Preferred Option at a combined SBC/City Council and Community meeting on 4/30/18. The City Council will vote for the Preferred Option on 5/1. The PSR report will be submitted to the MSBA on 5/9/18.	Record
1.2	Construction Manager	The Construction Manager will join the team in Design Development in 2019. The RFS for the CM will include requests for the CM to substantiate their renovation experience with Phased Occupied construction. The Design Team will work with the CM who will be responsible for the final phasing and Construction Management Plan.	Record
1.3	Fire Department	The Chief noted that permits are required for cutting and welding, and a uniformed officer must be on site for fire watch. The Chief asked about fire separations during construction for the occupied Addition/Renovation options. PE explained that if an Add/Reno option is selected, prior to Construction, the Design Team and Construction Manager will meet with LFD, LPD and other departments, to review phased occupied construction including but not limited to; site access/construction management plan, phasing plans (vertical separation separate occupants & construction), negative pressurization, details for construction separating occupied areas with students from unoccupied construction areas, etc. The project will comply with all applicable codes and the specifications will include requirements for fire protection during and after construction. Air quality will be monitored by the CM during construction.	Record
1.4	Lowell Regional Water Utility	No issues at this time based upon the level of detail available. Flow test will be performed in SD. Likely no cost for flow tests for City projects.	

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1.5	Lowell Regional Wastewater Utility	Bill Maher explained that additional study will be done during SD to determine if there are any existing outfalls into the canal, as well and proposed outfalls. RDA or NOI will be filed as required. Bill Maher also noted that the Design will include on-site infiltration and also seek to improve quality of water that leaves the site.	Record
1.6	Development Services	Diane Trann requested that the City forward the plans presented at this meeting and she will review and comment. PE requested comments be provided by 4/13 to be included in the PSR as appropriate. PE noted that preliminary FAR calculations for all options appears to be As-Of-Right and they will check their calculations.	Record
1.7	Conservation Commission	Eric Slagle noted that the Conversation Commission has jurisdiction for construction along the canal.	Record
1.8	Building Permits	The Building Commissioner requested that abatement paperwork be filed long before the building permit package is submitted. The City has not yet made decision about costs for Building Permits. Skanska noted that Building Permit costs are not reimbursed by the MSBA	Record
1.9	Historic	Steve Stockwell noted that his preliminary comment is that he would like the bridges to have a minimal impact, and would prefer 1 story bridges to the 2-tiered bridges shown. The revised PNF was submitted on 3/26. PE noted that the two-tier bridges are to provide efficient circulation for students and teachers on this large project. Bridges will be reviewed as part of the Historic Review process during SD.	Record
1.10	Traffic	The traffic study scope in the previous PSR dated 6/27/17, was based upon requirements by the City Traffic Engineer. The study determined that no substantial traffic mitigation was required for a new High School at the existing Downtown site. At the outset of the revised PSR, the City confirmed that no additional traffic study would be required for the Downtown Site in the PSR Update. Mike Geary asked if the “Five Bridges” project affected this project. Bryant Associates, subsequently confirmed that the “Five Bridges” project information was not provided by Nicolas Bosonetto for the Downtown traffic study in the previous PSR. The Design team will meet with the Traffic Department as the design is developed in SD.	Record
1.11	Eminent Domain	The City Eminent Domain process is ongoing; they have hired a relocation consultant, hired 2	Record

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		appraisers, and are targeting a possible Council Oder Taking vote for 6/5. This is an aggressive schedule which would enable andy additional required Geotechnical/Geoenvironmental borings to be done in July at the outset of Schematic Design to inform the design and budget.	
1.11	Air Rights	The City is still continuing to investigate approvals related to the demolition and rebuilding of the two existing pedestrian bridges over the Merrimack Canal that connect the 1980's and 1922 Buildings. Elliott Veloso explained that based upon the available information to date, the City has located an easement from the Proprietors of the Locks and Canals on the Merrimack River that would appear to allow for the demolition and reconstruction of the southern bridge (built c.1980) in it's current location, but has not yet found an easement for the northern bridge (built c. 1997) which is currently proposed to be located in a more southerly location. Steve Stockwell suggested that DCR regulates the air rights over the canals. It was also noted that ENEL GreenPower North America owns the canals. Mike McGovern questioned if there were any Article 97 restrictions related to the Downtown site and the land adjacent to the canal, and if so, does the Air Rights restriction extend into three dimensions, or are they just a two-dimensional restriction? The City will continue to research this issue and provide the Design team with a summary by 4/20/18, of governing agencies (including but not limited to: DCR, NPS, ENEL, Boston & Maine, etc.), development restrictions/required easements, and the approvals process related to the bridge demolition and reconstruction, as well as a timeline for any approvals to include in the PSR submission to the MSBA. Pending restrictions, the Design Team can explore options as required relative the bridge configurations and locations. The City will need to have substantiate full control of the property, including any Air Rights, by MSBA Module 5 – Project Funding Appropriation.	Record
1.15	Next Steps	Team to schedule follow-up meetings with City Departments during Schematic Design to review the specific layout and regulatory requirements for design as it develops.	Record

Next Meeting: Click here to enter a date. Date in Schematic Design to be determined.

This Meeting Record is our understanding of the items as they were discussed. Please report any discrepancies to Perkins Eastman. If no discrepancies are reported in five working days, this Meeting Record will stand as published.

cc: Mike McGovern, Rodney Conley, Conor Baldwin, Heather Varney ,
Distribution to City Departments via City Manager's Office
Skanska - Mary Ann Williams, James Dowd
Design Team

Attachments: Sign-In Sheets, Presentation

This Meeting Record is our understanding of the items as they were discussed. Please report any discrepancies to Perkins Eastman. If no discrepancies are reported in five working days, this Meeting Record will stand as published.

PERKINS EASTMAN

CITY ALL DEPARTMENT MEETING

LOWELL HS PROJECT



EXISTING IMAGERY COURTESY OF GOOGLE EARTH

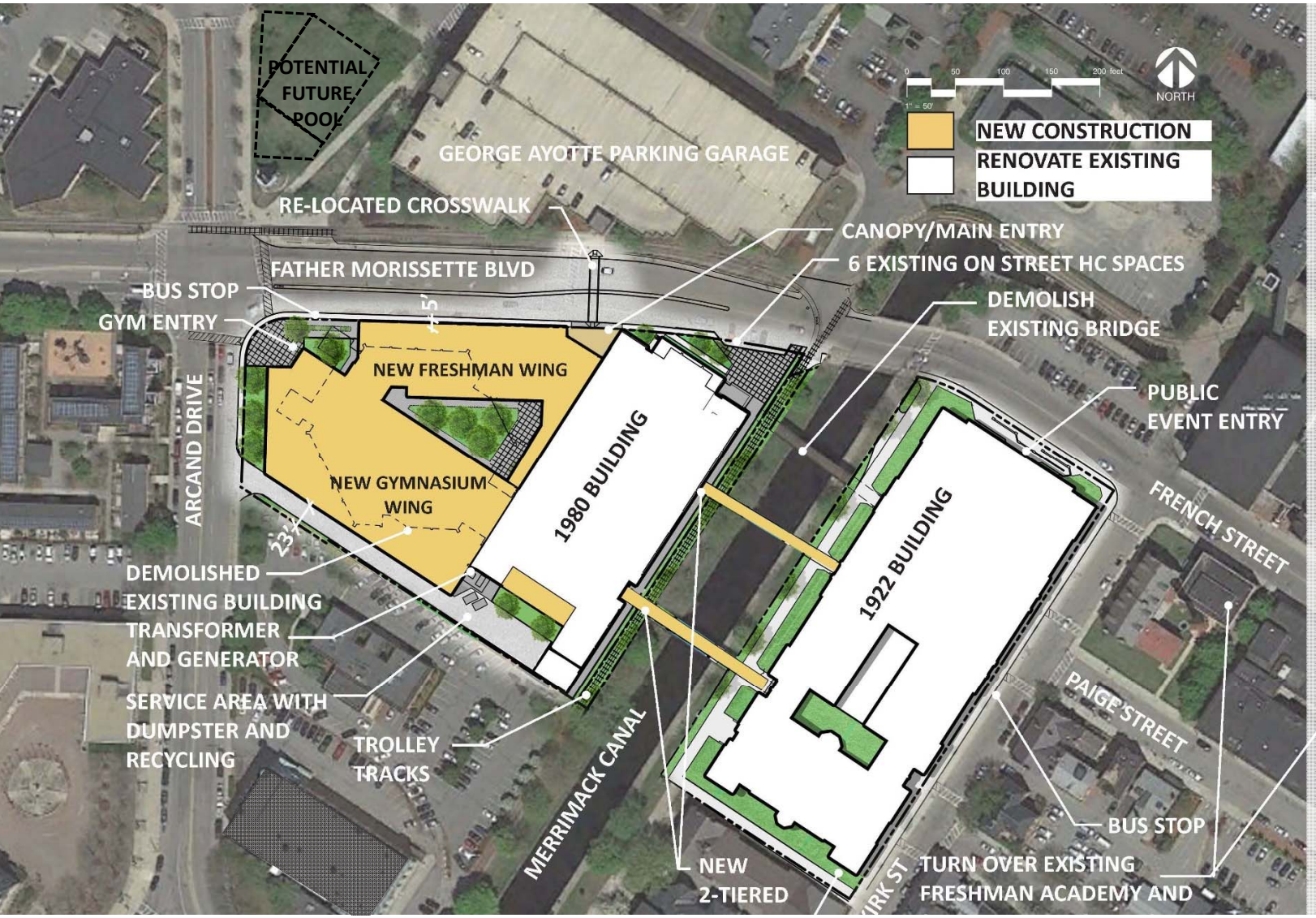
4 APRIL 2018

LOWELL HIGH SCHOOL

AGENDA

- Review Options/Phasing PSR Update:
  - Add/Reno Option 2A
  - Add/Reno Option 3A - Expanded Site
  - New Option A - Expanded Site
- City Department Questions
- Next Steps





ADD/RENO 2A EXISTING SITE

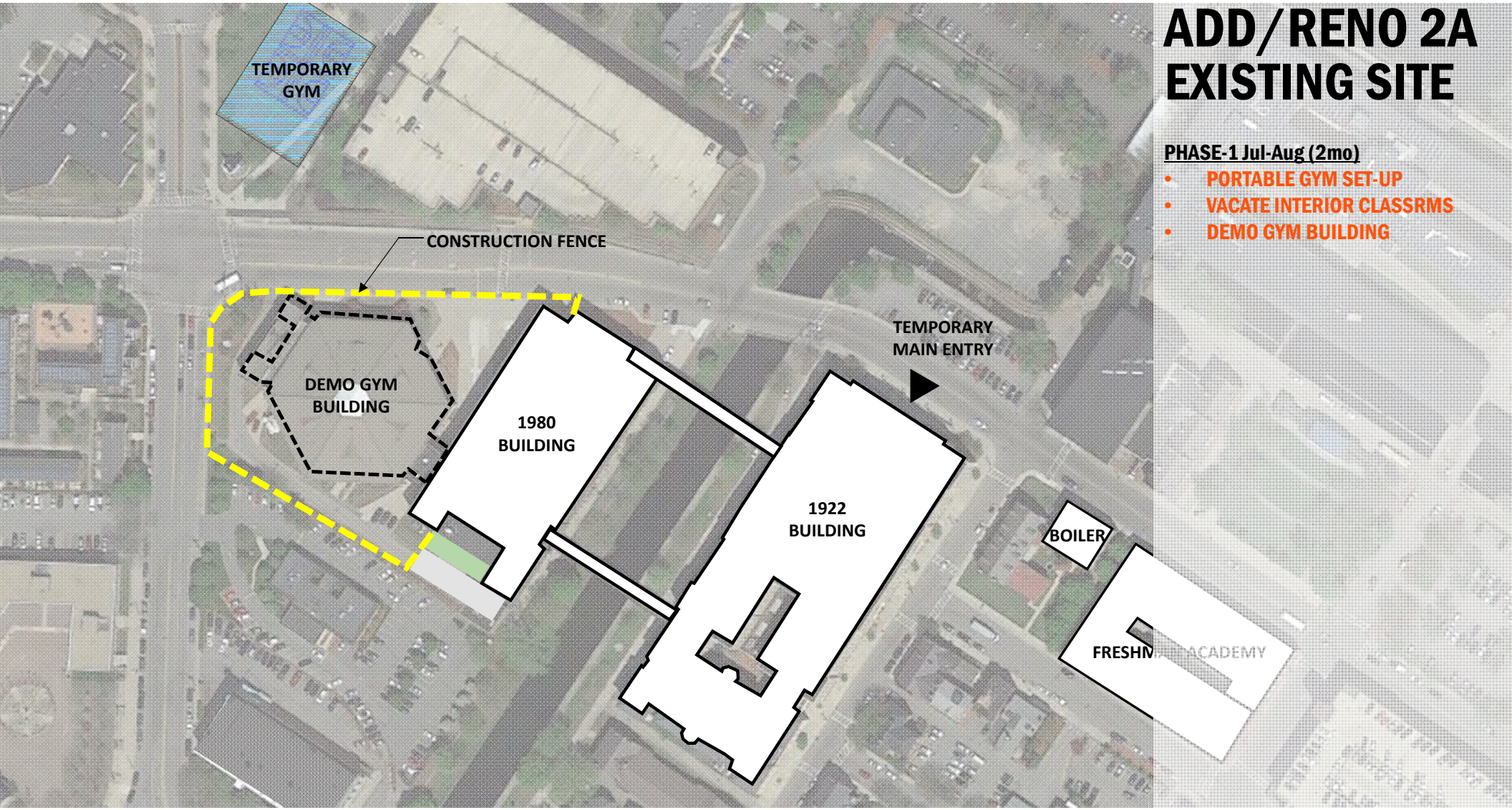
Updated Educ Program
(pool removed)

PRELIM. PROS/CONS:

+ **Consolidated Campus**
  (new freshman academy)
- **Temporary Gym Required**
- **Windowless Labs Remain**
- **Limited Green + Loading**

Phasing Est 4yrs + Summer

Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.



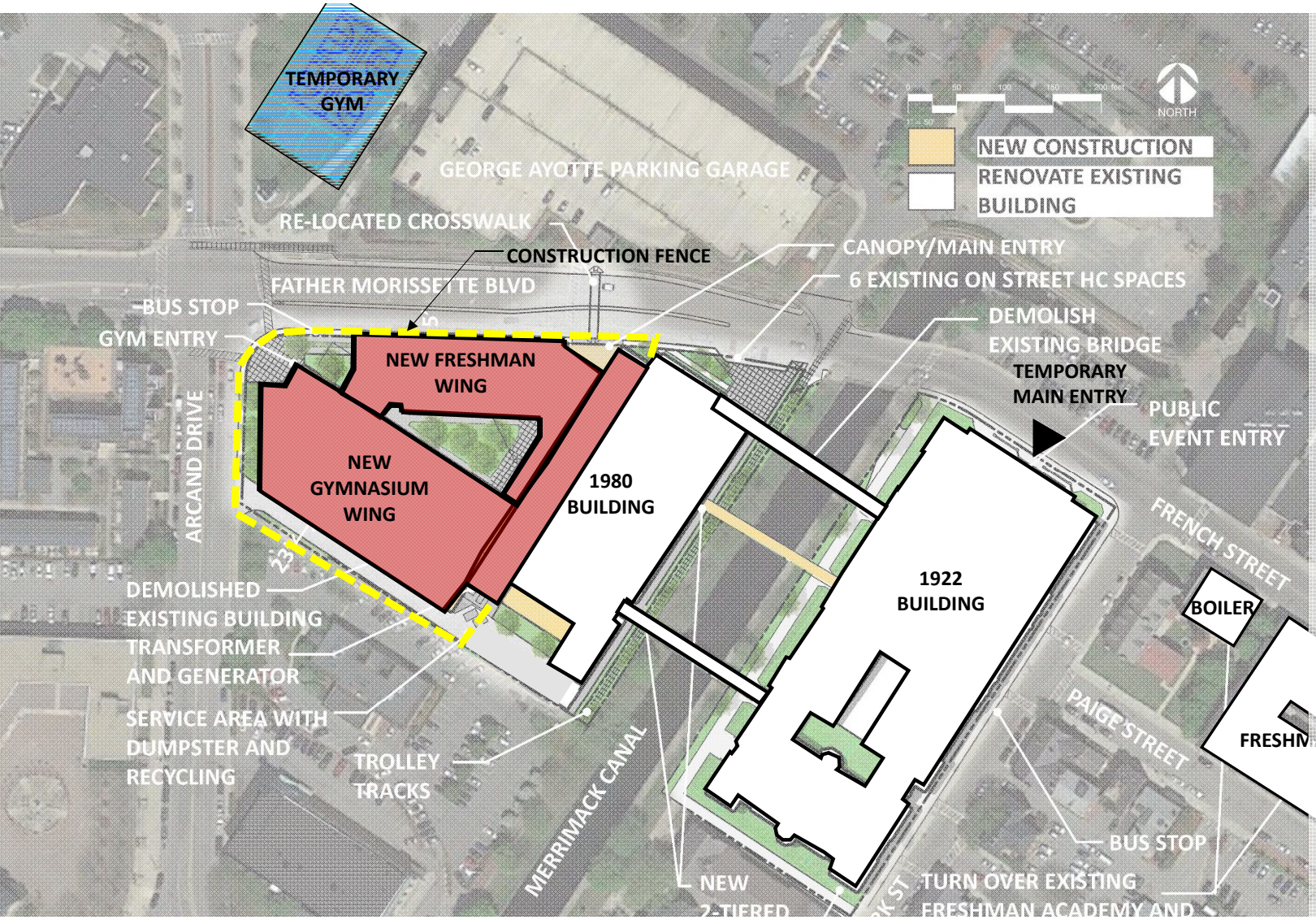
ADD/RENO 2A EXISTING SITE

PHASE-1 Jul-Aug (2mo)

- PORTABLE GYM SET-UP
- VACATE INTERIOR CLASSRMS
- DEMO GYM BUILDING

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

ADD/RENO 2A EXISTING SITE



PHASE-1 Jul-Aug (2mo)

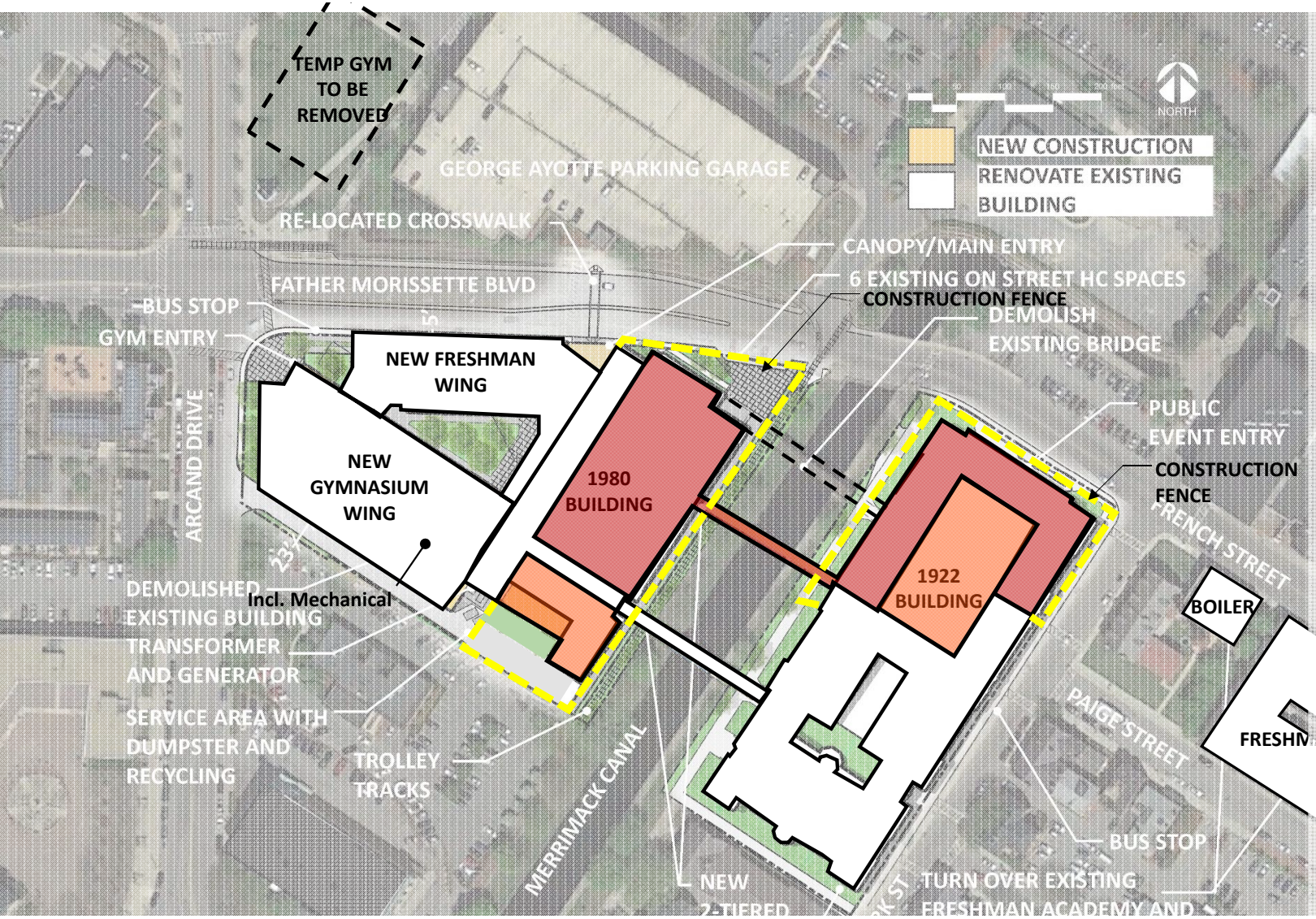
- PORTABLE GYM SET-UP
- VACATE INTERIOR CLASSRMS
- DEMO GYM BUILDING

PHASE-2 Jul-Aug 2yr 2mo (2mo overlap)

- BULK NEW CONSTRUCTION
- RENOVATE WEST SIDE OF LORD

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

ADD/RENO 2A EXISTING SITE



PHASE-1 Jul-Aug (2mo)

- PORTABLE GYM SET-UP
- VACATE INTERIOR CLASSRMS
- DEMO GYM BUILDING

PHASE-2 Jul-Aug 2yr 2mo (2mo overlap)

- BULK NEW CONSTRUCTION
- RENOVATE WEST SIDE OF LORD

PHASE-3 Jul-Aug 1yr 2mo (2mo overlap)

- RENOVATE REMAINDER OF LORD
  (SOUTH END RENO IN SUMMERS)
  (AUDITORIUM IN SUMMERS)
- RENOVATE NORTH END OF 1922
- BUILD NEW NORTH BRIDGE
- TEMP GYM TO BE REMOVED

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

ADD/RENO 2A EXISTING SITE



PHASE-1 Jul-Aug (2mo)

- PORTABLE GYM SET-UP
- VACATE INTERIOR CLASSRMS
- DEMO GYM BUILDING

PHASE-2 Jul-Aug 2yr 2mo (2mo overlap)

- BULK NEW CONSTRUCTION
- RENOVATE WEST SIDE OF LORD

PHASE-3 Jul-Aug 1yr 2mo (2mo overlap)

- RENOVATE REMAINDER OF LORD (SOUTH END RENO IN SUMMERS) (AUDITORIUM IN SUMMERS)
- RENOVATE NORTH END OF 1922
- BUILD NEW NORTH BRIDGE

PHASE-4 Jul-Aug 1yr 2mo (2mo overlap)

- RENOVATE REMAINDER OF 1922
- BUILD NEW SOUTH BRIDGE

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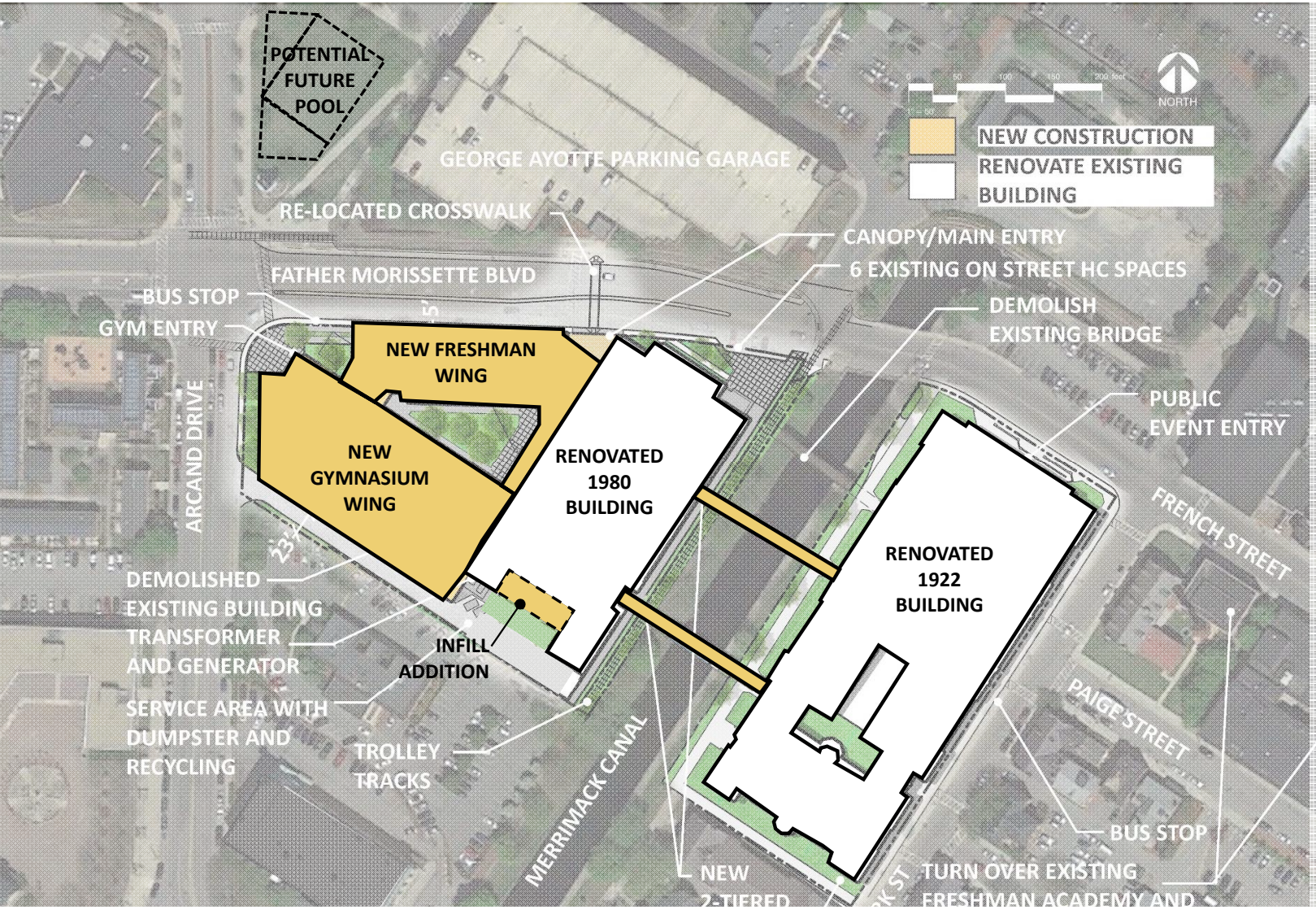
ADD/RENO 2A EXISTING SITE



PHASE-1 Jul-Aug (2mo)

- PORTABLE GYM SET-UP
- VACATE INTERIOR CLASSRMS
- DEMOLISH GYM BUILDING

PHASE-2 Jul-Aug 2yr 2mo (2mo overlap)

- BULK NEW CONSTRUCTION
- RENOVATE WEST SIDE OF LORD

PHASE-3 Jul-Aug 1yr 2mo (2mo overlap)

- RENOVATE REMAINDER OF LORD (SOUTH END RENO IN SUMMERS) (AUDITORIUM IN SUMMERS)
- RENOVATE NORTH END OF 1922
- BUILD NEW NORTH BRIDGE

PHASE-4 Jul-Aug 1yr 2mo (2mo overlap)

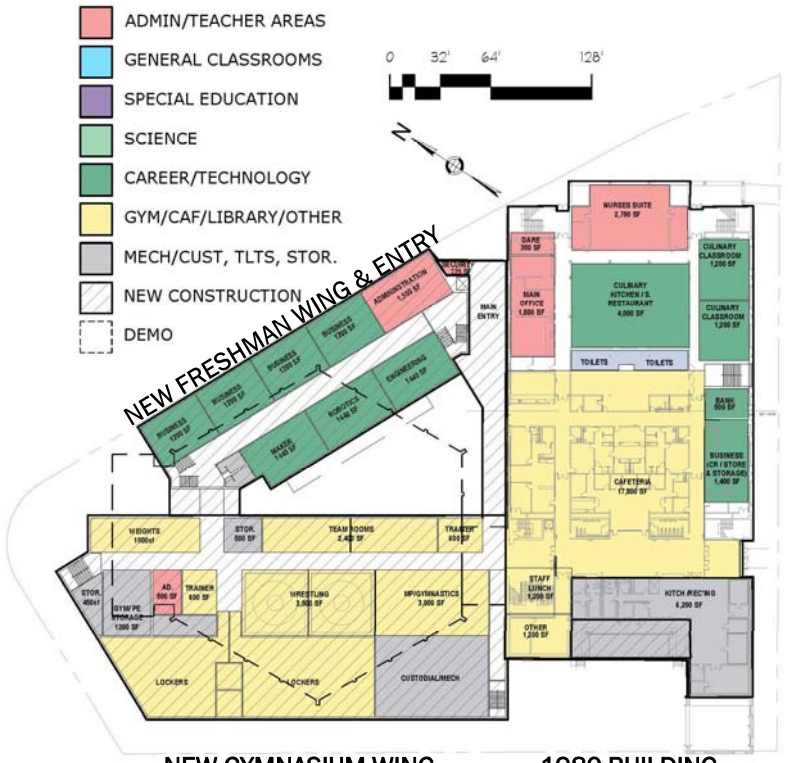
- RENOVATE REMAINDER OF 1922
- BUILD NEW SOUTH BRIDGE

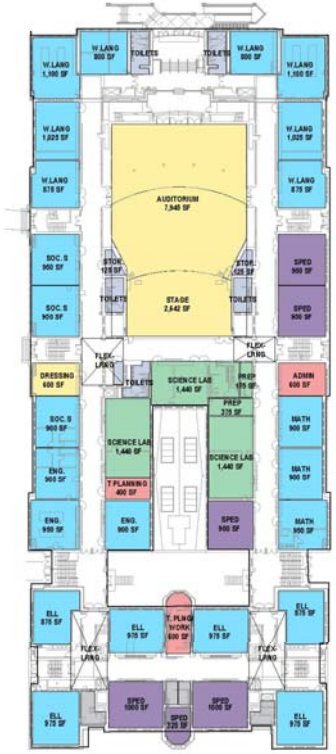
FINISHED FACILITY

Total Duration = 4 years + summer

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

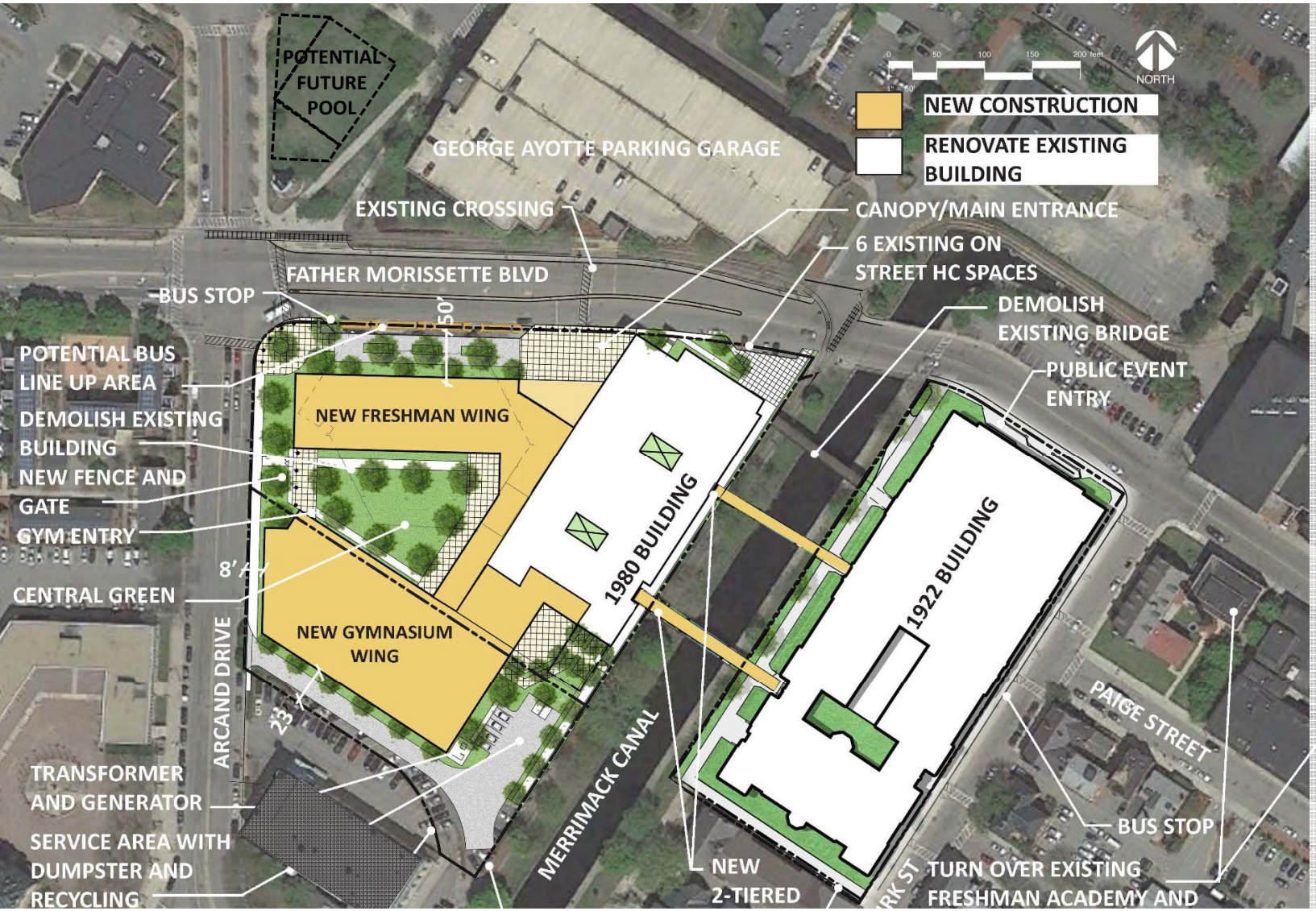
LOWELL HIGH SCHOOL: OPTION 2A FLOOR PLANS





MAIN FLOOR PLAN





ADD/RENO 3A EXPANDED SITE

Updated Educ Program

(pool removed)

PRELIM. PROS/CONS:

+ **Consolidated Campus**
  (new freshman academy)
+ **No Windowless Labs**
+ **Added Green + Loading**
— **Gym Areas More Remote**
— **Eminent Domain**

Phasing Est 5yrs

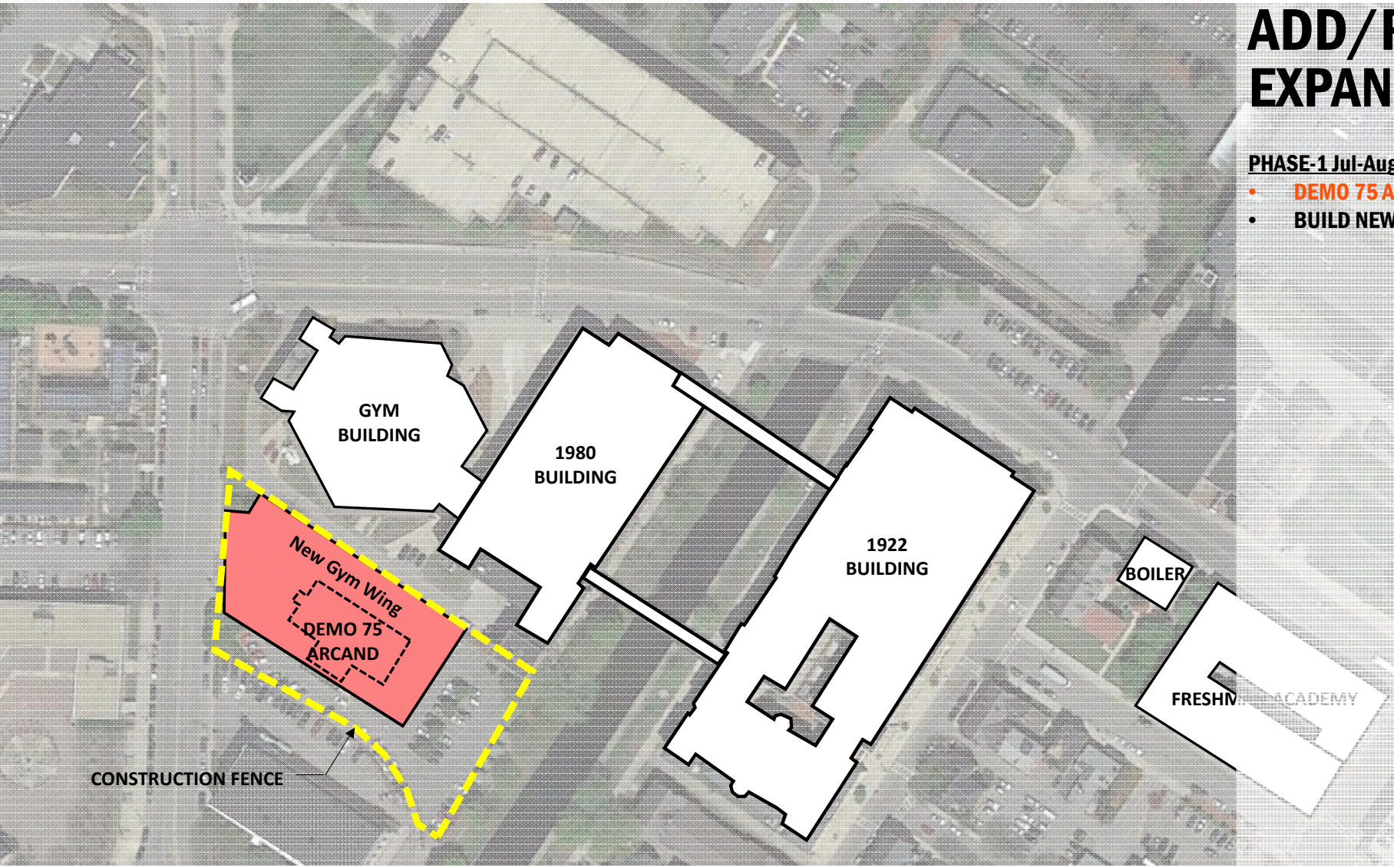
(but only 3 years on school site)

Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.

ADD/RENO 3A EXPANDED SITE

PHASE-1 Jul-Aug (1yr 2mo)

- **DEMO 75 ARCAND IN SUMMER**
- **BUILD NEW GYM BLDG OFF-SITE**



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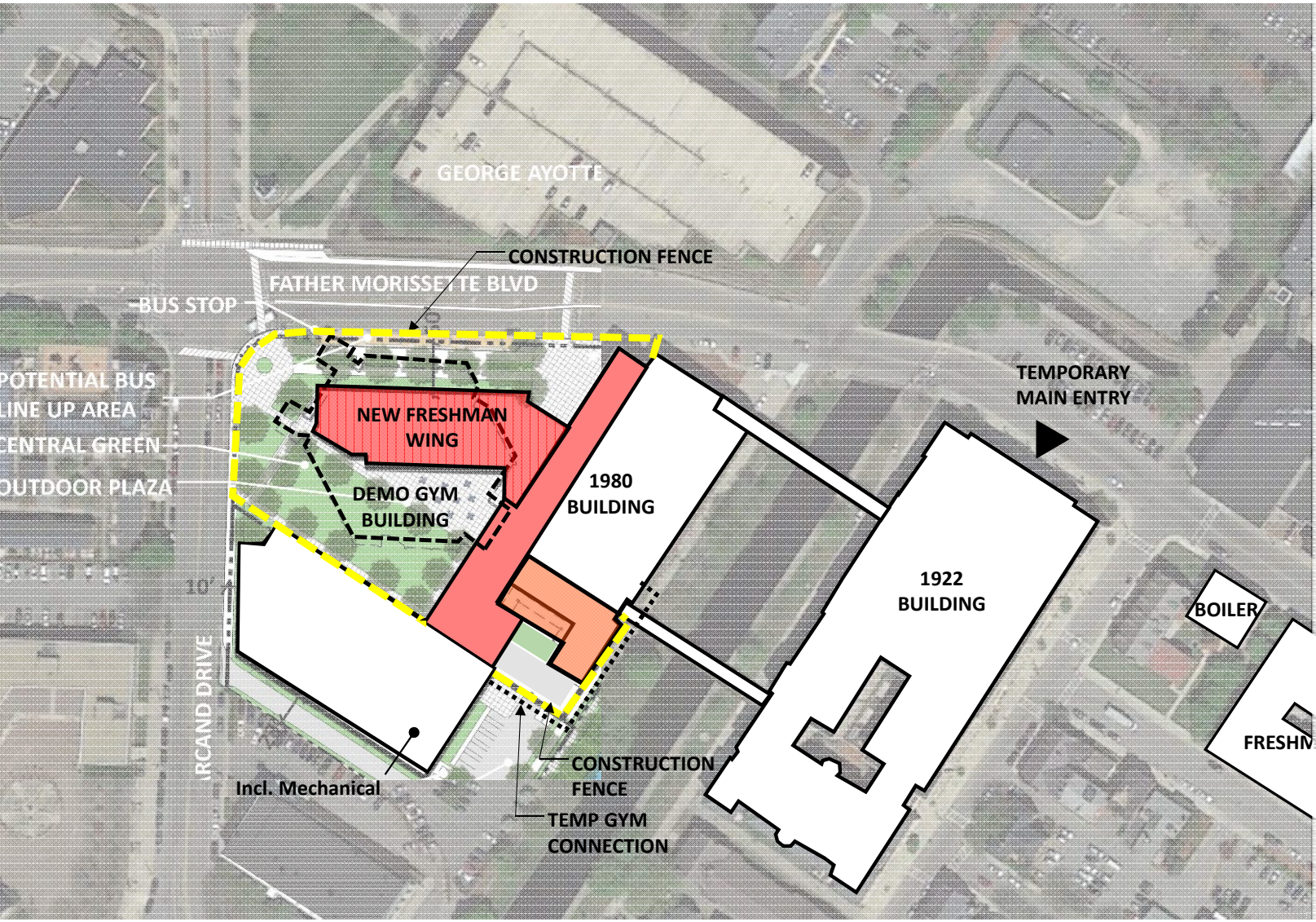
ADD/RENO 3A EXPANDED SITE



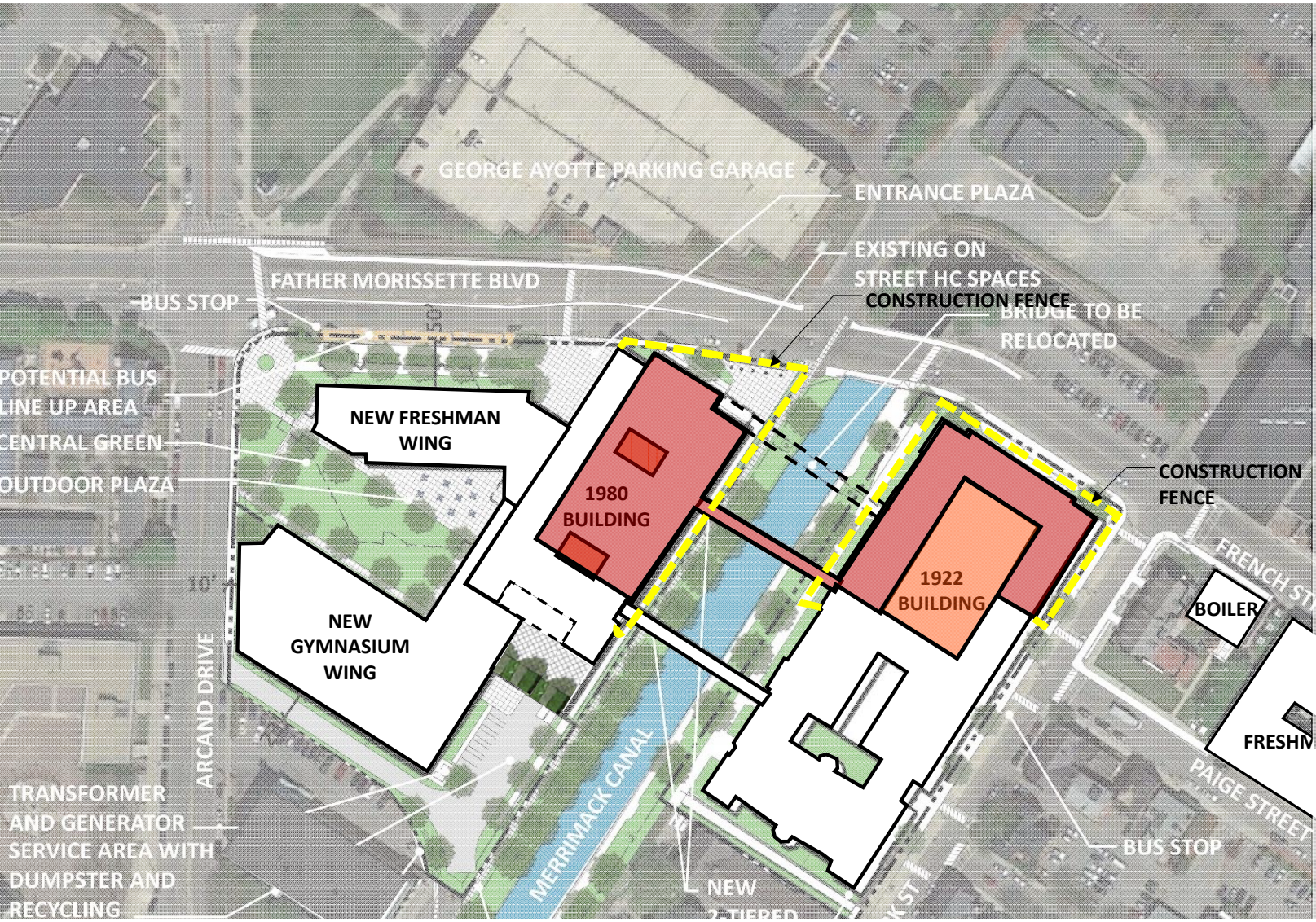
PHASE-1 Jul-Aug (1yr 2mo)

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW GYM BLDG OFF-SITE

PHASE-2 Jul-Dec 1yr 6mo (2mo overlap)

- DEMO FIELD HOUSE IN SUMMER
- VACATE INTERIOR CLASSRMS
- BUILD NEW FRESHMAN ACADEMY
- RENOVATE WEST SIDE OF LORD (SOUTH END RENO IN SUMMERS)

Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.



ADD/RENO 3A EXPANDED SITE

PHASE-1 Jul-Aug (2yrs 2mo)

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW GYM BLDG OFF-SITE

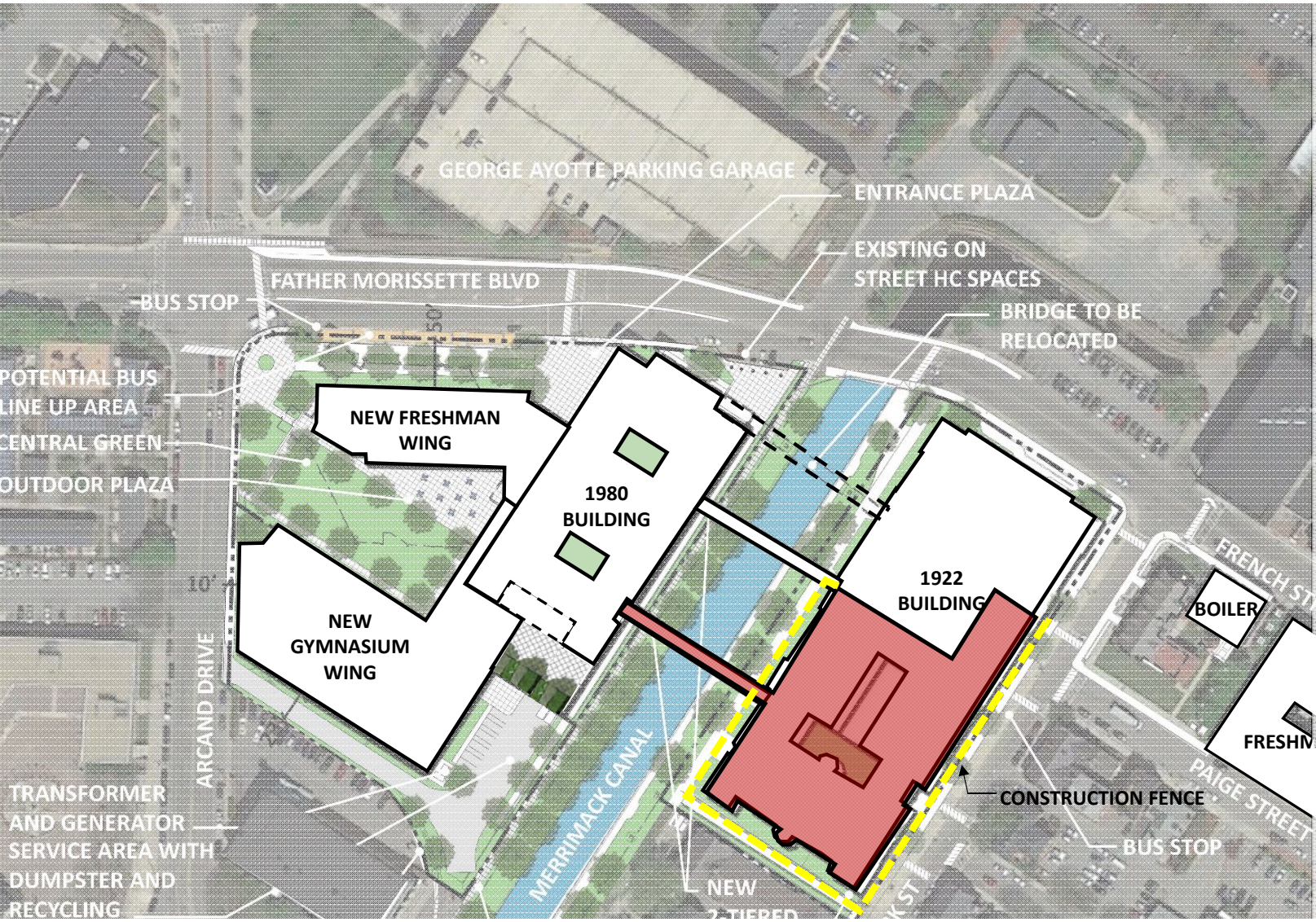
PHASE-2 Jul-Dec (1yr 6mo -2mo overlap)

- DEMO FIELD HOUSE IN SUMMER
- VACATE INTERIOR CLASSRMS
- BUILD NEW FRESHMAN ACADEMY
- RENOVATE WEST SIDE OF LORD (SOUTH END RENO IN SUMMERS)

PHASE-3 Jan-Mar (1yr 3mo)

- RENOVATE REMAINDER OF LORD
- RENOVATE NORTH END OF 1922 (AUDITORIUM IN SUMMERS)
- BUILD NEW NORTH BRIDGE

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager



ADD/RENO 3A EXPANDED SITE

PHASE-1 Jul-Aug (1yr 2mo)

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW GYM BLDG OFF-SITE

PHASE-2 Jul-Dec (1yr 6mo - 2mo overlap)

- DEMO FIELD HOUSE IN SUMMER
- VACATE INTERIOR CLASSRMS
- BUILD NEW FRESHMAN ACADEMY
- RENOVATE WEST SIDE OF LORD (SOUTH END RENO IN SUMMERS)

PHASE-3 Jan-Mar (1yr 3mo)

- RENOVATE REMAINDER OF LORD
- RENOVATE NORTH END OF 1922 (AUDITORIUM IN SUMMERS)
- BUILD NEW NORTH BRIDGE

PHASE-4 Apr-Jun (1yr 3mo)

- RENOVATE REMAINDER OF 1922
- BUILD NEW SOUTH BRIDGE

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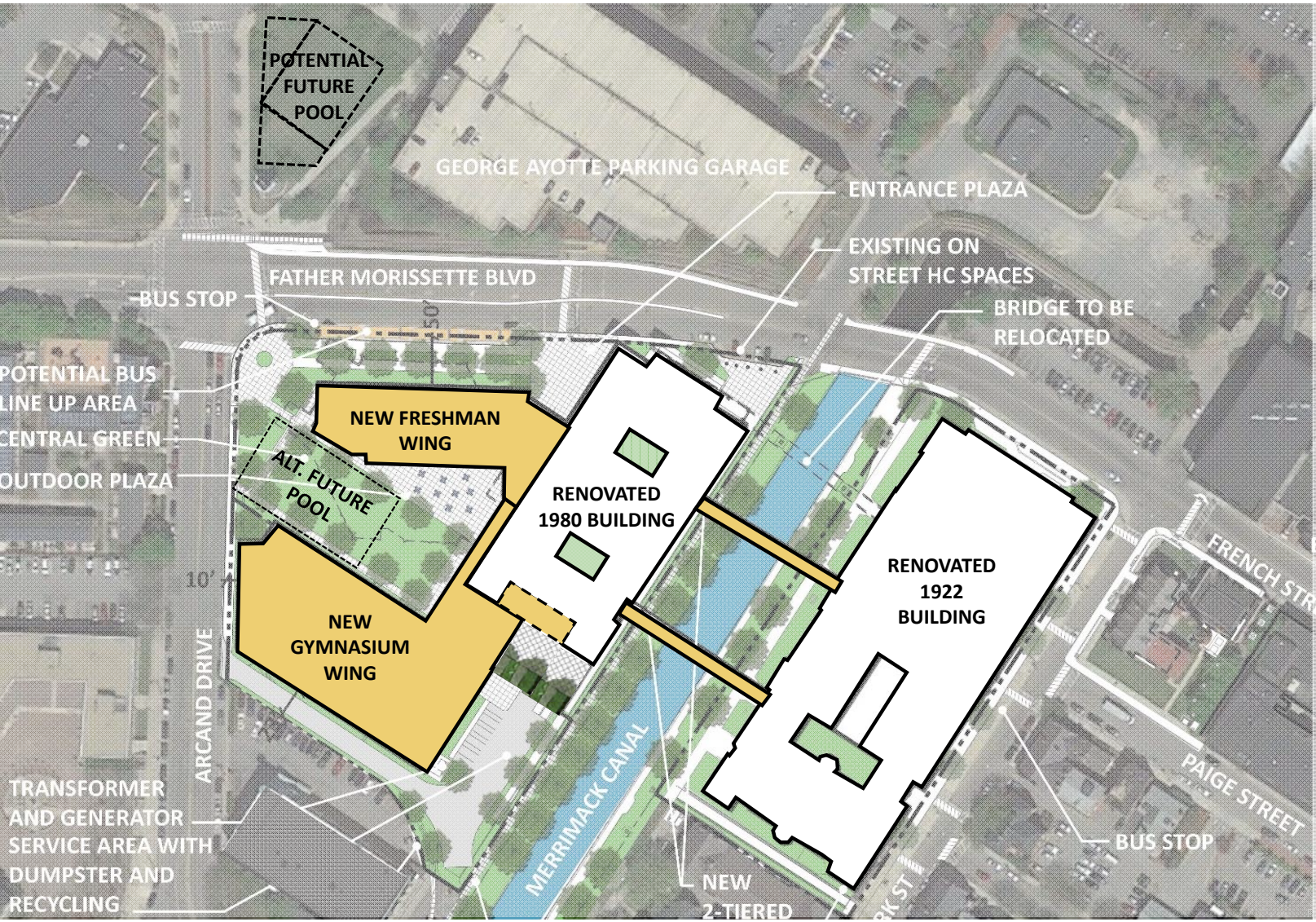


ADD/RENO 3A EXPANDED SITE

PHASE-1 Jul-Aug (2yrs 2mo)

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW GYM BLDG OFF-SITE

PHASE-2 Jul-Dec 1yr 6mo (2mo overlap)

- DEMO FIELD HOUSE IN SUMMER
- VACATE INTERIOR CLASSRMS
- BUILD NEW FRESHMAN ACADEMY
- RENOVATE WEST SIDE OF LORD (SOUTH END RENO IN SUMMERS)

PHASE-3 Jul-Aug 1yr 2mo (2mo overlap)

- RENOVATE REMAINDER OF LORD
- RENOVATE NORTH END OF 1922 (AUDITORIUM IN SUMMERS)
- BUILD NEW NORTH BRIDGE

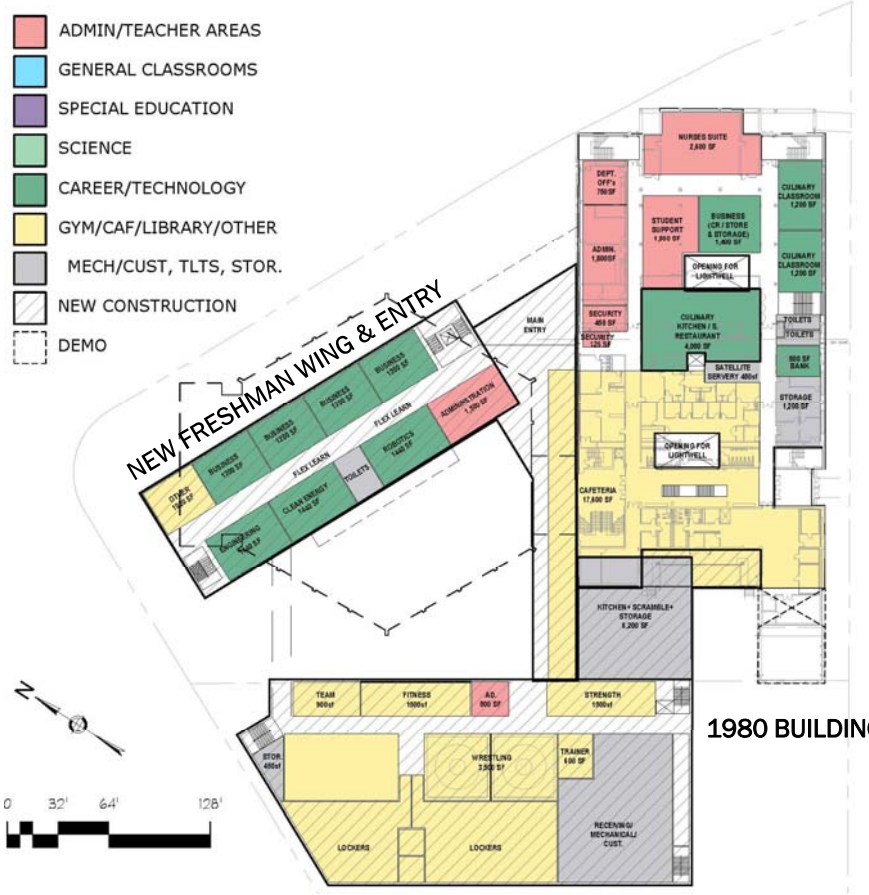
PHASE-4 Jul-Aug 1yr 2mo (2mo overlap)

- RENOVATE REMAINDER OF 1922
- BUILD NEW SOUTH BRIDGE

FINISHED FACILITY
Total Duration = 5 years (4 on site)

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

LOWELL HIGH SCHOOL: OPTION 3A FLOOR PLANS





MAIN FLOOR PLAN





NEW OPTION A EXPANDED SITE

1922 BLDG UNUSED

Updated Educ Program

(pool removed)

PRELIM. PROS/CONS:

+ **Consolidated Campus**
  (via 5 story + basement)
+ **Good Classrm Orientation**
- **24 Temporary Classrms & Temporary Gym Required**
- **Limited Green Space**
- **Eminent Domain**

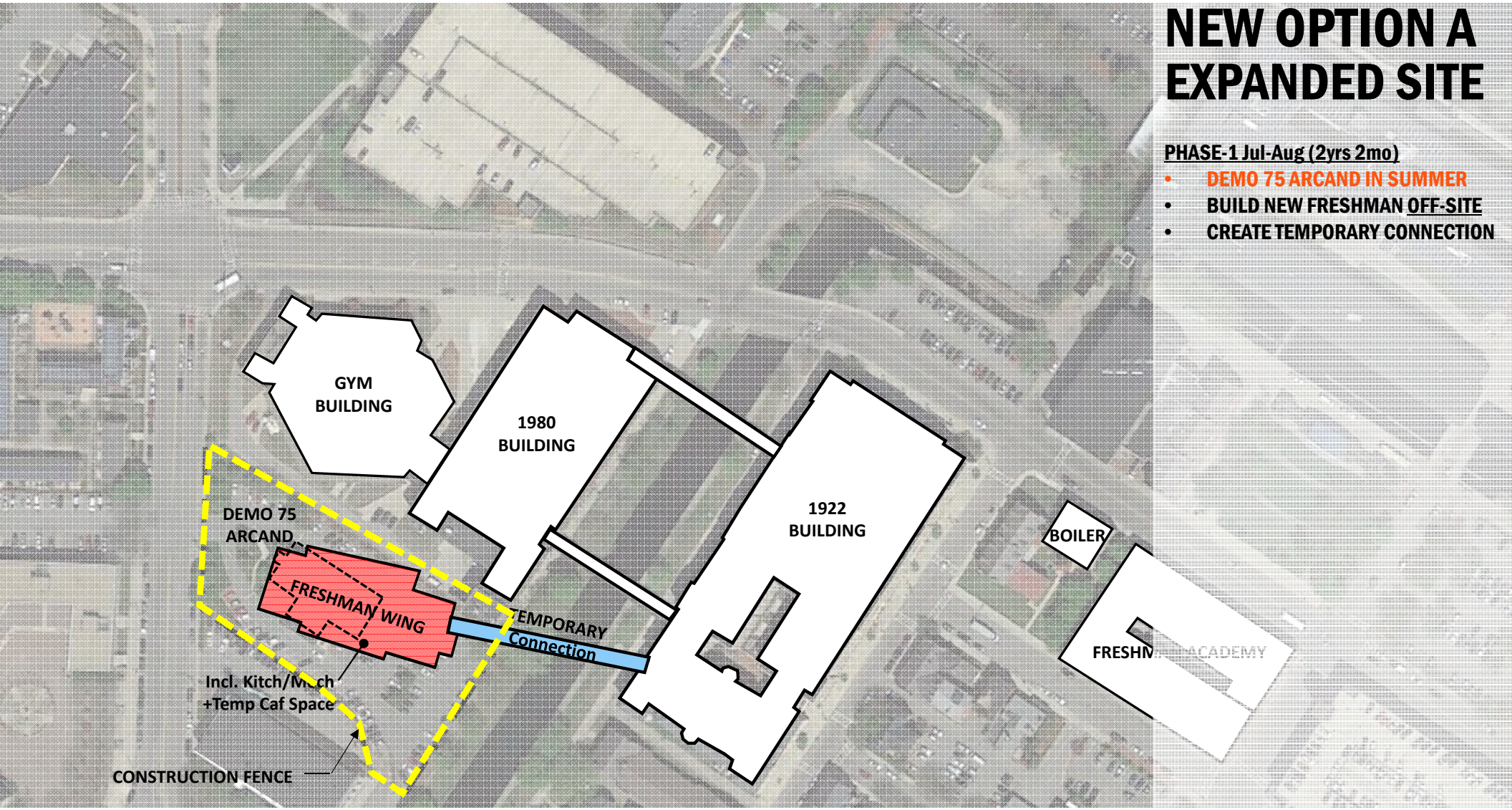
Phasing Est 4yrs + Summer
(but only 2 years on school site)

Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.

NEW OPTION A EXPANDED SITE

PHASE-1 Jul-Aug (2yrs 2mo)

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW FRESHMAN OFF-SITE
- CREATE TEMPORARY CONNECTION



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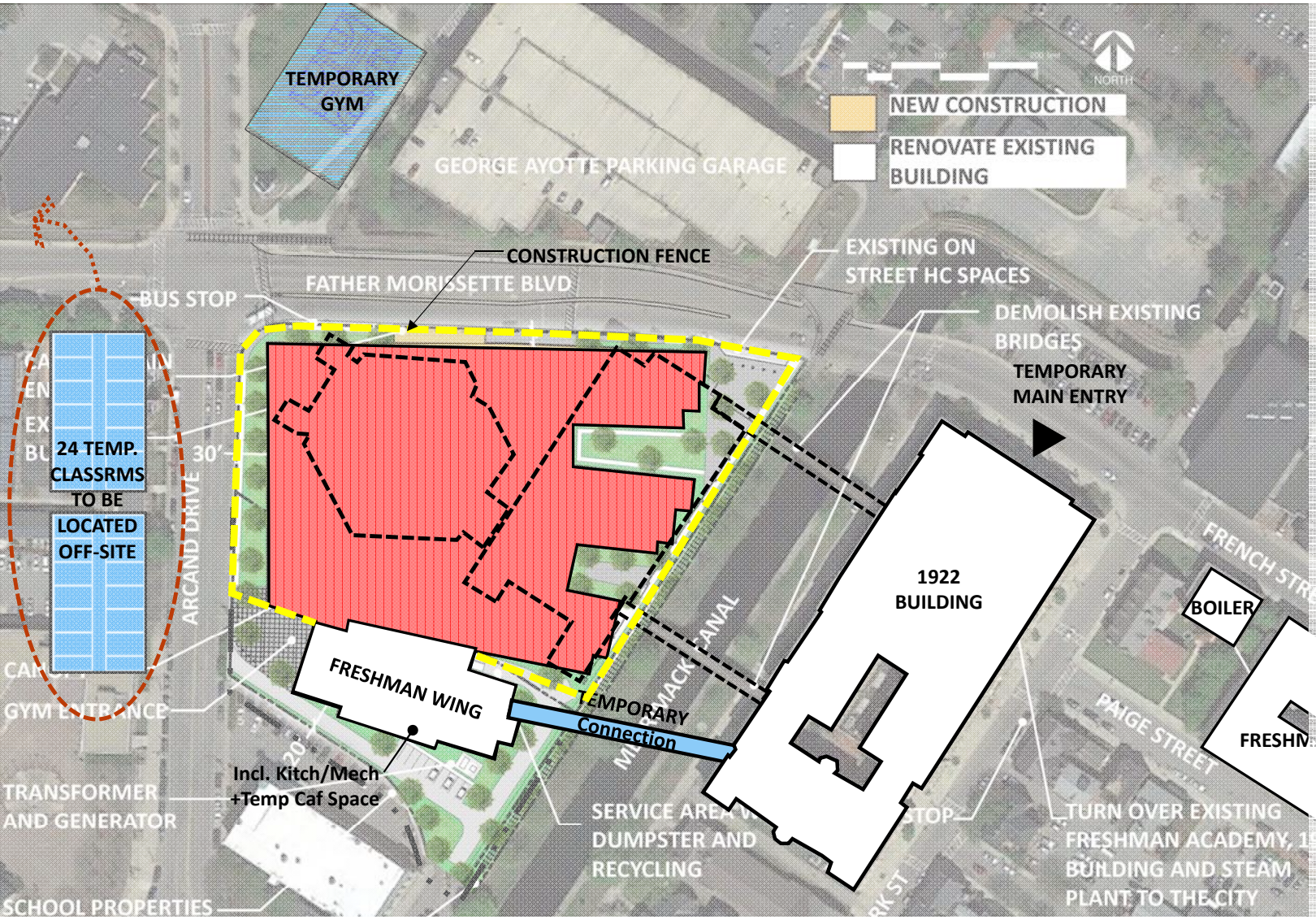
NEW OPTION A
EXPANDED SITE



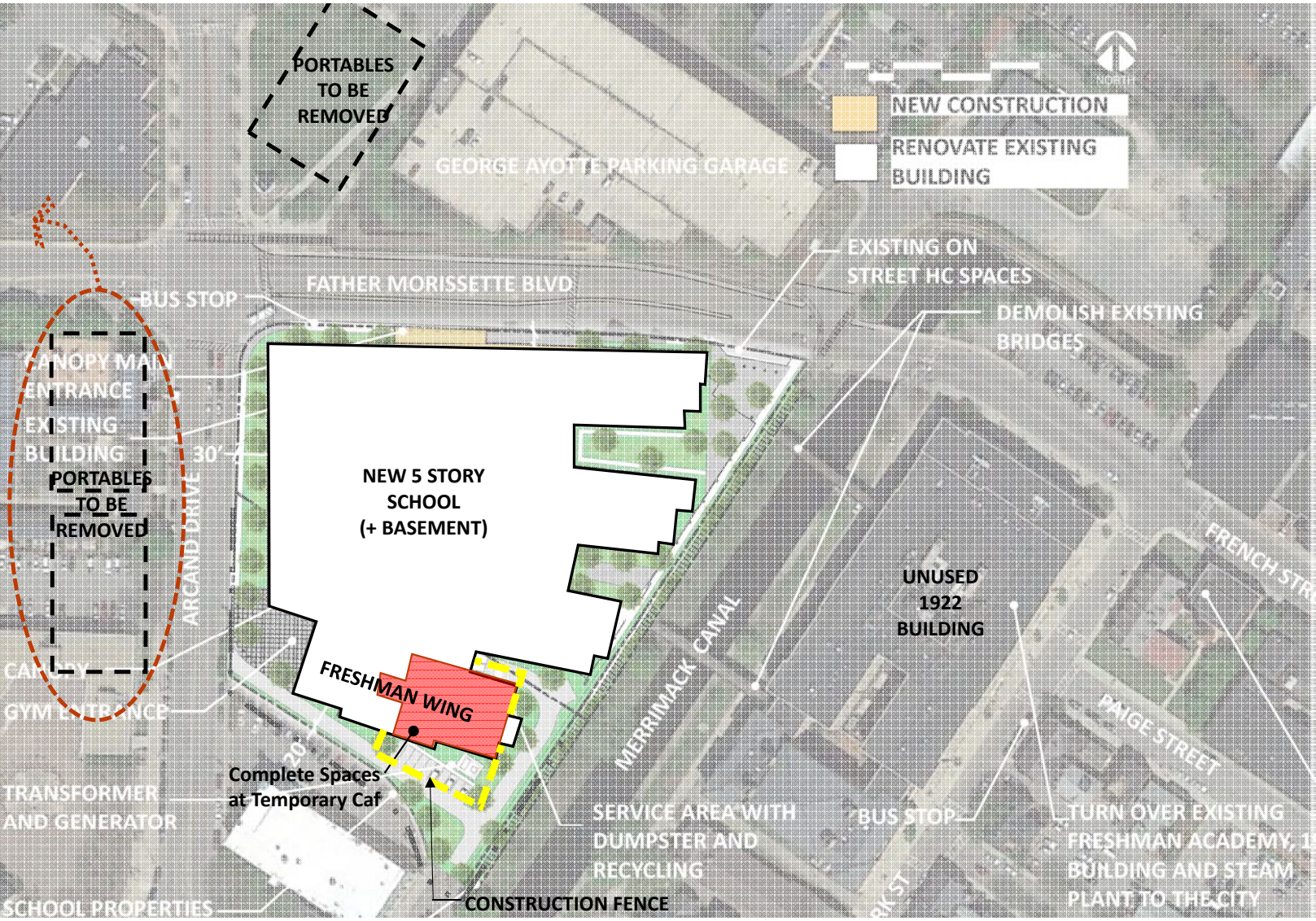
PHASE-1 Jul-Aug (2yrs 2mo)

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW FRESHMAN OFF-SITE
- CREATE TEMPORARY CONNECTION

PHASE-2 Jul-Aug 2yr 2mo (2mo overlap)

- PORTABLE GYM SET-UP
- VACATE INTERIOR CLASSRMS
- DEMO FIELD HOUSE IN SUMMER
- DEMO 1980 BLDG IN SUMMER
- BUILD BULK NEW CONSTRUCTION

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager



NEW OPTION A EXPANDED SITE

PHASE-1 Jul-Aug (2yrs 2mo)

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW FRESHMAN OFF-SITE
- CREATE TEMPORARY CONNECTION

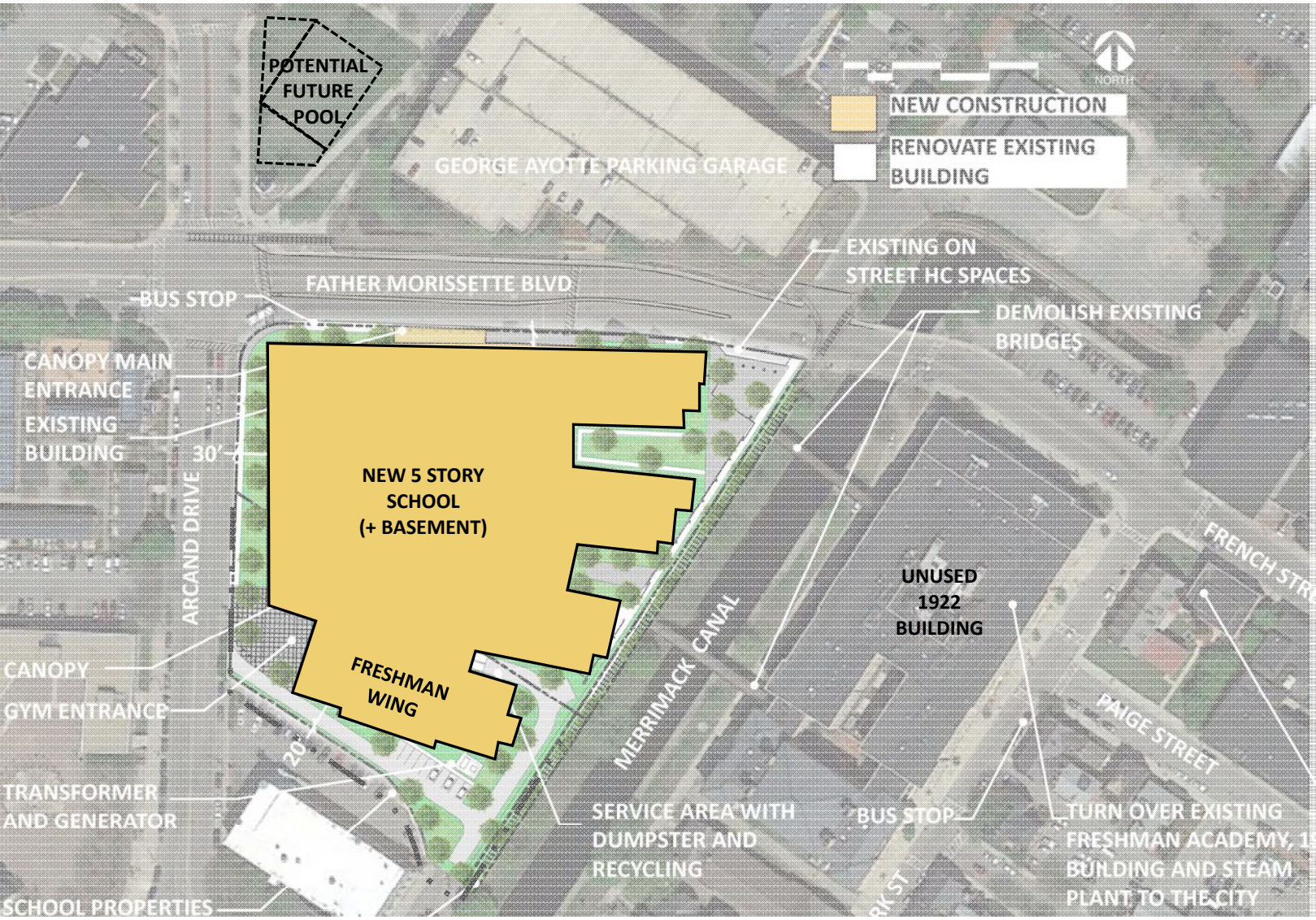
PHASE-2 Jul-Aug 2yr 2mo (2mo overlap)

- PORTABLE GYM SET-UP
- VACATE INTERIOR CLASSRMS
- DEMO FIELD HOUSE IN SUMMER
- DEMO 1980 BLDG IN SUMMER
- BUILD BULK NEW CONSTRUCTION

PHASE-3 Jul-Aug (2mo overlap)

- REMOVE PORTABLES
- COMPLETE FIT-OUT AT TEMP CAF

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager



NEW OPTION A EXPANDED SITE

PHASE-1 Jul-Aug (2yrs 2mo)

- DEMO 75 ARCAND IN SUMMER
- BUILD NEW FRESHMAN OFF-SITE
- CREATE TEMPORARY CONNECTION

PHASE-2 Jul-Aug 2yr 2mo (2mo overlap)

- PORTABLE GYM SET-UP
- VACATE INTERIOR CLASSRMS
- DEMO FIELD HOUSE IN SUMMER
- DEMO 1980 BLDG IN SUMMER
- BUILD BULK NEW CONSTRUCTION

PHASE-3 Jul-Aug (2mo overlap)

- REMOVE PORTABLES
- COMPLETE FIT-OUT AT TEMP CAF

FINISHED FACILITY

Total = 4 yrs + Summer (3 on site)

Note: Phasing is for conceptual purposes only based on preliminary information. Actual determinations will be the responsibility of the Construction Manager

LOWELL HIGH SCHOOL: NEW OPTION A FLOOR PLANS

- ADMIN/TEACHER AREAS
- GENERAL CLASSROOMS
- SPECIAL EDUCATION
- SCIENCE
- CAREER/TECHNOLOGY
- GYM/CAF/LIBRARY/OTHER
- MECH/CUST, TLTS, STOR.
- NEW CONSTRUCTION
- DEMO



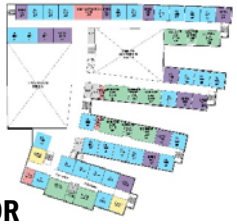
MAIN FLOOR PLAN



FIFTH FLOOR



FOURTH FLOOR



THIRD FLOOR



SECOND FLOOR



BASEMENT

LOWELL HIGH SCHOOL

- Next Steps:
  - 4/12 Community Meeting
  - 4/2 – 4/26 Estimate
  - 4/30 Combined SBC & Community Mtg.
    Cost Update / Vote Rec. Preferred Option
  - 5/1 City Council Vote SBC Recommendation
    Preferred Option
  - 5/9 MSBA PSR Submission
  - 6/6 MSBA FAS Meeting
  - 6/27 MSBA PSR Board Approval



PERKINS EASTMAN

MEETING RECORD

Perkins Eastman
Architects DPC

Date Prepared	4/13/2018	
Project Name	Lowell High School	
Project Number	67150.01	
Subject	Security Meeting	
Meeting Location	Lowell City Hall Mayor's Conference Room	
Meeting Date	4/12/2018	
Prepared By	Alicia Caritano / Matthew Williams	a.caritano@perkinseastman.com
	T: 617-449-4001	F: Fax Number
Participants	Eileen Donoghue – City Manager Mike McGovern– Assistant City Manager Jeannine Durkin – LPS Deputy Superintendent Marianne Busteed – LHS Head of School Roxane Howe – LHS Discipline & Operations Rick Underwood – LHS Operations & Maintenance Director Jeffrey Winward – LFD Chief Tim Casey – Deputy LFD David – Peaslee - LPD Mary Ann Williams, Jim Dowd - Skanska Joe Drown, Bob Bell, Alicia Caritano, Dawn Guariello – Perkins Eastman Matthew Williams – TSG Solutions Inc David Pereira – Garcia Galuska & DeSousa, Inc.	

NEW BUSINESS (AGENDA ITEMS)		NOTES
1.1	Purpose of the Meeting	Purpose of the meeting is to provide a high level overview of the Design Options being considered for the updated PSR at the downtown site, and discuss general security issues, as well as the specific security issues for each option.
1.2	Updated PSR Design Options Overview	Bob Bell provided an overview of the design options being considered for the preferred option in the Updated PSR: • Add/ Reno Option 2A • Add/ Reno Option 3A - Expanded Site • New Option A - Expanded Site Bob noted that all options and phasing are diagrammatic (vestibules, doors not yet shown) during this early Feasibility Study and that during SD the design will be refined once a preferred option has been selected, and phasing/temporary facilities will be refined once the Construction Manager comes on board in DD. Refer to the attached presentation for additional information including pros/cons/phasing/temporary facilities. Bob also noted that PE's approach to safety and security is a holistic approach that considers all factors including maximizing educational benefits and minimizing threats and bullying,

		transparency etc.
1.3	Safety & Security Overview	Matthew Williams discussed general security issues for all options which are summarized on the attached presentation. Additional discussion included: • **Consolidated campus/inclusion of the Freshman Academy (FA):** Preferable for both education & security, taking remote FA off-line is a benefit • **Main Entrance**: Roxane noted that in addition to the main entry on the 1980's /west side of the canal, the school would like a secure entry on the 1922/east side of the campus. Options for entrance include: double vestibule w/ secured access at second vestibule, single vestibule w/ more open security check. Benefits to locating SRO or Dare Office close to main entry. Review options in SD. • **Culinary Restaurant:** Security concern to control public access to the restaurant. Currently located on interior, but could be easier to control for security if on the perimeter. Some schools have a completely separate entrance for retail spaces. Review options in SD. It was also noted that secure check-in for dining may want to happen via the main entry/security. • **Evacuation/Emergency Exit**: School currently gathers during fire drills in the green triangle adjacent to Ayotte Garage, and full evacuation is at the Tsongas Arena. • **Number of Egress/Doors**: Target is to reduce number of entrances to reduce security risk. Existing campus has +/- 70 exterior doors. May be options to use staff at certain times of the day, i.e. morning arrival at doors that could only have key card access the rest of the day for staff. Option to have egress only doors with no exterior hardware. • **Location**: Location close to the street within the urban downtown has certain security risks, but proximity to Police and Fire Department provide for quick emergency response time. • **Construction / Phasing Safety & Security**: The Design Team has considerable experience in phased occupied renovations, and will work with LHS, the Construction Manager (CM), LFD, LPD, ISD and other City agencies to develop a phasing plans/Construction Management that keeps a clear and safe separation between students and construction so not to interrupt the students' education. Phasing will be developed in more detail when the CM joins the team during Design Development (DD). • **Other**: Location of 4 House Administrative Offices poses a challenge as to how to balance parent access, distributed campus, and security. The team also discussed specific topics related to each option which are summarized on the attached presentation. Additional discussion included: • **Greenspace:** Can affect safety & security i.e. trees size / foliage require careful selection to not obscure visibility, or provide access to low roofs and features such as bioswales adjacent to a building can be added security (moat-like). Enclosed courtyards can limit intruders, but can also be more difficult to exit during an emergency situation. • **Cafeteria:** Existing condition has cafeteria proximate to main entry. Team will discuss options in SD and seek to balance pros and cons for

		a vibrant heart to the school, and safety and security concerns i.e. ability to flee vs. infiltrate. • **Other Retail Space**: Public will have access to the Bank, School Store and culinary space/restaurant.
1.4	**Security Design Approach**	The fundamental goal is to provide a safe and secure environment that promotes students' individual and educational growth, which is balanced with a safe and secure environment. Security includes an iterative cycle: deter, detect, deny, & delay. Security is best achieved through layers which include: crime prevention through environmental design (CPTED), physical security, electronic security, and the critical enforcement of security policies and procedures.
1.5	**Current Environment**	The team discussed the current security environment and trends that can be explored in Schematic Design once a preferred option is selected. Team to evaluate cost vs. risk and balance with budget: • Exterior conditional LED: Color coded panel to display condition (normal, emergency, lockdown). GGD has experience with similar installations. • Exterior Glazing & Perimeter Hardening: o privacy windows i.e. one way glass o bullet resistant glass; MaryAnn noted cost for glass varies greatly, current costs $125 - $225/sf. mullion configurations can limit access. Roxane suggested possible use at entry vestibules only, and PE noted Lobby/Cafeteria glass too. o films are typically impact resistant but not bulletproof; difference between ballistic and bulletproof pending specific products. LHS has been exploring bullet resistant film, TSG suggested it may be ballistic rates as there currently isn't bullet resistant film available that they are aware of. o PE noted that glass must be located to get the maximum benefit for education & safety. PE noted that industry standards are +/- 40% glazing, but that they target installations target +/- 25% which can help with energy efficiency. PE also noted that sill heights can help prevent/deter access to exterior perimeter windows. • Classroom locking mechanism: Security function locks with an outside lever always allows egress, thumb turn on room side retracts latch to lock. PE suggests team consider. Discussed with LFD – meets egress requirements. • Other classroom considerations: PE suggested connecting doors between max. of 2 classrooms good balance between educational connections and lower security risk and acoustical breaches, solid classroom doors with sidelights with interior opaque window treatment. • Bathrooms – airport style with no doors preferred and benefits of higher accountability / less bullying. (same sex & gender neutral) • Systems integration including: Access control system, Video management system, intrusion detection system, mass notification system, and building management system. Systems will be integrated to improve communications to occupants and first responders during

		an incident. The system shall be referred to as the IESS or Integrated electronic security system.
1.6	Perimeter Door Classification	During SD, perimeter doors will be classified as: • Access Control Door – Main & Secondary Entrance: • Exist Doors – Allowable Egress Only • Emergency Exit – Allowable Emergency Egress Only
1.7	Security Systems Overview	Security topics that will be discussed in more detailed in Schematic Design were touched upon including: • **Policies and Procedures (P&P):** The architectural design and P&P need to align. During the design process, the team will review the LHS existing policies and procedures and develop the design in response to the new security principles. The school will continue to develop new policies and procedures for the new facility. The enforcement of these P&P are critical to security. Jeannine noted that LPS has districtwide policies, and there are specific P&P for the LHS. Roxane noted that LHS already has House Threat Assessment teams comprised of a Social Worker and 2 Councilors, as well as their own version of RHF/ALICE, which they have implemented. PE requested a copy of Lowell's Emergency Response Plan and or similar document that defines policy to further enhance design discussion. • **Access Control System (ACS):** Consists of card readers, door controllers and access control software that electronically controls and records/manages building entry. • **Video Management System (VMS):** Consists of IP CCTV cameras located throughout the facility both interior and exterior that record to a central storage server. The software allows for identifying events and integrates with ACS and IDS systems. Lowell currently utilizes Avigilon VMS for their CCTV system. Further discussions on the current capacity of Avigilon will be required to determine the cost benefit to expand existing vs. replace with new. • **Instrusion Dection System (IDS):** Intrusion detection consists of motion detectors, door contacts, and keypads. The IDS integrates with the VMS and ACS. Madison security after hours response is the existing central station being utilized. • **Duress Alarms:** Utilized to initiate lock down or shelter in place sequences and can be activated a number of ways and can should be located in critical areas for efficient response. Further discussion on duress sequences will happened in SD. • **Visitor Management**: Raptor Technologies • **Public Address System:** Can be integrated with the IESS for communication to the school. • **Mass Notification System**: Option for microphones in SRO office, for communication via mass notification speakers during a security event. The Mass notification system will be integrated with the IESS to notify occupants of the specific security event and the appropriate procedure. • **Additional Antennae / Repeater for Emergency Response Personnel**: TSG suggested this should be include in specifications.

		Fire alarm panel location typically in the vestibule or adjacent to the entry and will be located with the LDP.
1.8	Next Steps	4/30: SBC Vote Recommendation Preferred Option 5/1: Council Vote Preferred Option Recommendation Preferred Option 5/9: MSBA Submission & FAS 6/27: MSBA PSR Approval By 7/1: LHS to forward their existing Safety & Security Procedures to PE. 7/1: Start SD , Security meeting schedule tbd

Next Meeting: Click here to enter a date.
To be determined in SD phase.

cc: Attendees, City / City Department via Heather Varney, LHS attendees, Design Team

Attachments: Presentation

PERKINS EASTMAN

SECURITY MEETING

LOWELL HS PROJECT



EXISTING IMAGERY COURTESY OF GOOGLE EARTH

12 APRIL 2018

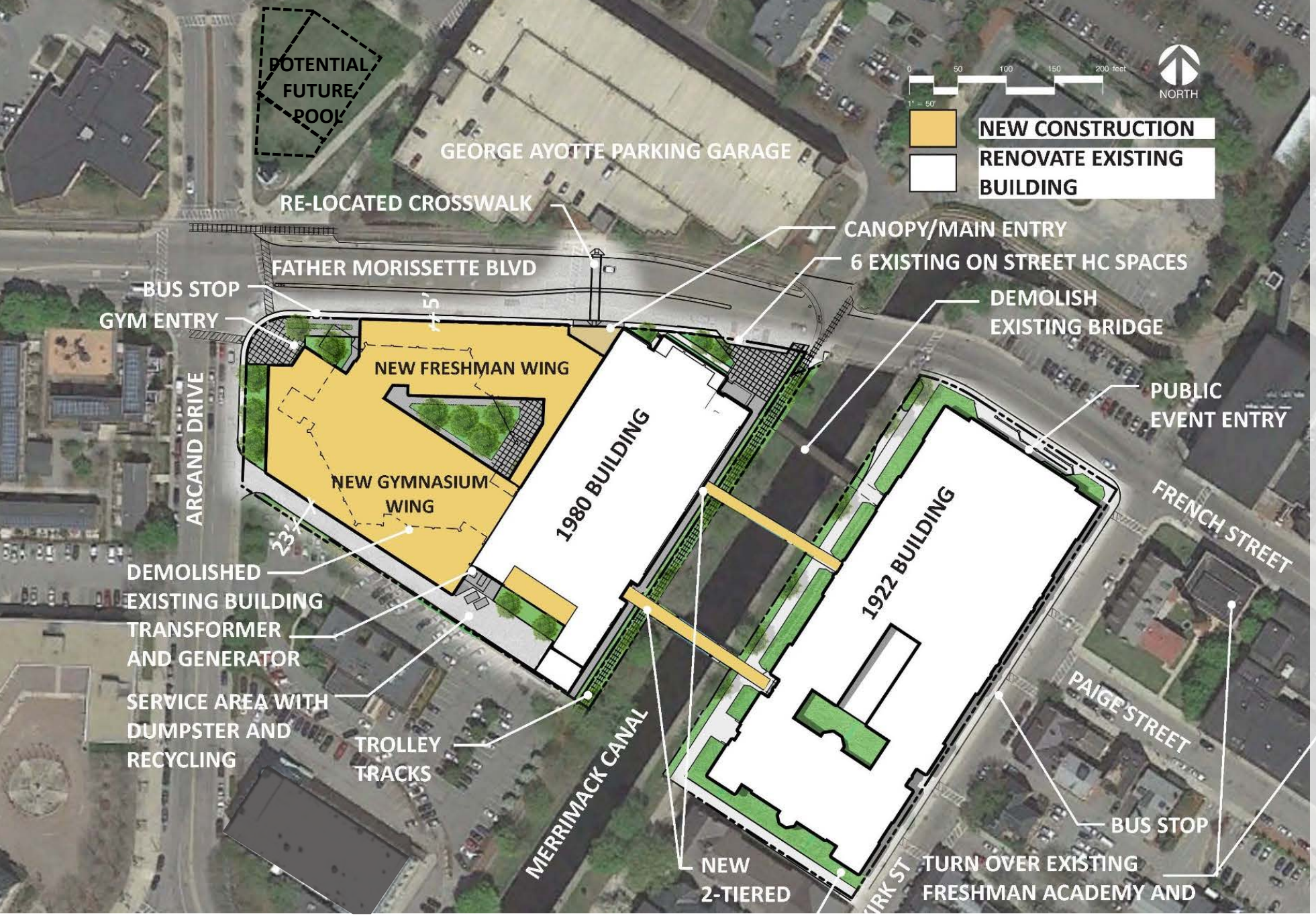
LOWELL HIGH SCHOOL

AGENDA

- Introductions
- Review Options/Phasing PSR Update:
  - Add/Reno Option 2A
  - Add/Reno Option 3A - Expanded Site
  - New Option A - Expanded Site
- Safety & Security Overview
  - General Security Concerns
  - Pro's & Con's
- Security Design Approach
  - Design Approach
  - Security Through Layers
- Current Environment
  - What are we seeing?
- Perimeter Door Classification
  - Card Access/Exit Door/Emergency Egress
- Security Systems Review
  - Existing – Moving Forward
- Open Discussion
  - General Concerns
  - Schematic Design Considerations



ADD/RENO 2A EXISTING SITE



Updated Educ Program
(pool removed)

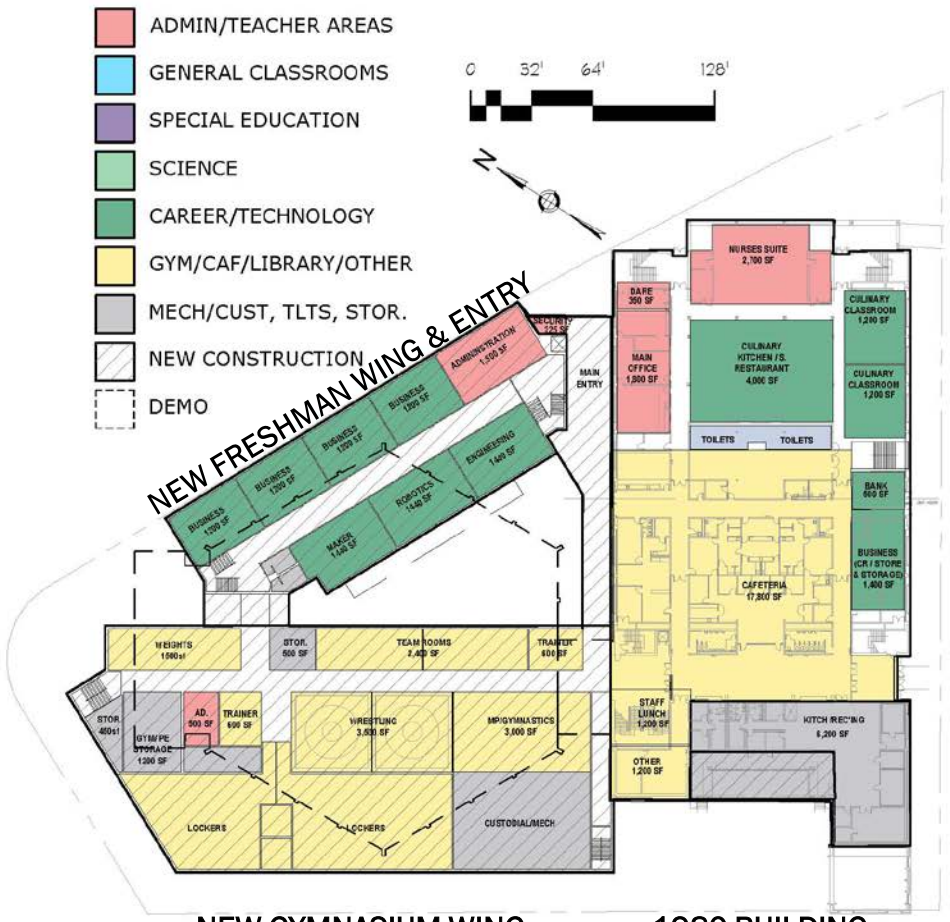
PRELIM. PROS/CONS:

+ **Consolidated Campus**
  (new freshman academy)
- **Temporary Gym Required**
- **Windowless Labs Remain**
- **Limited Green + Loading**

Phasing Est 4yrs + Summer

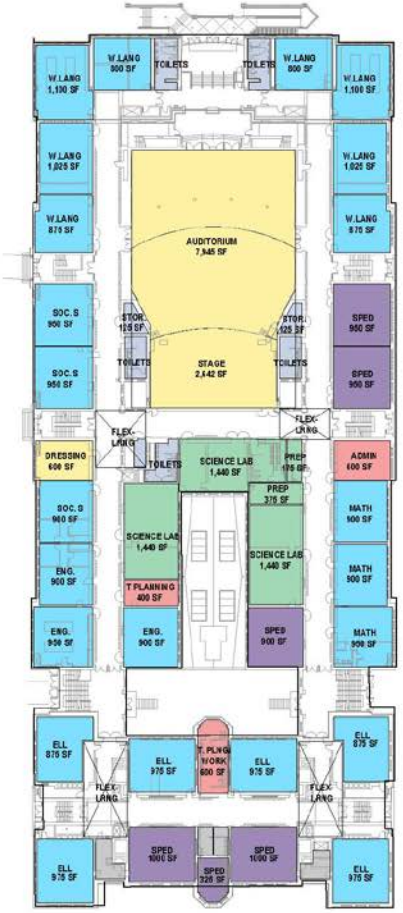
Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.

LOWELL HIGH SCHOOL: OPTION 2A FLOOR PLANS



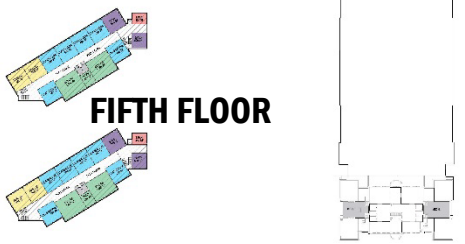
NEW GYMNASIUM WING

1980 BUILDING

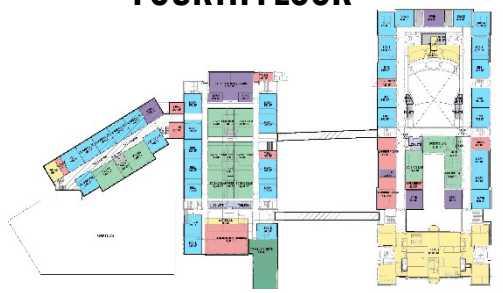


1922 BUILDING

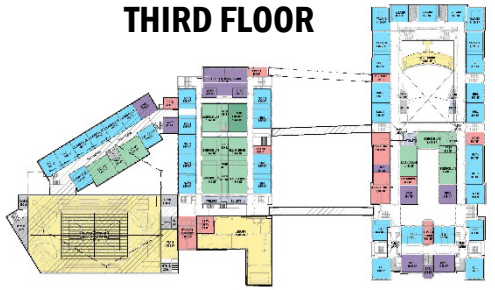
MAIN FLOOR PLAN



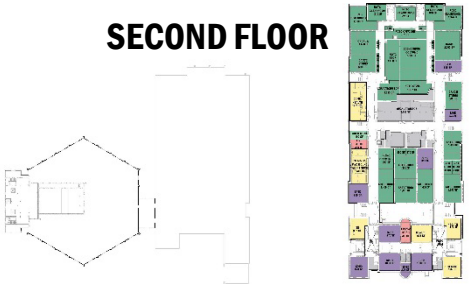
FIFTH FLOOR



FOURTH FLOOR

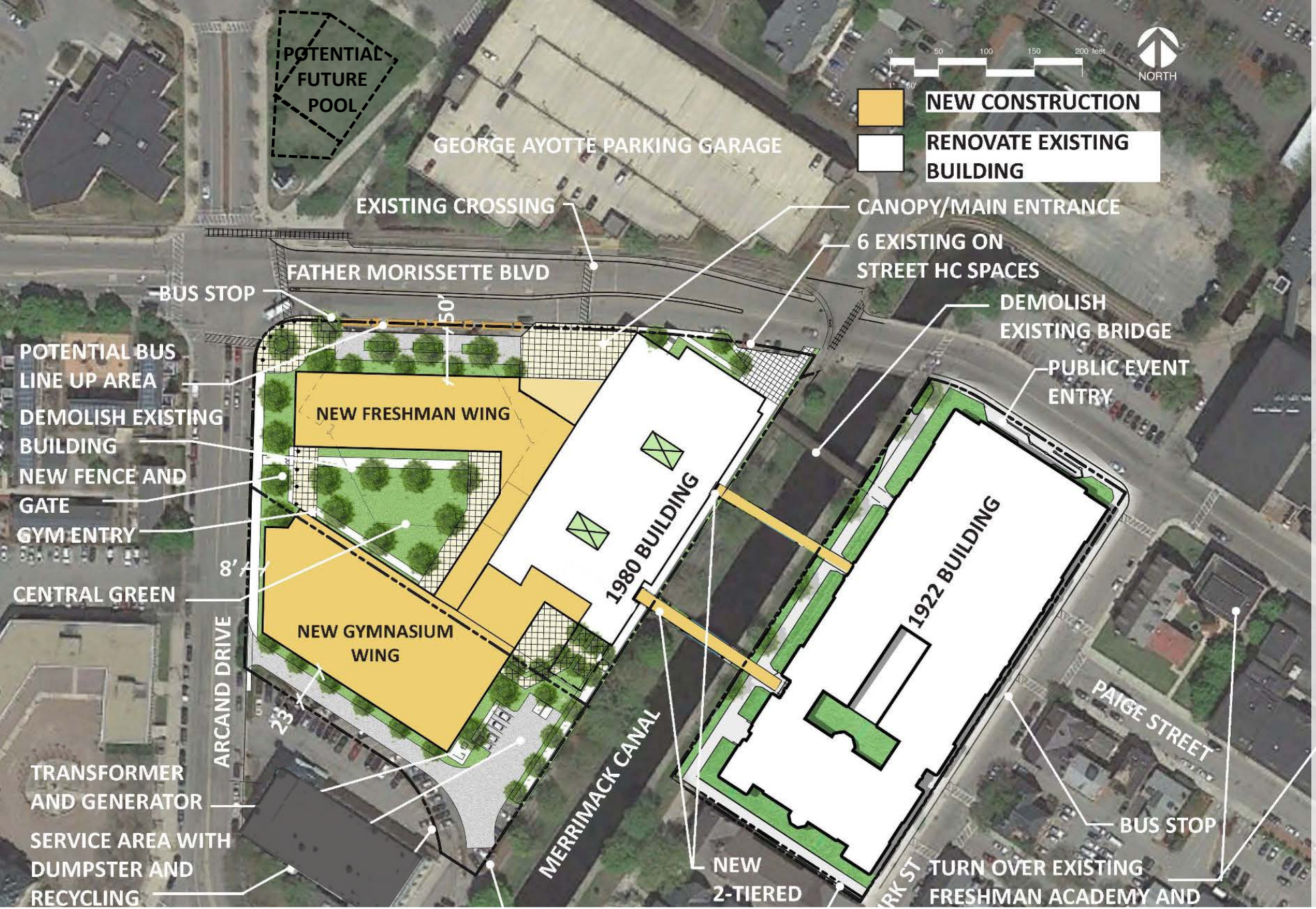


THIRD FLOOR



SECOND FLOOR

BASEMENT



ADD/RENO 3A EXPANDED SITE

Updated Educ Program
(pool removed)

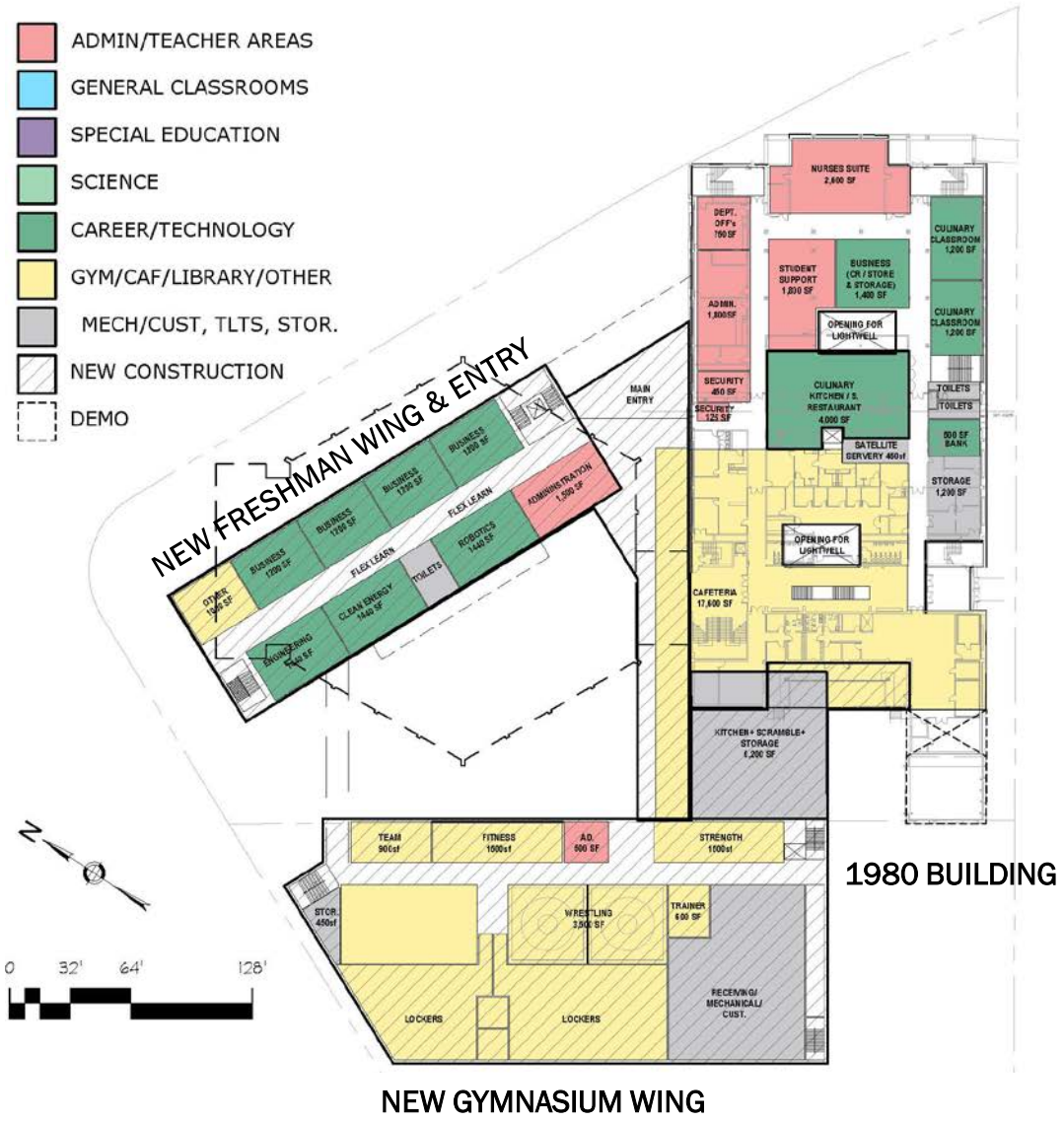
PRELIM. PROS/CONS:

+ **Consolidated Campus**
  (new freshman academy)
+ **No Windowless Labs**
+ **Added Green + Loading**
— **Gym Areas More Remote**
— **Eminent Domain**

Phasing Est 5yrs
(but only 3 years on school site)

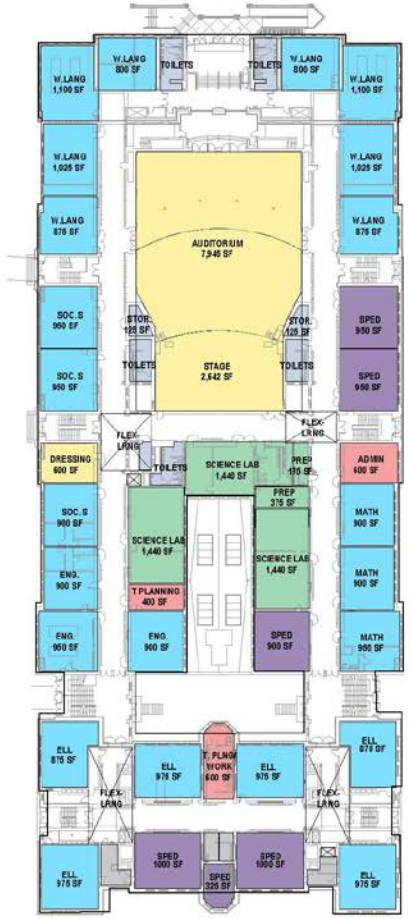
Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.

LOWELL HIGH SCHOOL: OPTION 3A FLOOR PLANS



1980 BUILDING

NEW GYMNASIUM WING



1922 BUILDING

MAIN FLOOR PLAN

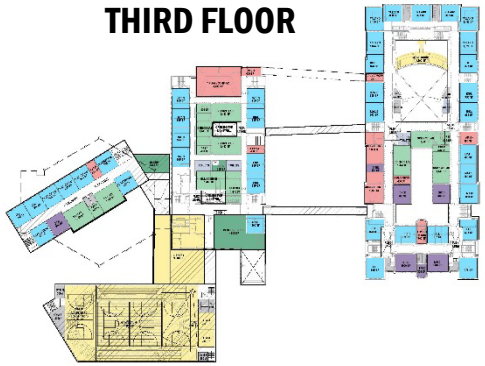


FIFTH FLOOR

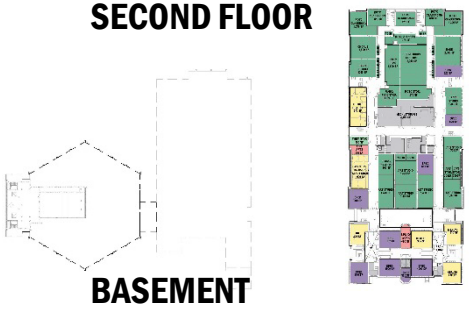
FOURTH FLOOR



THIRD FLOOR



SECOND FLOOR



BASEMENT



NEW OPTION A EXPANDED SITE

1922 BLDG UNUSED

Updated Educ Program

(pool removed)

PRELIM. PROS/CONS:

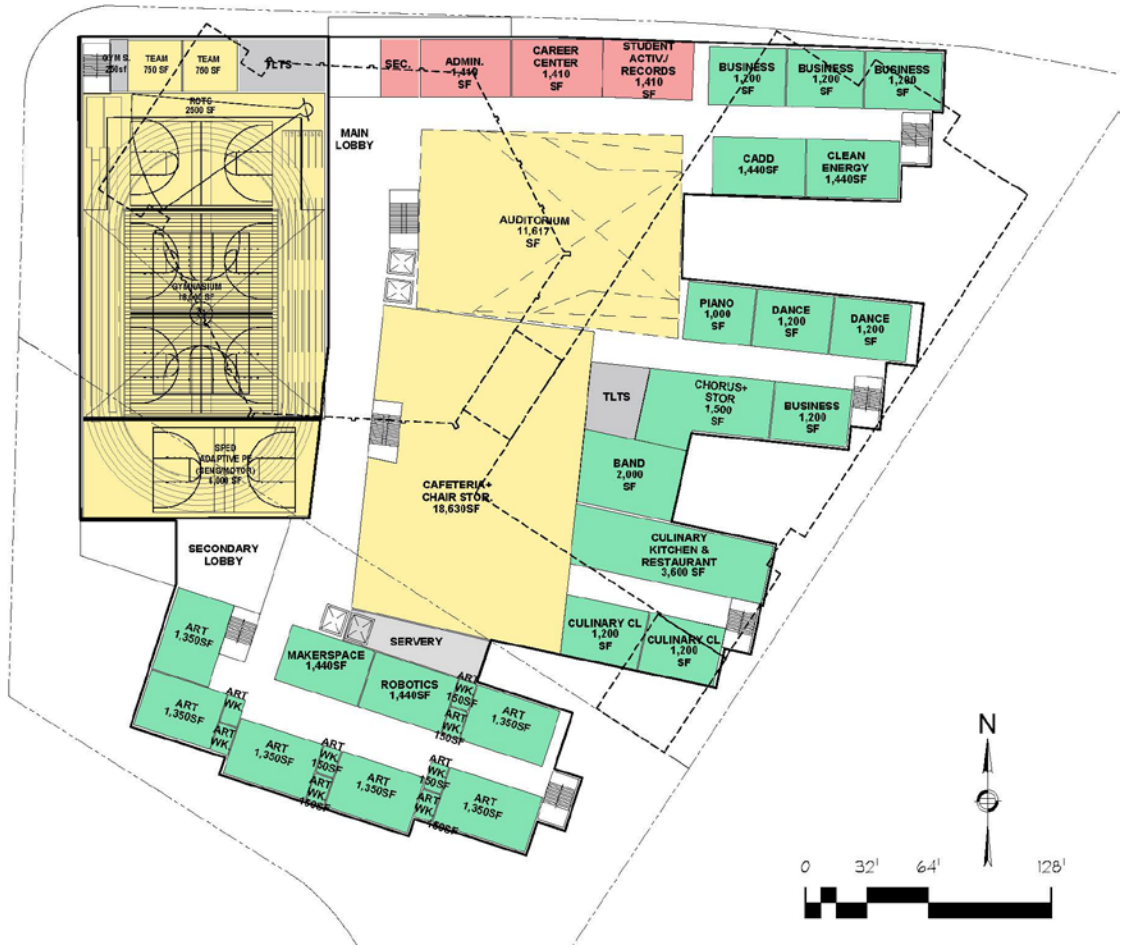
+ **Consolidated Campus**
  (via 5 story + basement)
+ **Good Classrm Orientation**
- **24 Temporary Classrms & Temporary Gym Required**
- **Limited Green Space**
- **Eminent Domain**

Phasing Est 4yrs + Summer
(but only 2 years on school site)

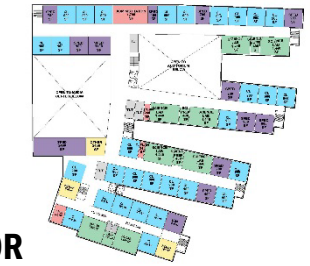
Note: Actual design pending study- Diagrams are adaptations from previous Feasibility Study for reference only to facilitate discussion about revised option scope.

LOWELL HIGH SCHOOL: NEW OPTION A FLOOR PLANS

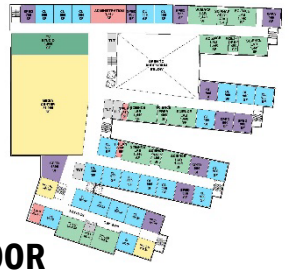
- ADMIN/TEACHER AREAS
- GENERAL CLASSROOMS
- SPECIAL EDUCATION
- SCIENCE
- CAREER/TECHNOLOGY
- GYM/CAF/LIBRARY/OTHER
- MECH/CUST, TLTS, STOR.
- NEW CONSTRUCTION
- DEMO



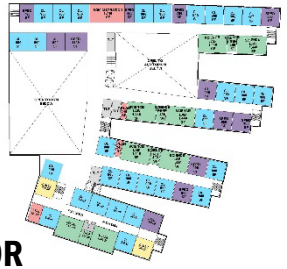
MAIN FLOOR PLAN



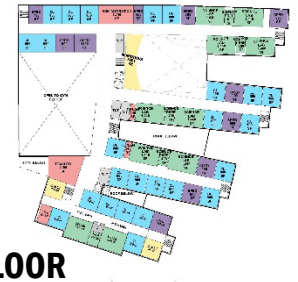
FIFTH FLOOR



FOURTH FLOOR



THIRD FLOOR



SECOND FLOOR



BASEMENT

LOWELL HIGH SCHOOL: SECURITY OVERVIEW – PRO'S & CON'S

NOTE: PRO'S & CON'S DEPICTED BY +/- (ASSUMED ALL OPTIONS SHALL HAVE ADEQUATE LIGHTING, WAYFINDING, BOUNDARIES, ACCESS CONTROL, VIDEO ASSESSMENT, AND THE INCORPORATION OF CPTED IN THE DESIGN

GENERAL

- (+) CONSOLIDATED CAMPUS (INCLUSION OF FRESHMAN ACADEMY)
  - REDUCTION OF INGRESS/EGRESS
  - MONITORING/STAFFING
  - IMPLEMENTATION OF LOCKDOWN
- (+) MAIN ENTRANCE
  - SECURITY DESIGN/CONTROLS
- (-) CULINARY/RESTAURANT
  - LOCATED WITHIN THE INTERIOR OF THE BUILDING. CONSIDER MOVING TO EXTERIOR
  - CASH/SAFE ONSITE
- (-) EVACUATION/EMERGENCY EXIT (FOOTPRINT)
  - FOOTPRINT IS LIMITED FOR EVACUATION AWAY FROM THE SITE
- (-) NUMBER OF INGRESS/EGRESS DOORS
  - LIMITED STAFFING DURING TRANSITION PERIODS
- (-) LOCATION
  - PROXIMITY TO THE PUBLIC
- (-) CONSTRUCTION/PHASING
  - SAFETY & SECURITY

ADD/RENO 2A

- (+) GREENSPACE
  - NOT OPEN TO THE PUBLIC
  - DECREASE PERIMETER INGRESS/EGRESS
  - DECREASE IN SECURITY IMPLEMENTATION
- (-) GYMNASIUM
  - CONNECTED TO FRESHMAN ACADEMY
  - ADDITIONAL SECURITY CONCERNS WITH PUBLIC ACCESS
- (-) SERVICE AREA
  - SMALLER FOOTPRINT – INCREASED POTENTIAL FOR INCIDENT
- (+) PERIMETER
  - LESS GREENSPACE, LESS OBSTRUCTIONS
- (-) MAIN ENTRANCE - SECURITY
  - SECURITY STAFF PRESENCE
- (-) CAFETERIA
  - PROXIMITY TO MAIN ENTRANCE

ADD/RENO 3A

- (-) GREENSPACE
  - OPEN TO THE PUBLIC
  - INCREASE PERIMETER INGRESS/EGRESS
  - INCREASE IN SECURITY IMPLEMENTATION
- (+) GYMNASIUM
  - REDUCED CONNECTIONS
  - REDUCED SECURITY CONCERNS WITH PUBLIC ACCESS
- (+) SERVICE AREA
  - LARGER FOOTPRINT – DECREASE IN POTENTIAL FOR INCIDENT
- (-) PERIMETER
  - ADDITIONAL GREENSPACE, INCREASED OBSTRUCTIONS
- (+) MAIN ENTRANCE - SECURITY
  - SECURITY STAFF PRESENCE
- (-) CAFETERIA
  - PROXIMITY TO MAIN ENTRANCE

NEW OPTION A

- (-) SERVICE AREA
  - ADDITIONAL PARKING – INCREASED POTENTIAL FOR INCIDENT
  - SERVICE ENTRY IS ISOLATED
  - SEPARATED FROM MECHANICAL ADDITIONAL SECURITY IMPLEMENTATION
- (-) PERIMETER
  - ADDITIONAL GREENSPACE, INCREASED OBSTRUCTIONS
- (+) NEW CONSTRUCTION
  - NO EXISTING CONDITIONS
  - INCREASED SECURITY
  - ADDRESS KNOWN/COMMON RISKS
  - REDUCED PERIMETER INGRESS/EGRESS
- (-) NEW CONSTRUCTION
  - LIMITED FOOTPRINT
  - PROXIMITY TO PUBLIC
  - TEMPORARY SPACE
- (-) CULINARY/RESTAURANT
  - LOCATED WITHIN THE BUILDING, MAIN LOBBY/HALLWAYS, LIMITED SECURITY– RECOMMEND MOVING TO EXTERIOR

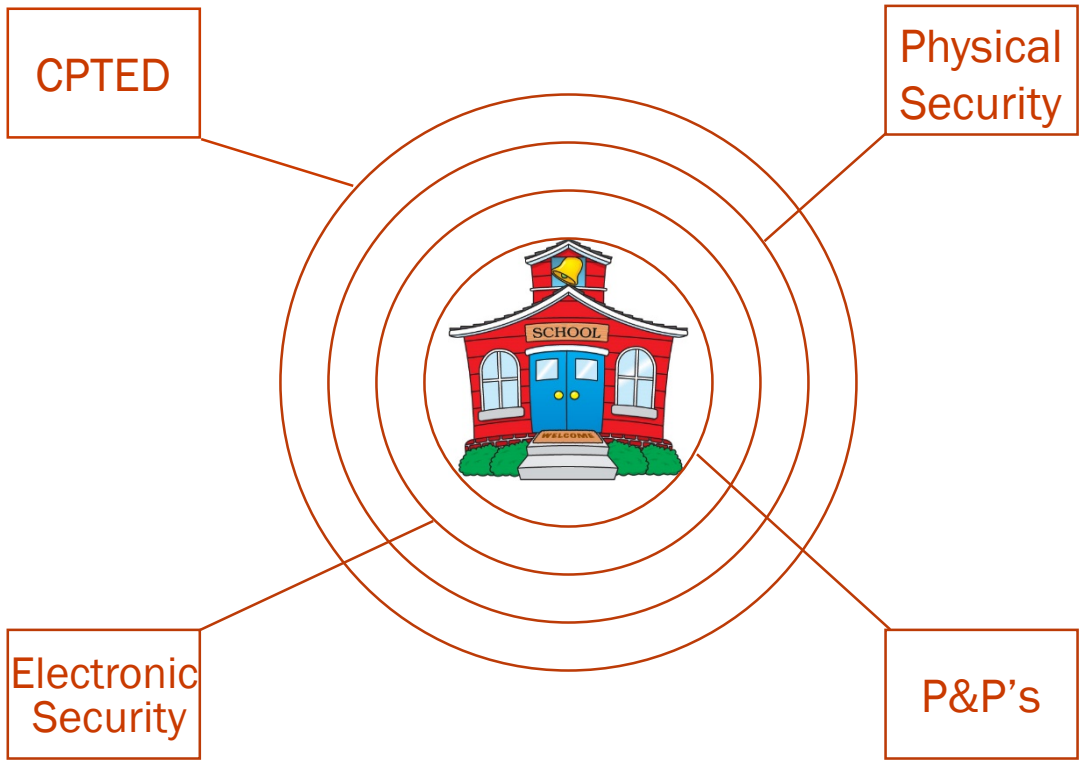
LOWELL HIGH SCHOOL: SECURITY DESIGN APPROACH

****Although the fundamental goal is to provide a safe and secure environment that promotes students individual and educational growth, there is a delicate balance that must be adhered to. Considering the current environment, safety and security must be at the forefront, yet not a hindrance.*

SECURITY THROUGH LAYERS

- **CRIME PREVENTION THROUGH ENVIRON. DESIGN (CPTED)**
  - ENVIRONMENTAL BARRIERS (PHYSICAL/DECORATIVE)
  - ADEQUATE LIGHTING
  - WAYFINDING
  - PLANTINGS/GREENSPACE
- **PHYSICAL SECURITY**
  - PROPER LOCKING HARDWARE
  - DESIGN ENHANCEMENTS
  - SRO/SECURITY PERSONNEL
- **ELECTRONIC SECURITY**
  - ACCESS CONTROL SYSTEM
  - VIDEO MANAGEMENT SYSTEM
  - INTRUSION DETECTION SYSTEM
  - VIDEO INTERCOM SYSTEM
  - COMMUNICATIONS
- **POLICY & PROCEDURES**
  - EMERGENCY RESPONSE PLAN
  - LOCKDOWN
  - ALICE
  - BEHAVIORAL THREAT ASSESSMENT MANAGEMENT TEAM

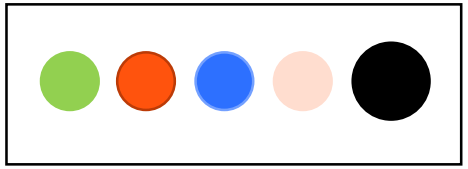
DETER, DETECT, DENY, DELAY

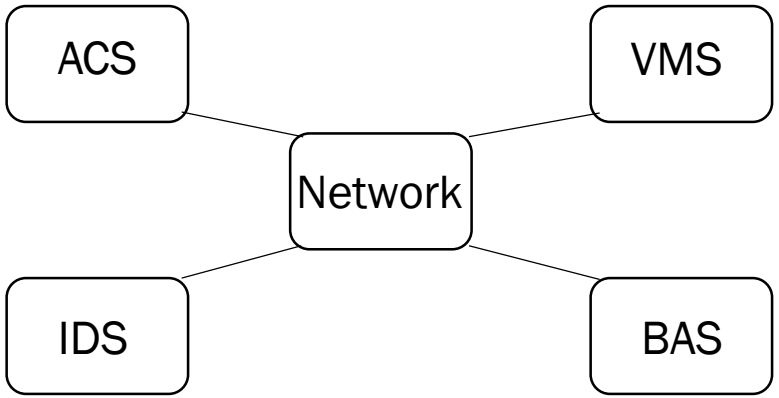


LOWELL HIGH SCHOOL: CURRENT ENVIRONMENT

WHAT ARE WE SEEING OUT THERE?

- **EXTERIOR CONDITIONAL LED** – REMOTE PANEL MOUNTED AT MULTIPLE LOCATIONS ON THE EXTERIOR OF THE BUILDING. DISPLAYS THE CURRENT CONDITION (NORMAL, FIRE, EMERGENCY, LOCKDOWN)
  - VISUAL & AUDIO BASED ON CONDITION
- **EXTERIOR GLAZING & PERIMETER HARDENING**
  - PRIVACY WINDOWS
  - BULLET RESISTANT GLASS
  - STOREFRONT – DECREASE GLASS, INCREASE MULLION
- **CLASSROOM – LOCKING MECHANISM**
  - CLASSROOM SECURITY LOCK
- **SYSTEM INTEGRATION – ACS, VMS, IDS, COMM, BAS**
  - FIRST IN – DISABLES IDS
  - IDS ALARM – ACTIVATES LIGHTING
- **SIDELIGHT MASKING**
  - EASY INSTALL, EASY IMPLEMENTATION







Classroom Security Lock
Latchbolt retracted by knob/lever from either side unless outside is locked by key from either side. When locked, latchbolt retracted by key outside or knob/lever inside. Auxiliary latch deadlocks latchbolt when door is locked. Inside lever is always free for immediate egress.

LOWELL HIGH SCHOOL: PERIMETER DOOR CLASSIFICATION

CLASSIFICATION OF PERIMETER INGRESS/EGRESS DOORS

Classification of perimeter ingress/egress doors is of the utmost importance. The goal is to reduce the number of primary entrances to one and secondary entrances to two or three. The primary entrance shall be referred to as the Main Entrance. Secondary Entrances shall be dedicated for faculty and staff.

- Access Control Door - Main & Secondary Entrance.
  - Utilized for both ingress/egress
- Exit Doors – Allowable Egress Only
  - Equipped with a door contact and REX Motion
- Emergency Exit – Allowable Emergency Egress Only
  - Equipped with a door contact and local audible alarm.

LOWELL HIGH SCHOOL: SECURITY SYSTEM REVIEW

WHAT'S WORKING, WHAT'S NOT, WHERE DO WE GO IN THE FUTURE

This section is meant to be a high-level review of current and future electronic security systems

- **POLICIES & PROCEDURES**
  - IDENTIFY OWNERSHIP
  - USAGE POLICY
- **ACCESS CONTROL SYSTEM (ACS)**
  - REQUIRED CAPABILITIES (I.E. LOCKDOWN)
- **VIDEO MANAGEMENT SYSTEM (VMS)** – AVIGILON
  - RECORDING (NVR, DVR, SERVER)
  - MONITORING (SECURITY, ADMIN)
  - IP BASED SYSTEM
  - REQUIREMENTS (LPD ACCESS)
- **INTRUSION DETECTION SYSTEM (IDS)** – MADISON SECURITY AFTER HOURS RESPONSE
  - ALL PERIMETER DOORS
  - MOTIONS – MAIN HALLWAYS VS. ALL PERIMETER; GROUND LEVEL VS. ALL FLOORS
  - THIRD PARTY MONITORING VS. LOWELL POLICE DEPARTMENT (PANIC ALARMS)
- **DURESS ALARMS**
  - STANDARD DURESS ALARMS (ADMIN, GYMNASIUM, SPECIALIZED EDUCATION)
  - OPTIONS (COPSSYNC, BLUE LIGHT EMERGENCY)
- **VIDEO INTERCOM STATIONS**
  - MAIN ENTRANCE
  - SERVICE ENTRANCE
  - CULINARY, CAFETERIA
- **VISITOR MANAGEMENT** – RAPTOR TECHNOLOGIES
  - MAIN ENTRANCE (SECURITY/ADMIN)
- **PUBLIC ADDRESS SYSTEM** – EXISTING NEEDS TO BE REPLACED (SIMPLEX)
  - REQUIREMENTS
- **MASS NOTIFICATION SYSTEM**
  - REQUIREMENTS
- **AUXILIARY ANTENNAE/REPEATER** FOR EMERGENCY RESPONSE PERSONNEL
  - ALLOWS FOR PROPER COMMUNICATION

LOWELL HIGH SCHOOL: OPEN DISCUSSION

WHAT'S WORKING, WHAT'S NOT, WHERE DO WE GO IN THE FUTURE

Open Discussion – Anything related to Safety & Security: Concerns
All topics are welcome, we want to ensure we address all concerns. We may not solve all of them, however this is the time to bring them to the table.

- Comments, Concerns, General Observations
- Design Requirements for Schematic Design Phase
  - Design Layout
  - Implementation of Electronic Security
  - Physical Design parameters
  - Policy & Procedures



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Eileen M. Donoghue
City Manager
Michael McGovern
Assistant City Manager

May 9, 2018

Ms. Diane Sullivan

Senior Capital Program Manager

40 Broad Street

Boston, Massachusetts 02109

Dear Ms. Sullivan:

The (**City of Lowell School District**) City Council and School Building Committee ("SBC") has completed its review of the Feasibility Study **Preferred Schematic Report (PSR)** for the Lowell High School project (the "Project").

On May 1, 2018, the City Council approved the Downtown Option 3A as the Preferred Option. A certified copy of the City Council meeting minutes, which includes the specific language of the vote and the number of votes in favor, opposed, and abstained, are attached and is included within the Preferred Schematic Report for the MSBA's consideration. A Summary of Meetings and Agendas:

Since the December 18, 2017 letter from the MSBA asking the City of Lowell its intent on a resubmission of the preferred project option for the City's High School, the City Council has held **7 meetings** regarding the proposed project, in compliance with the state Open Meeting Law.

City Council January 2, 2018 at 6:30pm City Hall:
CITY COUNCIL – MOTIONS:
6.2. C. Leahy - Req. City Council take a vote regarding the location of the preferred site of Lowell High School.
6.4. C. Elliott - Req. City Mgr. provide a report on the expenditures to date regarding the feasibility study on Lowell High School and the amount reimbursed to the City from the MSBA.

6.5. C. Kennedy - Req. City Mgr. and the Mayor notify the Massachusetts School Building Authority that the City Council intends to explore changing Lowell's preferred project option for the Lowell High School building project.
6.6. C. Kennedy - Req. School Committee endorse City Council's intent to explore changing Lowell's preferred project option for the Lowell High School building project and direct the Superintendent to notify the Massachusetts School Building Authority of the School Committee's endorsement.

City Council January 23, 2018 at 6:30pm City Hall:
CITY COUNCIL – MOTIONS:
7.1. C. Mercier - Req. City Mgr. review and explore other parcels of land in the downtown that may be available for the extension of Lowell High School.

City Council January 30, 2018 at 6:30pm City Hall:
CITY COUNCIL – MOTIONS:
11.9. C. Milinazzo - Req. City Mgr. take all necessary steps to reinstate the Article 97 restrictions on the parks and open space land which had been removed during the Lowell High School/MSBA site selection process.

City Council February 6, 2018 at 6:30pm City Hall:
CITY COUNCIL – MOTIONS:
7.5. C. Leahy - Req. City Mgr. provide update regarding latest meeting with the Massachusetts School Building Authority.

City Council February 27, 2018 at 6:30pm City Hall:
CITY COUNCIL – MOTIONS:
7.5. C. Kennedy - Req. City Mgr. instruct Perkins Eastman include an active shooter detection system (similar to Methuen High School system) as part of the plans for the new high school and recommend that the Superintendent of Schools consider similar systems for other schools within the City.
7.6. C. Kennedy - Req. City Mgr. instruct the Law Department to begin procedures and preparation necessary for the eminent domain taking of 75 Arcand Drive.

City Council March 6, 2018 at 6:30pm City Hall:
3. UNFINISHED BUSINESS
3.1. C. Kennedy - Req. City Mgr. instruct the Law Department to begin procedures and preparation necessary for the eminent domain taking of 75 Arcand Drive.
5.4. Vote-Transfer 15,000 to fund appraisals for 75 Arcand Drive

10.4. C. Elliott - Req. City Mgr. appoint a public safety personnel/security professional to the School Building Committee to ensure safety issues are addressed at high school.

City Council May 1, 2018 at 6:30pm City Hall:
- Review Building Options Plan Refinement
- Schedule Update
- Update on Additional Existing Conditions Investigations

- Review Options and Phasing
    - Add/Reno 2A
    - Add/Reno 3A Expanded site
    - New Option A Expanded Site
- Pros/Cons of Options
- Cost Update
- Vote on Recommended Preferred Option and authorization for OPM to submit Preferred Schematic Report to the MSBA no later than May 9, 2018.

Summary of Public and Other Participants

Since the City Council took a vote regarding the downtown location of the preferred site of Lowell High School on January 2, 2018, the SBC has held 3 SBC meetings regarding the proposed project, in compliance with the state Open Meeting Law.

SBC Meeting February 12, 2018 City Hall, Mayor's Conference Room at 6:30pm:

- Vote to Approve New Members
- Review of February 1, 2018 MSBA Meeting
- Discussion and Vote Relative to Which Sites to be Reviewed
- Eminent Domain Schedule
- Schedule
- Next Steps

SBC Meeting March 29, 2018 City Hall, City Council Chambers at 6:30pm:

- Review revised Educational Plan Approval
- Eminent Domain Update
- Review Options and Phasing
    - Add/Reno 2A
    - Add/Reno 3A Expanded site
    - New Option A Expanded Site
- Community Outreach
- Schedule
- Next Steps

SBC Meeting April 30, 2018 City Hall, City Council Chambers at 6:30pm:

- Building Options Plan Refinement
- Schedule Update
- Update on Additional Existing Conditions Investigations
- Presentation of PSR Options
- Pros/Cons of Options
- Cost Update
- Vote on Recommended Preferred Option

Educational Leadership Meetings (ELT) at Lowell HS Head Master's Conference Room

- February 26, 2018 – Review Downtown Options, Educational Plan and Space Summary
- April 4, 2018 – Sustainability update:
    - Sustainability/LEED Goals
    - Stretch Code
    - MSBA Requirements
- April 12, 2018 – Security Meeting:
    - General Security Concerns
    - Pro's & Con's for each option
    - Security Design Approach

School Committee Meeting at City Hall, City Council Chambers at 6:30pm:

- Review and approve revisions to updated Educational Plan

LHS Approval Process Meeting: Planning Board, Commissions and Department Meeting, Lowell City Hall Mayor's Reception Room April 4, 2018 at 2:30pm: City of Lowell Departments reviewing the Design Options to understand any approvals issues that can inform the PSR and the selection of the Preferred Option.

Additional Community outreach meetings regarding the proposed project:

- April 12, 2018 Public Meeting
- April 30, 2018 Public Meeting

The presentation materials for each meeting, meeting minutes, and summary materials related to the Project are available locally for public review at:

https://www.lowellma.gov/963/Lowell-High-School-Project

Lowell High School project website: The District has created a project website linked to the District's High School website. Project information (meeting memos, graphics, reports, etc.) can be viewed and downloaded by the public.

To the best of my knowledge and belief, each of the meetings listed above complied with the requirements of the Open Meeting Law, M.G.L. c. 30A, §§ 18-25 and 940 CMR 29 *et seq*.

If you have any questions or require any additional information, please contact: HVarney@lowellma.gov

By signing this Local Action and Approval Certification, I hereby certify that, to the best of my knowledge and belief, the information supplied by the District in this Certification is true, complete, and accurate.

By: Eileen Donoghue

Title: City Manager

Date: 5/4/18

By signing this Local Action and Approval Certification, I hereby certify that, to the best of my knowledge and belief, the information supplied by the District in this Certification is true, complete, and accurate.

By: Salah E. Khelfaoui, Ph. D.

Title: Superintendent of Schools

Date: 5/4/18

By signing this Local Action and Approval Certification, I hereby certify that, to the best of my knowledge and belief, the information supplied by the District in this Certification is true, complete, and accurate.

By: William Samaras, Mayor

Title: Chair of the School Committee

Date: 5/4/18

If you have any questions or require any additional information, please contact (*insert name, title, and contact information*).

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Kevin J. Murphy
City Manager
Michael McGovern
Assistant City Manager

School Building Committee MSBA Meeting

Meeting Minutes

Date: February 12, 2018
Time: 6:30 PM
Location: Mayor's Conference Room

1. - Attendance

Attendees: Kevin Murphy, Edward Kennedy, Rodney Elliott, Rady Mom, Connie Martin, Conor Baldwin, Maryann Ballotta, Nicolas Bosonetto, Marianne Busteed, James Cook, Gary Frisch, Robert Healy, Jay Mason, Maria Sheehy, Richard Underwood and Mike Vaughn.

Also in attendance: Mike McGovern, Elliott Veloso and Heather Varney.
From Skanska: Jim Dowd, Mary Ann Williams, and Dale Caldwell.
From Perkins Eastman: Joe Drown, and Robert Bell.

2. - Introduction New Members

K. Murphy welcomed the new members to the committee, introducing each of them to the group. C. Martin, M. Busteed, M. Sheehy and N. Bosonetto were present, while B. Barry and D. Cunningham were unable to attend. K. Murphy requested a motion to approve the new members, motioned by E. Kennedy and seconded by M. Vaughn. J. Cook noted B. Barry's opposition to the downtown site in the past, mentioning his email to the SBC asking if South Common could be looked into again. J. Cook stated that the SBC met over a year ago and eliminated the option, it doesn't make sense to reopen the option once it has been taken off the table.

3. - Review of the MSBA Meeting

K. Murphy noted that in the packet given to the SBC was a response to Councilor Leahy's motion on an update to the February 2, 2018. The document was published on the City Council agenda as well on the LHS Project website. K. Murphy noted that much is summarized in the document would be discussed later in this meeting by the engineers. On February 2, 2018 the city put forth the latest downtown options which were requested by MSBA. The Deputy Chief Executive Officer from the MSBA J. McCarthy noted that the downtown options will not be considered with a new pool unless the district builds a separate building or renovate the existing pool. K. Murphy noted that Perkins Eastman will discuss the difference between a gym and a fieldhouse. The MSBA requested at least one Add/Reno and the New School downtown option. Regarding eminent domain, the City would need full use and ownership of the property by

January 2019. After discussions, it has become apparent that the eminent domain issue should be addressed as early as July 2018 due to geotechnical testing on the expanded site.

E. Kenney motioned that the SBC should focus the review and eliminates options 4, 5, 6 and 7; seconded by J. Cook. Add/Reno Option 2 and Add/Reno Option 3 may not need as much effort in design as the new school on the expanded site. E. Kennedy noted that the new school on the expanded site would require a large number of modular classrooms. K. Murphy recommended that the SCB delete Options 4 and 5 that include renovation of the Lord building, as these options are most disruptive to students. He agrees with the engineers that options 6 and 7 would be a difficult endeavor. K. Murphy requested a motion to delete options 4, 5, 6 and 7 and move forward with options 2, 3 and the new school on the expanded site. All in favor, so voted.

Option 2A

R. Bell reviewed the three options for the SBC members. Option 2A is the existing site bringing the Freshman Academy on the campus. It is the same option as previously presented except it has the pool removed. This option would require a modular gym space and would keep the existing windowless labs in the Lord Building. The new gym building would provide flexibility and efficiency. The design plan would separate the students from contractors. There is limited greenspace in the layout with restricted loading and service docks. The phasing of this option would take 4 years and a summer.

Option 3A Expanded Site

R. Bell noted that option 3A is the expanded site on the adjacent property with the pool being removed. This option would allow construction off of the new gym facilities odd of the school site without the need for any modular classrooms or gym facility. There would be approximately 40 rooms available for swing space within the existing building(s) and just over 60 new rooms made available in the new Freshman Academy, totaling 100 rooms for swing space. The expanded site allows for breathing room, more natural lighting, greenspace and receiving areas. The phasing for this option would last for 4 ½ years and a summer; only 3 years of which would be on the actual school site(s).

The issue of a fieldhouse versus a gymnasium depending on MSBA specifications was addressed. R. Bell noted that a fieldhouse would include an area for track and field events such as javelin tournaments. He mentioned that based on student population the gym would require 9 physical education stations. R. Bell stated that it is possible for the design to be constructed so that a dividing wall can be put up between the gymnasium and some of the stations. He noted that the function of the facility warrants further conversations with the MSBA. The design team noted that Mayor Samaras told the MSBA that stacking the gym would be a management nightmare for the school administration and would be better suited as a continuous space.

New School Revised

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Kevin J. Murphy
City Manager
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The option to build a new school on the existing site was revised to eliminate the pool from the programming. The building would be five stories in addition to the basement for a condensed footprint. The third, fourth and fifth floors would have wings that fan out for daylight. This option would leave the 1922 building unused. The new school option would require extensive modular classrooms, a temporary gym and provide no additional greenspace. The phasing for this option would last 3 ½ years plus one summer.

R. Elliott inquired to the physical education square footage allotment and if the MSBA would limit funding. R. Bell noted that the MSBA standards do not scale to the size of some communities, especially a municipality the size of Lowell that values having s single high school. He continued that this is part of what makes the City's culture and school great. The default gym square footage for any high school is 12,000 square feet. The calculation for Lowell's enrollment, even with gym class sizes at 26 students, is 9 gym stations with a standard size of 3,000 sf (half of a basketball court). The city would require 27,000 square feet of space for physical education. This is more complicated with the additional 9,000 square feet of space needed for ROTC marching and Special Education adaptive physical education. Of the 27,000 square feet of physical education needs, 9,000 square feet would be on the floor below for gymnastics, fitness and weight room stations. The 27,000 square foot size is created by having an 18,000 square foot Gymnasium (the MSBA's maximum allowed) with the 9,000 square feet of ROTC and SPED PE added. The MSBA and the City will need to discuss multipurpose areas that provide the most flexibility possible.

R. Elliott asked about reimbursement for space for the gymnasium. R. Bell replied that it would depend on the MSBA accepting a continuous space or if there would need to be storage between to break up the space. E. Kennedy noted that the design team is requesting 27,000 square feet which is 1,400 square feet less that the current fieldhouse. R. Bell responded noting that the function of the space will be more effective than the current hexagon shape. He continued, stating that the MSBA normally approves 3,000 square feet for each station and should recognize the justification of the 27,000 square footage totals. R. Bell stated that the team would make a case to justify that the MSBA standards do not meet the scale of the city and will open an ongoing dialogue with the Authority. E. Kennedy stated that the pool was no longer on the table for the project. He mentioned the distinction between a fieldhouse and a gymnasium and if it fits into the current options. He wanted to clarify that Option 3 requires no modular classrooms or gymnasium, the New School would require extensive modular classrooms and Option 2 would need no modular classrooms but would require temporary gym space. K. Murphy stated that the project would proceed without a new pool, but the design team will look into identifying a possible location for a pool in the future.

K. Murphy inquired if there were any other break out areas aside from the weight and wrestling rooms. R. Bell commented that there is less square footage, but more functionality in

the new because of the shape of the existing fieldhouse. C. Martin noted that the existing building includes multiple floors including the pool and locker space; it seems that there is a real reduction in athletic space. She continued that the pool counts as one station and removing it from the plan would reduce the stations by 2,800 square feet. R. Bell noted that at the need for gym stations was calculated without the pool, because it was not to be listed under the MSBA's physical education category.

J. Cook asked to confirm the modular classrooms and temporary gymnasiums required for each option. He specifically inquired to the number of modular classrooms for the new school. R. Bell responded that the team did not fully flush out the new construction option yet (it was removed much earlier in the process), and did not wish to give an incorrect estimate until further research was conducted. R. Bell confirmed that Option 2A would require a temporary gym, Option 3 would require no modular classrooms or temporary gyms and the New School option would require extensive modular classrooms and a temporary gym. K. Murphy requested a motion to proceed with options 2A, 3A and New School; motioned by C. Martin and seconded by M. Ballotta.

3. - Eminent Domain

K. Murphy discussed the administrations understanding of the eminent domain schedule based on the February 2, 2018 MSBA meeting. The MSBA noted that the city would need to have full use and ownership of the property by January 2019. The consultants advise that it would be beneficial to begin the process prior to this in order to gain access to the parcel for testing. J. Drown stated that there was hazardous material and geotechnical testing done on the current downtown site, the same testing would need to be performed on the expanded parcel. K. Murphy stated there was discussion about commercial tenants being able to stay on the property for a minimum of 4 months after the taking; the city would not be able to evict the tenants prior to that. E. Veloso noted that research shows that upon recording of a taking, the City Council would take ownership removing the prior owner's right to damages. The Council would vote on an issue of order taking and would need to be recorded within thirty days to the Registry of Deeds. Under MGL c. 79, § 8B, upon recording of the Order of Taking, tenants are not required to vacate the property until at least four months after notice of the taking is provided to him. J. Cook inquired to how long tenants have to leave. E. Veloso noted that it would be a minimum of four months after receiving notice. If tenants still refuse to leave after that time, the City can provide a notice for refusal of possession. After thirty days of this notice, the Sheriff or Deputy of the county could then be brought in to take possession. Under MGL Ch. 79 § 6A, the city would be required to provide moving costs and expenses, which would include business equipment. Under MGL Ch. 79 § 7A, the Department of Housing and Community Development would also require the city to develop and submit a relocation plan for displaced tenants if there

are more than five business units. J. Cook noted that there has been misinformation provided by the media projecting the project to be delayed by years. E. Veloso commented that this is not likely unless the city has taken the land in bad faith and not for public use, or it was taken in an improper way. M. Vaughn inquired to of the tenants would be able to claim damages if the City tests on the property after possession. E. Veloso noted that the Law Department has not found any case law or statutes that suggest that the tenant could hinder the City's testing after the property has been properly taken and the Order of Taking recorded in the registry of deeds. E. Kennedy asked how many tenants are currently on the property. E. Veloso stated that he was not positive about the number of tenants at the time but stated that he believed it was four and that the number would dictate what relocation assistance the City would have to provide. E. Kennedy inquired to when testing is scheduled in relation to the taking and when the design team would submit to the MSBA. The taking would take place during the summer, assuming that the group targets moving forward from the PDP to the PSR. R. Elliott asked about the cost in general of acquiring the property and relocating the current tenants. E. Veloso commented on the reasonable cost as it includes certain limitations on a case by case basis depending on the nature of the business and the equipment used. E. Veloso stated that he believed that specialized equipment at a doctor's office, such as an x-ray machine, would be included in an estimate for the cost of moving and storage until tenants find an alternative site. R. Elliott asked who is responsible for the eminent domain process. E. Veloso responded that the taking authority, the City Council, would be responsible. He noted that the city could not take the eminent domain without two prior appraisals of the property. The appraisal would include the land value and the nature of the property (commercial / residential) as well as the fair market value of the equipment. J. Mason inquired if the property and damages would be appraised by the same appraiser. E. Veloso stated that he believed the approach would be holistic and value of the property would be based on fair market value. E. Veloso stated that it would be better to start the process sooner rather than later. N. Bosonetto asked if the door was closed on making an offer for the property. K. Murphy replied that no doors have been closed on the matter. E. Kennedy inquired to extending the 4 month period that tenants are allowed to stay on the property. E. Veloso noted that the four months is a minimum, and that theoretically the City could allow tenants to stay for an extended period.

4. - Schedule

E. Kennedy inquired to the current plan on submitting to the MSBA at the August meeting as the consultants completed the analysis of the three. J. Drown replied that the MSBA scheduled Board meetings take place every two months. To get onto the June meeting agenda, everything would need to be submitted by May 2018. He continued, that the information presented in June would need to have estimates in place, conversations and meetings to discuss the decision would

need to be held in advance of the meeting. The cost estimates would need to be in place by late February, early March if the city was to meet the deadline for the June meeting. J. Drown also mentioned that MSBA asked the City to take another look at the new school option, not just to dust off the original plan. J. Drown commented that Options 2 and 3 were taken as far as the Cawley new school site. The team needs to do the most work on bringing the new school at the down town site up to the same level as Options 2 and 3 because it was ruled out earlier in the process. R. Bell noted that the team would do their best to meet the June meeting. He also mentioned that extracting the pool would not be an excessive amount of work but they would need to update the market price changes and educational programming. J. Drown stated that the Educational Leadership Team and the School Committee would need to approve the educational program. The city would also host community meetings to address the citizens' concerns. J. Drown also mentioned that the MSBA needs the cost estimate analyzed closely, the design cannot just be dusted off.

E. Kennedy inquired if the reason that the August meeting is targeted is primarily due to the MSBA requirement to include the new school design. Many meetings were set up last year which will need to be set up again. The SBC as a group urged the design team to open an additional dialogue with the MSBA to ensure that the process is expedited as quickly as possible. E. Kennedy mentioned that the MSBA indicated an excess space that is not used for academic purposes which could be the equivalent of $17 million in construction cost (when using the cost per square foot from the Somerville project $625). R. Bell replied that the space stem from the education plan that was created with involvement from the school and community. The amount of square footage listed as other is important to the school and community but not supported by the MSBA. The educational plan conflicts with the MSBA guidelines, as is true for many school districts. For example, a network room for 1,000 students would need to be 200 square feet. The needs of LHS triple that, and the design team has included those specifications in the plans, as is true for the gym space, offices and teacher space. C. Martin asked about the educational plan in terms of the fieldhouse, other space and administrative space. R. Bell replied that many of the MSBA requirements do not reach the scale that Lowell needs, but this is something that will be addressed in future discussions. M. Vaughn inquired to what the impact of the schedule change from the August to June MSBA meeting would have on the eminent domain schedule. R. Bell noted that this would be a point of discussion with the MSBA. R. Underwood asked if the SBC could proceed with just options 2 and 3 as the new school site is bound to have little support in the community. R. Bell replied that the team will touch base with the MSBA on this as well. R. Underwood noted that it is a waste of time and money, in his opinion, for the design team to spend additional resources looking into something that is not going to be picked as a preferred option. E. Kennedy noted that the MSBA is providing the funding for most of the project so if they are asking us to do something, we should do it. He continued, stating that the expense of the

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modular classrooms and gym space is part of the issue though. The MSBA needs to acknowledge that the city is much larger than others.

5. - Next Steps

K. Murphy stated that the future SBC meetings will take place in the City Council chambers and will be covered by LTC. He confirmed that the SBC will continue to meet at night as it is easier for all the members to attend. The next meeting date will be determined in within a week and will advise the committee and public of the time and date. E. Kennedy asked if the city would provide information prior to the March date as the information is received from the consultants. K. Murphy noted that the Law Department will propose a schedule for eminent domain with both the June and August MSBA meeting dates. K. Murphy also stated that the team will find out the answer regarding the gym and fieldhouse. R. Healy motioned to adjourn at 7:50PM, seconded by M. Vaughn.

Notes taken and certified by:

HEATHER VARNEY
Notary Public
Commonwealth of Massachusetts
My Commission Expires Oct. 2, 2020

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School Building Committee MSBA Meeting

Meeting Minutes

Date: March 29, 2018
Time: 6:30 PM
Location: City Council Chambers

I. - Attendance

Present: William Samaras, Rodney Elliott, Edward Kennedy, Connie Martin, Conor Baldwin, Maryann Ballotta, Marianne Busteed, David Cunningham, Gary Frisch, Robert Healy, Salah Khelfaoui, Jay Mason, Maria Sheehy and Mike Vaughn.

Also in attendance: Senator Eileen Donoghue & City Councilor John Leahy

City: Mike McGovern, Elliott Veloso, Heather Varney, Alex Magee
Skanska: Maryann Williams
Perkins Eastman: Joe Drown, Robert Bell, Alicia Caritano and Dawn Guarriello
Traverse (Landscape): Ashley Iannuccilli

W. Samaras called the meeting to order at 6:38 PM

II. - Revised Educational Plan Approval

R. Bell discussed the revised education plan that is based on the site changes. He noted that the MSBA determined that the pool would not be part of the project. The revised education plan was presented to the School Committee along with the space summary. He discussed the changes to reference of a pool, adaptive physical education, ROTC, Katie's Closet and the Community Health room. The space summary noted changes to the upper and lower gym area. R. Bell clarified the depiction in the presentation, noting that the numbers 1-6 on the upper level identify the six gym stations, the MSBA maximum as contiguous space, but co-located with a U-shaped area designated for ROTC marching and additional space for adaptive PE. R. Bell noted that the MSBA recently reviewed and does not take issue with the colocation of the gym spaces noted in the preliminary letter to the design team. He also mentioned that the MSBA reserves the right to continue review of the space summary. The Department of Elementary and Secondary Education did not have an issue with the co-location either.

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Space Summary

E. Kennedy asked the design team whether they had received a communication from MSBA questioning the size of the project. R. Bell stated that following the normal course of action, the MSBA can accept or reject the size of certain rooms at end of Schematic Design. R. Bell commented that the team answered all the questions in the prior communication to the MSBA. R. Bell noted that the educational team met with the Superintendent of Schools, faculty staff, facility groups, to discuss goals and desires of the district.

W. Samaras inquired how the dialogue would go with MSBA if they will not allow space because of scaling limitations in place. R. Bell stated that the dialogue is submitted through the formal MSBA submission process in the PDP and PSR narratives. R. Bell noted that the team must articulate why the space should be larger and commented that it's a good sign that they will continue to review it. R. Bell commented that the MSBA realizes their template does not scale to fit a larger school. If the MSBA objected, they might use stronger language in their response. R. Bell noted that it may be frustrating when the City resubmits in May, because the review comments will tend to default back to 'the MSBA will continue to review.' R. Bell continued, noting that based on dialogue thus far, the MSBA recognizes that the space scale does not fit a school this size and that it is not their intent to penalize the District for having one large school rather than three or four high schools. R. Bell mentioned that it is worth defending the spaces and design, such as the co-location of the gym for more multi-purpose use and flexibility to better serves students and community.

Senator Donoghue noted this is a huge high school project, much larger than MSBA normally deals with. She stated that MSBA must get constant reminders regarding the size of the school. Senator Donoghue inquired if there are space changes between plans 2A and 3A. Perkins Eastman noted the education plan is the same for all of the options. Senator Donoghue asked how much square footage may not be reimbursable. Perkins Eastman replied they will need to get back to the committee. W. Samaras commented on the necessity of having an auditorium that will fit at least an entire class, as the MSBA limitations now would not allow for that.

III. - Eminent Domain Proceedings Update

E. Veloso noted the City Council voted to begin process to take 75 Arcand Dr. via eminent domain. He mentioned that the Law department will identify parties affected by and prepare for the taking process. He stated that the Law department is confident that the City can move forward with appropriate scheduling. At this point the City has begun process, but E. Veloso noted he is hesitant to describe the process due to attorney client privilege. E. Veloso stated that Law is proceeding on the process and moving forward as we speak. E. Kennedy commented on the need for two appraisals and discussed the 45 day window from time accepted and ability to

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proceed. M. Vaughn stated that this was correct. E. Kennedy noted the substantial amount of equipment for the medical practices, much of which may be depreciated. He inquired to how inventory within building will be dealt with, who will handle appraisal of equipment, how to proceed and arrive at a dollar value and if this will occur after the eminent domain taking. Mr. Veloso discussed relocation process for tenants. P. Sleeper was introduced as the relocation specialist out of Arlington MA, with over 50 combined years dealing with eminent domain. P. Sleeper stated that appraisers have 30 days to give to the owner an acceptance or rejection of the initial offer. He mentioned that the June 5, 2018 date needs to consider time for the tenant to consider what the City is offering. Mr. Sleeper and his associates will treat with sensitivity and compassion; as he hopes to have all practices relocated by December 2018. Mr. Sleeper's company will identify comparable space downtown and in other neighborhoods for the tenants. He mentioned it is a possibly to convert office space into a working dental office. P. Sleeper state that ideally businesses would like to close down Friday and reopen Monday in another location. He also mentioned that he has a lot of experience with takings in other municipalities. P. Sleeper discussed his hope to meet with tenants within a week or two. He mentioned the need to determine how much relocation benefits each tenant will receive, which will then be given to the City Manager's office as an estimate. If tenants do not accept the estimate, they can go to city, or DHC to figure out next steps. P. Sleeper stated that he will explain that the City has right to eminent domain to each tenant. He also stressed that he cannot waste taxpayer money but will be open-minded for the tenants' sake. P. Sleeper noted that he has a standardized 10-item list that he addresses to protect each of the businesses. E. Kennedy mentioned that the appraisals are scheduled to take 45 days and include a 30-day owner review; he questioned the required time and the timeline. P. Sleeper noted that a letter will need to be delivered by May 5, 2018 offering an estimate, in which the tenant then has 30 days to review and accept. He noted for the relocation component, after City takes ownership, it can take some time to move tenants. The transportation of equipment can take place after the order of taking. By the end of April, the relocation plan will be presented to DHCD and City. Each tenant has 21 days to review the plan. Most information in the plan will come directly from the tenants, including square feet of office space and current rent per month. After the hopeful May 21, 2018 approval, the City will seek a quick turnaround from DHCD. P. Sleeper noted that he plans on having the approval before order of taking. E. Kennedy commented that it may be a tight schedule as it could be over 6 weeks for appraisals. He expressed his hopes to tighten it up to a 4-5-week period. M. Vaughn stated that he will work on a 30-day angle. E. Kennedy noted it is important for the City Council to have ownership in early June prior to the MSBA meeting. M. McGovern noted the June 5, 2018 deadline is aggressive and tight, but it gives three more weeks prior to June 27, 2018 MSBA meeting. This means that in that time, there will be three City Council meetings to get the vote prior to the MSBA meeting. E. Kennedy inquired if the City will attempt to firm up the

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schedule early next week and confirm with the School Building Committee, City Council and School Committee. M. Vaughn agreed.

W. Samaras inquired to the relocation, specifically if the plan would simply replicate their existing practice and what would happen if the tenants were looking to have more sinks or x-ray machines. P. Sleeper stated that the tenant would need to pay for additional space and equipment themselves, the plan only addresses replicating the existing practice. He mentioned that the goal is to make sure that the tenants survive and are happy somewhere else.

Senator Donoghue noted that with her experience of eminent domain on the Stoklosa School and the Early Garage that the proceedings are very technical, and that timing is critically important to the process. She inquired to the bid process and timing. M. Vaughn stated that the City had only received one quote after soliciting quotes from 36 local licensed appraisers. He continued that under Chapter 30 B, no sealed bid was required for the appraisals. Senator Donoghue noted the importance that the City proceed carefully every step of the way through the process.

J. Mason wanted to clarify that City had only heard back from one appraiser. M. Vaughn stated that some other appraisers alluded that more quotes will be received on Monday. E. Kennedy noted it may make sense to reenergize search. M. Vaughn replied that the search included research on the Massachusetts Appraisal website, and that requests were sent to the appraisal firms listed. E. Kennedy commented that the City selected the procurement method that would streamline process; some vendors have declined, some must have not responded at all. He asked if it was worthwhile to follow up with the vendors who did not respond at all. M. Vaughn stated that he plans on following up and was surprised that some vendors did not participate. Senator Donoghue noted with the lack of interest in appraisals, it may be beneficial to bid the project. E. Kennedy asked R. Bell if the appraisals need to be completed by June 5, 2018 and if it was critical or likely to have a favorable vote if the City did not have possession of property. J. Drown commented that the MSBA doesn't typically require ownership of property and that the team is hoping to be able to access the site this summer for boring testing. E. Kennedy said if not done by early June, maybe by the end of June, could still do testing on the scheduled timeline.

R. Elliott noted that under Massachusetts General Law Chapter 30 B, projects under a certain threshold only require the City to solicit quotes, which may be less costly and time consuming than bids. M. Vaughn has not seen anything on the state's procurement website COMMBUYS, but he did go to the appraisal association websites. He added that he can investigate goods and services published on Monday as well as the State website. R. Elliott noted that having one quote is fine since the City reached out to so many appraisers and anticipates having more respond. Mr. Vaughn noted that he anticipates having more submit but, in his experience, he does not believe something will arrive until it is sitting in his hands.

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IV. - REVIEW OF OPTIONS AND PHASING

Architects D. Guarriello and A. Iannuccilli updated the refined education program. The program removes the pool which results in less additions. D. Guarriello noted that the presentation is an overview at feasibility level now, including concepts. The team is looking at the three options Add/Reno 2A, Add/Reno 3A and Option A.

A. ADD/ RENO Option 2A

This option fits onto existing site; the image in the presentation shows the new gym and freshman academy, renovation of the '80s building and the '22 building. The temporary gym would be necessary. The result of the design after construction has limited green space and loading dock space. The project would take four years plus summer for construction. Freshman academy would be built almost up to sidewalk, which may raise concerns with breathing room as students enter and exit the school. Phase 1: The temporary gym would be built on the grass land next to parking garage owned by city. The demolition of the existing fieldhouse would start in the summer. The phasing would then incorporate better utilization of space in the '80 building, '22 building and the freshman academy. Phase 2: the existing gym would be removed and renovation to the west side '80s building would begin. Phase 3: renovation on the '80 building would continue into the summer, allowing for continuous connection to new freshman academy, gym to the '22 building. Phase 4: the remainder of renovation work on '22 building and the construction of the second bridge would commence. The result is a new school consolidated on one campus with construction lasting four years and a summer. The phasing concept is preliminary, the number of rooms freed up and the number that the contractor can take are estimates. The construction manager hired after design complete will determine overall phasing. The presentation from the design team trying to create concept of how the project can be accomplished.

D. Guarriello noted the shuffled space on the '80 building. She continued to explain the slide with large yellow space representing a major cafeteria, and the kitchen as currently in school. The yellow colored spaces are all public; the blue are class rooms and the green class rooms represent science courses. J. Mason asked to clarify the ghosted walls going away to create cafeteria. R. Bell replied not really at design level of walls yet, and the group will not see this level of detail until later in the design process.

B. ADD/RENO Option 3A

This option is similar to Option 3 presented to the group previously, only the pool was removed. The campus is consolidated with the freshman academy on site. As shown previously, the design will bring light wells into the '80 building; window-less classrooms will now have natural

daylight. The design has green space on site for ROTC and physical education classes. The option does locate the gym on new site, which moves that building further away from other parts of school. The project is estimated to take five years; which is three months more than previously presented. Major transition points where summer contractor can move fencing without impacting the students. Demolition of 75 Arcand Drive without disrupting school and building of the new gym, with no temporary gym or temporary class room required. Phase 2: the freshman academy would be relocated to the existing gym space; which would create swing space needed to renovate the '80 building same time. Summer work would take place in the south portion '80 building. Phase 3: complete the renovation of the '22 building. This option provides more outdoor green space, plaza space, and has the freshman academy and gym further away from street. This option would take five years, four years on school property and the first year would be off the site.

D. Guarriello noted option 3A was set back from Father Morrissett further. There is more space at the heart of school to work with. Natural lighting and the additional outdoor spaces make the design more vibrant.

C. New School Option A

This option is an all new facility on the '80s side of the canal with the expanded site. The building would be five stories plus the basement level. Overall the building consumes much of the footprint with limited plaza and green space. The new freshman wing would be temporarily connected to the '22 building, construction would then occur to remove existing bridges. This option would require twenty-four additional modular classrooms off site. Possible modular host sites are illustrated in presentation materials. Part of the phasing would take the cafeteria off line; convert the new freshman academy into a temporary café which will then be converted back into classrooms in the final phase. This option would take four years and a summer. E. Kennedy noted this was a little different and asked the design team please review for audience at home which options require modulars and amount required.

Option 2A – Existing site would require a modular gym and locker / team room space.

Option 3A – Expanded site would require no modulars of any kind.

Option A – Expanded site would require the most modular class rooms (twenty-four) as well as a gym, locker room and team space.

D. Guarriello mentioned that the modulars are not eligible for reimbursement and cost is fully shifted to the City.

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E. Kennedy inquired if the freshman academy building would be suitable for the swimming pool, perhaps a municipal pool down the road. R. Bell commented it would take many of the engineers to look at this analyze the architecture, and that would be a very different study. W. Samaras asked what a temporary gym would look like. R. Bell replied there are structures that may sound interesting, inflatable roof structures are envisioned, and have been used in Boston. The gym would be a large shell of space with a gym floor. M. Williams noted the modular gym is required but it is not something that the City can rent, it must be purchased. W. Samaras inquired if it was reimbursable if it needs to be procured. Senator Donoghue mentioned the last site, Option A, with 24 modular classrooms and inquired where the modulars would be placed. R. Bell replied that a potential offsite and laydown space/staging area is included in the presentation. The map illustrates stared locations – fourteen parcels of use or available that may or may not be within walking distance. The design team has begun looking into closest ones, particularly the parking lot behind the post office, where approximately half the modulars would fit. Senator Donoghue inquired if security concerns would be addressed in option 3A. D. Guarriello replied that the concerns have not yet been addressed but the plan will be discussed on April 4, 2018.

V. - Community Outreach

M. McGovern commented that there is an April 12, 2018 community meeting, similar to a previously held meeting at Senior Center. He noted that the Manager's Office is currently speaking to various local and neighborhood stakeholders to put this together. The meeting will be set up as a break out style community meeting, with a presentation by Skanska and Perkins Eastman, and then give participants time to have a discussion and come back with questions.

At the end of April, when cost estimates are received, the School Building Committee meeting and City Council presentation will need to take place. The SBC meeting could take place Thursday night and then the City Council could vote on the next Tuesday. W. Samaras noted that the group can talk about dates and what the committee would like to do moving forward.

E. Kennedy motioned to set a SBC meeting on Monday April 30th, noting a recommendation to be made to the City Council on a preferred option. Seconded by D. Cunningham.

M. McGovern noted that the April 12, 2018 community meeting would take place at LHS cafeteria as the Senior Center already has something else scheduled. He noted that the cafeteria may work out better for seating at tables for question and answers. The community meeting on April 12, 2018 will be recorded and replayed by LTC.

E. Kennedy motioned that the second community meeting take place at the same time and date at the SBC meeting on April 30, 2018. Seconded by J. Mason.

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A. Caritano noted that the estimator will look at package and submit to MSBA on May 9, 2018. The Facility Sub Committee meeting will take place by June, prior to the then MSBA meeting June 7, 2018 meeting.

City Councilor J. Leahy spoke regarding the safety of the designed options.

E. Kennedy inquired when the School Building Committee receives information and materials if the School Committee and City Council could be included. M. McGovern noted that the School Building Committee, City Council and School Committee will receive the package. The package will also be posted on the City and LHS Project websites.

Motion to adjourn by R. Healy. Seconded by E. Kennedy. 8:05 PM.

Notes taken by Alex Magee and certified by:

HEATHER VARNEY
Notary Public
Commonwealth of Massachusetts
My Commission Expires Oct. 2, 2020

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Eileen Donoghue
City Manager
Michael McGovern
Assistant City Manager

School Building Committee Meeting

Meeting Minutes

Date: April 30, 2018
Time: 6:30 PM
Location: City Council Chambers

I. - Attendance

Present: Eileen Donoghue, William Samaras, Conor Baldwin, Maryann Ballotta, Brian Barry, Marianne Busteed, James Cook, David Cunningham, James Donison, Gary Frisch, Edward Kennedy, Salah Khelfaoui, Connie Martin, Jay Mason, Rady Mom, Maria Sheehy, Richard Underwood, Michael Vaughn.

Also in attendance:

City Councilors: John Leahy, Vesna Nuon, James Milinazzo, Rita Mercier, David Conway, & Karen Cirillo

School Committee Members: Andre Descouteaux, Gerry Nutter and Jackie Doroghty

City: Mike McGovern, Mike Geary, and Heather Varney
Skanska: Maryann Williams, Dale Caldwell, Jim Dowd
Perkins Eastman: Joe Drown, Robert Bell, Alicia Caritano, Dawn Guarriello

Taverse Landscape Architects: Ashley Iannuccilli

City Manager E. Donoghue called the meeting to order at 6:30 PM.

II. - Update on Tasks Since Last SBC Meeting

A. Caritano discussed the overview of meetings on the LHS project since the March 2018 School Building Committee meeting. On April 4, 2018 the Sustainability meeting was held consisting of a work shop for 22 people including the members of the School Department, Skanska, Perkins Eastman, and their consultants, and the City. The group discussed sustainable strategies for the new high school. A. Caritano noted that there was also a City Department Head meeting on April 4, 2018 in which all relevant department managers were present to discuss approvals needed and the timeline. The Security meeting on April 12, included a workshop of 17 people to discuss security issues for all the options and current trends. A. Caritano also mentioned the April 12, 2018 community meeting in which the open forum provided a good amount of input. She stated that the team has updated the estimated EUI,

energy use intensity, for the design options to provide a relative comparison for each of the options as compared to the existing buildings. The EUI for the existing buildings is 63 kBtu/SF-yr, Option 2A is 42.53, Option 3A is 41.98, and New A is 36.23. The energy update serves as a benchmark for future study which will include lifecycle cost analysis.

III. - Design Option Overview and Cost Update

B. Bell provided an overview of the three design options. All options meet the Educational program including relocating the Freshman Academy to provide a consolidated campus. Option 2A has a, limited green space and loading, windowless labs, and requires a temporary gymnasium. Option 3A incorporates the adjacent land at 75 Arcand Drive which allows for a larger entry plaza, an expanded footprint which includes lightwells in the 1980 building so that there are no windowless labs, and additional greenspace and loading. Option 3A also requires no temporary facilities, but requires Eminent Domain. New Option A, also takes the adjacent land and requires Eminent Domain. However the footprint fills the site and has a limited entry plaza, and green space. In addition, New Option A requires a temporary gymnasium and 24 temporary classrooms. R. Bell noted that the presentation includes the pros and cons for each option in additional to specific building specifications.

D. Guarriello discussed the massing of all the options. There were multiple meetings, during the PSR where the Design Team explained the design options included the proposed plans and phasing. She noted that the floor plans illustrated in the presentation are only for the main floor so that the audience can get an idea of the layout. She also mentioned that the size of the new gymnasium, locker room and fitness area is consistent among options 2A and 3A.

D. Guarriello discussed Option 3A, which includes the expanded site with more greenspace, new bridges and light wells. She noted that the building is set back from the property line giving students more space on the Father Morrissett Blvd. J. Mason inquired to the comparison of the two courtyard sizes for Options 2A and 3A. A. Iannuccilli stated that 2A is approximately 3,600 square feet, and 3A is 15,000 square feet. D. Guarriello compared the square footage to the size of four classrooms for 2A and sixteen classrooms for 3A. A. Ianunuccilli also compared the size to the green space across the street from the high school by the parking garage which is 14,000 square feet.

D. Guarriello discussed New A, which is almost up to the property line at the street. She mentioned that the design lets light into the classrooms as they are set up in bars. D. Guarriello stated that the auditorium would be located in the windowless space.

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J. Drown noted that the team has been working on an updated cost estimate. He mentioned that there are a few points to make note of including a schedule conflict which resulted in Perkins Eastman bringing in new cost estimators, PM&C, and the project estimator staffing at SKANSKA also changed. These staffing changes resulted in a "fresh set of eyes" on the project. J. Drown noted that the space program changed as the swimming pool was removed, reducing the size of the school. While refining the design Perkins Eastman has the opportunity to make the design more efficient. J. Drown also noted that the cost estimates reconciled within 1% of one another. By the end of the meeting, both estimators understood how other was viewing the project, which was a very constructive important meeting. The estimated project cost is within the MSBA average of $400-$500 / square foot construction.

J. Drown noted that the slide for reconciled revised PSR cost estimate includes projected costs from Perkins on right and SKASNKA on left. He explained that the construction cost includes the cost of the building and the site. The Project Budget includes the construction cost as well as the other soft project costs such as Design Team, Operation Project Manager fees, and construction contingencies etc. Option 2A construction cost is $ 262,135,000 with a project budget of $333,040,000. Option 3A construction cost is $270,456,000 with a project budget of $345,400,000. New A construction cost is $289,153,000 with a project budget of $361,624,000. The city share for 2A is $124,282,000; for 3A is $135,960,000 and New A is $160,955,000.

W. Samaras inquired to the reimbursement cost, if the City would ever be able to obtain a higher rate of reimbursement, how the city may begin conversations with the state on this topic. M. Williams addressed this noting that the City may open discussions with the MSBA to consider spaces that exceed the space summary guidelines if the argument about the scale of the school and student population can be justified, and argue that the school does not fit with the average model used as a guideline. B. Barry inquired if there was a different reimbursement rate for each option. M. Williams noted that the team looked at the last set of responses from MSBA on the comments for ineligible costs. It is a snapshot in time, the spaces consider ineligible cost for reimbursements will need to be carried by the City, unless the MSBA does approve items for reimbursement. She continued, noting that the guidelines are generally for schools with a thousand students. This is an important part of why the size of school may fall outside the guidelines. B. Barry asked why the construction costs go down so much. A. Caritano replied that Option New A includes temporary classrooms, which are not required for any other option, and constitute a large chunk of the cost. B. Barry inquired to why the gross numbers illustrated for state reimbursement on Option 2A is $209,000,000, and Option New A reimbursement is

$8,000,000 less. J. Drown stated that there more factors than just if an item is ineligible or eligible, they also need to be within the maximum $/sf for reimbursement in order to be reimbursed. He noted that with Option New A, some of the limits were reached, making the costs ineligible for reimbursement. R. Bell reinforced this noting that the design hit the cap on the reimbursement; a building may be more expensive even if the footprint is smaller. D. Guarriello stated that the differential between the reconciled revised PSR cost estimates has a substantial amount of money that is ineligible as it relates to reimbursable $/ sf.

E. Kennedy followed up to W. Samaras' notion that the City's portion could go down and asked what the team meant by being conservative. J. Drown stated that the city portion can go down, but this is not known until the city enters into a conversation with the MSBA. E. Kennedy inquired to why the portion may go down. J. Drown noted that the square footage is scaled down, and more spaces become eligible with more money reimbursed by the MSBA.

E. Kennedy asked if there will be a negotiation. M. Williams replied that the team will not know until final project budget scope when the City receives more feedback from the MSBA submission, how the reimbursement will be reflected. E. Kennedy asked what the duration of Schematic Design will be, and if it would be July 1. M. Williams stated that April 10, 2019 is when the MSBA Board approval would be scheduled for Schematic Design. The team would submit February of 2019. With the local appropriation, the state gives the city 120 days to appropriate funding for the project by mid-august, which is reflected in the project schedule. E. Kennedy asked if the loan order could be brought before the City Council in late spring, early summer. M. Williams replied yes. D. Guarriello noted that the team would definitively know when the OPM fills out the 3011 forms to determine the square footage ineligible. M. Williams added that a caveat to this is that the funding agreement will not be signed until eminent domain is complete, at which time the city would have to have complete control of the land. W. Samaras inquired if there would be negotiation with the MSBA. R. Bell stated that the Irish Auditorium at LHS is one of the spaces that may be ineligible currently. There may be an argument that making the existing facility smaller may cost more, which makes it prudent to renovate the existing space instead. J. Mason asked if at the end of schematic design, the City would have a number with the MSBA that could change during the design element. M. Williams noted that when the OPM submits form 3011 with the scope and budget, there may be some communication prior to the agreement; but once the Scope and Budget Conference is held, that would be the final number agreed upon with no more negotiations. D. Guarriello stated that the MSBA sets a total maximum grant amount which may fluctuate during construction; the number can change when change orders are deemed ineligible. She noted that at the end of schematic design, only 20% of the design will be complete, but Perkins Eastman will be further along in the process than the district and community may typically see for a project in Schematic Design. B. Barry asked if the

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gymnasium and Freshman Academy is the same size in options 2A and 3A. R. Bell noted that the size is the same for all three options.

IV. - Community Forum

Two members of the community spoke. E. Donoghue noted that the City Manager's Office is tasked with updating the project website to make sure that it is up to date and accurate. She mentioned that the office will work regularly with the consultants. M. Williams noted that the project design for a phased occupied demolition and construction that will take 21 months after the project is approved by the MSBA and the City. The start of the construction will begin August 1, 2021. Option 2A would take 4 years plus a summer, 3A would take five years and the New A would take 4 years.

B. Barry inquired if the extent of the rehabilitation is to gut the entire buildings or to keep much of the existing structure. R. Bell stated that this could depend on the design once the team gets into more detail. He explained that on a preliminary level, based on the wall thickness, the team will make judgments to take out a whole wall rather than to make many holes in the wall. R. Bell noted that the walls would not be recognizable. The idea is not to completely gut the buildings at this point, but a substantial gut is likely. The walls, stairs, corridors may remain as shells, or may be moved based on a number of variables. B. Barry inquired to if there would be all new systems in the buildings or if existing electric and heating systems will remain. R. Bell noted that there would be all new plumbing, heating and electric systems. J. Drown noted that the 1980 building will be entirely redone with new systems, right down to the wire.

V. - Vote on Recommended Preferred Option to the City Council for the PSR Submittal to the MSBA

E. Donoghue asked if there were any additional comments or concerns prior to the vote. B. Barry stated that this was his first meeting but he has followed the project all along. He noted that the SBC is charged with coming up with the best and most cost effective site to recommend to the City Council. He stated that he does not think that any of three options before the committee at the moment are the most effective, all have compromises in them. He mentioned that he sent a communication regarding looking into South Common prior to being on the committee. E. Kennedy motioned to vote to recommend a preferred option to the City Council.

City Manager Eileen Donoghue	Option 3A
Mayor William Samaras	Option 3A
Conor Baldwin	Option 3A

Maryann Ballotta	Option 3A
Brian Barry	Option 2A
David Beati	Absent
Head of School Marianne Busteed	Option 3A
James Cook	Option 3A
David Cunningham	Option 3A
James Donison	Option New A
Councilor Rodney Elliott	Absent
Gary Frisch	Option 3A
Robert Healy	Absent
Councilor Edward Kennedy	Option 3A
Superintendent Salah Khelfaoui	Option 3A
School Committee Member Connie Martin	Option 3A
Jay Mason	Option 3A
State Representative Rady Mom	Option 3A
Maria Sheehy	Option 3A
Richard Underwood	Option 3A
Michael Vaughn	Option 3A

1 Option 2A, 16 Option 3A, 1 Option New A. The School Building Committee approves Option 3A as the recommended preferred option to the City Council. So voted.

E. Kennedy motioned to adjourn, seconded by M. Vaughn. Meeting adjourned 7:25 PM.

Notes taken and certified by:

Heather Varney

HEATHER VARNEY
Notary Public
Commonwealth of Massachusetts
My Commission Expires Oct. 2, 2020

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Lowell City Council
Regular Meeting Minutes

Michael Q. Geary
City Clerk

Date: **January 2, 2018**
Time: **6:30 PM**
Location: **City Council Chamber, 375 Merrimack Street, 2nd Floor, Lowell, MA**

1. ROLL CALL

Roll Call showed 9 present.

Mayor Samaras presiding.

2. CITY CLERK
2.1. Minutes of Zoning SC December 12th; City Council Meeting December 12th, for acceptance.

In City Council, minutes read, **Motion** "To accept as amended and place on file" by C. Kennedy, seconded by C. Mercier. So voted.

3. COMMUNICATIONS FROM CITY MANAGER
3.1. Communication-Appoint Cormac Hondros-McCarthy to Sustainability Council.

In Council, **Motion** to adopt by C. Kennedy, seconded by C. Conway. Adopted per Roll Call vote 9 yeas. So voted. Mr. Hondros-McCarthy was present and thanked the Council.

4. ORDERS FROM THE CITY MANAGER
4.1. Order-60 day trial (various)

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Kennedy, seconded by C. Mercier. Adopted per Roll Call vote 9 yeas. So voted.

5. REPORTS (SUB/COMMITTEE, IF ANY)

None.

6. CITY COUNCIL - MOTIONS

6.1. C. Mercier - Req. City Mgr. allow people of Laotian descent to acquire a site at the JFK Plaza to construct their monument.

In City Council, seconded by C. Kennedy, referred to City Manager. Adopted per Roll Call vote 9 yeas. So voted. C. Mercier noted the need to make a formal motion and requested a roll call vote. C. Elliott noted the cultural importance with the motion.

6.2. C. Leahy - Req. City Council take a vote regarding the location of the preferred site of Lowell High School.

In City Council, C. Leahy requested the motion be withdrawn with no objections. So voted.

6.3. C. Elliott - Req. City Mgr. provide a report regarding the policy of City vehicles being taken home; the number of vehicles issued to employees; and the associated costs.

In City Council, seconded by C. Cirillo, referred to City Manager. So voted. C. Elliott noted the need to keep public updated about costs involved and the policy that is in effect.

6.4. C. Elliott - Req. City Mgr. provide a report on the expenditures to date regarding the feasibility study on Lowell High School and the amount reimbursed to the City from the MSBA.

In City Council, seconded by C. Mercier, referred to City Manager. So voted. C. Elliott commented on the need to have exact reimbursement figure from MSBA and to set that rate so has process moves along there would be a cleared picture of costs involved. C. Leahy noted the importance of costs in further feasibility studies.

6.5. C. Kennedy - Req. City Mgr. and the Mayor notify the Massachusetts School Building Authority that the City Council intends to explore changing Lowell's preferred project option for the Lowell High School building project.

In City Council, seconded by C. Conway, referred to City Manager. Adopted per Roll Call vote 9 yeas. So voted. C. Kennedy noted the MSBA meeting and correspondence with the City regarding future proceedings for change of location. C. Milinazzo questioned the wording of the motion. C. Kennedy outlined purpose of motion. C. Elliott commented on issues with delays in the project. C. Kennedy requested Roll Call vote.

6.6. C. Kennedy - Req. School Committee endorse City Council's intent to explore changing Lowell's preferred project option for the Lowell High School building project and direct the Superintendent to notify the Massachusetts School Building Authority of the School Committee's endorsement.

In City Council, seconded by C. Milinazzo, referred to City Manager. So voted. C. Kennedy commented on prior motion and the need for the School Committee to be involved in the same process.

7. ANNOUNCEMENTS

In City Council, **Motion** to suspend rules to discuss heating in public buildings by C. Elliott, seconded by C. Conway. So voted. M. Samaras commented heating issues in the high school. Manager Murphy noted the issues are present in high school and other public buildings. James Green (DPW – Head of Buildings) commented on the problems and the manner that they are being addressed. Manager Murphy noted that high school would be closed tomorrow to address heat issues. M. Samaras questioned procedures to protect citizens from the cold. Manager Murphy noted the safety operations in place to protect people from elements. C. Nuon questioned heating issue in public library. Mr. Green outlined those issues and their cause. C. Mercier noted the need to protect all citizens during these cold spells. C. Kennedy noted the unprecedented cold and its effect on all communities and commented on a long term solution to issues and that money may still be available in school budget to address quickly. C. Elliott questioned the closing of schools. C. Leahy questioned the arrival of parts for the equipment. Mr. Green noted the equipment was older and parts take a little longer to arrive. C. Leahy questioned if any reimbursement would be available for work being done. C. Milinazzo noted that they were doing a good job and questioned the status of the Amerisco contract. Manager Murphy noted he would update Council on contract.

8. ADJOURNMENT

In City Council, **Motion** to Adjourn by C. Kennedy, seconded by C. Mercier. So voted.

Meeting adjourned at 7:20 PM.

Michael Geary, City Clerk

A TRUE COPY ATTEST

Michael Q. Geary
City Clerk, Lowell, MA

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Lowell City Council
Regular Meeting Minutes

Michael Q. Geary
City Clerk

Date: **January 23, 2018**
Time: **6:30 PM**
Location: **City Council Chamber, 375 Merrimack Street, 2nd Floor, Lowell, MA**

1. ROLL CALL

Roll Call showed 9 present.

Mayor Samaras presiding.

2. CITY CLERK
2.1. Minutes of City Council Meeting January 16th, for acceptance.

In City Council, minutes read, **Motion** "To accept and place on file" by C. Mercier, seconded by C. Conway. So voted.

3. GENERAL PUBLIC HEARINGS
3.1. Loan Order-Additional Bridge Repairs.

In City Council, Given 2nd Reading, hearing held. **Motion** to adopt and refer to Clerk's Office for twenty (20) days by C. Elliott, seconded by C. Conway. Adopted per Roll Call vote, 9 yeas. So voted. Referred to City Clerk for twenty (20) days. Speaking in favor was Conor Baldwin (CFO) who outlined order and reasoning behind it. No Remonstrants. C. Elliott commented on effect of future grants on this financing package. Mr. Baldwin noted possible reduction in loan amount.

4. COMMUNICATIONS FROM CITY MANAGER
4.1. Motion Responses.

In City Council, **Motion** "To accept and place on file" by C. Mercier, seconded by C. Kennedy. So voted.

A) LHS Feasibility Cost – C. Milinazzo commented on related costs associated with Article 97 procedures. C. Kennedy commented on anticipated additional funding.

Manager Murphy commented on added fund and how the Massachusetts School Building Authority (MSBA) will dictate future costs. C. Elliott noted report gave picture of current position of the City and that accuracy in future costs will be important. Mr. Baldwin noted there are encumbered costs as well. C. Elliott questioned the reimbursement rate of the MSBA. Mr. Baldwin commented on current rates. C. Kennedy noted that remaining money could cover upcoming costs.

B) LTC – None.

C) Laotian Monument – C. Mercier commented on the report and noted that community members were meeting to raise funds for a monument.

D) High Water Costs – C. Leahy commented on estimated water bills going out. Mark Young (Ex. Director Water Utility) noted there remained a small number of estimated bills going out and that complaints are way down. C. Elliott commented on meter replacement and the use of technology to track overuse and as a safety measure. Mr. Young noted that a software upgrade will enable that to happen. C. Milinazzo questioned procedures of other cities and towns using water facility. Mr. Young commented on inter-municipal contracts in place. C. Leahy noted the oversight ability with the new meters. Mr. Young noted that would improve with implementation of new software.

E) Process of Appealing Unusually High Water and Sewer Bills – C. Kennedy questioned review process for bills. Mr. Young outlined that process along with appeal process. C. Kennedy questioned time frame for such appeals. C. Mercier questioned procedure for paying disputed bills.

F) Canal Bridge Update – C. Nuon noted report and the importance of the project. Claire Ricker (DPD) provided summary of project which included design; funding scheme; partnerships and bid procedures. Ms. Ricker noted one bridge to be eliminated to adjust to high cost associated with the project and that bridge would be bid separately. Manager Murphy commented on partnerships and the financial contributions and noted that project is fully funded with upcoming loan order. C. Nuon commented on any funding gaps. Manager Murphy noted closing those gaps and commented on availability of revolving grants. C. Cirillo commented on compliance with Complete Streets Program and having bridges be walkable and bicycle ready. Ms. Ricker commented on plans and the use of the right of way. C. Elliott commented on funding, timing and traffic management of the project. Ms. Ricker commented on traffic management and the ability to do all bridges at the same time. C. Elliott noted the advantages of having one contractor for entire project. C. Kennedy questioned bidding strategy. Ms. Ricker outlined the bidding process noting State and Federal procedures.

C. Kennedy noted loan order and commented on secure funding. C. Milinazzo noted preference for bidding procedure in place and commented on super versus infra structure. C. Elliott noted that change orders in these types of projects would increase costs dramatically. C. Leahy made note of current state of the Suffolk Street Bridge.

4.2. Informational
Informational:
G) Letter to Secretary Pollack re Rourke Bridge – C. Noun recognized the efforts of the State Delegation.

H) SolSmart Designation – Katherine Moses (DPD) commented on the recent recognition for energy saving programs.

I) Warming Center – Chief Winward (LFD) commented on safety operations during stretch of hazardous weather. C. Mercier commented on the number of people who benefited from the actions of the City. C. Kennedy questioned the amount of homeless that were helped. Chief Winward noted that assistance with homeless helped ease burdens on other shelters.

4.3. Communication-Accept Resignation of Nick Speros Lowell Cultural Council.

In City Council, **Motion** "To accept and place on file" by C. Kennedy, seconded by C. Cirillo. So voted.

4.4. Communication-Accept resignation of Quinn Lawrence-Sustainability Council.

In City Council, **Motion** "To accept and place on file" by C. Kennedy, seconded by C. Nuon. So voted. C. Nuon requested that letters of thanks be provided to former members.

4.5. Communication-Appoint Donna Scannell Richards to Pollard Memorial Library Board of Trustees.

In City Council, read, **Motion** to adopt by C. Milinazzo, seconded by C. Mercier. Adopted per Roll Call vote 9 yeas. So voted. C. Milinazzo recognized the prior contributions of the appointment. Ms. Richards was present and addressed the Council.

4.6. Communication-Reappoint Jo-Ann Keegan to Board of Health.

In City Council, read, **Motion** to adopt by C. Mercier, seconded by C. Nuon. Adopted per Roll Call vote 9 yeas. So voted.

4.7. Communication - City Manager request Out of State Travel (3) LPD.

In City Council, read, **Motion** to adopt by C. Kennedy, seconded by C. Nuon. Adopted per Roll Call vote 9 yeas. So voted.

5. REPORTS (SUB/COMMITTEE, IF ANY)
5.1. Wire Insp. - National Grid/Verizon NE - Request permission to install stub pole at corner of West Jenness and Rexford Streets.

In City Council, read, **Motion** to adopt and accept the accompanying order by C. Kennedy, seconded by C. Mercier. So voted.

C. Leahy commented on Acre Neighborhood meeting.

6. PETITIONS
6.1. Claims - (5) Property Damage.

In Council, **Motion** to refer to Law Department for report and recommendation by C. Kennedy, seconded by C. Mercier. So voted.

6.2. Misc. - Stephen Malagodi request permission to address Council regarding support of immigrant families.

In City Council, **Motion** "To accept and place on file" and refer to Environmental SC by C. Kennedy, seconded by C. Nuon. So voted. Mr. Malagodi addressed the body.

6.3. Misc. - Guillermina Rivera request installation of (1) handicap parking sign at 28B Cork Street.

In Council, **Motion** to refer to Traffic Engineer for report and recommendation by C. Conway, seconded by C. Elliott. So voted.

7. CITY COUNCIL - MOTIONS
7.1. C. Mercier - Req. City Mgr. review and explore other parcels of land in the downtown that may be available for the extension of Lowell High School.

In City Council, seconded by C. Elliott, referred to City Manager. Adopted per Roll Call vote 5 yeas, 4 nays (C. Cirillo, C. Kennedy, C. Nuon, M. Samaras). So voted. C. Mercier commented on recent referendum and eminent domain and cited some examples of parcels in the City. C. Kennedy opposed motion as it would send a mixed message to MSBA and requested Roll Call on matter. C. Milinazzo supported motion as to fact gathering but noted he was fully in support of Option 3 (eminent domain) process. C. Elliott noted it was the MSBA request to explore all options. C. Nuon noted referendum was clear and that he would not support motion and supported Option 3. C. Cirillo stated referendum was clear and Option 3 has her support. C. Conway noted referendum and election noted Option 3 was supported but supports motion for information purposes. C. Leahy noted motion just request information and commented on changes that could affect Option 3 which would include installation of swimming pool at new school. M. Samaras relinquished Chair to Vice-Chair Nuon at 7:45 PM. M. Samaras noted opposition to motion as it does not send clear message to MSBA and that other land would be very difficult to identify, further indicating his support of Option 3. C. Mercier commented it was suggestion from MSBA to review all options and that is purpose of motion. C. Nuon returned Chair to M. Samaras at 7:52 PM.

7.2. C. Mercier - Req. City Council name the basketball court at the Butler/Shaughnessy School on Gorham Street in honor of Lawrence M. Cavanaugh, Sr.

In City Council, seconded by C. Leahy, referred to City Manager/Board of Parks. Adopted per Roll Call vote, 9 yeas. So voted. C. Mercier noted it was a request by the family and commented on the many accomplishments of Mr. Cavanaugh and further requested that it be referred to Board of Parks with a roll call. C. Elliott commented on the honoree. C. Nuon noted it was an appropriate request.

7.3. C. Conway - Req. City Mgr. meet with Supt. of Police, Supt. of Schools and other interested parties to re-establish the "Safety Task Force".

In City Council, seconded by C. Elliott, referred to City Manager. So voted. C. Conway noted should always be an attempt to better things and commented on task force formation and history. C. Nuon noted task force is a manner to share information. C. Elliott noted there should be a pro-active approach to safety measures. M. Samaras commented on history and success of task force.

7.4. C. Conway - Req. City Mgr. update the Council regarding the status of the "Crime Stoppers Hotline".

In City Council, seconded by C. Mercier, referred to City Manager. So voted. C. Conway commented on effectiveness of the hotline.

7.5. C. Nuon - Req. City Mgr. have City Solicitor meet in an Executive Session with Council to discuss all current or potential legal action to be taken against the City and any legal challenges anticipated by the administration against any entity.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Nuon noted the need to have clear picture of litigation in the City. Manager Murphy indicated that has been past practice and will continue.

7.6. C. Nuon - Req. City Council have appropriate subcommittee hold meeting to determine methods on how to best protect senior residents from being victims of fraud; said meeting should include interested entities such as Elderly Commission and the Massachusetts Attorney General Office.

In City Council, seconded by C. Conway, referred to City Manager. So voted. C. Nuon commented on established entities that protect a certain segment of society.

7.7. C. Kennedy - Req. City Mgr. consider installing water detection devices at strategic locations in all municipal buildings throughout the City.

In City Council, seconded by C. Cirillo, referred to City Manager. So voted. C. Kennedy noted the need and availability of this protective element. C. Kennedy informed Council that added funding may be available to restore Pollard Library through State channels.

7.8. C. Elliott - Req. City Mgr. and Building Department provide a report regarding all abandoned homes in the City.

In City Council, seconded by C. Mercier, referred to City Manager. So voted. C. Elliott commented it was a good opportunity to expand on the Attorney General's program and run concurrent one by the City. C. Kennedy requested inventory list of properties so they have a clear picture of what it entails. Manager Murphy noted he would provide list and engage Inspectional Services. C. Leahy noted burnt homes should be included as well. C. Elliott questioned if there was an ordinance to cover burnt buildings. Manager Murphy noted such an ordinance could be crafted to protect homeowner who is pro-active in resolving issue. C. Kennedy noted that property on Clark Road should be investigated. M. Samaras relinquished Chair to Vice-Chair Nuon at 8:21 PM.

7.9. M. Samaras - Req. City Council establish subcommittees to address any issues regarding senior citizens and non-profit organizations in the City.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. M. Samaras noted the important word done by subcommittees and one for seniors and non-profits would be most beneficial. C. Mercier noted that they are good areas to involve subcommittees.

8. ANNOUNCEMENTS

In City Council, C. Kennedy requested that parking rates be posted in garages as stated prior.

9. ADJOURNMENT

In City Council, **Motion** to Adjourn by C. Mercier, seconded by C. Cirillo. So voted.

Meeting adjourned at 8:30 PM.

A TRUE COPY ATTEST

Michael Geary, City Clerk

Michael Q. Geary
City Clerk, Lowell, MA

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Lowell City Council
Regular Meeting Minutes

Michael Q. Geary
City Clerk

Date: **January 30, 2018**
Time: **6:30 PM**
Location: **City Council Chamber, 375 Merrimack Street, 2nd Floor, Lowell, MA**

1. ROLL CALL

Roll Call showed 9 present.

Mayor Samaras presiding.

C. Mercier requested moment of silence in darkened chamber for Louise Paquette and Karol J. Szafran.

2. MAYOR'S BUSINESS
2.1. Recognition - African Cultural Association's distinguished guest, Professor Plo Lumumba.

In City Council, **Motion** "To accept and place on file" by C. Kennedy, seconded by C. Cirillo. So voted. M. Samaras read biography of Professor Lumumba and presented Key to the City to him. Professor Lumumba addressed the body. C. Elliott noted that there would be a flag raising this week for the African community.

2.2. Recognition - Lowell Sustainability Council Green Award winners.

In City Council, **Motion** "To accept and place on file" by C. Milinazzo, seconded by C. Mercier. So voted. M. Samaras presented UMass-Lowell with the 2017 Green Design Award for the Pulichino Tong Business Center. Tom Dreyer accepted the award on behalf of the university and acknowledged his dedicated team. M. Samaras presented the Daley School Climate Change Club with the 2017 Community Leadership Award. Marisa Shea, teacher at school, introduced students in the club each of whom thanked the Council for the recognition.

3. CITY CLERK
3.1. Minutes Of City Council Meeting January 23rd, For Acceptance.

In City Council, minutes read, **Motion** "To accept and place on file" by C. Mercier, seconded by C. Nuon. So voted.

4. GENERAL PUBLIC HEARINGS
4.1. Order-Abandon Portion Of Newell Street. (Cont.)

In City Council, Given 2nd Reading, hearing continued from January 9th re-opened. Hearing held and closed. **Motion** to refer Clerk's Office for seven days and to City Manager for dispute resolution by C. Leahy, seconded by C. Elliott. So voted. Speaking in favor was Sarah Brown (DPD) and John Dowling. Speaking in opposition were Henry and Liz Tucker. C. Leahy questioned portion of abandonment as well as plowing. Manager Murphy noted that they could resolve plowing issues to move matter forward. C. Kennedy noted that only remaining issue is snow plowing.

5. COMMUNICATIONS FROM CITY MANAGER
5.1. Motion Responses:

In City Council, **Motion** "To accept and place on file" by C. Conway, seconded by C. Kennedy. So voted.

A) Deferred Maintenance Issues in All Municipal Buildings – Motion by C. Kennedy, seconded by C. Nuon to refer matter to Municipal Facilities SC. So voted. C. Cirillo noted the report. Conor Baldwin (CFO) outlined the expenses and funding for maintenance program. Manager Murphy commented on work being done to enhance preventive maintenance program. C. Elliott noted the need to stay on top of issues moving forward.

B) Pedestrian Crossing at School and Branch Streets – C. Leahy questioned if intersection was being redesigned. Manager Murphy noted that there were no redesign plans on property.

C) National Grid Tree Trimming – C. Nuon requested outline of the report. Tom Bellegarde (DPW) commented on the process and working with National Grid regarding tree trimming. Manager Murphy noted the pending retirement of Mr. Bellegarde. Each Councilor lauded the achievements and dedication of Mr. Bellegarde throughout the years. Mr. Bellegarde noted past and present City Councilors and Administrations recognizing their support and team work throughout his tenure.

D) 311 App – None.

E) Western Ave Studios Tax Assessments – Motion to refer to Finance SC by C. Milinazzo, seconded by C. Kennedy. So voted.

F) Stedman Street Sidewalk – None.

G) Traffic Signal at Intersection of Mammoth Road and 4th Ave – None.

H) East End Club Handicap Parking – C. Mercier confirmed that three spaces were in current 60 Day Trial Order. Nicolas Bosonetto (Traffic Engineer) noted that East End Club was provided the three spaces they requested. C. Mercier made reference to South Street request for signage. C. Leahy noted that parking issues with the Association for the Blind had been resolved.

I) Stop Sign at Intersection Havilah and Remington Streets – None.

J) Foch Street – C. Leahy requested updated list of streets to be accepted.

K) School Street and Laurel Street Traffic Signage – None.

L) Report of Abandoned Homes in the City – C. Elliott requested total number of abandoned homes in the City. C. Elliott commented on SWAT approach to identifying problem properties. Manager Murphy commented on the approach. C. Mercier commented on fire damaged properties in the City and that list should be upgraded as well. C. Elliott questioned why banks would not jump on a hot real estate market and transfer these properties. Manager Murphy noted that banks were not in the real estate business. Eric Slagle (Inspectional Services) commented on registration fees. C. Elliott noted that fees may be increased and that other communities should be polled to see how there fees are set.

M) Update on 29 Frothingham Street – C. Leahy questioned if property was a two or three-family. Manager noted that it was reverted to a two-family. C. Leahy noted the continued problem of number of vehicles on the street. C. Milinazzo questioned if assessment was for a three-family and was informed that it would be assessed in future as a two-family.

N) Plans to Revitalize Business Corridors – M. Samaras questioned the High Street corridor. Manager Murphy commented on the use of CBDG funds to help revitalize these areas.

5.2. Informational:
O) Inactive Voter List – Motion by C. Nuon, seconded by C. Milinazzo to refer to Ad Hoc Election Laws SC. So voted.

6. VOTES FROM THE CITY MANAGER
6.1. Vote-Appropriate $752,000 of Water Enterprise Fund Certified Retained Earnings.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Kennedy, seconded by C. Milinazzo. Adopted per Roll Call vote 9 yeas. So voted. C. Elliott requested information regarding vote. Mr. Baldwin outlined the vote and the purpose of the transfer. C. Milinazzo questioned if payments were going to interest or principal.

7. ORDERS FROM THE CITY MANAGER
7.1. Order-60 day trial (various).

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Kennedy, seconded by C. Mercier. Adopted per Roll Call vote 9 yeas. So voted.

8. ORDINANCES FROM THE CITY MANAGER
8.1. Ordinance-Amend C. 56 Personnel Ordinance.

In City Council, Given 1st Reading, **Motion** to refer to Public Hearing on February 13, 2018 at 7 PM by C. Elliott, seconded by C. Cirillo. So voted. C. Elliott questioned the purpose of the ordinance. Manager Murphy noted it was to protect employees of the City. C. Elliott questioned the need for coverage and requested more information be provided for the public hearing.

9. REPORTS (SUB/COMMITTEE, IF ANY)

None.

10. PETITIONS
10.1. Claims - (3) Property Damage.

In Council, **Motion** to refer to Law Department for report and recommendation by C. Mercier, seconded by C. Cirillo. So voted.

11. CITY COUNCIL - MOTIONS

11.1. C. Elliott - Req. City Mgr. apply for funding from Gateway Communities Program from the State for planting of trees program.

In City Council, seconded by C. Cirillo, referred to City Manager. So voted. C. Elliott noted the name was the Gateway Communities Program and it was important to quality of life in the City.

11.2. C. Elliott - Req. City Mgr. have proper department remove sign infrastructure at police garage on Middlesex Street.

In City Council, seconded by C. Mercier, referred to City Manager. So voted. C. Elliott noted the sign was an eyesore to the area.

11.3. C. Elliott - Req. City Mgr. initiate street/sidewalk/parking plan for Branch Street business corridor to coincide with Overpass construction.

In City Council, seconded by C. Conway, referred to City Manager. So voted. C. Elliott commented on the effectiveness of the business corridor.

11.4. C. Elliott/C. Leahy - Req. City Mgr. provide a report to the Finance SC regarding FY18 property valuation assessments; 3rd Quarter tax bills and abatement process; and budget impact on tax bills.

In City Council, no second needed, referred to City Manager. So voted. C. Elliott noted it was important to inform public and to have a discussion regarding impact on tax bills. C. Leahy noted the need to have an update on the process. C. Kennedy requested the Council be provided the information as well. Manager Murphy outlined abatement process to the public.

11.5. C. Leahy - Req. City Mgr. have DPD provide a report regarding the progress on finding a new location in the City for the Merrimack Valley Food Bank.

In City Council, seconded by C. Nuon, referred to City Manager. So voted. C. Leahy requested for report on any progress in finding new location.

11.6. C. Leahy - Req. City Mgr. work with Downtown Redevelopment SC to identify and enhance the types of businesses that DPD is attracting to the City.

In City Council, seconded by C. Nuon, referred to City Manager. So voted. C. Leahy noted the need to re-energize the efforts and to get an updated picture of the downtown as well as identifying the direction of the downtown.

11.7. C. Leahy - Req. City Mgr. work with DPD to establish and enhance marketing campaign for City of Lowell.

In City Council, seconded by C. Mercier, referred to City Manager. So voted. C. Leahy noted the importance to attract businesses and patrons to the City. C. Kennedy noted the need to make downtown a welcoming environment and as such requested report regarding cleaning and security measures in the parking garages. C. Elliott commented that there is no excuse for parking garages to be poorly cleaned and secured. C. Milinazzo commented on the security in the garages. C. Nuon noted it was an ongoing effort. C. Leahy noted that downtown is in good shape and that all efforts should be made to maintain that.

11.8. C. Mercier - Req. City Mgr. provide update regarding prior motion for Utopia Park including the status of it as well as the status of the Utopian Park Public Art Hydro Sculpture Project.

In City Council, seconded by C. Cirillo, referred to City Manager. So voted. C. Mercier provided overview of the park.

11.9. C. Milinazzo - Req. City Mgr. take all necessary steps to reinstate the Article 97 restrictions on the parks and open space land which had been removed during the Lowell High School/MSBA site selection process.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Milinazzo questioned how to unwind the restrictions removed from the property. C. Kennedy questioned the steps or legislation which must be used. Solicitor O'Connor commented on legislation being specific and also having a "sunset" clause in it and stated that a report would be provided.

11.10. C. Nuon - Req. City Mgr. provide a report regarding the scope of the project and parking proposal for the William Fidelity Investment dormitory project on Merrimack Street.

In City Council, seconded by C. Cirillo, referred to City Manager. So voted. Registered speaker, Patti Coffey (UML) addressed the body providing a statement from the University. C. Noun commented on the project in the Acre that would require Planning Board and Zoning Board of Appeal oversight and that there were some concerns on it.

C. Mercier commented on Planning Board oversight and her ability to oppose the proposal as a private citizen. Solicitor O'Connor acknowledged the right of a councilor to speak as an individual at meetings. C. Leahy noted project is not a good fit in the Acre. C. Cirillo noted neighborhood concerns.

11.11. C. Nuon - Req. City Mgr. provide a report regarding the status of the voting rights litigation against the City.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Nuon noted the importance of the issues and the public right to know. M. Samaras noted discussion should be had in Executive Session as it involves current litigation. C. Kennedy noted scheduled Executive Session.

11.12. C. Conway - Req. City Mgr. work with proper departments to ensure pedestrian safety and walk-ability at the intersection of Pawtucket Blvd. and the Rourke Bridge.

In City Council, seconded by C. Elliott, referred to City Manager. So voted. C. Conway noted residential concern and safety issue.

11.13. C. Kennedy/C. Cirillo - Req. City Mgr. meet with representatives from the OFO Bike Sharing Program and provide City Council with a report regarding the feasibility of establishing a bike sharing program in Lowell.

In City Council, no second needed, referred to City Manager. So voted. C. Kennedy noted the genesis of the motion and its tie into economic development. C. Kennedy noted Worcester's use of the program and outlined how it operated. C. Cirillo commented on the program and the company and further noted economic benefits that it could provide. C. Milinazzo noted Revere used similar program with much success. Manager Murphy noted he has communicated with the company and other similar ones and he would provide report to Council. Registered speakers, Geoffrey Koetsch and Lisa Arnold, addressed the Council.

12. CITY COUNCIL - EXECUTIVE SESSION

12.1. Executive Session - Update on matters of litigation public discussion of which could have a detrimental effect on the City's position.

In City Council, M. Samaras stated reason for Executive Session, **Motion** by C. Nuon, seconded by C. Kennedy to enter Executive Session for stated purpose (8:55 PM). Adopted per Roll Call vote, 9 yeas. So voted. M. Samaras stated that body would adjourn from the Executive Session.

13. ANNOUNCEMENTS

None.

14. ADJOURNMENT

In Executive Session, **Motion** to Adjourn by C. Mercier, seconded by C. Kennedy. So voted.

Meeting adjourned at 9:55 PM in Executive Session.

Michael Geary, City Clerk

A TRUE COPY ATTEST

Michael Q. Geary
City Clerk, Lowell, MA

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Lowell City Council
Regular Meeting Minutes

Michael Q. Geary
City Clerk

Date: **February 6, 2018**
Time: **6:30 PM**
Location: **City Council Chamber, 375 Merrimack Street, 2nd Floor, Lowell, MA**

1. ROLL CALL

Roll Call showed 9 present.

Mayor Samaras presiding.

C. Leahy requested moment of silence in darkened chamber for Ronald "Stu" Mulligan.

2. CITY CLERK
2.1. Minutes of City Council Meeting January 30th, for acceptance.

In City Council, minutes read, **Motion** "To accept and place on file" by C. Mercier, seconded by C. Nuon. So voted.

3. COMMUNICATIONS FROM CITY MANAGER
3.1. Motion Responses.

In City Council, **Motion** "To accept and place on file" by C. Kennedy, seconded by C. Conway. So voted.

A) Pedestrian Safety at Intersection of Pawtucket Blvd. and Rourke Bridge – C. Conway noted report and the increase of safety in that area.

B) Utopian Park Hydro Sculpture – C. Mercier noted matter had been referred to Parks & Recreation SC for further review and further information.

C) Merrimack Valley Food Bank – C. Leahy questioned location of the building and if Tanner Street was a possible fit. Andrew Shapiro (DPD) commented on the challenges with the location and logistics of the building. Maria Dickinson (DPD) noted the challenge with Tanner Street is possible contamination and would not be a long term fit. C. Elliott noted the need to keep business in Lowell. Mr. Shapiro commented on Co-Star software that tracks inventory of properties in the City, including City owned ones.

C. Elliott recognized efforts of the department. C. Mercier noted the number of calls for property in the City and noted Ramalho's Gym was seeking a new location.

D) Enhance Types of Businesses Attracted to the City – Registered speaker, Steven Malagodi, addressed the Council. C. Leahy noted that the Downtown Redevelopment SC would be addressing the matter with interested parties. C. Milinazzo noted that subcommittee was proper forum. C. Mercier questioned if there were a downtown coordinator. Mr. Shapiro noted it was done as a team effort. C. Mercier noted the need to have constant relationship with business owners in the City. C. Kennedy noted the need to address vacancies on the second and third stories of buildings downtown. Manager Murphy noted issues with those floors are often sprinkler systems and elevators. C. Kennedy requested report on the status of those vacancies.

E) Traffic Control at Howe Bridge – C. Mercier questioned the partnership with the UML police force. Superintendent Taylor (LPD) outlined the partnership and the responsibilities of each department. Supt. Taylor commented on the issues at this intersection in terms of blocking and pedestrian safety. C. Leahy noted that the University should explore the hiring of crossing guards to ensure student safety.

3.2. Informational

F) Ameresco Contract Scope and Savings – Motion by C. Milinazzo, seconded by C. Mercier to refer matter to Finance SC. So voted. C. Elliott noted subcommittee should review the savings. Kathleen Moses (DPD) commented on rate changes and how they are built into savings projections. **Motion** by C. Cirillo, seconded by C. Kennedy to develop maintenance program to ensure further energy savings. On motion, C. Elliott wanted to be informed of costs associated with the request. M. Kennedy offered friendly amendment to motion to refer to Manager for a cost analysis report. No objections so voted as amended.

3.3. Communication-Appoint Lisa Patenaude to Animal Advisory Committee as Resident Dog Owner.

In City Council, read, **Motion** to adopt by C. Mercier, seconded by C. Leahy. Adopted per Roll Call vote 9 yeas. So voted. Ms. Patenaude was present and thanked Council.

3.4. Communication-Reappoint Dr. William J. Galvin III to Board of Health.

In City Council, read, **Motion** to adopt by C. Elliott, seconded by C. Cirillo. Adopted per Roll Call vote 9 yeas. So voted.

4. VOTES FROM THE CITY MANAGER

4.1. Vote-Auth CM and or Board of Trustees of LMA proceed under MGL c.30 for Mgmt Svcs-5 yr term w an option for an additional 3 yr ext.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Kennedy, seconded by C. Elliott. Adopted per Roll Call vote 9 yeas. So voted. C. Elliott requested copy of the RFP in order to understand the scope of the contract. C. Mercier requested explanation of the vote. Manager Murphy outlined the vote and how it is structured to attempt to bring more acts to the venue. C. Nuon noted the importance of increased bookings at the venue. Conor Baldwin (CFO) commented on the RFP language concerning increased bookings and maintenance of the facility. C. Kennedy requested time line for selection of the management team. C. Milinazzo commented on the lease with the theatre group. Manager Murphy noted he would furnish report to body. C. Elliott noted that there has been operating deficits associated with the building. Mr. Baldwin commented on spending done at the site. Manager Murphy noted the use of grant money to assist in the maintenance of the building. C. Kennedy noted a common complaint is that there are not enough shows booked.

4.2. Vote-Auth CM and or Treasurer proceed under MGL 30B for Banking Services-5 year term.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Milinazzo, seconded by C. Nuon. Adopted per Roll Call vote 9 yeas. So voted. C. Milinazzo questioned the use of procurement committee in the City. Mr. Baldwin outlined process for procurement in the City noting certification of employees for that purpose. C. Milinazzo questioned if there was an employee of the City who was certified in construction regarding procurement of contracts.

4.3. Vote-Transfer 5,000 to fund building inspector overtime.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Mercier, seconded by C. Cirillo. Adopted per Roll Call vote 9 yeas. So voted.

5. REPORTS (SUB/COMMITTEE, IF ANY)

None.

6. PETITIONS

6.1. Claims - (2) Property Damage.

In Council, **Motion** to refer to Law Department for report and recommendation by C. Kennedy, seconded by C. Nuon. So voted.

6.2. Misc. - National Grid request City Council grant easement on Franklin Street for electric distribution construction.

In Council, **Motion** to refer to Law Department for report and recommendation by C. Kennedy, seconded by C. Conway. So voted.

6.3. Misc. - Carol LaMarche request installation of (1) handicap parking sign at 16 Methuen Street.

In Council, **Motion** to refer to Traffic Engineer for report and recommendation by C. Kennedy, seconded by C. Cirillo. So voted.

6.4. Misc. - Diane Allen request installation of (1) handicap parking sign in front of 14 Mt. Washington Street.

In Council, **Motion** to refer to Traffic Engineer for report and recommendation by C. Kennedy, seconded by C. Nuon. So voted.

7. CITY COUNCIL - MOTIONS

7.1. C. Mercier - Req. City Council support naming the Parks Department building on Stedman Street in honor of Thomas R. Bellegarde for his many years of service.

In City Council, seconded by C. Nuon, referred to City Manager. Adopted per Roll Call vote, 9 yeas. So voted. C. Mercier commented about the accomplishments and dedication of Mr. Bellegarde.

7.2. C. Conway - Req. City Council create subcommittee on Municipal Health Insurance.

In City Council, seconded by C. Leahy, referred to City Manager/City Solicitor. Substitute **Motion** adopted per Roll Call vote, 9 yeas. So voted. C. Conway noted the need to provide information to employees on an important issue. M. Samaras relinquished Chair to Vice-Chair Nuon at 7:28 PM. C. Milinazzo noted that issue should be before Finance SC. **Substitute Motion** by M. Samaras, seconded by C. Milinazzo to refer matter to City Manager and City Solicitor for review in light of Plan E Charter. On substitute motion, C. Elliott noted it made sense to review and to provide information. C. Kennedy requested information from the City Solicitor. Solicitor

O'Connor noted she would conference with maker of motion and fashion a response. Vice-Chair Nuon returned Chair to M. Samaras at 7:35 PM.

7.3. C. Cirillo - Req. City Mgr. provide a report regarding cost analysis of recycling pick-up every week comparing it to current cost pick-up of every other week; in addition provide possible options for residents that bins overflow i.e. a second bin for people who request it.

In City Council, seconded by C. Nuon, referred to City Manager. So voted. Registered speaker, Peter Martin, addressed the Council. C. Cirillo outlined motion noting dedication to recycling. C. Elliott requested information on costs associated with proposal. Manager Murphy outlined the recycling system in the City. C. Leahy commented on contract and noted that a second drop-off location is needed in the City. C. Kennedy noted that some changes could be made to current procedures. C. Mercier noted report would be helpful in making decisions.

7.4. C. Cirillo - Req. City Mgr. provide a report regarding Lowell Memorial Auditorium; said report to include updates on proposals for a management company due February 22nd, money allotted in budget for use and upgrades including larger loading dock doors and restrooms, and efforts being made to increase its use.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Cirillo noted the interest and prior discussion regarding the auditorium and that there is an increased need to attract superior acts to the venue.

7.5. C. Leahy - Req. City Mgr. provide update regarding latest meeting with the Massachusetts School Building Authority.

In City Council, seconded by C. Mercier, referred to City Manager. So voted. C. Leahy requested information to clarify the meeting and to outline path moving forward. C. Kennedy noted that the media misrepresented the context of the meeting and outlined his perspective of it indicating a working meeting which touched on many issues. C. Milinazzo noted his frustration with the administration regarding this project and was not supportive of the administration and their approach. C. Elliott indicated that prior remarks were out of order and that the blame game will not get results. C. Elliott noted that it is the MSBA process and that needs to be followed so that a new high school becomes a reality. C. Mercier noted the delays and how they were caused throughout the process. C. Kennedy questioned why options were presented during that meeting. Manager Murphy noted that options were provide as per request. M. Samaras relinquished Chair to Vice-Chair Nuon at 8:00 PM. C. Kennedy commented on revised

plans and money needed to be spent moving forward at this phase. C. Conway noted media clouded the issue and that there is a clear indication that Option 3 is going to be used. C. Conway questioned status of the School Building Committee and their schedule. Manager Murphy noted schedule and notice of the meetings. M. Samaras noted that the editorial in the local paper was not accurate and in addition voiced his displeasure with Perkins/Eastman and Skanska work on the project. M. Samaras note the need to have resolution with those vendors. C. Leahy noted the need to identify path ahead in terms of all issues including pool and fieldhouse and that our consultants need better leadership. C. Leahy noted that during further negotiations with Perkins/Eastman and Skanska they would need to own their part of the delays in the project. C. Cirillo noted that consultants should have the team covering the project that was part of the original contract. Michael McGovern (Asst. City Manager) noted the team has not changed and indicated that they have been on other projects while this one was idle. C. Elliott noted Option 3 included a pool and that they were behind because option was changed. C. Kennedy noted that meetings should be held a night to ensure full opportunity for attendance. C. Kennedy noted that costs should be limited if all they are doing is eliminating the pool from Option 3. C. Milinazzo commented on pool and field house issues and that there was no need to start the whole process over. M. Samaras commented on issues with consultants' ability to convey information to the public and that they are the experts on this project. C. Cirillo questioned membership on the School Building Committee. Manager Murphy noted how membership was developed. Vice-Chair Nuon returned Chair to M. Samaras at 8:32 PM.

7.6. C. Conway - Req. City Mgr. work with DCR to install appropriate signage at the entrance to Trotting Park Road directing forest vistitors to the parking area.

In City Council, seconded by C. Leahy, referred to City Manager. So voted. C. Conway noted motion was evident.

8. ANNOUNCEMENTS

In City Council, C. Kennedy requested suspension of rules to place motion on floor. No objections. **Motion** by C. Kennedy, seconded by C. Elliott to request Educational Partnerships SC explore Lowell be designated as a global learning City. So voted.
In City Council, C. Mercier provided treasurer's report on the Friends of the Council on Aging Committee outlining the work they have done to ease costs in that department.
In City Council, C. Leahy recognized Mr. George Duncan and the Enterprise Bank on their 30th Year Anniversary. Manager Murphy noted he would send formal recognition.

9. ADJOURNMENT

In City Council, **Motion** to Adjourn by C. Kennedy, seconded by C. Nuon. So voted.

Meeting adjourned at 8:45 PM.

Michael Geary, City Clerk

A TRUE COPY ATTEST

Michael Q. Geary
City Clerk, Lowell, MA

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Lowell City Council
Regular Meeting Minutes

Michael Q. Geary
City Clerk

Date: **February 27, 2018**
Time: **6:30 PM**
Location: **City Council Chamber, 375 Merrimack Street, 2nd Floor, Lowell, MA**

1. ROLL CALL

Roll Call showed 8 present, 1 absent (C. Conway).

M. Samaras presiding.

C. Mercier requested moment of silence in darkened chamber for Rita Burke and Atty. James Flood.

M. Samaras requested that Item #2.2 be taken out of order with no objections. So voted.

M. Samaras recognized Women's Week.

2. MAYOR'S BUSINESS
2.1. Discussion - Process and Procedure for selection of City Manager.

In City Council, M. Samaras opened the discussion regarding the process. Mary Callery (HR Director) outlined the prior procedure for selection of City Manager. **Motion** to proceed in the same manner as prior selection by C. Kennedy, seconded by C. Cirillo. C. Kennedy noted that there could possibly be less advertising for the position but process should be followed. Amended **Motion** by C. Mercier, seconded by C. Leahy to post only in-house and offer position to interested party to be interviewed. Defeated per Roll Call vote, 2 yeas, 6 nays (C. Cirillo, C. Elliott, C. Kennedy, C. Milinazzo, C. Nuon, M. Samaras), 1 absent (C. Conway). So voted. On amended motion C. Mercier noted that it was not proper or fair to proceed with a full process when it is apparent that there is a person who will fill the positon. C. Cirillo noted that there is a need for a process. C. Leahy noted that interested parties would be a good fit for the position and that the need does not exist for an exhaustive search. C. Milinazzo noted support of motion and questioned if there was a legal impediment to such a selection. C. Nuon noted preference for an open process noting there may be

additional candidates suited for the position. C. Kennedy noted if there are to be interviews there must be candidates that would only come through posting the position and that would be a fair and complete process. C. Elliott noted the need for the process and prior process was fair and that it should be done in a timely manner. C. Mercier noted that a candidate seems to assured of the position so resources should not be done in furtherance of filling that position. C. Cirillo noted that each applicant would be given equal measure. C. Milinazzo noted the need for a fair process. Substitute **Motion** by C. Kennedy, seconded by C. Cirillo to post position until March 14, 2018 on City website and Mass Municipal Association website; resumes sent to Council out of which top 3 selections will be sent to Ms. Callery by March 20, 2018; interviews scheduled by Ms. Callery for the week of March 25, 2018. Adopted per Roll Call vote 7 yeas, 1 nay (C. Mercier), 1 absent (C. Conway). So voted.

2.2. Recognition - Lowell High School 2018 Boys Track Team.

In City Council, C. Elliott recognized the team for their State Championship and other noted accomplishments. Coach Ouellette and other senior team members commented on the accomplishments and the support that they have received.

3. CITY CLERK
3.1. Minutes of Parks & Recreation SC February 13th; City Council Meeting February 13th, For Acceptance.

In City Council, minutes read, **Motion** "To accept and place on file" by C. Kennedy, seconded by C. Milinazzo. So voted.

4. COMMUNICATIONS FROM CITY MANAGER
4.1. Motion Responses.

In City Council, **Motion** "To accept and place on file" by C. Elliott, seconded by C. Mercier. So voted.

A) Class Action Suit Regarding Opioids – C. Elliott requested item be delayed one week as the law firm which will be representing the City would be present.

4.2. Informational
B) Downtown Business Meeting – Manager Murphy noted that a meeting was scheduled for March 5th at Enterprise Bank. C. Milinazzo noted that the Downtown Redevelopment SC would meet sometime after that meeting.

C) NIBRS Five Year Comparison – Manager Murphy noted the favorable statistics with

the crime rate. Supt. Taylor (LPD) commented on the report and the progress that has been made over the past five years. Supt. Taylor commented on the recent shootings in the City. C. Elliott questioned the status of gun buy-back programs. Supt. Taylor noted the success of the program in getting guns off the street. C. Leahy questioned Lowell High School safety awareness and protection of students. Supt. Taylor outlined current active shooter program. C. Noun commented on recent shootings. M. Samaras noted that the stats show progress and that mental health issues need to be addressed as well. Supt. Taylor noted that grant money would be sought after to assist with mental health issues and its relationship with crime.

4.3. Communication-Accept Resignation of Zachary Ware from Sustainability Council.

In City Council, **Motion** "To accept and place on file" by C. Mercier, seconded by C. Nuon. So voted.

4.4. Communication-Reappoint George Villaras to Historic Board.

In City Council, read, **Motion** to adopt by C. Kennedy, seconded by C. Cirillo. Adopted per Roll Call vote 8 yeas, 1 absent (C. Conway). So voted.

4.5. Communication - City Manager request Out of State Travel (4) LPD.

In City Council, read, **Motion** to adopt by C. Mercier, seconded by C. Cirillo. Adopted per Roll Call vote 8 yeas, 1 absent (C. Conway). So voted.

5. REPORTS (SUB/COMMITTEE, IF ANY)
5.1. Educational Partnerships SC February 27, 2018.

In City Council, C. Kennedy provided report regarding designating Lowell as global learning city. C. Kennedy noted process would be beginning with a learning festival in the City in April. **Motion** to accept the report as a report of progress and to refer to City Manager for organization of the festival by C. Kennedy, seconded by C. Cirillo. So voted.

C. Leahy requested suspension of rules to take Item #7.7 out of order and to allow speakers on the matter. No objections. So voted.

6. PETITIONS
6.1. Claims - (2) Property Damage.

In Council, **Motion** to refer to Law Department for report and recommendation by C. Nuon, seconded by C. Mercier. So voted. C. Mercier noted claims came out of condition of Swan Street which should have been addressed earlier. Manager Murphy commented he would supply Council with plans for accepted streets.

6.2. Misc. - Colonial Gas d/b/a National Grid request license for storage of flammables (19,600 gals. 50/50 water/glycol Cl. IIIB; AST) at 333 School Street.

In City Council, Given 1st Reading, **Motion** to refer to Public Hearing on March 13, 2018 at 7 PM by C. Mercier, seconded by C. Nuon. So voted.

6.3. National Grid - Request installation of heavy duty handhole and electric conduit in front of 43 Market Street.

In City Council, Given 1st Reading, **Motion** to refer to Public Hearing on March 20, 2018 at 7 PM by C. Nuon, seconded by C. Cirillo. So voted.

7. CITY COUNCIL - MOTIONS

7.1. C. Cirillo - Req. City Mgr. explore feasibility of implementing "Paws to Read" program at the Pollard Memorial Library.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Cirillo outlined the program that is used throughout the Country and that does not exist in Massachusetts.

7.2. C. Cirillo - Req. City Mgr. provide a report regarding road and sidewalk upgrades in Acre; in and around Mt. Washington St., Merrimack St. (Sizzling Kitchen) and Market St.

In City Council, seconded by C. Nuon, referred to City Manager. So voted. C. Cirillo noted motion originated from Acre Neighborhood meeting. C. Leahy commented on work being done on sidewalks in the City.

7.3. C. Cirillo - Req. City Mgr. provide a report regarding Spring cleaning procedures throughout the City.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Cirillo requested procedures and noted that businesses should be involved with clean-up as well.

7.4. C. Elliott - Req. City Mgr. provide a status report regarding inspection of multi-family units per City ordinance.

In City Council, seconded by C. Nuon, referred to City Manager. So voted. C. Elliott requested update of the process and that appears to be going well and that it is important to keep housing stock in good condition.

7.5. C. Kennedy - Req. City Mgr. instruct Perkins Eastman include an active shooter detection system (similar to Methuen High School system) as part of the plans for the new high school and recommend that the Superintendent of Schools consider similar systems for other schools within the City.

In City Council, seconded by C. Mercier, referred to City Manager. So voted. C. Kennedy noted need for safety and the sign of the times and that there should be an exploration of the costs and best system. C. Kennedy noted it should be explored district wide and that the MSBA may be able to reimburse. C. Mercier commented on the system in Methuen noting it was costly and that other safety measures should be examined as well. C. Cirillo noted expenses should not hinder safety. C. Elliott noted the need to take measures and questioned current status of Safety Task Force.

7.6. C. Kennedy - Req. City Mgr. instruct the Law Department to begin procedures and preparation necessary for the eminent domain taking of 75 Arcand Drive.

In City Council, seconded by C. Cirillo, **Motion** to delay for one week by C. Kennedy, seconded by C. Cirillo. So voted. C. Kennedy noted the need to layout process so that City may be prepared before next MSBA meeting in June. C. Mercier questioned costs and the need to know before any votes are taken. C. Milinazzo noted that motion address the need to know the costs before vote. C. Elliott requested more information via a report for cleared instructions and suggested a friendly amendment to the motion. C. Kennedy noted motion was satisfactory as to such information. Manager Murphy indicated a report is forthcoming from Law Department. C. Kennedy noted that such a report would be furnished quickly and noted he was in favor of delaying matter for one week.

7.7. C. Leahy - Req. City Mgr. place Duren Avenue on paving list for 2018.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Leahy noted need for repairs. Residents of the street spoke on matter and provided pictures and petition for the Council. C. Elliott noted ability to increase funding for repairs pursuant to "Complete Streets Program". Manager Murphy noted program does

help with such funding and that street would be added to paving lists. C. Kennedy requested complete paving lists for review.

7.8. C. Leahy - Req. Neighborhoods SC begin discussion regarding residential parking program throughout the City.

In City Council, seconded by C. Cirillo, referred to Neighborhoods SC. So voted. C. Leahy noted issue needs updated discussion.

8. ANNOUNCEMENTS

In City Council, Manager Murphy noted that the Pollard Memorial Library would open on February 28th; that the VFW Highway would be closed for repairs; and Thorndike Street work would be done at night to ease congestion.

9. ADJOURNMENT

In City Council, **Motion** to Adjourn by C. Mercier, seconded by C. Cirillo. So voted.

Meeting adjourned at 8:11 PM.

Michael Geary, City Clerk

A TRUE COPY ATTEST

Michael Q. Geary
City Clerk, Lowell, MA

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Lowell City Council
Regular Meeting Minutes

Michael Q. Geary
City Clerk

Date: **March 6, 2018**
Time: **6:30 PM**
Location: **City Council Chamber, 375 Merrimack Street, 2nd Floor, Lowell, MA**

1. ROLL CALL

Roll Call showed 9 present.

M. Samaras presiding.

2. CITY CLERK
2.1. Minutes Of Education Partnerships SC February 27th; City Council Meeting February 27th, For Acceptance.

In City Council, minutes read, **Motion** "To accept and place on file" by C. Cirillo, seconded by C. Elliott. So voted.

3. UNFINISHED BUSINESS
3.1. C. Kennedy - Req. City Mgr. instruct the Law Department to begin procedures and preparation necessary for the eminent domain taking of 75 Arcand Drive.

In City Council, seconded by C. Conway, referred to City Manager. Adopted per Roll Call vote 8 yeas, 1 nay (C. Mercier). So voted. C. Kennedy noted report provided and that matter was first taken up one week prior. C. Elliott noted the need for the report to fully understand the process and that it cleared up many matters. C. Nuon noted the report provided information and that is was very detailed. C. Mercier noted she would not support the process but information including estimated costs for relocation should be made available.

4. COMMUNICATIONS FROM CITY MANAGER
4.1. Motion Responses.

In City Council, **Motion** "To accept and place on file" by C. Mercier, seconded by C. Nuon. So voted.

A) Lowell Memorial Auditorium – C. Cirillo noted report and requested an update. Conor Baldwin (CFO) outlined the report along with future funding on the facility. Manager Murphy commented on language of the RFP to include ability to attract more and larger acts. C. Elliott noted the different approach in selection of a management company. Mr. Baldwin commented on striving to attract more to the venue. C. Conway questioned members of the review committee. Manager Murphy noted it was being developed and welcomed suggestions. C. Kennedy noted individuals who have been involved with the operations of the facility. C. Leahy commented on allocation of risk with the management contract. Manager Murphy noted the importance of having a financially stable management company in place.

B) Lowell Car Wash – C. Mercier noted the progress being made and the involvement of the owners.

C) Union Lowell, LLC Private Dormitory – Registered speaker, Armand Hebert, addressed the body. C. Nuon noted the report adding that the Planning Board is a separate entity and independent and the decision was based on parking issues for the project. C. Mercier noted that unions were welcomed on the job but the project was not a good fit in that neighborhood as it did not fit many zoning requirements. C. Mercier noted that many development conditions would be placed on any projects of this nature.

D) Timeline for the Eminent Domain Process - Registered speaker, Armand Hebert, addressed the body. M. Samaras questioned veracity of the statements from the speaker. C. Kennedy commented on prior vote and the report provided.

E) Spring Cleaning Procedures – C. Cirillo noted report and requested update. Jim Troup (DPW) outlined the cleaning procedures and the schedule. C. Kennedy commented on efforts of outside groups in assisting with cleanup. Mr. Troup noted there would be contact with these groups.

F) Cost Analysis Recycling – C. Cirillo commented on the report. Gunther Wellenstein (Recycling Dir.) noted the process for extra items to be recycled. Manager Murphy noted that an audit would help educate public regarding suitable items to be recycled. C. Mercier commented on the costs involved with recycling. C. Elliott noted need to establish a drop area downtown. Mr. Wellenstein noted challenges with downtown drop area. C. Leahy commented on added site along with costs associated with same. Mr. Wellenstein noted challenges and how information is dispersed to the public.

G) Greening Communities Program – C. Elliott noted the response and the availability of free money. C. Mercier commented on prior cutting and replacement program.

Yovani Baez-Rose (DPD) commented on tree removal in the City. C. Conway questioned costs for removing trees and if there were a maintenance plan to keep trees healthy. Manager noted he would provide such information. C. Leahy commented on tree removal and replacement especially along Merrimack Street.

H) Meters for Homeless – C. Cirillo recognized the complexities of the program. Manager Murphy laid out legal challenges of the program.

4.2. Communication-Appoint Nathan Freehling to Veterans Commission.

In City Council, read, **Motion** to adopt by C. Elliott, seconded by C. Nuon. Adopted per Roll Call vote 8 yeas, I absent (C. Conway). So voted. Mr. Freehling was present and thanked the Council.

5. VOTES FROM THE CITY MANAGER

5.1. Vote-Apply, Accept, Expend Grant from Mass. Div. of Energy Resources Green Communities Div. for 250,000.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Cirillo, seconded by C. Mercier. Adopted per Roll Call vote 8 yeas, 1 absent (C. Conway). So voted. C. Mercier commented on the deadline and the fact that the City did not have to match the grant. Katherine Moses (DPD) outlined the vote, the application process and the use of the money.

5.2. Vote-Auth. Mgr. Ex. License Agreement with Top Donut 2018-2021.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Mercier, seconded by C. Leahy. Adopted per Roll Call vote 9 yeas. So voted. C. Leahy questioned the number of spaces leased. Manager Murphy noted it was extending and existing lease with no added spaces and the City would have the ability to end lease at any time.

5.3. Vote-Authorize Mgr. Ex. Temporary License Agreement with Mark Van Der Hyde for a public art project.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Cirillo, seconded by C. Elliott. Adopted per Roll Call vote 9 yeas. So voted. C. Cirillo commented on the work of the artist. C. Elliott noted the artist as well. Mr. Van Der Hyde was present and thanked the Council.

5.4. Vote-Transfer 15,000 to fund appraisals for 75 Arcand Drive.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Kennedy, seconded by C. Conway. Adopted per Roll Call vote 9 yeas. So voted. M. Samaras requested information on the process. Manager Murphy outlined procedure for soliciting quotes and that they would be open to all vendors.

5.5. Vote-Transfer 36,000 to fund appraisals for Rt. 38 widening project.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Elliott, seconded by C. Kennedy. Adopted per Roll Call vote 9 yeas. So voted.

5.6. Vote-Transfer 54,000 for additional expenses at Lowell Police Dept.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Conway, seconded by C. Nuon. Adopted per Roll Call vote 9 yeas. So voted. C. Elliott questioned reasons for the transfer. Mr. Baldwin noted the items that were needed in the department.

6. ORDERS FROM THE CITY MANAGER
6.1. Order-60 day trial (various).

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Conway, seconded by C. Milinazzo. Adopted per Roll Call vote 9 yeas. So voted.

6.2. Bond Sale Premium Application Order.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Kennedy, seconded by C. Elliott. Adopted per Roll Call vote 9 yeas. So voted.

7. ORDINANCES FROM THE CITY MANAGER
7.1. Ordinance-Create one new grant position Resource Room Navigator and establish salary in the Career Center of Lowell.

In City Council, Given 1st Reading, **Motion** to refer to Public Hearing on March 20, 2018 at 7 PM by C. Conway, seconded by C. Kennedy. So voted.

7.2. Ordinance-Create one Systems and Project Specialist position and establish salary in the Police Dept.

In City Council, Given 1st Reading, **Motion** to refer to Public Hearing on March 20, 2018 at 7 PM by C. Nuon, seconded by C. Cirillo. So voted. C. Elliott questioned proposed

position. Manager Murphy noted that move would be additional police officer on the street. Mr. Baldwin noted it would be included in next year's budget.

8. REPORTS (SUB/COMMITTEE, IF ANY)
8.1. Neighborhoods SC March 6, 2018.

In City Council, C. Cirillo provided report noting the attendance and the discussion with neighborhood leaders, parking programs and rooming houses in the City. C. Leahy noted the use of City lots for parking in the Back Central neighborhood. C. Leahy commented on strengthening the rooming house ordinance. David Koch, representative of Back Central Neighborhood Group addressed the body. **Motion** to accept the report as a report of progress by C. Kennedy, seconded by C. Mercier. So voted.

9. PETITIONS
9.1. Claims - (4) Property Damage.

In Council, **Motion** to refer to Law Department for report and recommendation by C. Mercier, seconded by C. Cirillo. So voted.

9.2. Misc. - CH LH CrossPoint Owners, LLC request license for additional storage of flammables (7,500 gals. AST Fuel Oil #2/Diesel II) at 900 Chelmsford Street.

In City Council, Given 1st Reading, **Motion** to refer to Public Hearing on March 20, 2018 at 7 PM by C. Nuon, seconded by C. Milinazzo. So voted.

10. CITY COUNCIL - MOTIONS
10.1. C. Cirillo - Req. City Mgr. Distribute To All Condominium Associations Multiple Copies Of The Parking Rates To Be Given To Residents Who Pay For Garage Parking. This Is So Each Individual Residence Will Be Given A Copy To Make It Clear To Them What Rate/Senior Discount Rate They Are Responsible For. Also, Direct The Parking Director To Post The Rates Each Parking Garage In A Very Easily Accessible Viewing Area.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Cirillo noted the need to provide the information. C. Kennedy commented on sending notices out with other City forms. Manager Murphy noted each listed user of the garages will receive the rates as well.

M. Samaras requested Items #10.6 and 10.12 be taken out of order as they pertain to similar issue. No objections. So voted.

10.2. C. Cirillo - Req. City Mgr. Provide A Report For Budgeted Cost And Implementation Regarding These Options For Bicycle Safety: 1. Painting And Upkeep Of Bicycle Lanes Throughout The City. 2. Bike Lanes Being Segregated By A Barrier For Added Safety.

In City Council, seconded by C. Kennedy, referred to City Manager. Adopted per Roll Call vote 8 yeas, 1 nay (C. Mercier). So voted. Registered speakers, Mindy Dopler Nelson and Kevin Soleil (per letter read into record by Charles Arnold), addressed the Council. C. Cirillo noted the remarks of the speakers and the need for safety precautions. C. Mercier noted the need to stripe but was not in favor of barriers throughout the City and requested Roll Call on matter. C. Kennedy noted that there are different types of barriers that could be used. C. Elliott noted it was only a request for information.

10.3. C. Cirillo - Req. City Mgr. Provide A Report Updating The City Council Regarding The Lowell Complete Streets Policy Enacted on August 11, 2015 And What Goals For Travel Mode Distribution, i.e. Bicycle Routes, Have Been Developed And/Or Achieved In Accordance With The Policy Within The Stated Incremental Five Year Time Period Which Will End On August 11, 2020.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. Registered speaker, Mindy Dopler Nelson, addressed the Council. C. Cirillo noted the need for such a report.

10.4. C. Elliott - Req. City Mgr. appoint a public safety personnel/security professional to the School Building Committee to ensure safety issues are addressed at high school.

In City Council, seconded by C. Mercier, referred to City Manager. So voted. C. Elliott C. Elliott noted need to be diligent regarding security at the high school. C. Leahy questioned inner working of the School Building Committee.

10.5. C. Elliott/C. Nuon - Req. Board of Parks consider re-naming Clemente Park to Palin Park and ensure stone is re-located to the new Roberto Clemente Field at Komanzelis Park.

In City Council, C. Elliott withdrew the motion with no objections.

10.6. C. Mercier - Req. City Mgr. have proper department post parking garage fees; especially for seniors (62 and up) monthly rate of $26; and in addition if

there are remaining excise tax bills to be delivered include said rate list in the billing envelope.

In City Council, seconded by C. Leahy, referred to City Manager. So voted. C. Mercier noted the need to get information posted, including the rates for the elderly. C. Kennedy noted posting should be in a highly visible public place. C. Elliott questioned parking during snow emergency.

10.7. C. Mercier - Req. City Mgr. provide an update regarding the need for a supervisor for the CO-OP Team.

In City Council, seconded by C. Nuon, referred to City Manager. So voted. C. Mercier commented on the team and the effort put forth to combat the issues. Manager Murphy noted ordinance would be drafted to create the position.

10.8. C. Nuon - Req. City Mgr. have DPD organize a business group representing entities along the Branch and Middlesex Street business corridors.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Nuon noted it was Branch Street and that need to organize is critical. C. Leahy noted that City would be assisting with organization and would not be running the group. C. Kennedy noted the City could help to organize and let them run it themselves. C. Elliott noted need for business leaders to gather.

10.9. C. Nuon - Req. City Mgr. have Elections Department and any other department work with UML and the Lowell Plan regarding developing a plan to increase civic engagement in the City.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Nuon noted that civic engagement is important and that it goes beyond voting. Registered speaker, Mary Turaff, addressed the Council.

10.10. C. Nuon - Req. City Mgr. have LPD provide a report regarding any incidents occurring at the Edge Dormitory Project.

In City Council, seconded by C. Kennedy, referred to City Manager. Adopted per Roll Call vote, 8 yeas, 1 nay (C. Leahy). So voted. C. Nuon requested report since the facility opened. C. Leahy questioned the reasoning behind the motion and could not support it. C. Nuon noted the need for information on a private dormitory. C. Kennedy noted the need to see if there are concerns. C. Conway questioned if request was prudent. City Solicitor O'Connor noted there would be no legal issue with the request.

C. Elliott questioned if issues exist. C. Kennedy noted the request is to see if information exist.

10.11. C. Nuon - Req. City Mgr. have proper department improve sidewalk conditions along the Branch and Middlesex Street business corridors.

In City Council, seconded by C. Cirillo, referred to City Manager. So voted. C. Nuon noted the need for accessibility in a business corridor.

10.12. M. Samaras - Req. City Mgr. instruct the proper department make all city parking garage rates (including any senior or other applicable discounts) readily available to constituents in both digital and printed formats that can be shared.

In City Council, seconded by C. Mercier, referred to City Manager. So voted. M. Samaras noted motion has been addressed.

11. CITY COUNCIL - EXECUTIVE SESSION
11.1. Executive Session - Hear a complaint pursuant to Exemption (a)(1).

In City Council, M. Samaras stated the need for the session no longer is needed and withdrew matter from agenda. No objection. M. Samaras stated that an Ad Hoc Subcommittee would be established to review our current rules regarding the order and decorum of City Council meetings. C. Mercier offered thanks for altered seating.

12. ANNOUNCEMENTS

In City Council, C. Mercier noted recent meeting of business leaders in downtown at Enterprise Bank and commented on the positive results. C. Leahy questioned when information would be forthcoming regarding St. Patrick Day events.

13. ADJOURNMENT

In City Council, **Motion** to Adjourn by C. Kennedy, seconded by C. Nuon. So voted.

Meeting adjourned at 8:21 PM.

A TRUE COPY ATTEST

Michael Geary, City Clerk

Michael Q. Geary
City Clerk, Lowell, MA

Office of the City Clerk
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Lowell City Council
Regular Meeting Minutes

Michael Q. Geary
City Clerk

DRAFT

Date: **May 1, 2018**
Time: **6:30 PM**
Location: **City Council Chamber, 375 Merrimack Street, 2nd Floor, Lowell, MA**

1. ROLL CALL

Roll Call showed 9 present.

M. Samaras presiding.

C. Mercier requested moment of silence in darkened chamber for John Levicki.

2. CITY CLERK
2.1. Minutes of Finance SC April 24th; City Council Meeting April 24th, for acceptance.

In City Council, minutes read, **Motion** "To accept and place on file" by C. Leahy, seconded by C. Mercier. So voted.

3. COMMUNICATIONS FROM CITY MANAGER
3.1. Communication from City Manager - Motion Responses

In City Council, **Motion** "To accept and place on file" by C. Mercier, seconded by C. Kennedy. So voted.

A) Motion Response - EV Charging Stations – C. Cirillo noted the report. Nick Navin (Parking Director) spoke to the report noting charging ports costs were covered by grants. C. Cirillo noted that Tesla would provide free stations for the City. C. Leahy questioned if best use for the garages. C. Mercier noted that there should be a cost to use these stations as well. C. Conway questioned the costs to run these stations each year. Mr. Navin noted the cost estimates. C. Conway noted that the usage should be audited. Mr. Navin commented on the use of the stations. C. Kennedy noted that more stations made available would increase use.

B) Motion Response - Bike Sharing – C. Kennedy commented on the report noting that any plans to implement programs should be accelerated. C. Cirillo noted the need to move quicker on the program. Manager Donoghue noted that they would move quicker with the partners they have in the program. C. Kennedy noted the benefit of having pilot program.

C) Motion Response - Emergency Management Plans – Motion by C. Nuon, seconded by C. Milinazzo to refer report to Public Safety SC for further discussion. So voted. C. Leahy noted the plan and the people involved with same. Fire Chief Winward (LFD) noted that training on emergency plans has begun.

D) Motion Response - Condition of Fire Stations 2018 – C. Nuon noted the detailed report commenting on the needed repairs. Fire Chief Winward commented on plans to facilitate the repairs. **Motion** by C. Leahy, seconded by C. Nuon to refer report to Municipal Facilities SC. So voted. C. Elliott commented on the use of capital money for repairs. Conor Baldwin (CFO) noted FY19 Capital Budget money for repairs. C. Elliott questioned use of in-house labor for repairs. Mr. Baldwin noted they were used if the scope of the work was not extensive.

E) Motion Response - Civic Engagement – C. Nuon commented on the report. Eda Matchak (Elections) commented on Flagship Partnerships and outlined process for hiring poll workers. C. Elliott noted the importance of outreach from the Elections Department.

F) Motion Response - Arts Funding – C. Cirillo commented regarding investments by the City in the Arts. Mr. Baldwin noted the support of events through the operating budget.

3.2. Communication from the City Manager
School Building Committee Recommendation Vote Relative To The Preferred Option For The Lowell High School Project.

In City Council, **Motion** "To accept and place on file" by C. Kennedy, seconded by C. Cirillo. So voted. C. Kennedy requested that Item #4.1 be taken up at this time. No objections. So voted. Manager Donoghue provided a report regarding the meeting outlining the attendance and the presentation made. Robert Bell (Perkins/Eastman) presented the three options along with costs regarding proposed location of the new high school. Joe Drown (Perkins/Eastman) noted the costs for each option. Manager Donoghue stated that the School Building Committee recommended Option 3A to the body. C. Elliott noted his support of Option 3A. Registered speaker, Mike Dillon, Jr.

addressed the body. C. Mercier noted her choice had been passed over and that she continued to not support the eminent domain taking on Arcand Drive. **Motion** by C. Mercier, seconded by C. Elliott to "lock in" costs has established and presented by consultants for the selected option. Defeated per Roll Call vote, 2 yeas, 7 nays (C. Cirillo, C. Conway, C. Kennedy, C. Leahy, C. Milinazzo, C. Nuon, M. Samaras). So voted. C. Cirillo commented on the phasing of construction. C. Kennedy noted motion was premature as to costs. C. Leahy noted that costs have been projected into the future. C. Milinazzo noted it was too early to lock into costs. C. Nuon noted final number would come with final design. Manager Donoghue noted estimates done were projections into the schematic design phase of the project. C. Conway noted it was too early and that the number could be decreased by the end of all design. C. Kennedy requested roll call on the matter. C. Mercier questioned time frame for eminent domain taking. Manager Donoghue outlined the process noting the need to appraise site and produce relocation costs for the site and noting the process would be complete before funding phase of the project. C. Elliott commented on fluctuating number involved from the beginning of the process and the oversight of costs is important for this project. Manager Donoghue commented on the MSBA formula and the restraints that it presents with financial limits that are used. C. Milinazzo requested that reviews should be made regarding when and what adjustments to the cap have been made by the MSBA. **Motion** to proceed to vote on preferred location of the high school C. Kennedy, seconded by C. Nuon. So voted. On first ballot roll call 8 in favor of Option 3A; 1 in favor of Option 2A (C. Mercier). Option 3A declared preferred option. So voted.

3.3. Communication-Accept Resignation of Geoffrey McDonough-Conservation Commission.

In City Council, **Motion** "To accept and place on file" by C. Kennedy, seconded by C. Conway. So voted.

3.4. Communication-Appoint Aurora Erickson to Historic Board as Historical Society Representative.

In City Council, read, **Motion** to adopt by C. Mercier, seconded by C. Nuon. Adopted per Roll Call vote 9 yeas. So voted.

3.5. Communication-Appoint Troy Depeiza to Historic Board as Architect Rep.

In City Council, read, **Motion** to adopt by C. Kennedy, seconded by C. Mercier. Adopted per Roll Call vote 9 yeas. So voted.

3.6. Communication - City Manager request Out of State Travel (1) LPD.

In City Council, read, **Motion** to adopt by C. Mercier, seconded by C. Cirillo. Adopted per Roll Call vote 9 yeas. So voted.

4. VOTES FROM THE CITY MANAGER

4.1. Vote-Approve a preferred site for Lowell High School.

In City Council, **Motion** to proceed to vote on preferred location of the high school C. Kennedy, seconded by C. Nuon. So voted. On first ballot roll call 8 in favor of Option 3A; 1 in favor of Option 2A (C. Mercier). Option 3A declared preferred option. So voted. See prior discussion under Item #3.2.

4.2. Vote-Transfer 45,000 to fund school priority projects.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Kennedy, seconded by C. Nuon. Adopted per Roll Call vote 9 yeas. So voted. C. Mercier questioned which projects money would be used on. Jim Donison (DPW) noted the identified projects mostly centered on the high school. C. Milinazzo commented on the funding source. Mr. Baldwin noted funding was from a salary account that had available funds due to current vacancies. C. Mercier noted the need for Manager to meet with department heads after each Council meeting.

4.3. Vote-Transfer 50,000 to provide design engineering services.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Kennedy, seconded by C. Milinazzo. Adopted per Roll Call vote 7 yeas, 1 nay (C. Leahy), 1 absent (C. Elliott). So voted. C. Leahy requested information from the Manager. Manager Murphy noted funding needed to conclude schematic design portion of the high school project. Mr. Baldwin noted amendments needed to contract to conclude scope of work. Michael McGovern (Asst. City Manager) commented on additional work needed by the consultants. C. Leahy noted he would not support the transfer. C. Mercier questioned if funds were coming from Manager's Contingency Fund. Mr. Baldwin noted that it was from that fund and that would exhaust fund for budget year.

4.4. Vote-Transfer 53,525 provide new police vehicle.

In City Council, Read twice, full reading waived with no objections, **Motion** to adopt by C. Leahy, seconded by C. Nuon. Adopted per Roll Call vote 9 yeas. So voted. C. Leahy requested information regarding transfer. Deputy Supt. Richardson (LPD) commented on the funds noting the cost savings for such a transfer. C. Leahy noted the need to use vehicles once they are no longer in service.

5. ORDINANCES FROM THE CITY MANAGER

5.1. Ordinance-Amend Ch. 290 Entitled Zoning by extending existing INST zoning district to include all of 39 Plymouth Street.

In City Council, Given 1st Reading, **Motion** to refer to Planning Board for report and recommendation on May 21, 2018 and to Public Hearing before City Council on May 29, 2018 at 7 PM by C. Kennedy, seconded by C. Nuon. So voted.

6. CONSTABLE BONDS

6.1. Communication - City Mgr. request approval of Constable Bond for Jason Burke.

In City Council, read, **Motion** to adopt by C. Elliott, seconded by C. Nuon. Adopted per Roll Call vote 9 yeas. So voted.

7. REPORTS (SUB/COMMITTEE, IF ANY)

7.1. Technology & Utilities SC May 1, 2018.

In City Council, M. Samaras noted meeting had been cancelled. C. Elliott reported out on Animal Advisory Committee noting the attendance and the establishment of a task force to assist with the regulation of animals in the City.

8. PETITIONS

8.1. Claim - (1) Property Damage.

In Council, **Motion** to refer to Law Department for report and recommendation by C. Mercier, seconded by C. Nuon. So voted.

8.2. Comcast Cable request to amend license for additional storage of flammables 7,380 gals. Diesel (3,690 gals. Class II, AST; 3,690 gals. Class II, AST) at 12 Washer Street.

In City Council, Given 1st Reading, **Motion** to refer to Public Hearing on May 15, 2018 at 7 PM by C. Kennedy, seconded by C. Cirillo. So voted. C. Leahy questioned petition.

8.3. National Grid - Req. permission to install 1,720 feet of new gas main from 1852 Middlesex Street to Chelmsford town line.

In City Council, Given 1st Reading, **Motion** to refer to Public Hearing on May 22, 2018 at 7 PM by C. Kennedy, seconded by C. Milinazzo. So voted. C. Cirillo questioned the location.

8.4. National Grid - Req. permission to relay existing 2,100 feet of gas main on Chelmsford Street between Howard and Liberty Street.

In City Council, Given 1st Reading, **Motion** to refer to Public Hearing on May 22, 2018 at 7 PM by C. Elliott, seconded by C. Cirillo. So voted. C. Milinazzo disclosed relative lived on indicated street.

8.5. Misc. - Broadway Street Holdings, Inc. (Atty. George Theodorou) request zoning amendment to extend Urban Mixed Use (UMU) district into parcels located at 232 and 234 Mt. Vernon Street; also change of zoning to Light Industrial (LI) at parcels located at 268 and 294 Mt. Vernon Street and 5 Farnham Street.

In Council, **Motion** to refer to Law Department to draft proper ordinance by C. Conway, seconded by C. Nuon. So voted.

9. CITY COUNCIL - MOTIONS

9.1. C. Elliott - Req. City Mgr. have proper department explore repair of Constance Drive and placing same on paving list.

In City Council, seconded by C. Nuon, referred to City Manager. So voted. C. Elliott noted street needed attention.

9.2. C. Elliott - Req. City Mgr. report on status regarding training and procedures in the Lowell Police Department.

In City Council, seconded by C. Nuon, referred to City Manager. So voted. C. Milinazzo requested his motion Item #9.9 be taken out of order as they are similar. No objections. So voted. C. Elliott noted serious incidents have happened and a report on training is needed. Manager Donoghue noted there would be a discussion upon the return of Supt. Taylor (LPD).

9.3. C. Nuon - Req. City Mgr. and Human Resource Dept. work with Supt. of Schools and School H/R department to explore means to attract a diverse pool of candidates for future employment openings.

In City Council, seconded by C. Milinazzo, referred to City Manager. So voted. C. Nuon noted need to be diverse and commented on efforts of school administration. C. Kennedy commented on prior efforts of the School Committee and suggested a formula of using high school for recruitment purposes. M. Samaras commented on possible initiatives. C. Leahy noted the existing programs in the City. C. Conway commented that there may need to be a more creative approach to the issue.

9.4. C. Nuon - Req. City Mgr. have Human Resource Department develop a recruitment policy and procedure for hiring purposes.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Nuon noted request was in line with prior motion. C. Leahy questioned development of an existing policy. C. Nuon noted need to do a better job. Manager Donoghue noted she would report on motion.

9.5. C. Nuon - Req. City Mgr. take necessary means to repair potholes on Marlborough Street.

In City Council, seconded by C. Mercier, referred to City Manager. So voted. C. Nuon noted the request speaks for self.

9.6. C. Nuon - Req. City Mgr. work with various departments (i.e. Elections Dept.) to begin listening sessions through the Ad Hoc Election Laws SC regarding Voting Rights litigation.

In City Council, seconded by C. Cirillo, referred to City Manager. So voted. C. Nuon noted it was a delicate issue as litigation is pending but he was interested in setting up listening session throughout City.

9.7. C. Leahy - Req. City Mgr. have proper department review the work being done regarding gas repairs throughout Belvidere.

In City Council, seconded by C. Mercier, referred to City Manager. So voted. C. Leahy requested scheduling update as well as oversight of repairs being done by the entity after work completed. C. Elliott noted frustration in the community when repair is not done properly. C. Mercier questioned if performance bond could be tied with the projects. C. Conway questioned what department is charged with oversight of

contractors. Manager Donoghue noted Engineer Department oversees these projects. C. Kennedy noted the need to research what the public utility future schedule entails. Mr. McGovern commented on future work being done by the utilities. C. Leahy noted all work being done should be consistent with each contractor.

9.8. C. Mercier - Req. City Mgr. honor the commitment by the City to replace sidewalks on Humphrey Street.

In City Council, seconded by C. Kennedy, referred to City Manager. So voted. C. Mercier commented that work done was satisfactory but sidewalks were not completed as promised to the neighborhood. C. Kennedy noted the need for replacement or repair of the area.

9.9. C. Milinazzo - Req. City Mgr. provide a report regarding the 2016 incident in the police detention center as well as all training received by civilian employees since 2013.

In City Council, seconded by C. Nuon, referred to City Manager. So voted. C. Milinazzo noted that there may be a need for an Executive Session on the matter due to circumstances present. C. Kennedy requested updated report regarding State accreditation of the Police Department. C. Nuon noted the importance of training in the department.

10. ANNOUNCEMENTS

In City Council, C. Mercier requested suspension of rules to discuss Manning/Ventura Park. No objection. **Motion** by C. Mercier, seconded by C. Elliott to refer discussion of above to Parks & Recreation SC for review. So voted. C. Noun noted event for Center of Hope and Healing. C. Elliott noted upcoming fundraisers for Lowell High School ROTC.

11. ADJOURNMENT

In City Council, **Motion** to Adjourn by C. Kennedy, seconded by C. Leahy. So voted.

Meeting adjourned at 8:30 PM.

A TRUE COPY ATTEST

Michael Geary, City Clerk

Michael Q. Geary
City Clerk, Lowell, MA

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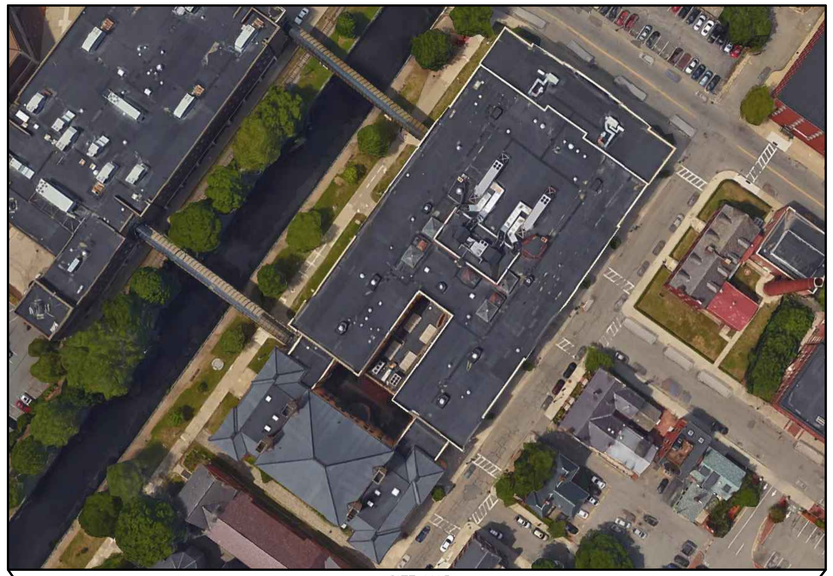
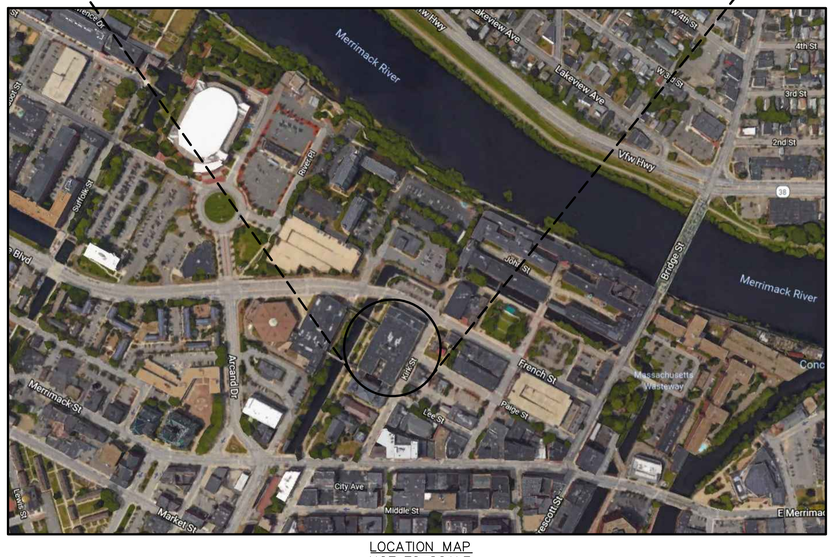


SITE MAP
NOT TO SCALE



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□103	□□□□□□ □□□□ □□□□ □□□N
□□01	□□□□□□
□□02	□□□□□□
□□03	□□□□□□
□□04	□□□□□□
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□□06	□□□□□□
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Engineers and Planners

163 □□□□□ □□□□□ □□ □□ □□M□□□□□M□
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PROJECT
ROOF REPLACEMENT AND ASSOCIATED WORK
AT THE LOWELL HIGH SCHOOL
50 FATHER MORISETTE BLVD
LOWELL, MA 01852

OWNER
CITY OF LOWELL
375 MERRIMACK STREET
LOWELL, MA 01852

NO.	DATE	DESCRIPTION	BY

PROJECT NO.	833360
CADD FILE	833360 G100
DESIGNED BY	RCO
DRAWN BY	JVL
CHECKED BY	SRM
DATE	2/2/2018
DRAWING SCALE	NOT TO SCALE

GRAPHIC SCALE

SHEET TITLE

COVER SHEET

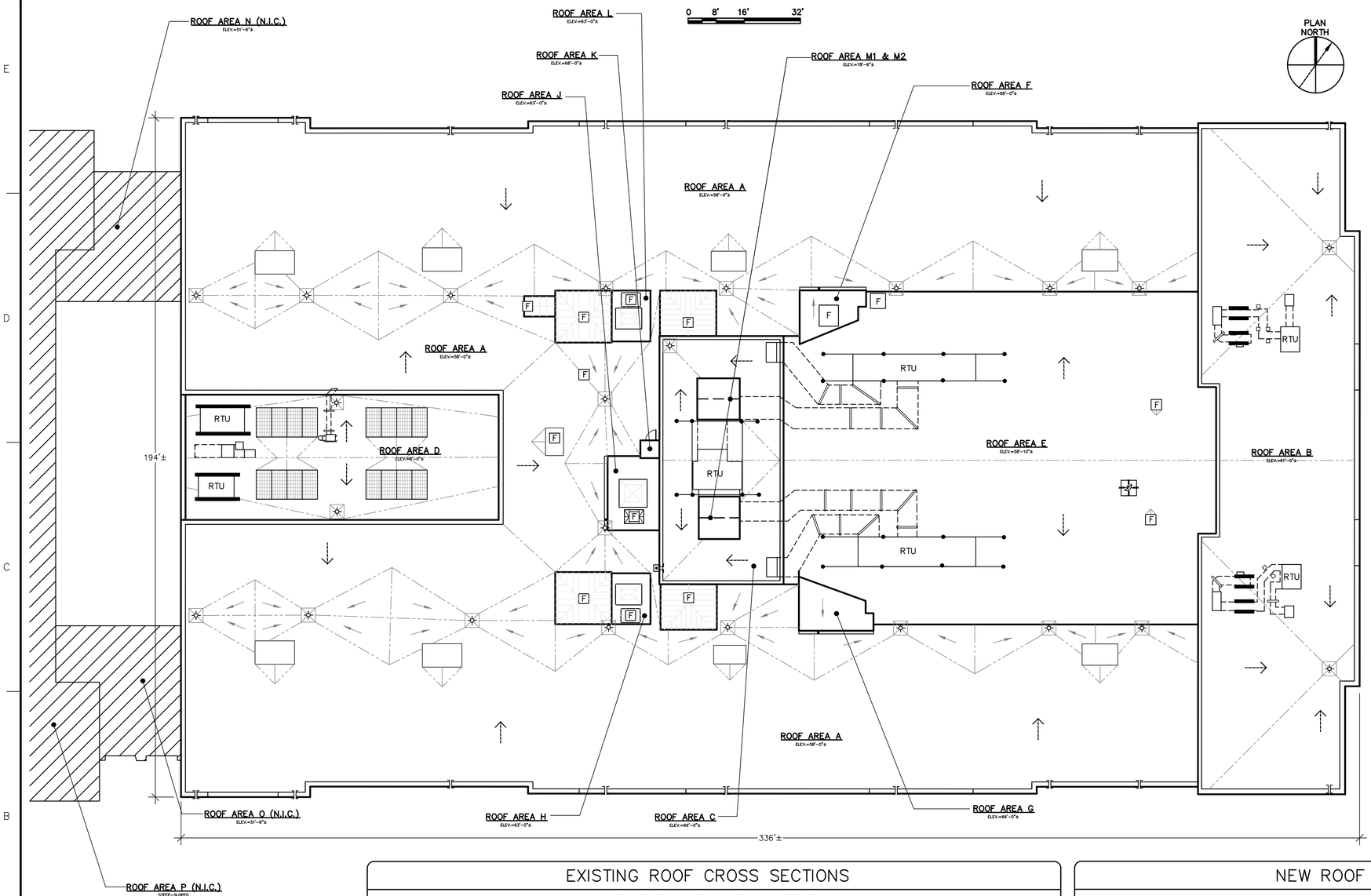
DRAWING NO.

G100

CONCEPTUAL TAPERED INSULATION PLAN

SCALE: 1/16"=1'-0"

0 8' 16' 32'



CONCEPTUAL TAPERED INSULATION PLAN NOTES

1. THIS TAPERED INSULATION PLAN DOES NOT SHOW ALL ROOF PENETRATIONS AND ROOF WORK. REFER TO ROOF AREA PLANS FOR ROOF PENETRATIONS AND ADDITIONAL INFORMATION.
2. THE INFORMATION SHOWN ON THIS DRAWING HAS BEEN COMPILED FROM VARIOUS SOURCES, AND MAY NOT REFLECT THE ACTUAL CONDITIONS AT THE TIME OF CONSTRUCTION.
3. HATCH PATTERNS ARE FOR REPRESENTATION ONLY AND SHOULD NOT BE USED AS A MEANS FOR QUANTIFYING.
4. CONCEPTUAL TAPERED INSULATION LAYOUT TO PROVIDE MINIMUM INSULATION HEIGHTS AT ROOF TO WALL AND PERIMETER LOCATIONS. SPECIFIC TAPERED LAYOUT TO BE DEVELOPED BY THE CONTRACTOR IN CONJUNCTION WITH THE INSULATION SUPPLIER. ALL ROOF PENETRATIONS ARE NOT SHOWN ON THIS CONCEPTUAL LAYOUT; PROVIDE CRICKETS BEHIND UNITS TO PROMOTE DRAINAGE. CONTRACTOR TO VERIFY EXISTING ROOF DECK SLOPE AS THE WORK PROGRESSES.
5. ADJUSTMENTS TO WOOD BLOCKING HEIGHTS AND CONFIGURATIONS OF FLASHINGS TO CONFORM TO TAPERED INSULATION LAYOUT IS THE RESPONSIBILITY OF THE CONTRACTOR. NO ADDITIONAL COSTS WILL BE ALLOWED TO THE CONTRACTOR IF PROPOSED DETAIL CONFIGURATIONS ARE ALTERED. ALL DETAILS ARE SHOWN SCHEMATICALLY.
6. THE STRUCTURAL SLOPE AT ROOF AREAS TO RECEIVE NO TAPERED INSULATION (ROOF AREAS A, B, C, D, E, F & G) IS ASSUMED TO BE A MINIMUM OF 1/4" PER FOOT. FIELD MODIFICATIONS MAY BE REQUIRED TO PREVENT PONDING.
7. THERE IS ASSUMED TO HAVE NO STRUCTURAL SLOPE AT ROOF AREAS TO RECEIVE 1/4" PER FOOT TAPERED INSULATION (ROOF AREAS F & G). FIELD MODIFICATIONS MAY BE NECESSARY TO PREVENT PONDING.
8. ANY PONDING WATER ENCOUNTERED AFTER THE INSTALLATION OF THE NEW ROOF SYSTEM WILL BE ADDRESSED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER. PONDING WATER IS DEFINED AS 1/2" OR GREATER OF STANDING WATER WITHIN A 100 SQUARE FOOT AREA AFTER A 24 HOUR PERIOD.
9. REVIEW OF THE EXPOSED ROOF DECKS BY THE CONTRACTOR WILL BE REQUIRED PRIOR TO THE PLACEMENT OF THE INSULATION SYSTEM TO DETERMINE POTENTIAL UNFORESEEN LOW AREAS.
10. COORDINATE FINAL WOOD BLOCKING HEIGHTS WITH THAT OF THE FINAL TAPERED INSULATION HEIGHTS. WOOD BLOCKING HEIGHTS SHALL REMAIN CONSTANT AROUND EACH INDIVIDUAL ROOF AREA. REFER TO THE CONSTRUCTION DETAILS FOR ADDITIONAL INFORMATION. PROVIDE TAPERED EDGE STRIPS AT ROOF EDGES TO PROVIDE A SMOOTH TRANSITION.

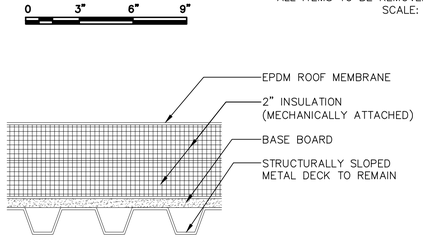
LEGEND

- ROOF EDGE
- PARAPET
- RIDGE/HIP LINE
- DUCT/RTU SUPPORT
- DUCTWORK ABOVE ROOF
- F — EXHAUST FAN
- RTU — ROOF TOP UNIT
- SKYLIGHT
- EXISTING STRUCTURAL SLOPE
- CRICKET SLOPE
- VALLEY/CRICKET IN INSULATION
- ROOF AREA NOT IN CONTRACT
- F — GLASS SKYLIGHT WITH FAN
- ROOF DRAIN WITH 4'-0"X4'-0" SUMP; # INDICATES DIAMETER
- SCUPPER W/ DOWNSPOUT
- GUTTER W/ DOWNSPOUT
- SATELLITE DISH
- DUNNAGE
- WOOD SLEEPER
- ROOF ANTENNA
- DOOR
- ELEV.=_'-_"± — ROOF ELEVATION RELATIVE TO GRADE WHICH IS ASSUMED TO BE ZERO FEET
- N.I.C. — NOT IN CONTRACT
- ABANDONED SHAFT W/ METAL HOOD
- OVERFLOW SCUPPER
- TRANSLUCENT SKYLIGHT PANELS

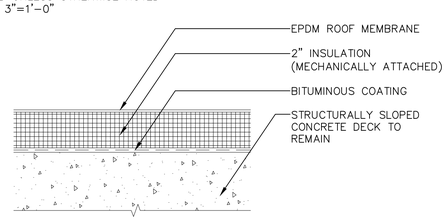
EXISTING ROOF CROSS SECTIONS

ALL ITEMS TO BE REMOVED UNLESS OTHERWISE NOTED
SCALE: 3"=1'-0"

0 3" 6" 9"



EXISTING ROOF CROSS SECTION AT ROOF AREA B

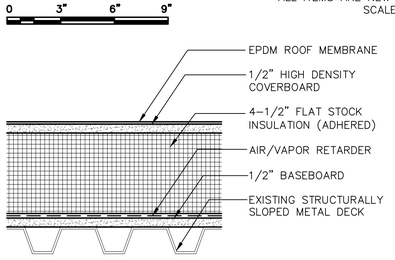


EXISTING ROOF CROSS SECTION AT ROOF AREAS A, C, D, E, F, G

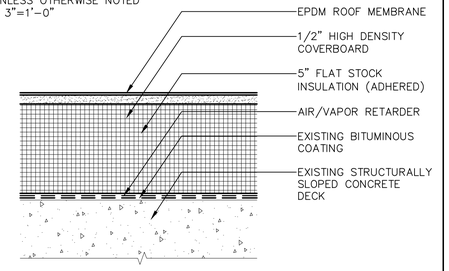
NEW ROOF CROSS SECTIONS

ALL ITEMS ARE NEW UNLESS OTHERWISE NOTED
SCALE: 3"=1'-0"

0 3" 6" 9"



NEW ROOF CROSS SECTION AT ROOF AREA B



NEW ROOF CROSS SECTION AT ROOF AREAS A, C, D, E, F, G

GALE
G□□ A□□□□□□□, I□□□
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163 □□□□□ □□□□□ □□ □□ □□M□□□□□M□
0218□ 781.33.□646□ 781.33.□6467
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□□□M□□□N

PROJECT
ROOF REPLACEMENT AND ASSOCIATED WORK
AT THE LOWELL HIGH SCHOOL
50 FATHER MORISETTE BLVD
LOWELL, MA 01852

OWNER
CITY OF LOWELL
375 MERRIMACK STREET
LOWELL, MA 01852

NO.	DATE	DESCRIPTION	BY

PROJECT NO.	833360
CADD FILE	833360 G101
DESIGNED BY	RCO
DRAWN BY	JVL
CHECKED BY	SRM
DATE	2/2/2018
DRAWING SCALE	AS NOTED

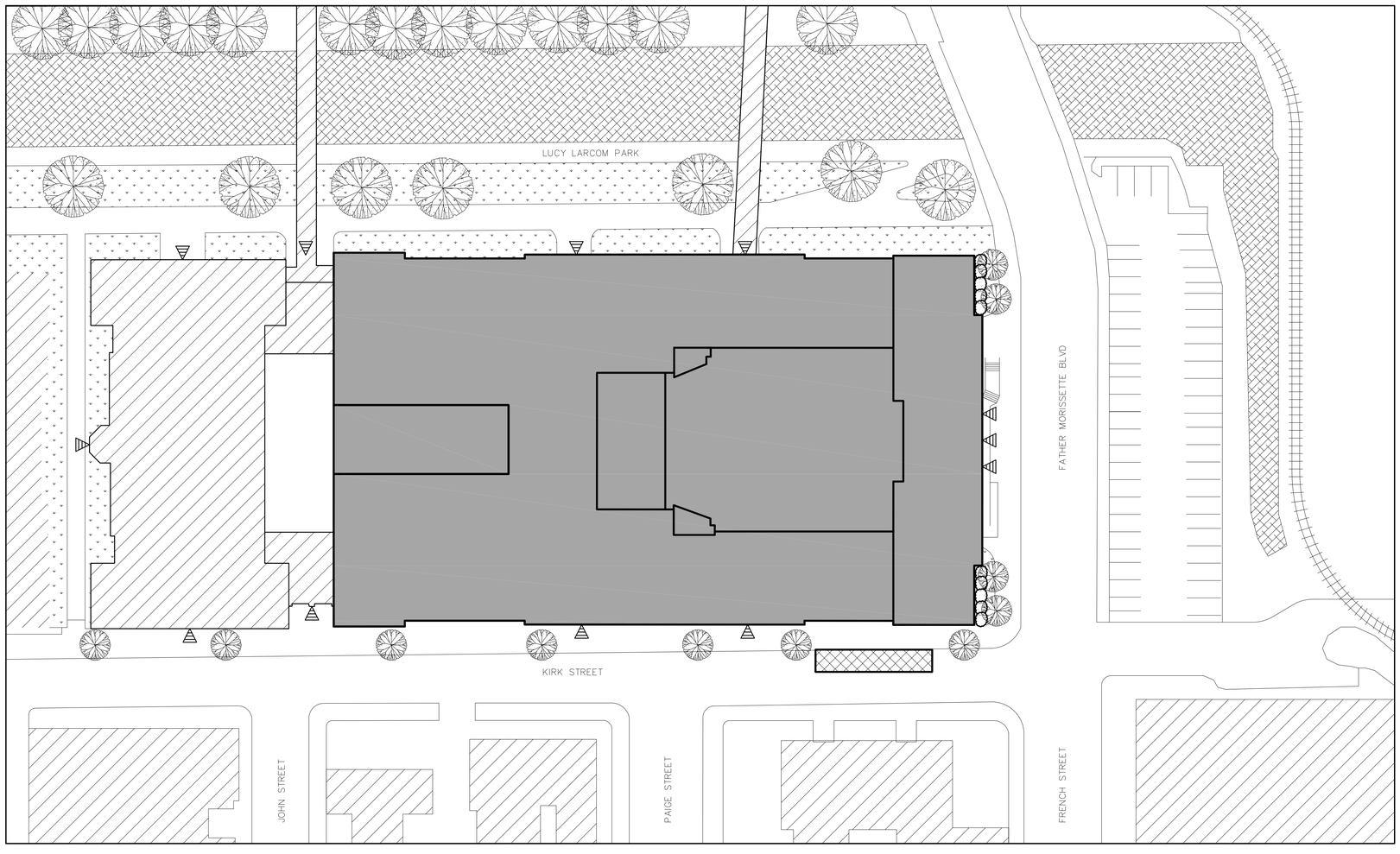
GRAPHIC SCALE

SHEET TITLE

CONCEPTUAL TAPERED INSULATION PLAN & ROOF CROSS SECTIONS

DRAWING NO.

G101



1 SITE PLAN
SCALE: 1/32"=1'-0"

SITE NOTES

1. CONTRACTOR SHALL PROVIDE ALL OVERHEAD PROTECTION AT BUILDING ENTRANCE WAYS IN ACCORDANCE WITH OSHA, LOCAL, STATE AND FEDERAL GUIDELINES.
2. CONTRACTOR SHALL PROVIDE ALL TEMPORARY BARRICADES TO PREVENT PEDESTRIANS FROM ACCESSING THE WORK AREA OR FROM WALKING UNDER WORK LOCATIONS.
3. ALL OVERHEAD PROTECTION SHALL EXTEND A MINIMUM OF 8'-0" BEYOND THE BUILDING'S ROOF EDGE.
4. CONTRACTOR SHALL PROVIDE TEMPORARY BARRICADES AT PEDESTRIAN WALKWAYS SHOULD THE ROOF AREAS ABOVE SAID WALKWAYS BE REMOVED AND REPLACED IN THE SAME DAY. CONTRACTOR WILL BE REQUIRED TO PROVIDE A MONITOR AT GROUND LEVEL TO WARN PEDESTRIAN TRAFFIC OF ABOVE ROOF LINE WORK.
5. THE CONTRACTOR IS CAUTIONED THAT THE DUMPSTER AND CRANE HOISTING LOCATION IS TO BE LOCATED ON KIRK STREET AND MUST NOT IMPEDE VEHICLE TRAFFIC AND SHALL NOT BLOCK PEDESTRIAN CROSSWALKS. ALL MATERIALS SHALL BE STORED ON THE ROOF. CONTRACTOR WILL BE RESPONSIBLE FOR ALL STREET/SIDEWALK PERMITS AND POLICE DETAILS.
6. NOTE: NO LIFT ACCESS SHALL BE PERMITTED ALONG THE NORTH ELEVATION OF THE SCHOOL, ALONG LUCY LARCOM PARK UNLESS WRITTEN PERMISSION IS GRANTED BY THE OWNER.
7. CONTRACTOR SHALL PROVIDE TEMPORARY DEBRIS PROTECTION ALONG THE NORTH ELEVATION OF THE SCHOOL ALONG LUCY LARCOM PARK IN ORDER TO PROTECT THE CANAL FROM DEBRIS. HAY BALES SHALL BE ACCEPTABLE.
8. ANY SITE WORK DAMAGED DURING CONSTRUCTION SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO REPAIR AT NO ADDED COST TO THE OWNER.
9. NOTE: THIS DRAWING IS FOR CONCEPTUAL PURPOSES ONLY AND DOES NOT SHOW ALL EXISTING CONDITIONS. CONTRACTOR TO DO THEIR OWN DUE DILIGENCE.

LEGEND

- BUILDING IN CONTRACT
- BUILDING NOT IN CONTRACT (N.I.C.)
- CANAL
- GRASS
- APPROXIMATE DUMPSTER LOCATION
- BUILDING ENTRANCE

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Boston Baltimore Orlando Hartford

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PROJECT
ROOF REPLACEMENT AND ASSOCIATED WORK
AT THE LOWELL HIGH SCHOOL
50 FATHER MORISETTE BLVD
LOWELL, MA 01852

OWNER
CITY OF LOWELL
375 MERRIMACK STREET
LOWELL, MA 01852

NO.	DATE	DESCRIPTION	BY

PROJECT NO.	833360
CADD FILE	833360 C101
DESIGNED BY	
DRAWN BY	JVL
CHECKED BY	
DATE	
DRAWING SCALE	1/32"=1'-0"

GRAPHIC SCALE

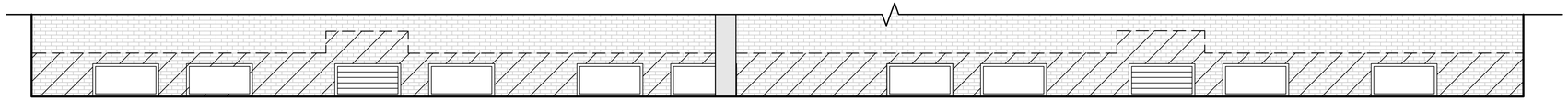
SHEET TITLE

SITE PLAN

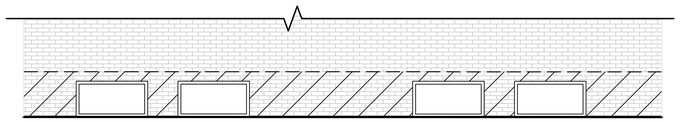
DRAWING NO.

C101

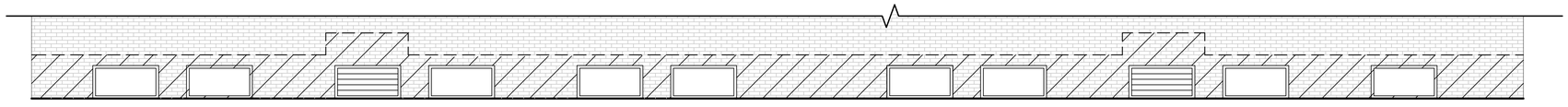
PLAN NORTH



1 PARTIAL NORTH COURTYARD ELEVATION
SCALE: 1/4"=1'-0"



2 PARTIAL EAST COURTYARD ELEVATION
SCALE: 1/4"=1'-0"



3 PARTIAL WEST COURTYARD ELEVATION
SCALE: 1/4"=1'-0"

GENERAL NOTES

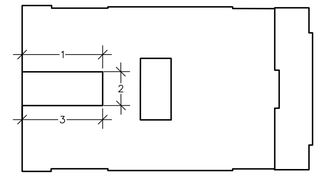
1. THE INFORMATION SHOWN ON THIS DRAWING HAS BEEN COMPILED FROM VARIOUS SOURCES, AND MAY NOT REFLECT THE ACTUAL CONDITIONS AT THE TIME OF CONSTRUCTION. CONTRACTOR TO VERIFY ALL EXISTING CONDITIONS.
2. HATCH PATTERNS ARE FOR REPRESENTATION ONLY AND SHOULD NOT BE USED AS A MEANS FOR QUANTIFYING.

LEGEND

- EXISTING ROOF ELEVATION
- EXISTING BRICK MASONRY
- EXISTING BRICK MASONRY TO BE REMOVED
- EXISTING WINDOW UNIT TO BE REMOVED
- EXISTING LOUVER TO BE REMOVED AND REPLACED; SEE DETAIL 33/A506
- EXISTING VENT

KEY PLAN

SCALE: NOT TO SCALE



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PROJECT
ROOF REPLACEMENT AND ASSOCIATED WORK
AT THE LOWELL HIGH SCHOOL
50 FATHER MORISETTE BLVD
LOWELL, MA 01852

OWNER
CITY OF LOWELL
375 MERRIMACK STREET
LOWELL, MA 01852

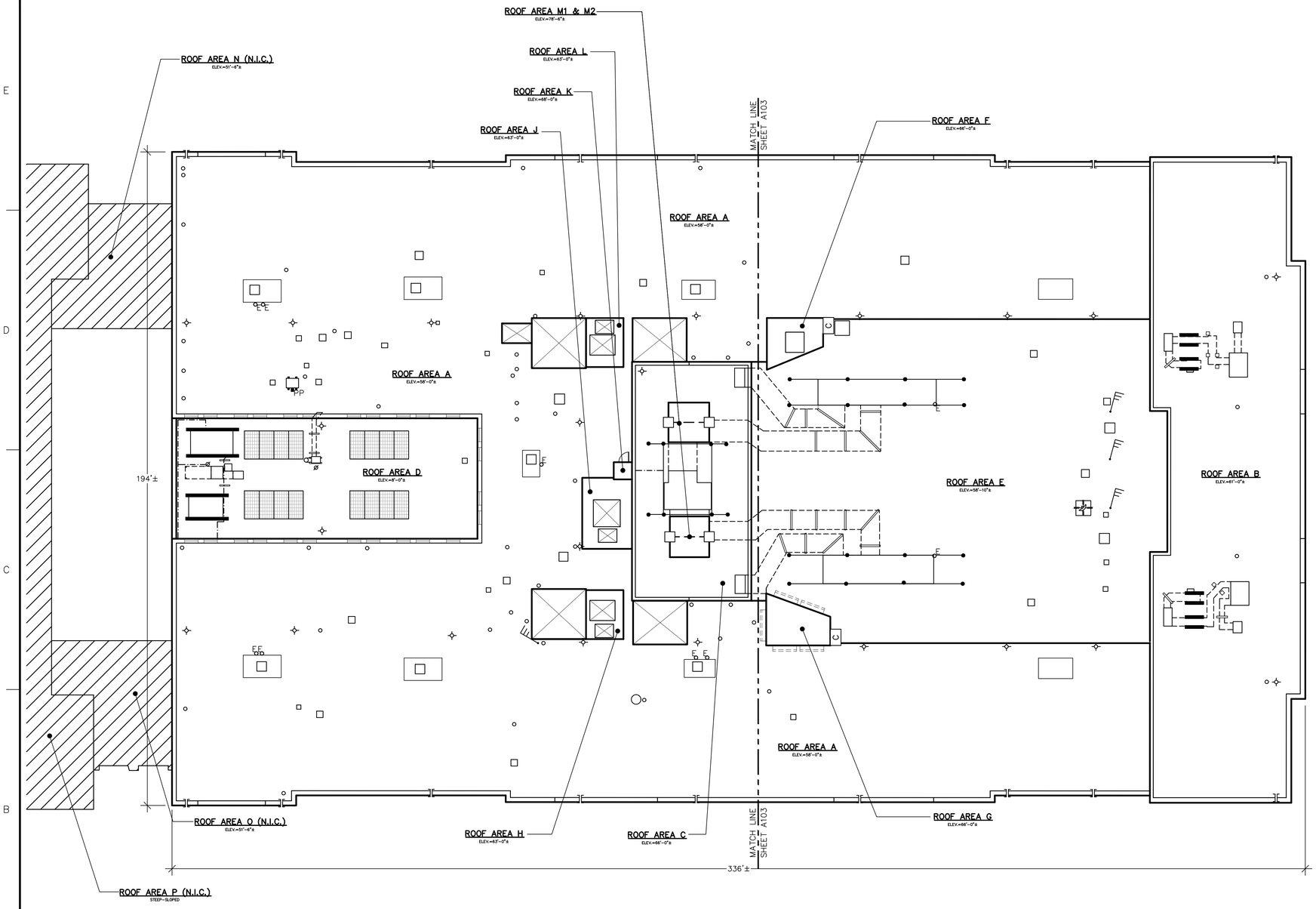
NO.	DATE	DESCRIPTION	BY

PROJECT NO.	833360
CADD FILE	833360 A200s
DESIGNED BY	RCO
DRAWN BY	JVL
CHECKED BY	SRM
DATE	2/2/2018
DRAWING SCALE	1/16"=1'-0"

GRAPHIC SCALE
0 8' 16' 32'

SHEET TITLE
PARTIAL DEMOLITION ELEVATIONS

DRAWING NO.
D201



1 OVERALL ROOF AREA PLAN
SCALE: 1/16"=1'-0"

GENERAL NOTES

1. THE INFORMATION SHOWN ON THIS DRAWING HAS BEEN COMPILED FROM VARIOUS SOURCES, AND MAY NOT REFLECT THE ACTUAL CONDITIONS AT THE TIME OF CONSTRUCTION.
2. HATCH PATTERNS ARE FOR REPRESENTATION ONLY AND SHOULD NOT BE USED A MEANS FOR QUANTIFYING.
3. ALL DIMENSIONS PROVIDED ON THE PLAN ARE ±. THE CONTRACTOR IS RESPONSIBLE FOR CHECKING AND VERIFYING ALL DIMENSIONS, CONDITIONS, HEIGHTS, MATERIALS, THICKNESSES, ETC., IN THE FIELD PRIOR TO COMMENCING CONSTRUCTION.
4. THE CONTRACTOR SHALL REPORT DETERIORATED OR UNSUITABLE STRUCTURAL DECK OR SUBSTRATES TO THE OWNER AND ENGINEER PRIOR TO PERFORMING WATERPROOFING INSTALLATION.
5. ALL ROOFING SHALL BE 100% WEATHER TIGHT ON A DAILY BASIS. REMOVE ONLY AS MUCH EXISTING ROOFING AS CAN BE REPLACED ON THE SAME DAY. PHASED CONSTRUCTION IS NOT PERMITTED.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING AND LEGALLY DISPOSING OF ALL MATERIALS LISTED AND/OR INDICATED ON THE DRAWINGS OR NOTED IN THE SPECIFICATIONS – TYPICAL.
7. THE BUILDING SHALL BE MAINTAINED IN A DUST FREE CONDITION. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY TEMPORARY PROTECTION TO ENSURE THE INTERIOR OF THE BUILDING REMAINS DUST FREE. NOT DEMOLITION CAN PROCEED UNTIL AN APPROVED TEMPORARY PROTECTION SYSTEM IS IN PLACE.
8. THE CONTRACTOR IS RESPONSIBLE FOR REMOVING, PROTECTING, STORING, AND REINSTALLING EXISTING TO REMAIN LIGHTING, WALL MOUNTED FIXTURES, CONDUIT AND OTHER BUILDING COMPONENTS AS REQUIRED TO REMOVE AND INSTALL WATERPROOFING AND ASSOCIATED COMPONENTS.

LEGEND

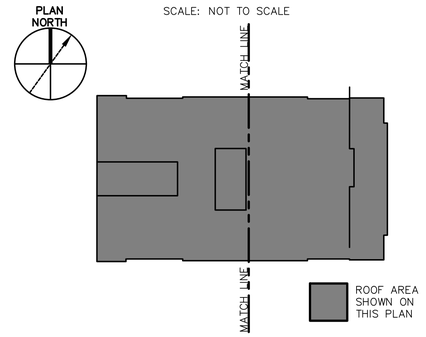
- ROOF EDGE
- PARAPET
- DUCTWORK ABOVE ROOF
- RIDGE/HIP LINE
- EXISTING PENETRATION; REFER TO PARTIAL ROOF AREA PLANS FOR TYPE
- ROOF AREA NOT IN CONTRACT (N.I.C.)
- GLASS PYRAMID SKYLIGHT; REMOVED AND ENCLOSED
- ABANDONED SHAFT; CAPPED
- C — CHIMNEY
- OVERFLOW SCUPPER
- TRANSLUCENT SKYLIGHT PANELS (SEE ALTERNATE #1)
- ELEV.=_'-_"± ROOF ELEVATION RELATIVE TO GRADE WHICH IS ASSUMED TO BE ZERO FEET

WORK DESIGNATION SYMBOLS

- MASONRY SUBCONTRACTOR
- PLUMBING SUBCONTRACTOR

KEY PLAN

SCALE: NOT TO SCALE



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95% SUBMISSION

PROJECT
ROOF REPLACEMENT AND ASSOCIATED WORK
AT THE LOWELL HIGH SCHOOL
50 FATHER MORISETTE BLVD
LOWELL, MA 01852

OWNER
CITY OF LOWELL
375 MERRIMACK STREET
LOWELL, MA 01852

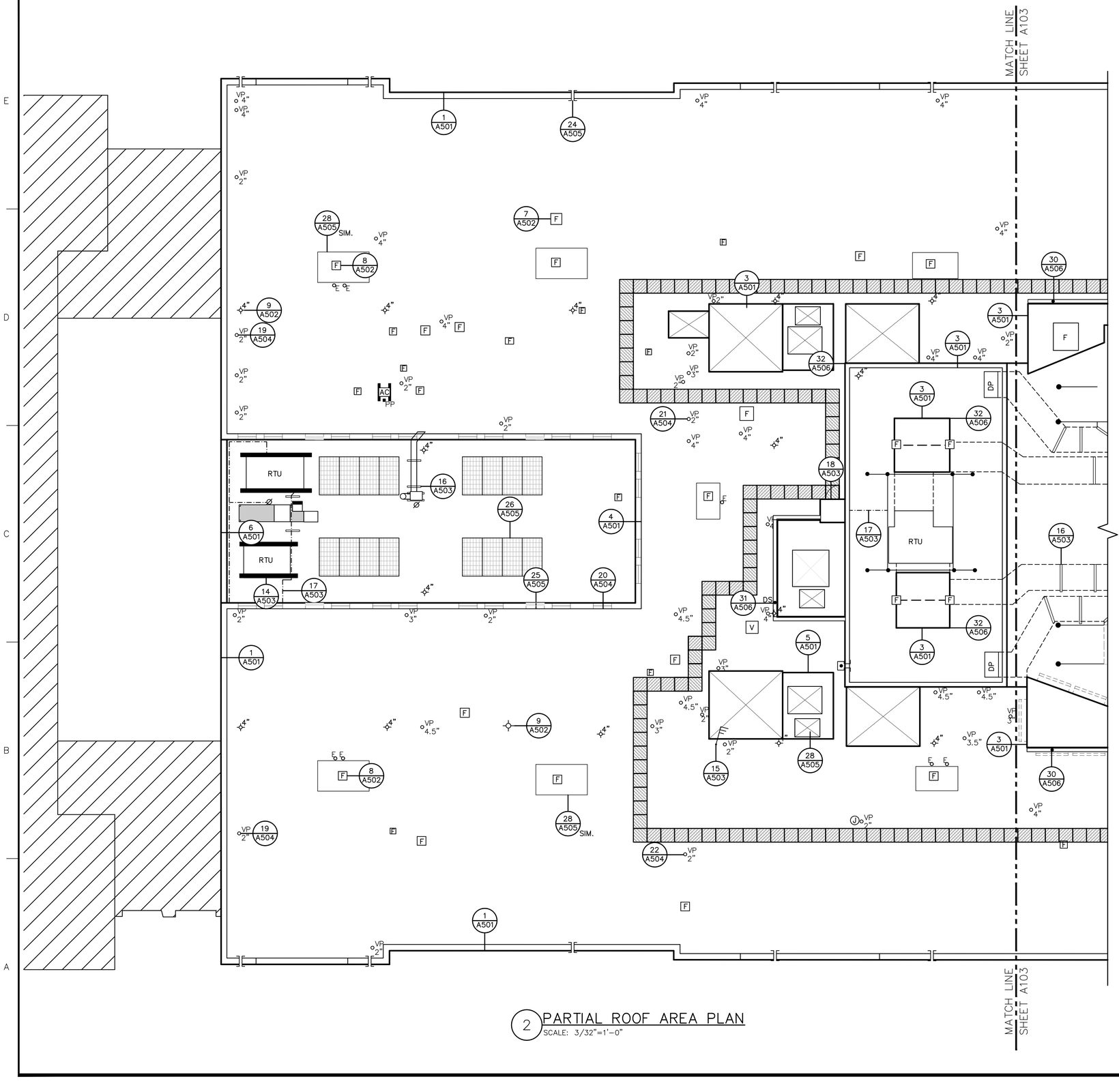
NO.	DATE	DESCRIPTION	BY

PROJECT NO.	833360
CADD FILE	833360 A100s
DESIGNED BY	RCO
DRAWN BY	JVL
CHECKED BY	SRM
DATE	2/2/2018
DRAWING SCALE	1/16"=1'-0"

GRAPHIC SCALE
0 8' 16' 32'

SHEET TITLE
OVERALL ROOF AREA PLAN

DRAWING NO.
A101



2 PARTIAL ROOF AREA PLAN
SCALE: 3/32"=1'-0"

LEGEND

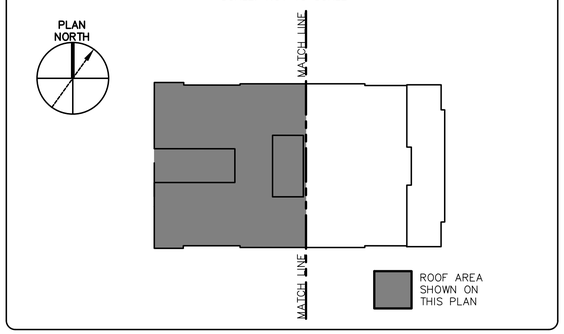
- ROOF EDGE
- PARAPET
- RIDGE/HIP LINE
- CONDUIT LINE
- DUCT/RTU SUPPORT
- DUCTWORK ABOVE ROOF
- AC — AIR CONDENSING UNIT
- F — EXHAUST FAN
- V — VENT
- J — J-VENT
- RTU — ROOF TOP UNIT
- PYRAMID SKYLIGHT; CAPPED
- ROOF AREA NOT IN CONTRACT (N.I.C.)
- SKYLIGHT; CAPPED
- ABANDONED SHAFT; CAPPED
- VENT THROUGH MASONRY WALL (ABOVE ROOF); TO BE REMOVED
- VP — VENT PIPE; # INDICATES DIAMETER
- PIPE PENETRATION
- E — ELECTRICAL PENETRATION
- PP — PITCH POCKET
- ROOF DRAIN; # INDICATES DIAMETER
- SCUPPER WITH DOWNSPOUT
- SATELLITE DISH
- DUNNAGE
- WOOD SLEEPER
- ROOF ANTENNA
- REPLACE DOOR
- ELEV.=_'-_"± — ROOF ELEVATION RELATIVE TO GRADE WHICH IS ASSUMED TO BE ZERO FEET
- OVERFLOW SCUPPER
- GUTTER WITH DOWNSPOUT
- TRANSLUCENT SKYLIGHT PANELS (SEE ALTERNATE #1)
- WALKWAY PADS

GENERAL NOTES

1. THE INFORMATION SHOWN ON THIS DRAWING HAS BEEN COMPILED FROM VARIOUS SOURCES, AND MAY NOT REFLECT THE ACTUAL CONDITIONS AT THE TIME OF CONSTRUCTION.
2. FOR THE SAKE OF CLARITY, EACH INDIVIDUAL DETAIL ON THE PLAN HAS NOT BEEN INDICATED. INSTALLATION DETAILS HAVE BEEN INDICATED FOR TYPICAL COMPONENTS AT RANDOM LOCATIONS. DETAILS NOT DEPICTED SHALL BE CONSTRUCTED IN A MANNER CONSISTENT WITH THE DETAIL DRAWINGS.
3. HATCH PATTERNS ARE FOR REPRESENTATION ONLY AND SHOULD NOT BE USED A MEANS FOR QUANTIFYING.
4. ALL DIMENSIONS PROVIDED ON THE PLAN ARE ±. THE CONTRACTOR IS RESPONSIBLE FOR CHECKING AND VERIFYING ALL DIMENSIONS, CONDITIONS, HEIGHTS, MATERIALS, THICKNESSES, ETC., IN THE FIELD PRIOR TO COMMENCING CONSTRUCTION.
5. THE CONTRACTOR SHALL REPORT DETERIORATED OR UNSUITABLE STRUCTURAL DECK OR SUBSTRATES TO THE OWNER AND ENGINEER PRIOR TO PERFORMING WATERPROOFING INSTALLATION.
6. ALL WATERPROOFING SHALL BE 100% WEATHER TIGHT ON A DAILY BASIS. REMOVE ONLY AS MUCH EXISTING WATERPROOFING AS CAN BE REPLACED ON THE SAME DAY. PHASED CONSTRUCTION IS NOT PERMITTED.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING AND LEGALLY DISPOSING OF ALL MATERIALS LISTED AND/OR INDICATED ON THE DRAWINGS OR NOTED IN THE SPECIFICATIONS – TYPICAL.
8. THE BUILDING SHALL BE MAINTAINED IN A DUST FREE CONDITION. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY TEMPORARY PROTECTION TO ENSURE THE INTERIOR OF THE BUILDING REMAINS DUST FREE. NOT DEMOLITION CAN PROCEED UNTIL AN APPROVED TEMPORARY PROTECTION SYSTEM IS IN PLACE.
9. THE CONTRACTOR IS RESPONSIBLE FOR REMOVING, PROTECTING, STORING, AND REINSTALLING EXISTING TO REMAIN LIGHTING, WALL MOUNTED FIXTURES, CONDUIT AND OTHER BUILDING COMPONENTS AS REQUIRED TO REMOVE AND INSTALL WATERPROOFING AND ASSOCIATED COMPONENTS.
10. ROOF AREA DESIGNATIONS ARE NOT SHOWN ON THIS PLAN FOR CLARITY. REFER TO SHEET A101 FOR ROOF AREA DESIGNATIONS AND ROOF ELEVATIONS.
11. DISCONNECT, REMOVE, RAISE, REINSTALL, AND RECONNECT EXISTING ROOFTOP EQUIPMENT AND ASSOCIATED MECHANICAL/ELECTRICAL PENETRATIONS TO PROVIDE MINIMUM SPECIFIED FLASHING HEIGHTS.

KEY PLAN

SCALE: NOT TO SCALE



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PROJECT
ROOF REPLACEMENT AND ASSOCIATED WORK AT THE LOWELL HIGH SCHOOL
50 FATHER MORISETTE BLVD
LOWELL, MA 01852

OWNER
CITY OF LOWELL
375 MERRIMACK STREET
LOWELL, MA 01852

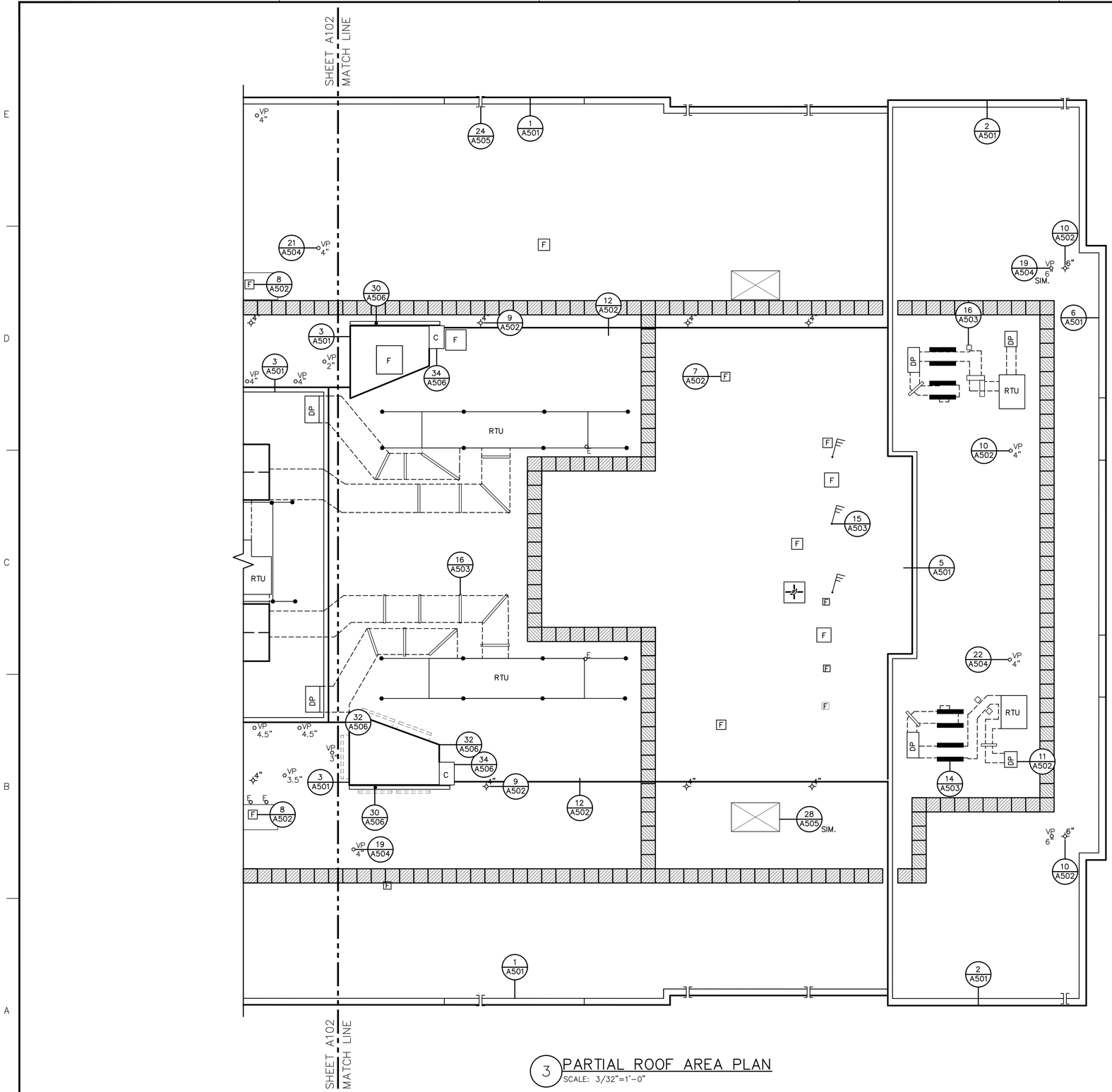
NO.	DATE	DESCRIPTION	BY

PROJECT NO.	833360
CADD FILE	833360 A100s
DESIGNED BY	RCO
DRAWN BY	JVL
CHECKED BY	SRM
DATE	2/2/2018
DRAWING SCALE	3/32"=1'-0"

GRAPHIC SCALE
0 8' 16' 24'

SHEET TITLE
PARTIAL ROOF AREA PLAN

DRAWING NO.
A102



3 PARTIAL ROOF AREA PLAN
SCALE: 3/32"=1'-0"

LEGEND

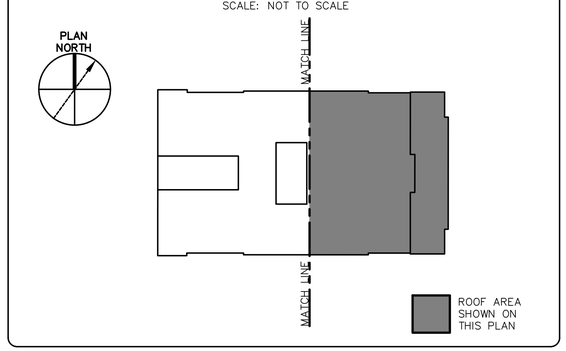
- ROOF EDGE
- PARAPET
- RIDGE/HIP LINE
- CONDUIT LINE
- DUCT/RTU SUPPORT
- DUCTWORK
- AC — AIR CONDENSING UNIT
- F — EXHAUST FAN
- V — VENT
- J — J-VENT
- RTU — ROOF TOP UNIT
- EXISTING ABANDONED PENETRATION FLASHED W/ ROOF MEMBRANE
- C — CHIMNEY
- DP — DUCT PENETRATION
- WALKWAY PADS
- VP — VENT PIPE; # INDICATES DIAMETER
- PIPE PENETRATION
- ELECTRICAL PENETRATION
- PP — PITCH POCKET
- ROOF DRAIN
- SCUPPER W/ DOWNSPOUT
- GUTTER W/ DOWNSPOUT
- SATELLITE DISH
- DUNNAGE
- WOOD SLEEPER
- ROOF ANTENNA
- ELEV.=_'-_"± — ROOF ELEVATION RELATIVE TO GRADE WHICH IS ASSUMED TO BE ZERO FEET
- OVERFLOW SCUPPER
- VENT THROUGH MASONRY WALL (ABOVE ROOF); TO BE REMOVED

GENERAL NOTES

1. THE INFORMATION SHOWN ON THIS DRAWING HAS BEEN COMPILED FROM VARIOUS SOURCES, AND MAY NOT REFLECT THE ACTUAL CONDITIONS AT THE TIME OF CONSTRUCTION.
2. FOR THE SAKE OF CLARITY, EACH INDIVIDUAL DETAIL ON THE PLAN HAS NOT BEEN INDICATED. INSTALLATION DETAILS HAVE BEEN INDICATED FOR TYPICAL COMPONENTS AT RANDOM LOCATIONS. DETAILS NOT DEPICTED SHALL BE CONSTRUCTED IN A MANNER CONSISTENT WITH THE DETAIL DRAWINGS.
3. HATCH PATTERNS ARE FOR REPRESENTATION ONLY AND SHOULD NOT BE USED A MEANS FOR QUANTIFYING.
4. ALL DIMENSIONS PROVIDED ON THE PLAN ARE ±. THE CONTRACTOR IS RESPONSIBLE FOR CHECKING AND VERIFYING ALL DIMENSIONS, CONDITIONS, HEIGHTS, MATERIALS, THICKNESSES, ETC., IN THE FIELD PRIOR TO COMMENCING CONSTRUCTION.
5. THE CONTRACTOR SHALL REPORT DETERIORATED OR UNSUITABLE STRUCTURAL DECK OR SUBSTRATES TO THE OWNER AND ENGINEER PRIOR TO PERFORMING WATERPROOFING INSTALLATION.
6. ALL WATERPROOFING SHALL BE 100% WEATHER TIGHT ON A DAILY BASIS. REMOVE ONLY AS MUCH EXISTING WATERPROOFING AS CAN BE REPLACED ON THE SAME DAY. PHASED CONSTRUCTION IS NOT PERMITTED.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING AND LEGALLY DISPOSING OF ALL MATERIALS LISTED AND/OR INDICATED ON THE DRAWINGS OR NOTED IN THE SPECIFICATIONS – TYPICAL.
8. THE BUILDING SHALL BE MAINTAINED IN A DUST FREE CONDITION. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY TEMPORARY PROTECTION TO ENSURE THE INTERIOR OF THE BUILDING REMAINS DUST FREE. NOT DEMOLITION CAN PROCEED UNTIL AN APPROVED TEMPORARY PROTECTION SYSTEM IS IN PLACE.
9. THE CONTRACTOR IS RESPONSIBLE FOR REMOVING, PROTECTING, STORING, AND REINSTALLING EXISTING TO REMAIN LIGHTING, WALL MOUNTED FIXTURES, CONDUIT AND OTHER BUILDING COMPONENTS AS REQUIRED TO REMOVE AND INSTALL WATERPROOFING AND ASSOCIATED COMPONENTS.
10. ROOF AREA DESIGNATIONS ARE NOT SHOWN ON THIS PLAN FOR CLARITY. REFER TO SHEET A101 FOR ROOF AREA DESIGNATIONS AND ROOF ELEVATIONS.
11. DISCONNECT, REMOVE, RAISE, REINSTALL, AND RECONNECT EXISTING ROOFTOP EQUIPMENT AND ASSOCIATED MECHANICAL/ELECTRICAL PENETRATIONS TO PROVIDE MINIMUM SPECIFIED FLASHING HEIGHTS.

KEY PLAN

SCALE: NOT TO SCALE



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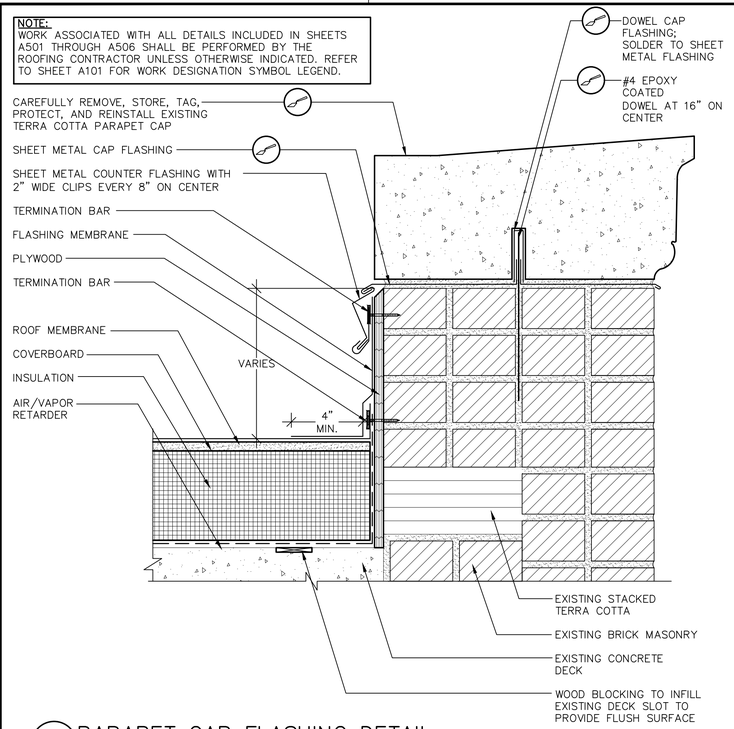
DRAWN BY	JVL
CHECKED BY	SRM
DATE	2/2/2018
DRAWING SCALE	3/32"=1'-0"

GRAPHIC SCALE
0 8' 16' 24'

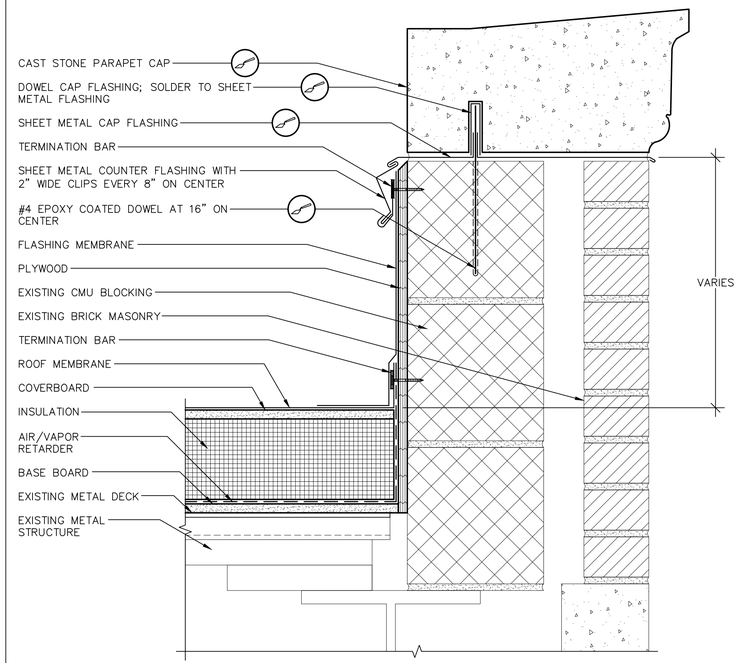
SHEET TITLE
PARTIAL ROOF AREA PLAN

DRAWING NO.
A103

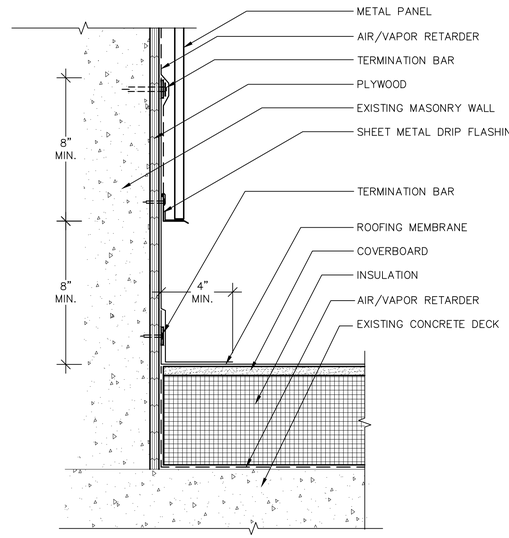
NOTE:
WORK ASSOCIATED WITH ALL DETAILS INCLUDED IN SHEETS A501 THROUGH A506 SHALL BE PERFORMED BY THE ROOFING CONTRACTOR UNLESS OTHERWISE INDICATED. REFER TO SHEET A101 FOR WORK DESIGNATION SYMBOL LEGEND.



1 PARAPET CAP FLASHING DETAIL
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)

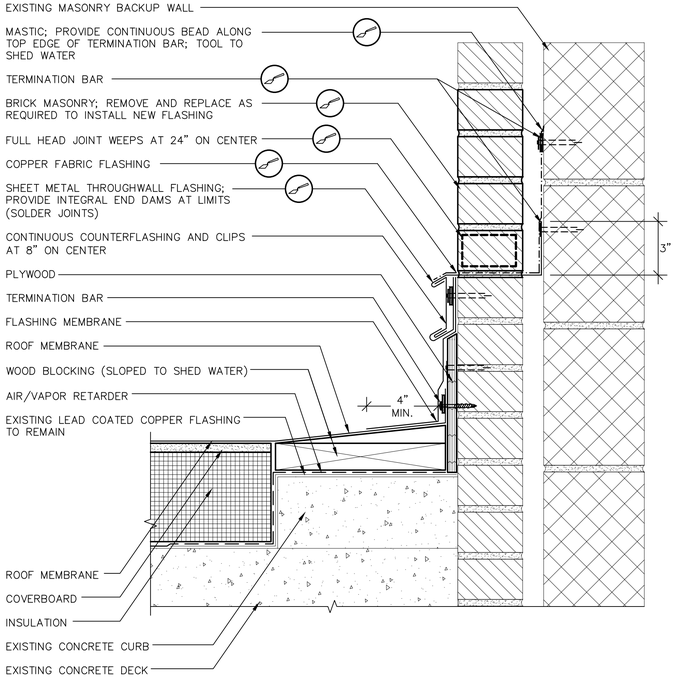


2 METAL DECK PARAPET FLASHING DETAIL
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)

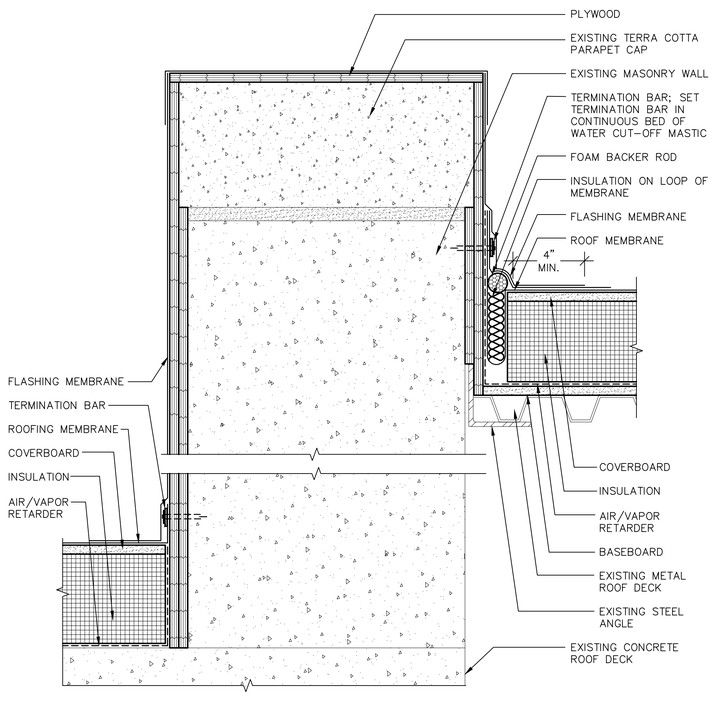


3 RISING METAL WALL BASE FLASHING
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)

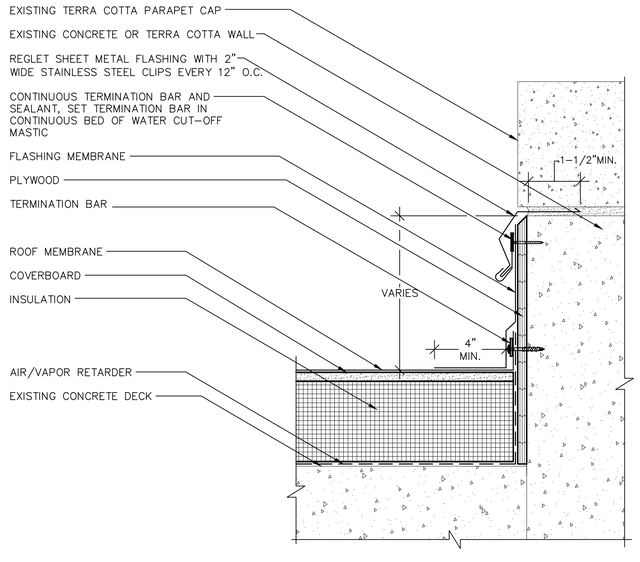
NOTE:
FASTENERS PENETRATING THE FACE OF METAL PANEL ARE TO BE SET IN BED OF SEALANT.



4 THROUGHWALL FLASHING DETAIL
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)



5 ROOF EXPANSION JOINT DETAIL
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)



6 CONCRETE DECK PARAPET REGLET FLASHING DETAIL
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)

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NO.	DATE	DESCRIPTION	BY

PROJECT NO.	833360
CADD FILE	833360 A500s
DESIGNED BY	RCO
DRAWN BY	JVL/RCO/ACP
CHECKED BY	SRM
DATE	2/2/2018
DRAWING SCALE	3"=1'-0"

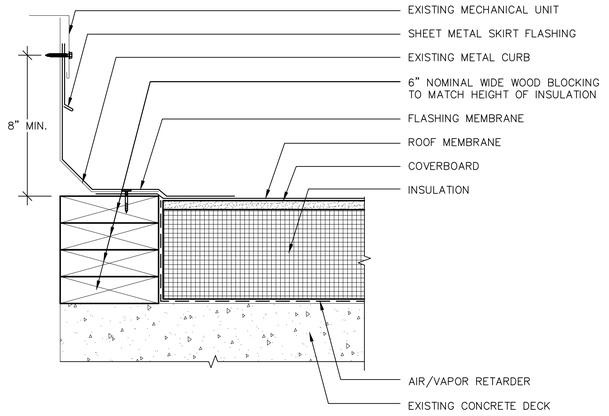
GRAPHIC SCALE
0 3" 6" 9"

SHEET TITLE
DETAILS

DRAWING NO.
A501

1. ALL DISCONNECTS/RECONNECTS SHALL BE PERFORMED BY LICENSED TRADES PERSONS.
2. TEMPORARILY DISCONNECT AND EXTEND ALL ELECTRICAL AND CONDENSER LINES AT AIR CONDITIONING UNITS AS REQUIRED TO RAISE THE UNITS TO ACCOMMODATE THE FINAL FINISHED ROOF HEIGHT.
3. RESECURE UNIT HOOD WITH STAINLESS STEEL FASTENERS THROUGH EPDM BACKED STAINLESS STEEL WASHERS.

PROVIDE MANUFACTURER'S WALKWAY PAD AROUND UNITS



7 FAN CURB UNIT
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)

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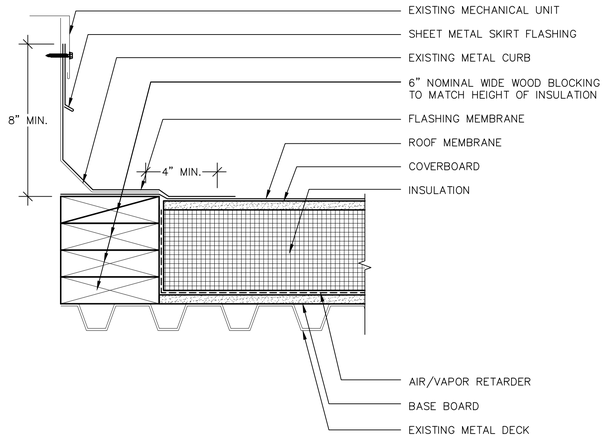
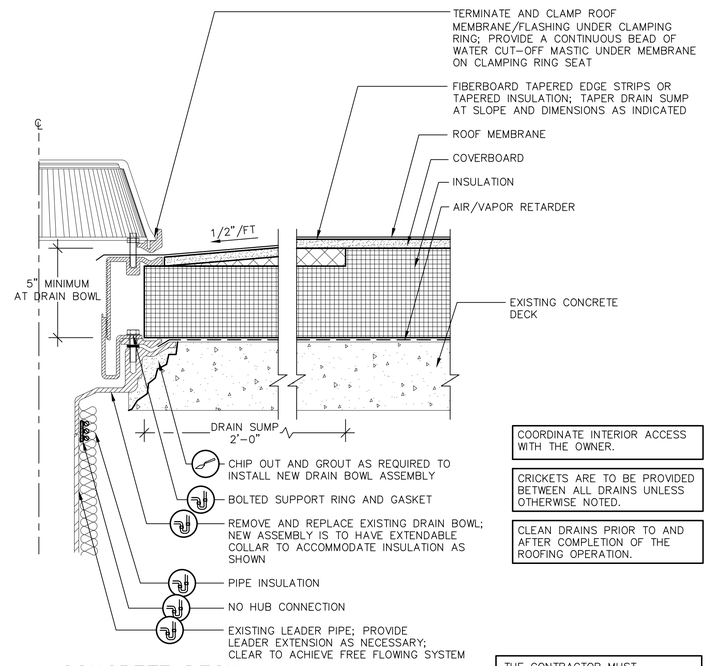
2. TEMPORARILY DISCONNECT AND EXTEND ALL ELECTRICAL AND CONDENSER LINES AT AIR CONDITIONING UNITS AS REQUIRED TO RAISE THE UNITS TO ACCOMMODATE THE FINAL FINISHED ROOF HEIGHT.
3. RESECURE UNIT HOOD WITH STAINLESS STEEL FASTENERS THROUGH EPDM BACKED STAINLESS STEEL WASHERS.

PROVIDE MANUFACTURER'S WALKWAY PAD AROUND UNITS



8 FAN CURB UNIT
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)



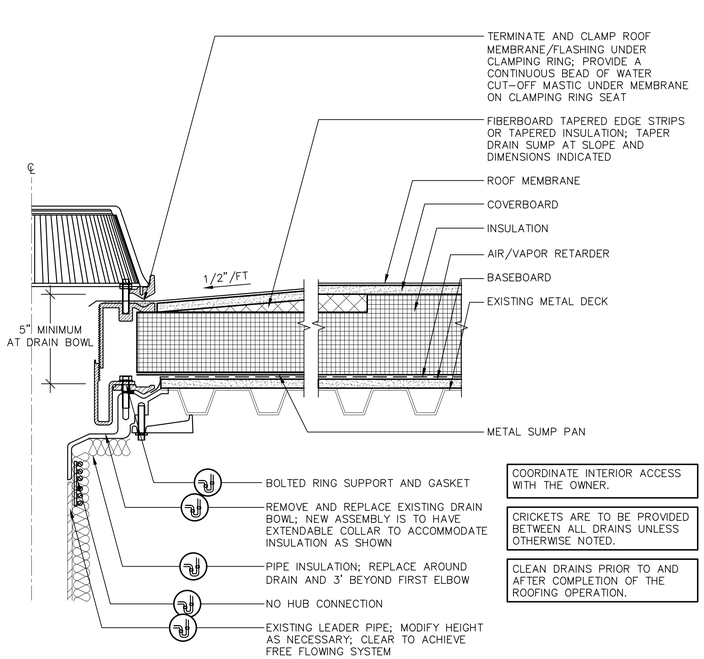
COORDINATE INTERIOR ACCESS WITH THE OWNER.

CRICKETS ARE TO BE PROVIDED BETWEEN ALL DRAINS UNLESS OTHERWISE NOTED.

CLEAN DRAINS PRIOR TO AND AFTER COMPLETION OF THE ROOFING OPERATION.

THE CONTRACTOR MUST PROVIDE TEMPORARY PROTECTION ON THE INTERIOR OF THE DRAIN LEADER LINE TO PREVENT DUST MIGRATION INTO THE BUILDING.

9 CONCRETE DECK ROOF DRAIN DETAIL
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)



COORDINATE INTERIOR ACCESS WITH THE OWNER.

CRICKETS ARE TO BE PROVIDED BETWEEN ALL DRAINS UNLESS OTHERWISE NOTED.

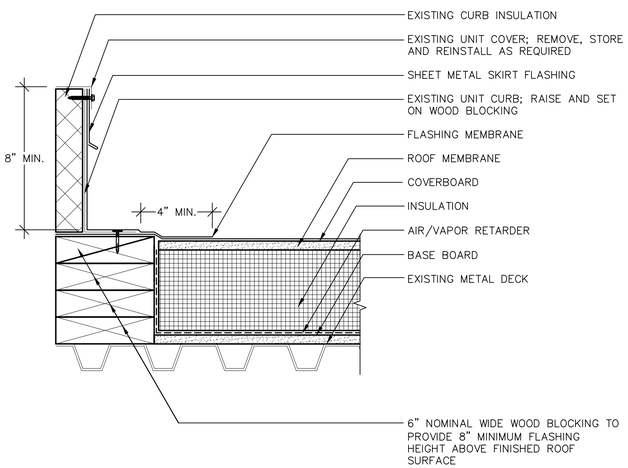
CLEAN DRAINS PRIOR TO AND AFTER COMPLETION OF THE ROOFING OPERATION.

THE CONTRACTOR MUST PROVIDE TEMPORARY PROTECTION ON THE INTERIOR OF THE DRAIN LEADER LINE TO PREVENT DUST MIGRATION INTO THE BUILDING.

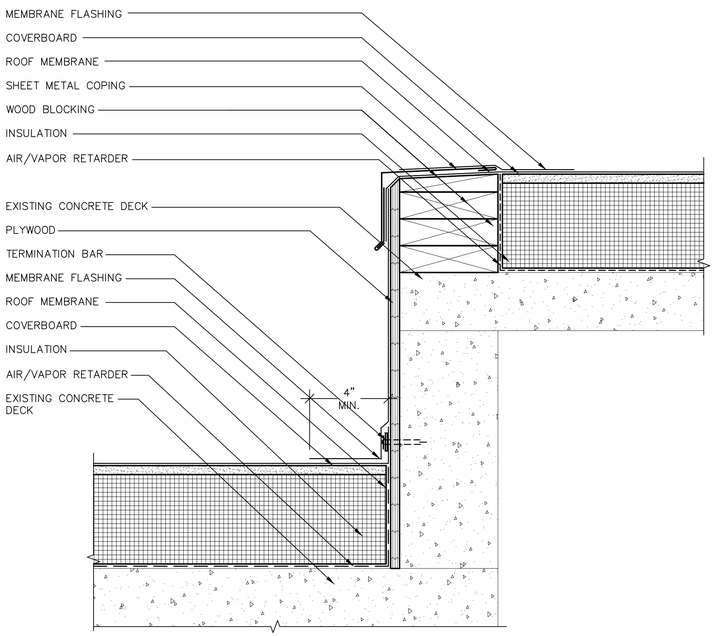
10 METAL DECK ROOF DRAIN DETAIL
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)

1. ALL DISCONNECTS/RECONNECTS SHALL BE PERFORMED BY LICENSED TRADES PERSONS.
2. TEMPORARILY DISCONNECT AND EXTEND ALL ELECTRICAL AND CONDENSER LINES AT AIR CONDITIONING UNITS AS REQUIRED TO RAISE THE UNITS TO ACCOMMODATE THE FINAL FINISHED ROOF HEIGHT.
3. RESECURE UNIT HOOD WITH STAINLESS STEEL FASTENERS THROUGH EPDM BACKED STAINLESS STEEL WASHERS.

PROVIDE MANUFACTURER'S WALKWAY PAD AROUND UNITS



11 METAL DECK INSULATED CURB DETAIL
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)



12 ROOF TRANSITION DETAIL
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)

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NO.	DATE	DESCRIPTION	BY

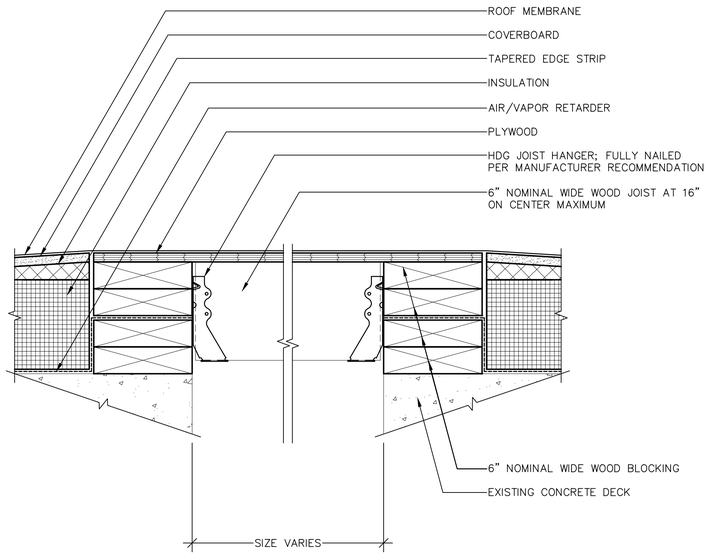
PROJECT NO.	833360
CADD FILE	833360 A500s
DESIGNED BY	RCO
DRAWN BY	RCO/ACP
CHECKED BY	SRM
DATE	2/2/2018
DRAWING SCALE	3"=1'-0"

GRAPHIC SCALE
0 3" 6" 9"

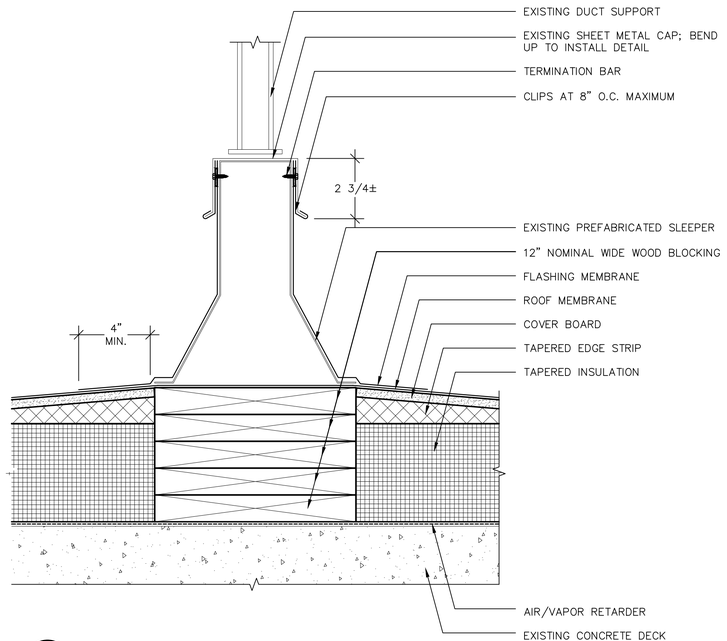
SHEET TITLE
DETAILS

DRAWING NO.
A502

NOTE:
1. ALL MECHANICAL AND ELECTRICAL DISCONNECTS SHALL BE PERFORMED BY LICENSED TRADES PERSONS.

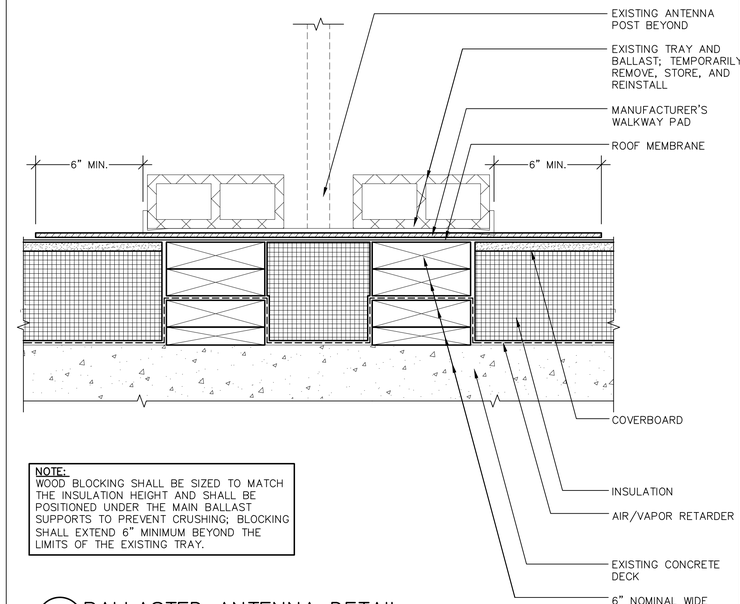


13 ABANDONED FAN UNIT INFILL
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)



14 PREFABRICATED SLEEPER DETAIL
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)

NOTE:
COORDINATE THE DISCONNECTION AND RECONNECTION OF THE COMMUNICATION EQUIPMENT WITH THE OWNER AND THEIR SERVICE SUPPLIER.



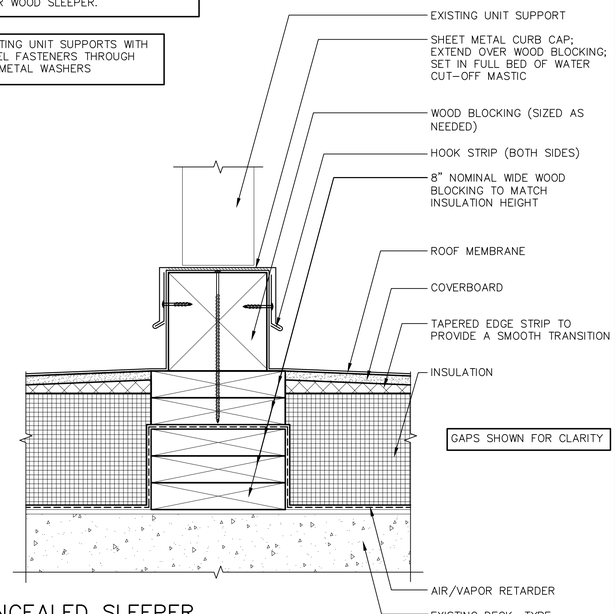
NOTE:
WOOD BLOCKING SHALL BE SIZED TO MATCH THE INSULATION HEIGHT AND SHALL BE POSITIONED UNDER THE MAIN BALLAST SUPPORTS TO PREVENT CRUSHING; BLOCKING SHALL EXTEND 6" MINIMUM BEYOND THE LIMITS OF THE EXISTING TRAY.

15 BALLASTED ANTENNA DETAIL
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)

PROVIDE TAPERED EDGE STRIPS AS REQUIRED TO PROVIDE A SMOOTH TRANSITION WITH THE WOOD BLOCKING

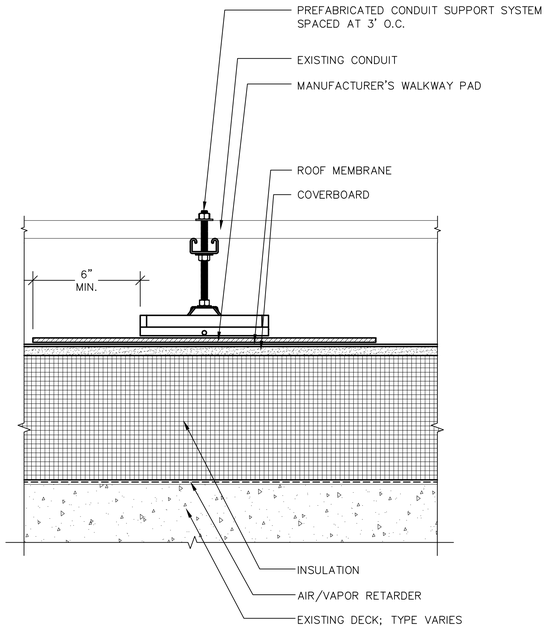
PROVIDE ALL TEMPORARY SHORING AS REQUIRED TO INSTALL WORK AS SHOWN. RESECURE UNIT WITH A MINIMUM OF TWO FASTENERS PER WOOD SLEEPER.

RESECURE EXISTING UNIT SUPPORTS WITH STAINLESS STEEL FASTENERS THROUGH EPDM BACKED METAL WASHERS

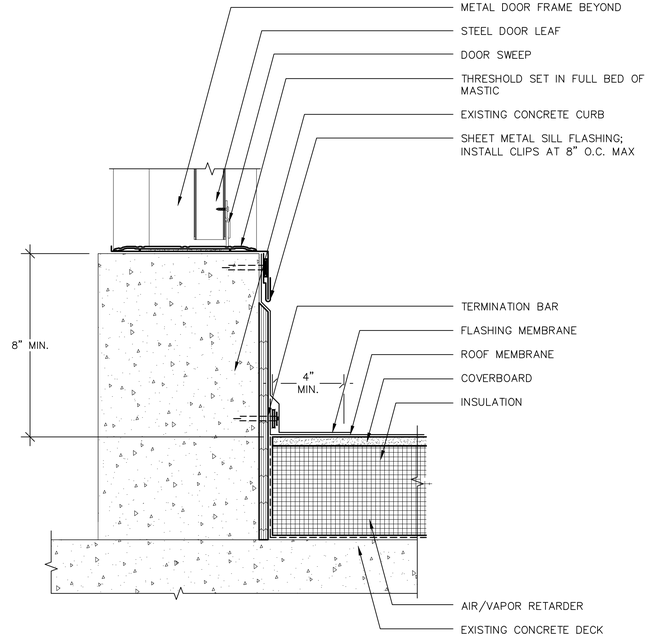


16 CONCEALED SLEEPER
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)

CONDUIT LESS THAN OR EQUAL TO 1-1/4" SHALL BE SUPPORTED AT 5'-0" INTERVALS; CONDUIT GREATER THAN 1-1/4" SHALL BE SUPPORTED AT 8'-0" INTERVALS.



17 CONDUIT SUPPORT
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)



18 DOOR THRESHOLD DETAIL
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)

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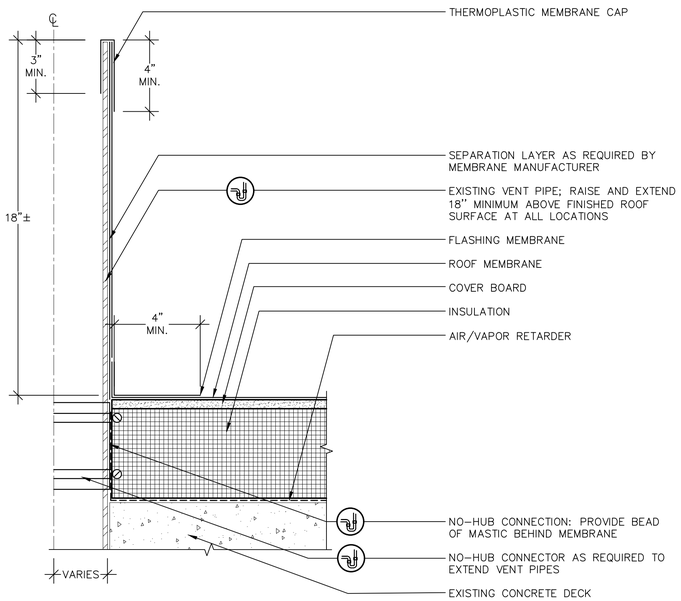
DESIGNED BY	RCO
DRAWN BY	JVL/ACP
CHECKED BY	SRM
DATE	2/2/2018
DRAWING SCALE	3"=1'-0"

GRAPHIC SCALE
0 3" 6" 9"

SHEET TITLE
DETAILS

DRAWING NO.
A503

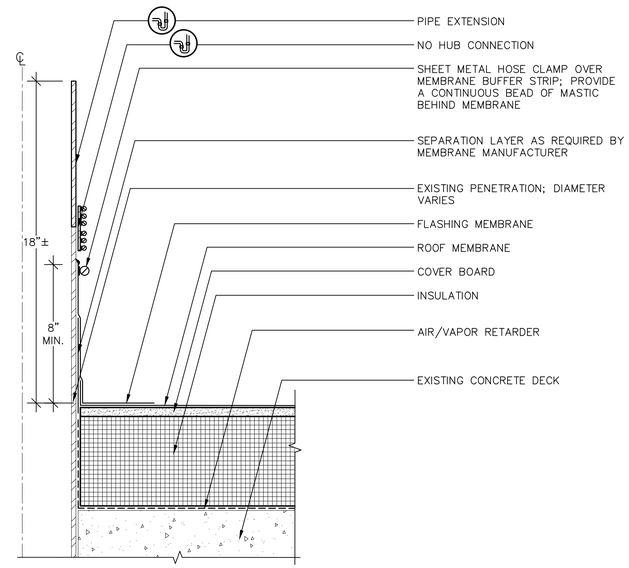


VENT PIPE – OPTION 1

SHOULD THE EXISTING VENT PIPES ALLOW A MINIMUM 8" PIPE WRAP DETAIL, THE EXTENSION AND NO HUB CONNECTION CAN BE INSTALLED ABOVE THE ROOF SYSTEM; COORDINATE IN FIELD.

19 TYPICAL VENT PIPE FLASHING DETAIL

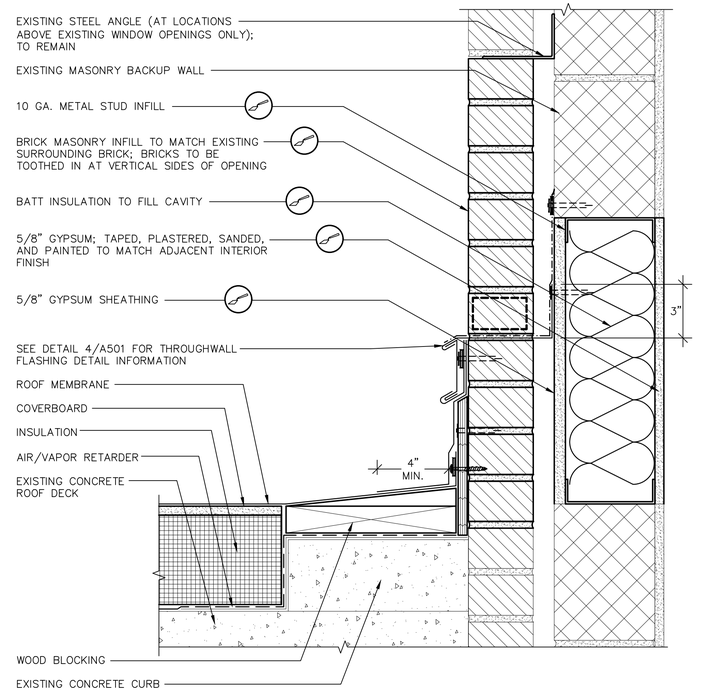
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)



VENT PIPE – OPTION 2

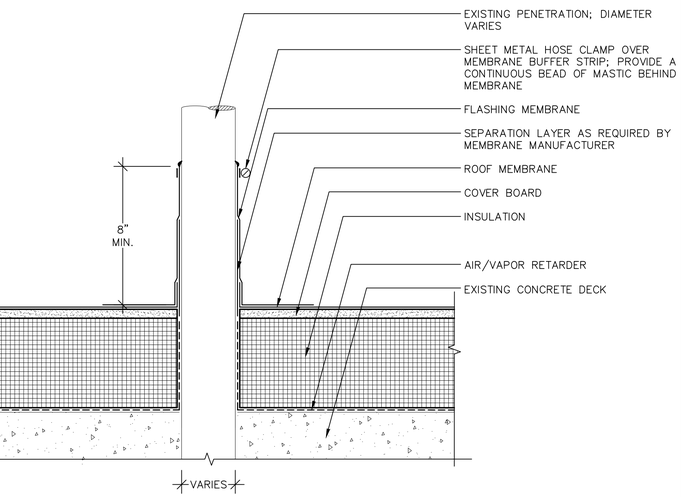
THE EXISTING VENT PIPES APPEAR TO BE LESS THAN 12" ABOVE THE EXISTING ROOF SURFACE, AND ALL PIPES ARE ANTICIPATED TO REQUIRE RAISING UNDER THIS CONTRACT.

CONTRACTORS ARE TO COORDINATE THE CUTTING OF THE PIPE AND INSTALLATION OF THE NO HUB CONNECTION BELOW THE INSULATION SYSTEM.



20 BRICK MASONRY INFILL DETAIL

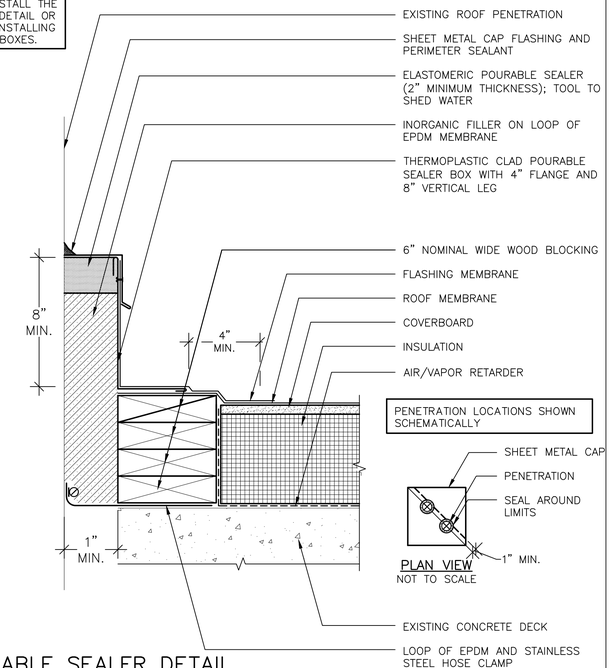
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)



21 PIPE WRAP DETAIL

SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)

PLEASE NOTE THAT THIS DETAIL IS NOT INDICATED ON THE ROOF AREA PLANS. CONTRACTOR IS TO EXHAUST ALL EFFORTS TO INSTALL THE PIPE PENETRATION DETAIL OR SIMILAR PRIOR TO INSTALLING POURABLE SEALER BOXES.



PENETRATION LOCATIONS SHOWN SCHEMATICALLY

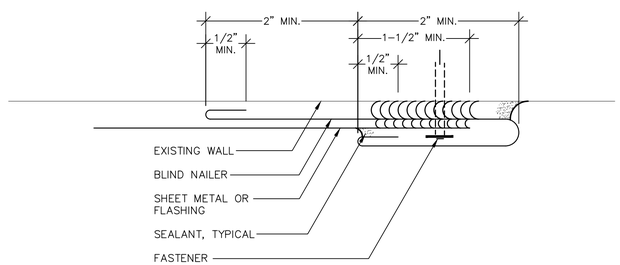
PLAN VIEW
NOT TO SCALE

22 POURABLE SEALER DETAIL

SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)

PLEASE NOTE THAT THIS DETAIL IS NOT INDICATED ON THE ROOF AREA PLANS. CONTRACTOR IS TO EXHAUST ALL EFFORTS TO INSTALL THE PIPE PENETRATION DETAIL OR SIMILAR PRIOR TO INSTALLING POURABLE SEALER BOXES.

WHERE PRACTICAL, BLIND NAILERS AND FLASHINGS SHALL EXTEND 6" MINIMUM BEYOND THE ROOF EDGES BELOW TO SHED WATER AWAY FROM THE NEW ROOF SYSTEM.



23 TYPICAL BIND NAILER DETAIL

SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)

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Boston Baltimore Orlando Hartford

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PROJECT
ROOF REPLACEMENT AND ASSOCIATED WORK
AT THE LOWELL HIGH SCHOOL
50 FATHER MORISETTE BLVD
LOWELL, MA 01852

OWNER
CITY OF LOWELL
375 MERRIMACK STREET
LOWELL, MA 01852

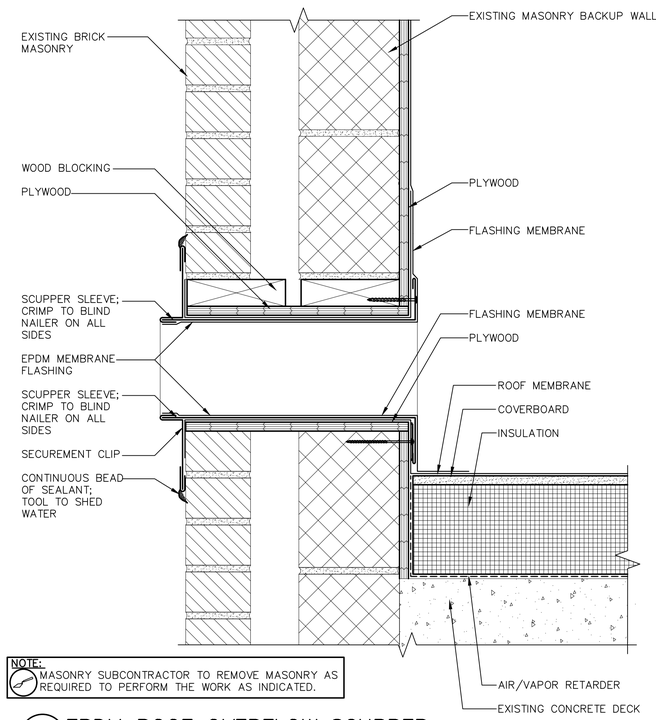
NO.	DATE	DESCRIPTION	BY

PROJECT NO.	833360
CADD FILE	833360 A500s
DESIGNED BY	RCO
DRAWN BY	JVL/RCO/ACP
CHECKED BY	SRM
DATE	2/2/2018
DRAWING SCALE	3"=1'-0"

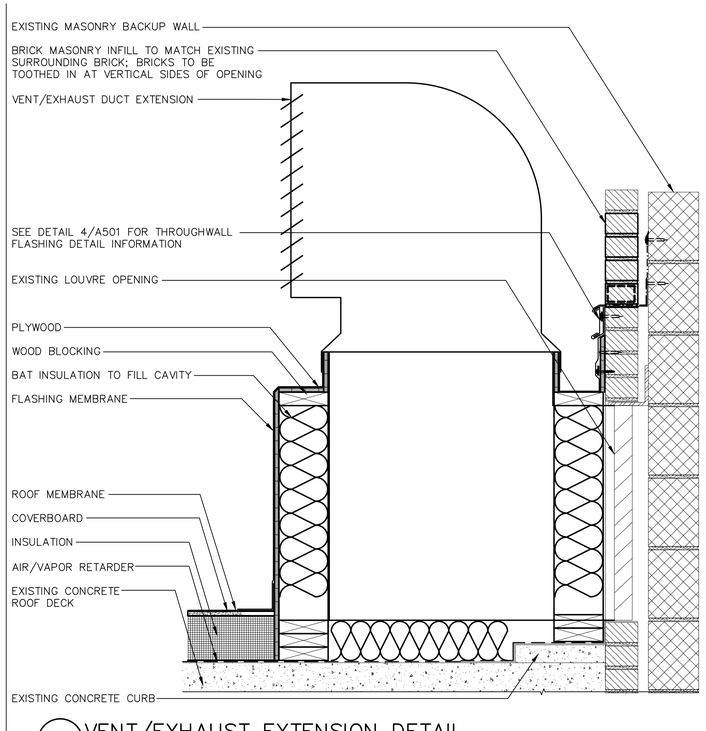
GRAPHIC SCALE
0 3" 6" 9"

SHEET TITLE
DETAILS

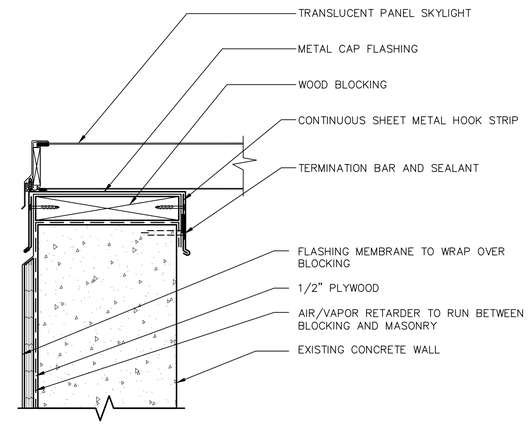
DRAWING NO.
A504



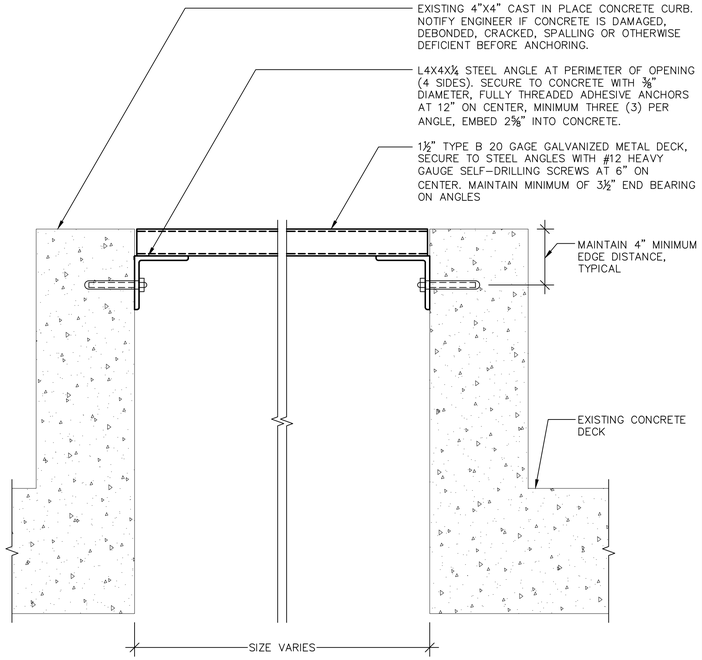
24 EPDM ROOF OVERFLOW SCUPPER
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)



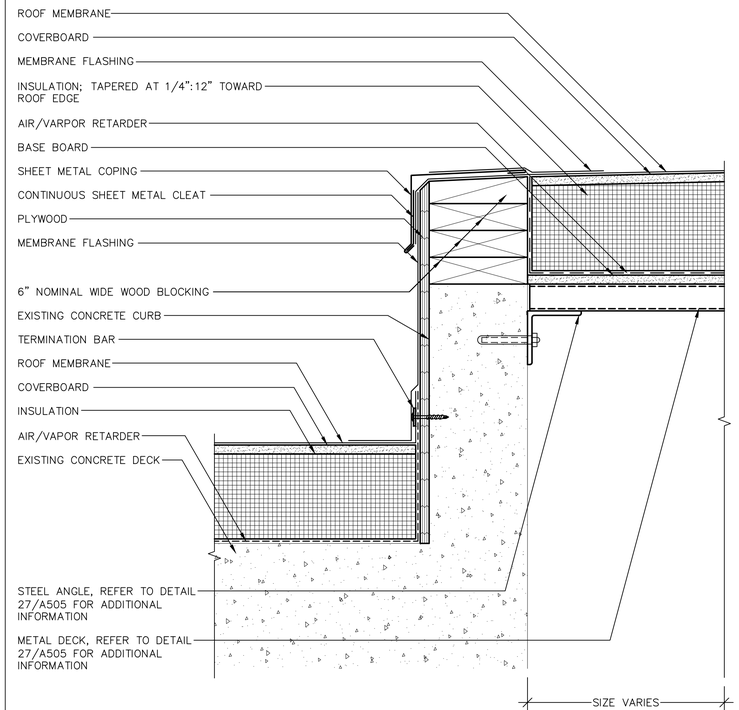
25 VENT/EXHAUST EXTENSION DETAIL
SCALE: 6"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)



26 LOWER SKYLIGHT CONNECTION DETAIL
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)



27 ABANDONED CURB INFILL
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)



28 ABANDONED CURB FLASHING
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)

NOTE: HEIGHT OF ABANDONED CURB VARIES.

29 NOT USED
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)

DETAIL INTENTIONALLY LEFT BLANK

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AT THE LOWELL HIGH SCHOOL
50 FATHER MORISETTE BLVD
LOWELL, MA 01852

OWNER
CITY OF LOWELL
375 MERRIMACK STREET
LOWELL, MA 01852

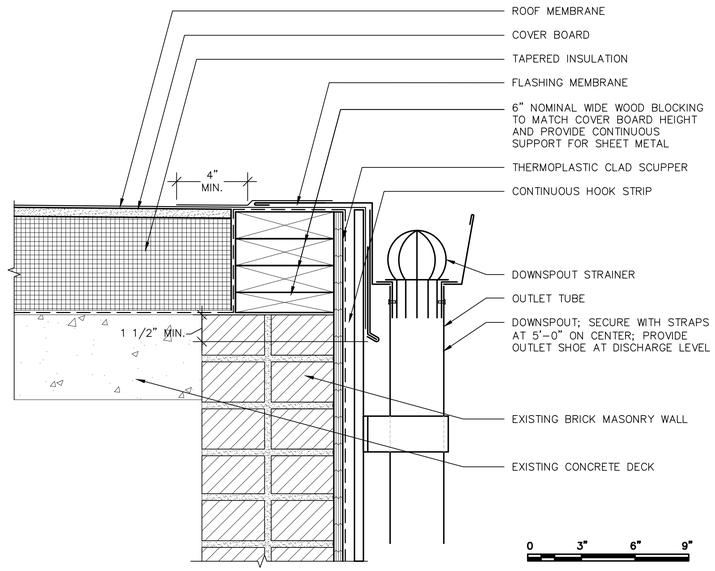
NO.	DATE	DESCRIPTION	BY

PROJECT NO.	833360
CADD FILE	833360 A500s
DESIGNED BY	RCO
DRAWN BY	JVL/ACP
CHECKED BY	SRM
DATE	2/2/2018
DRAWING SCALE	3"=1'-0"

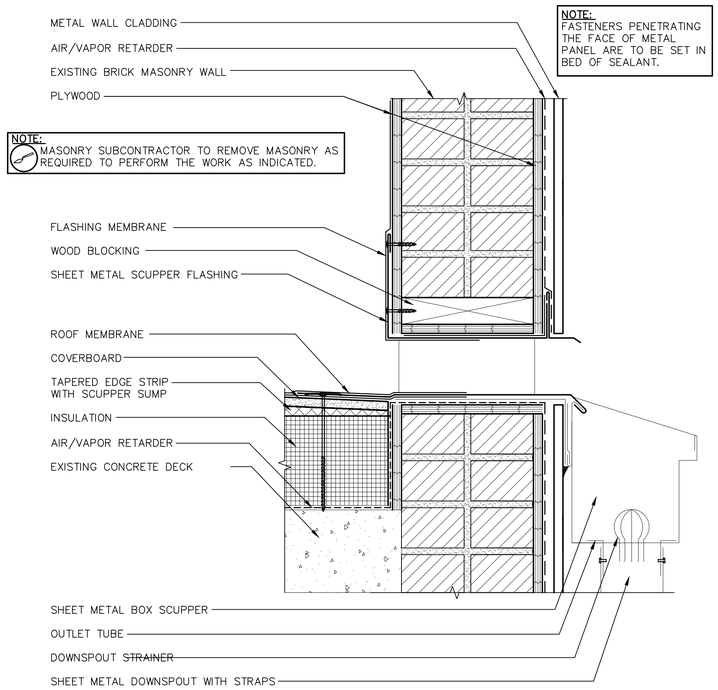
GRAPHIC SCALE
0 3" 6" 9"

SHEET TITLE
DETAILS

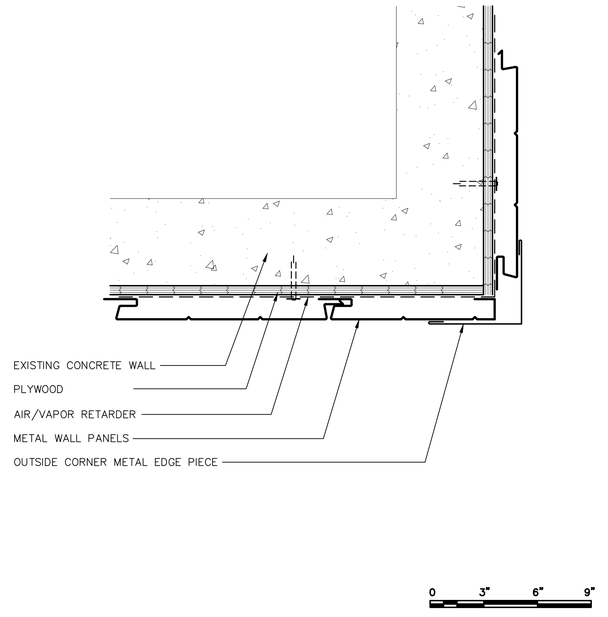
DRAWING NO.
A505



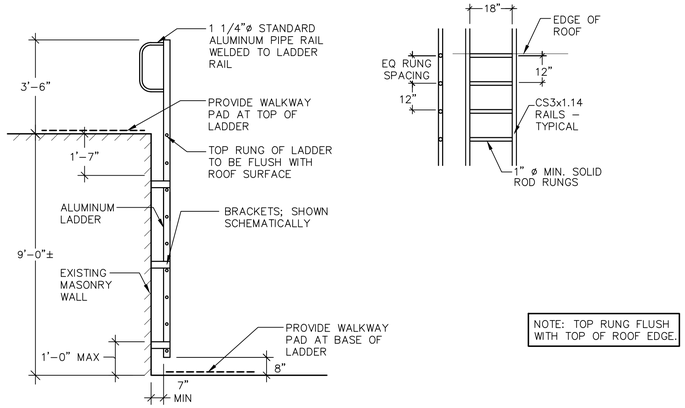
30 GUTTER WITH DOWNSPOUT DETAIL
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)



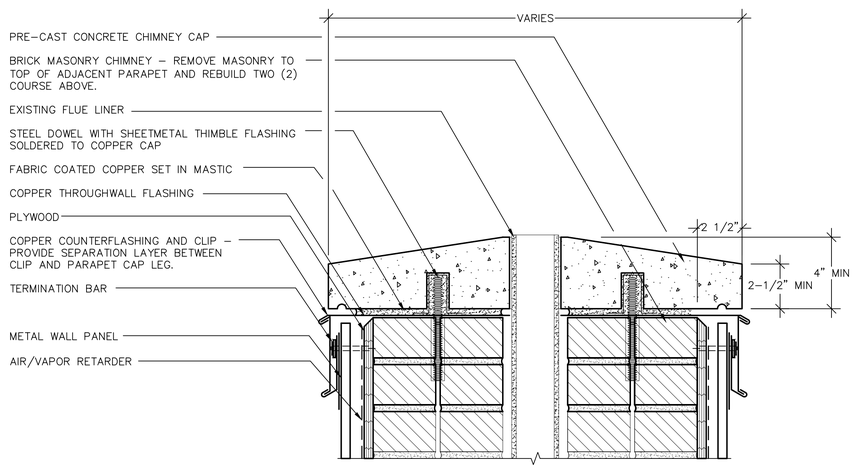
31 SCUPPER THROUGHWALL DETAIL
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)



32 METAL WALL PANEL CORNER DETAIL
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)



33 METAL LADDER DETAIL
SCALE: 3/8"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)
0 2' 4' 6'



34 CHIMNEY CAP DETAIL
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)
0 3" 6" 9"

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PROJECT
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LOWELL, MA 01852

OWNER
CITY OF LOWELL
375 MERRIMACK STREET
LOWELL, MA 01852

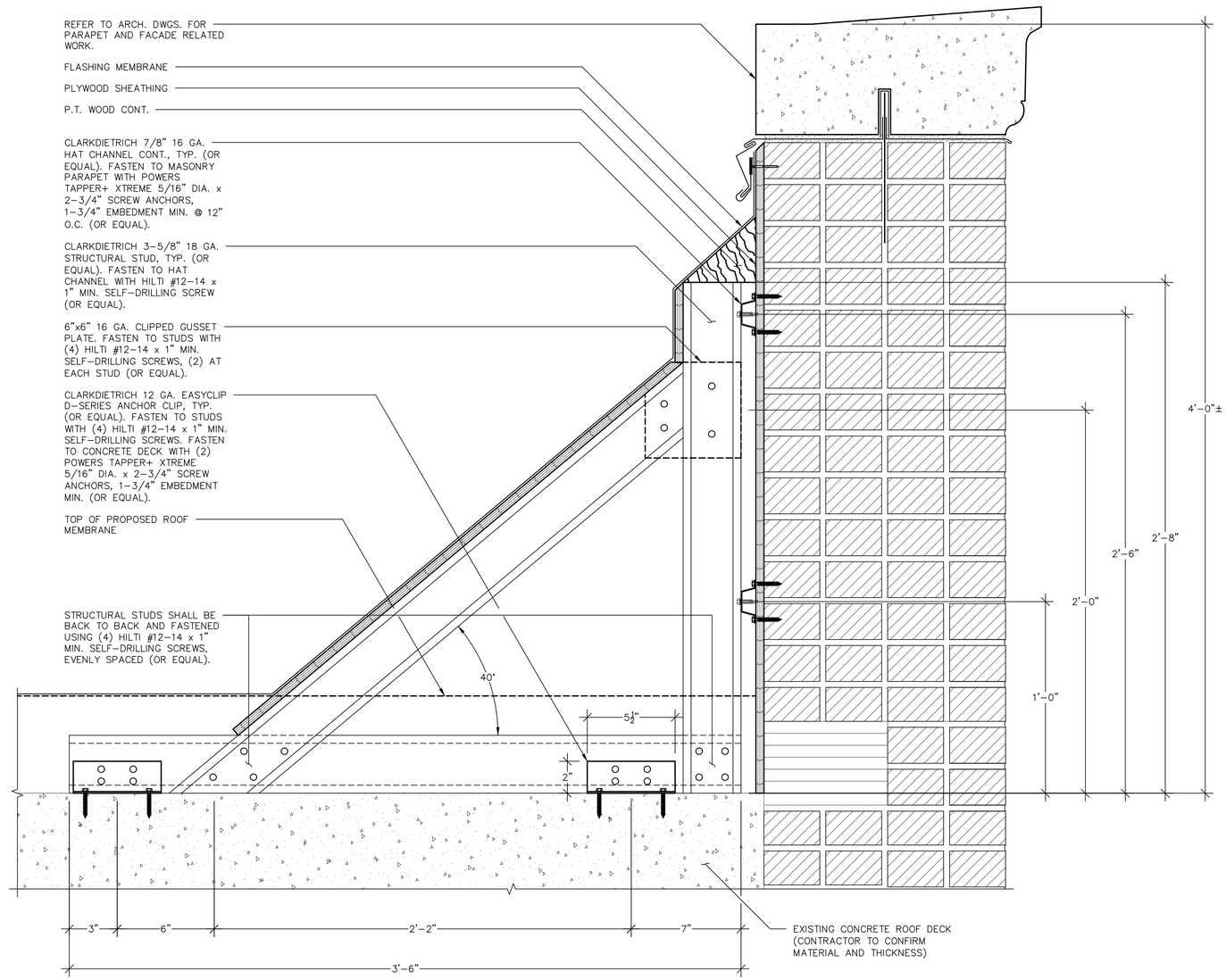
NO.	DATE	DESCRIPTION	BY

PROJECT NO.	833360
CADD FILE	833360 A500s
DESIGNED BY	RCO
DRAWN BY	JVL
CHECKED BY	SRM
DATE	2/2/2018
DRAWING SCALE	AS NOTED

GRAPHIC SCALE

SHEET TITLE
DETAILS

DRAWING NO.
A506



1 PARAPET BRACING DETAIL
SCALE: 3"=1'-0"
(ALL ITEMS ARE NEW UNLESS DESIGNATED AS EXISTING)

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PROJECT
ROOF REPLACEMENT AND ASSOCIATED WORK
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50 FATHER MORISETTE BLVD
LOWELL, MA 01852

OWNER
CITY OF LOWELL
375 MERRIMACK STREET
LOWELL, MA 01852

NO.	DATE	DESCRIPTION	BY

PROJECT NO.	833360
CADD FILE	833360 S500s
DESIGNED BY	RCO
DRAWN BY	SPJ
CHECKED BY	SRM
DATE	2/2/2018
DRAWING SCALE	3"=1'-0"

GRAPHIC SCALE
0 3" 6" 9"

SHEET TITLE
PARAPET BRACING DETAIL

DRAWING NO.
S501

ROOF REPLACEMENT
AND ASSOCIATED WORK AT THE
LOWELL HIGH SCHOOL
50 FATHER MORISSETTE BLVD.
LOWELL, MASSACHUSETTS

February 2, 2018

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Prepared For:

City of Lowell
375 Merrimack Street
Lowell, MA 01851

Prepared By:

Gale Associates, Inc.
15 Constitution Drive
Bedford, NH 03110

Gale JN 833140

ROOF REPLACEMENT
AND ASSOCIATED WORK AT THE
LOWELL HIGH SCHOOL
50 FATHER MORISSETTE BLVD.
LOWELL, MASSACHUSETTS

GALE JN 833360

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ROOF REPLACEMENT
AND ASSOCIATED WORK AT THE
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50 FATHER MORISSETTE BLVD.
LOWELL, MASSACHUSETTS

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SUMMARY OF WORK

SECTION 01 10 00

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

In general, the Contractor shall supply all labor, materials, equipment, temporary protection, tools and appliances necessary for the proper completion of the work, as required in the Specifications, in accordance with good construction practice, and as required by the materials manufacturer. The work includes, but is not limited to, the following items:

General

A. At roof areas A, B, C, D, E, F and G, remove and dispose of the entire existing roofing assembly. This includes, but is not limited to, EPDM membrane, insulation, fiberboard cover boards, edge metal and fascia, sealants and all other associated roofing components down to the existing concrete and metal decks to remain.

B. Install and furnish new fully adhered EPDM roofing assembly over existing concrete and metal decks. EPDM roofing assembly will consist of, but not be limited to, EPDM membrane, adhered cover board, adhered tapered insulation, adhered flat stock insulation to meet R-20 minimum, and self-adhered vapor retarder over existing roof decks. Include all wood blocking, edge metal, counter flashing, sealants and all accessories required for a complete watertight installation.

C. Strip in all field seams with EPDM. Two ply stripping to be used by applying a 5" wide strip of flashing over which a 9" wide strip is to be applied. Uncured membrane shall be utilized where required by the manufacturer or by detail conditions. Stripping shall be continuous over the entire seam and extend onto the field membrane 4" minimum.

D. Remove existing interior and exterior window and perimeter sealants and caulkings from all window and skylight frames. The existing sealants associated with the window and skylight components are ***assumed to contain asbestos***; remove and dispose of the windows and skylights in accordance with all local and state guidelines for the removal and disposal of Asbestos containing material.

E. Remove existing window units, louvers and brick masonry as identified in the Contract Drawings at Roof Area D. Install new throughwall flashing and new brick masonry infill as identified in the Contract Drawings. Existing steel lintels above window units are to remain.

F. Remove and dispose of skylight glass, frame, flashings and vent within penthouse roofs. Remove and dispose of internally mounted translucent panel skylight and attachment clips within stairwell. Remove and replace damaged bricks as a result of

skylight and translucent panel removal. The skylight assemblies and associated components are ***assumed to contain asbestos*** and shall be disposed of in accordance with all local and state guidelines for the removal and disposal of asbestos containing materials.

D. Remove all existing roof drains, clamping rings, strainers and bowls from all roof areas and prepare opening for new drain systems.

E. Remove existing terra cotta parapet caps to be recoated and reinstalled.

F. Remove and dispose of existing precast stone parapet caps to be replicated.

G. Remove all existing mechanical vent/fan units as designated in the Contract Drawings.

H. Remove existing metal louvers as identified in the Contract Drawings.

I. Provide miscellaneous electrical and mechanical disconnections.

J. Remove and store for reinstallation existing electrical conduits and any other removable obstruction as required to complete the work.

K. Create molds and cast new cast stone parapet caps to match the profile, color and texture of existing. Upon completion of the project, all molds generated for the replacement of cast stone components shall be issued to the Owner and stored in an Owner approved location on site.

L. Chip out and grout existing concrete substrate around perimeter of existing roof drain bowls as required to remove existing roof drain bowls and install new roof drain bowls. Coordinate this work with the Plumbing Contractor per Section 22 30 00 for limits and work activities.

M. Repair cracked or spalled concrete roof deck under the Unit Price scope of work. There are no known quantities of deteriorated concrete decking. Refer to Section 01 22 00 for additional information.

N. Install new through wall flashings as indicated in the Contract Documents. Coordinate the installation of the new flashings with Section 07 53 00 – Elastomeric Roofing and Flashings. Coordinate installation of the flashings with the Roofing Contractor.

O. Install new brick masonry to match existing as indicated on the Contract Drawings.

P. Notify Architect of any cracked or spalled brick masonry for review and approval prior to replacement on a unit price basis, in coordination with Section 01 22 00 Unit Prices.

Q. Install new wall mounted aluminum roof ladder.

R. Install and furnish new wood blocking, wood nailers and exterior grade plywood to accommodate the installation of the new roofing assembly. Install at all locations shown in the Contract Drawings.

S. Install and furnish 1/2" exterior grade plywood backing for all vertical membrane flashing and metal wall panel installation.

T. Install structural wood framing at locations to be infilled as identified in the Contract Drawings.

U. Install metal stud framing and gypsum infill at lower Roof Area D to form a 2-hour fire rated assembly. Coordinate work time with the City, as the interior of the school rooms may be occupied during school hours.

V. Install new wood framed box units to house the new vent/exhaust extensions required at Roof Area D. Coordinate with Section 26 10 00 Temporary Mechanical/Electrical Disconnects.

W. Install metal wall panels at rising masonry walls.

X. Install roof metal door and frame.

Y. Under Alternate No. 1 remove and replace the existing translucent panel skylight assemblies.

Z. Remove coating and underlying paint from all parapet caps to remain. Coating removal shall be performed with a chemical stripper. Mechanical means of coating removal may be required. Power-wash the surfaces once coating is removed. The Contractor shall take extreme caution during coating removal procedures.

AA. Upon completion of all cast stone, concrete and masonry repairs, recoat all existing and new parapet caps.

BB. Paint newly installed interior gypsum wall infill to match the existing wall colors.

CC. Install new cast-iron roof drain bowls, clamp rings, and strainers. Install new drain bowl collar extensions to accommodate the required minimum 2" of insulation.

DD. Clean all low slope roof drain systems from roof level to the point where it exits the building to achieve a free-flowing system. Perform at beginning of roofing operations and after substantial completion.

EE. Coordinate to replace, patch, seal, and repair all existing construction assemblies removed, damaged, or cut to allow for the installation of the new drain bowl assemblies. Repaired areas shall match the surrounding existing construction.

FF. Install vent pipe extensions where required to meet a minimum height of 18-inches, and a maximum height of 24-inches from the height of the new roof system to the top of the vent pipe. Coordinate with Section 07 53 00 Elastomeric Roofing and Flashing.

GG. Raise existing gas line to a minimum of 3.5 inches above the new finished roof height in coordination with Section 01 22 00 Unit Prices.

HH. Temporarily disconnect, remove, and support existing roof top fans, vents and mechanical ventilation equipment. Fans and equipment shall be re-installed and reconnected after installation of roofing and flashing of roof curbs. Provide electrical extensions, mechanical ductwork extensions, and roof curb extensions as required to extend the equipment above the new roof surface.

II. Remove and replace the designated mechanical curbs to provide a water tight condition; note, the existing curbs have been modified with exposed wood blocking on the exterior, to support the existing fan hood.

JJ. Remove existing louvers indicated at Roof Area D and install vent/exhaust extensions as required to maintain the existing louver opening size and terminate as required above the new roof membrane. Coordinate with Section 06 10 00 Rough Carpentry for wood blocking to be installed around new vent/exhaust extensions.

KK. Install Roofing Manufacturer approved walkway pads at designated locations.

LL. Supply all shoring, staging and protection necessary to protect the building area, building systems, parking areas and occupants.

MM. Provide all scaffolding, lifts, cranes, and equipment necessary to perform the work.

NN. Clean and restore all areas affected by the work including the site.

1.2 PROJECT CONDITIONS

A. The building will be occupied during the construction period. The Contractor shall take all necessary precautions required to minimize disruption to the building, site occupants and users during the course of the work hereunder. No loud noise, loud radios, etc. will be allowed on the job site(s). The Contractor's full agreement and cooperation in this regard are essential elements to the successful performance of the work under this Contract. The Owner shall have the right, at his/her sole discretion to require removal of any of the Contractor's employees, Subcontractors, agents or assigns that are found in violation of standards of conduct.

B. If required, the Contractor shall comply with all requirements of City of Manchester regarding temporary protection, staging and use of the site.

C. All existing items including windows, doors, building, plant life and site features, including but not limited to, pavement, lawns, sidewalks, frames, glazing, flashings, sealants, and trim shall be protected from the effects of all new work.

D. All temporary protection shall be properly secured and able to withstand all perils of weather and use. At a minimum, protection shall include plywood covering over

window and door assemblies below or adjacent to all active demolition/construction areas.

E. The Contractor shall supply, install and maintain all barriers; protection or warning lines; lights and lighting; and personnel as required to support the structure, fixtures and facilities affected by the work, and to segregate the work area(s) from pedestrian and/or vehicular traffic, as applicable, as well as to prevent damage to the building, its occupants and the surrounding site elements as required. All applicable OSHA and D.L.I. requirement shall be strictly followed by the Contractor, its Sub-Contractors, employees, agents and assigns at all times during the performance of the work under this Contract.

F. The Contractor shall schedule and execute all work without exposing the interior of the buildings to the effects of weather. Protect the buildings and their occupants and users against such risks, at all times during the course of the work hereunder. All work/weather related damage shall be repaired/replaced to the satisfaction of the Owner at no additional cost to the Owner.

G. The Contractor shall conform to all requirements of this Specification as well as those of all manufacturers of materials used in performing the work hereunder.

H. All materials and workmanship shall be of the best quality and the highest standard of construction practice. Refer to the requirements of materials manufacturers and the specifications for handling and installation of all materials used in the work under this Contract.

I. Protect the buildings and site and any other areas not included in the scope of work. The Contractor shall replace or repair all damage to the buildings or site elements because of the performance of the work hereunder to the satisfaction of the Owner at no additional cost to the Owner.

J. Supply all labor, equipment, tools, appliances, services, shoring, supports or other items as required to properly support, elevate, and protect fixtures, equipment and facilities affected by the work as required and to properly execute the work.

K. Remove only as much existing construction as can be completely replaced and made weathertight by the end of each workday including all flashing work. Install temporary barriers during all work breaks as required to protect the public and the work.

L. A disposal plan, materials delivery and storage plan shall be submitted by the Contractor (for Owner and Engineer review and approval) outlining all methods and techniques to be used in the transportation, storage and delivery of debris and materials at the site.

M. Supply all necessary disposal facilities, transportation and labor in connection therewith as necessary to legally dispose of all demolished materials, dirt and debris off-site. The Contractor shall obtain all permits required to transport and dispose of all materials rubbish and debris in strict compliance with all legal requirements.

N. Any open ducts, grills, thermostats, electric boxes or similar fixtures and/or items which could be soiled or adversely affected by the work shall be masked, protected and cleaned as necessary by the Contractor at no additional cost to the Owner.

O. The Contractor shall cooperate and coordinate with all Contractors working at the site during the course of work hereunder.

1.4 SUBMITTALS

A. Emergency Response Contacts
B. Construction Schedule
C. Schedule of Values
D. Material Safety Data Sheets (MSDS)
E. Refer to technical specification sections for material submittals.

1.5 PRECONSTRUCTION CONFERENCE

A. A Preconstruction Conference will be held with the Owner, Engineer, Contractor and all involved trades to discuss all aspects of the project. The Contractor's foreman or field representative will attend this Conference. The foreman must be English-speaking. The conference will not be held until all shop drawings and submittals have been received and reviewed by the Owner.

B. The Owner shall reserve the right to require an alternate Superintendent and/or Foreman.

C. Delivery of materials and commencement of construction shall not proceed until the preconstruction conference is held. Delays in obtaining a complete set of submittals shall not extend the Contracted completion date.

1.6 REFERENCES

Applicable publications: Publications listed herein form a part of the Specification to the extent referenced and are indicated in the text by basic designation only. Applicable publications referenced shall be those that were issued and in use at the time of the Bid Submission.

1.7 EMERGENCY RESPONSE

A. The Contractor shall provide the Owner with after-hours (24 hour), emergency telephone numbers of the Contractor's Superintendent and Foreman.

B. The Contractor must respond to emergency situations or calls within two (2) hours.

1.8 CONSTRUCTION SCHEDULE

A. The Contractor shall be responsible for coordinating and scheduling all applicable trades as well as the erection of all staging, delivery of materials and disposal of

existing materials scheduled to be removed within the time constraints established in the Contract.

1. Mobilization Start
2. Substantial Completion
3. Final Completion

B. The Contractor's Construction Schedule shall clearly identify the on-site crew foreman and the size of the crew to be utilized. The crew size shall remain consistent and work shall be continuous throughout the project, from start-up to completion.

C. The Owner shall review the Contractor's Construction Schedule prior to the start of any work. It shall be the responsibility of the Contractor to supply the Owner with written notice, 72 hours in advance, if his work location(s) for a workday is different from the schedule. The Contractor shall update his Construction Schedule weekly, and submit a copy to the Owner for review.

1.9 DIMENSIONS AND QUANTITIES

A. Verify dimensions and quantities in the field prior to bid submission. The Project Plans and Drawings have been compiled from various sources and may not reflect the actual field conditions at the time of construction.

B. The Contractor is solely responsible for compliance with the project specifications, plans and drawings. Make necessary investigations and take necessary precautions to properly supply, fabricate, and install work.

C. Additional compensation due to unfamiliarity with project conditions will not be considered.

D. In case of inconsistency between Drawings and Specifications or within either document, the better quality and/or greater quantity of work shall be provided, as determined by the Owner.

1.10 SCHEDULE OF VALUES

Provide a line item breakdown of construction labor and materials costs for each Specification Section included in these Contract Documents. Additionally, provide line items values for Unit Price Work included in these Specifications. Utilize AIA Forms G703 and G703A to prepare and submit the Schedule of Values.

1.11 WORK RESTRICTIONS

A. Contractor shall maintain public driveway access at all times. On-Site Work Hours: Work shall be generally performed during normal business working hours of 7:00 a.m. to 6:00 p.m., Monday through Friday, except otherwise indicated.

B. Contractor shall maintain work areas in an orderly condition and will be responsible for clean-up and removal of debris to the Contractors dumpster on a daily basis. If, in

the opinion of the Owner, clean-up is not being performed satisfactorily, the Owner shall, after 24 hours of having notified the Contractor of the same, have the work performed by others and all charges incurred thereby deducted from the next progress payment of the Contractor.

C. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas where work is directly being performed. Do not disturb portions of the site beyond the areas in which the Work is indicated.

D. Site Enclosure Fence: Not required.

1.12 PROGRESS MEETINGS

The Owner shall schedule progress meetings as deemed necessary.

1.13 MATERIAL SAFETY DATA SHEETS

Material safety data sheets (MSDS) shall be submitted in complete sets for all products to be used prior to any work being performed.

1.14 GUARANTEES

A. Refer to specific Sections of this specification for systems and product warranty requirements. Verify with Manufacturer of proposed systems and products that specified warranty requirements are acceptable, without exception, prior to selecting materials for use on this project.

B. Submit a full Contractor Warranty of the Work to be free from defect in materials and workmanship upon Substantial Completion, and prior to final payment. This Warranty shall be for a period of two (2) years from the date of Substantial Completion, and shall be signed by a Principal of the Contractor's firm, and sealed if a Corporation.

1.15 INDEMNIFICATION AND WAIVER OF LIENS

Beginning with the first Application for Payment and thereafter, the Contractor, Sub-Contractor(s) and suppliers shall submit an Indemnification and Waiver of Liens for the construction period covered by the previous application on the form attached as part of the required documentation in any application for payment.

1.16 DUST AND ODOR CONTROL

A. The Contractor shall coordinate with the Owner the daily shutdown of HVAC intake units in the work areas, which may be affected by construction dust, fumes, odors or air borne debris. If the Owner cannot shut down or cannot permit shut down of the air intakes, it shall be the responsibility of the Contractor to provide control of dusts, odors or fumes as required by the Owner and as necessary to protect the health and safety of the building's occupants.

B. The Contractor will install clear plastic secured with duct tape over all air intake vents at the beginning of each work day to reduce any construction related odors and dust from entering the building. The Contractor will remove the plastic at the end of each workday.

C. During removal operations, the Contractor shall be responsible for the containment of all dust, dirt, debris, overspray and/or run-off resulting from the performance of the work. The Contractor shall collect and contain all materials and repair any resulting damage to adjacent materials, building and/or site elements and personal property. Specific attention is drawn to the use of chemicals and cleaners that must be used responsibly in strict compliance with manufacturer's requirements and all applicable regulatory guidelines.

1.17 WORK INSIDE THE BUILDING

A. The Contractor shall not leave or store any tools, equipment, materials, debris or other items on or within the building unless permission is given by Owner.

B. Contractor shall not use building's dumpster for debris associated with this project.

1.18 CLEAN-UP

Restore property of the Owner to its original condition prior to the start of construction. Refer to Section 01 50 00 – Temporary Facilities. General clean-up of the site shall be performed on a daily basis.

A. Clean, restore and/or replace items stained, dirtied, discolored or otherwise damaged due to the Work, as required by the Owner.

B. Clean roof, building (interior and exterior), landscaped and parking areas so they are free of trash, debris and dirt caused by, or associated with the Work.

C. Sweep paved areas clean.

D. Site clean-up shall be performed daily.

1.19 MANUFACTURER INSPECTIONS

The chosen roof membrane manufacturer's representative will be required to periodically visit the site. The manufacturer's representative shall provide guidance on the proper use and installation of their products. Each materials manufacturer shall provide a written report on their findings of their site visit noting any actions to the Engineer (promptly following each site visit) indicating any items or materials not installed as recommended by the manufacturer or as specified by the Engineer.

1.20 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Roof Replacement and Associated Work at the Waste Water Treatment Annex Building

1. Project Location: 300 Winston Street, Manchester, NH 03103.

B. Owner: City of Manchester, 475 Valley Street, Manchester, New Hampshire 03103-5613.

1. Owner's Representative: Chris Crowley / Eric Krueger
2. Owner's Representatives duties include:
   a. Administer construction contracts.
   b. Establish and maintain coordination procedures.
   c. Develop, implement, monitor and expedite procedures for submittals, change orders, information requests, progress payments and approvals.
   d. Monitor compliance with labor standards outlined in the construction Contractor's contract
   e. Conduct periodic job site visits to review progress, discuss/resolve problems and coordinate work
   f. Maintain records and submit routine reports to the Owner.
   g. Monitor Contractor's performance for adherence to contract procedures, schedules and technical requirements and provide written reports
   h. Advise the occupants on issues related to staging, planning and sequencing, handling/storage of materials, etc.
   i. Provide cost control through progress payment review and verification according to the approved schedule and budget.
   j. Provide claims control by documentation, prompt disposition, fact finding and negotiation and assist the Owner in the resolution of any claims.

C. The Work consists of the following: and per the construction drawings and documents enclosed in this

1. Mobilization.
2. Demo of existing roof per plans with a method approved by the owner.
3. Installation of new roofing system per drawings, submittals, specifications and or sketch’s.
4. Repairs to existing roof membranes and systems.
5. Cleanup and demobilization.
6. Site Safety/Security

1.21 TYPE OF CONTRACT

A. Project will be constructed under a single prime contract. Roofing Contractor is required to carry other trades to complete the work detailed in the documents.

1.22 WORK UNDER OTHER CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this

Contract. Coordinate the Work of this Contract with work performed under separate contracts.

B. Separate Contract: The Owner reserves the right to perform construction operations at the site. Those operations may be conducted simultaneously with work under this Contract. No specific projects are planned at this time.

1.23 USE OF PREMISES

A. General: Contractor shall have full use of the rooftop for construction operations, including limited use of Project site as defined by the owner, during construction period.

B. Contractor is responsible for safety on the job site at all times. Contractor shall take the appropriate actions to assure the areas of construction are secured from the public. Contractor shall construct and/or install temporary fencing, signs and barricades as required assuring a safe and secure environment. Proper barricading of work area is a requirement, to protect people and City property.

C. Contractor's staging/lay down areas is to be coordinated through the owner representative. The Contractor is responsible for obtaining any and all building permits (fees will be waived) and satisfying all requirements for accessing the City streets from the site. Contractor shall coordinate with the local authorities. Contractor is responsible for repairing any damage to staging/lay down area. Contractor shall not place trailers, equipment, lay down, storage facilities outside of project site after normal working hours. Contractor shall have no vehicles, trailers, storage containers in any fire lanes or prohibited areas.

D. Contractor shall not restrict the owner's access to the buildings entrances area. If, the Contractor should need to temporarily restrict the owner's access to any areas, the Contractor shall submit a written notice to the owner 24 hours in advance of access restriction.

E. Contractor to supply temporary facilities (toilets).

PART 2 – PRODUCTS

NOT USED.

PART 3 – EXECUTION

NOT USED.

END OF SECTION

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SECTION 01 22 00

UNIT PRICES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the Contract and General Conditions and all Sections within Division 1 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

B. Examine all other Sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.2 DESCRIPTION OF WORK

This Section contains instructions and references other Contract Documents that relate to Unit Prices. The Owner may elect certain aspects of the work, whose quantities cannot be determined at this time, to be performed or deleted by the General Contractor. If such work items are elected, the Contract price will be adjusted by the Unit Price amount shown for each item in the Bid Forms.

A. A Unit Price is an amount proposed by Bidders and stated on the Bid Form as a price per unit of measurement for materials or services that will be **added to or deducted** from the Contract Sum by Change Order in the event the estimated quantities of Work required by the Contract Documents are increased or decreased.

B. The Bidders shall submit with their Bids, prices for the performance of Unit Price work. The general scope of the Unit Price work is defined within this section.

C. The successful Bidder shall coordinate related work and modify or adjust adjacent work as necessary to ensure that work affected by each Unit Price Item is complete and fully integrated into the project.

D. The specific quantities of Unit Price Work included in the Base Bid are provided herein. This applies to items whose exact quantities are unknown but are anticipated to exist, for example, deteriorated roof decking.

E. The specific quantities of Unit Price Work included in the Alternate scope of work are provided herein. This applies to items whose exact quantities are unknown but are anticipated to exist, for example, deteriorated roof decking.

F. The quantities of Unit Price Work listed in this Section and the bid and contract forms **are in addition to the quantities shown on the Contract Drawings (if any).**

G. The Unit Prices requested herein shall include a pro-rata share of all costs for materials, labor, equipment costs, overhead, profit, and applicable taxes.

H. Where not otherwise specified, Unit Prices cover net costs and credits to the Owner for executing authorized changes in the Work. No separate adjustments are made for labor, materials, transportation, handling, storage, overhead, profit, or other related work expenses.

I. If unit price quantities vary greater than twenty (20) percent above the amounts carried in the Base Bid, the Owner reserves the right to re-negotiate lower unit price costs. The Contractor will be required to notify the Owner once they approach this limit as the work progresses.

1.3 SCOPE OF WORK

A. The Unit Prices for items of Work, as set forth in the Schedule of Unit Prices, shall be used to determine adjustments to the Contract Amount when changes in the Work involving said items are made in accordance with the Contract Documents.

B. Materials, methods of installation, and definitions of terms set forth under the various Unit Price items in the Schedule of Unit prices shall be as indicated in the Contract Documents.

C. The successful Bidder shall coordinate related work and modify or adjust adjacent work as necessary to ensure that work affected by each Unit Price Item is complete and fully integrated into the project.

1.4 APPLICABILITY OF UNIT PRICES

A. Prior to commencing removal or replacement of materials set forth in the schedule of Unit Prices, the General Contractor shall notify the Owner in sufficient time to permit proper inspection and measurements to be taken. Only quantities that have been approved in writing by the Owner will be considered in the determination of adjustments to the Contract Sum.

B. Unit Price Work includes providing and installing all accessories and appurtenant work necessary to properly execute the Unit Price Work.

C. Performance of work not required by the Contract Documents, or which is not authorized by Change Order or Field Order, whether or not such work is set forth hereunder as a Unit Price item, shall not be considered cause for extra payment. The General Contractor will be held fully responsible for such unauthorized work, including the performance of all corrective measures required by the Owner.

1.5 VERIFICATION OF UNIT PRICE QUANTITIES

The following minimum procedures must be included by the Contractor for each of the indicated unit repair items for the duration of the project:

A. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices and estimated quantities. Methods of measurement and payment for unit prices and estimated quantities are as follows:

1. For work covered by scheduled quantities, notify the Owner and Engineer a minimum of 24 hours in advance of the performance of such work.
2. Document such work in writing, identifying type of work, quantity and location of work. Submit documentation on General Contractor's letterhead.
3. All documentation of work covered by scheduled quantities will be subject to verification and approval by the Owner and Engineer.
4. In order to be considered for payment, documentation for work covered by scheduled quantities shall be submitted within one month of performance of such work. Requests for payment of such work submitted more than one month after the work has been performed will not be accepted.
5. Only documentation signed and verified by the General Contractor, Trade, and the Owner's Representative will be considered valid. Documentation not signed by all these parties will be considered invalid.

B. The General Contractor shall contact the Owner and Engineer if a Unit Price quantity is anticipated to be reached prior to exceeding that quantity. No additional costs will be awarded to the General Contractor for additional Unit Price Work without written approval from the Owner and/or Engineer.

C. The General Contractor must provide safe, adequate, and ample access to the Owner and Engineer for verification of the Unit Price Work throughout the course of construction.

D. The General Contractor is required to track and record actual placed and completed Unit Price Work throughout the course of construction, and submit a breakdown to the Owner and Engineer on a weekly basis or as requested. The breakdown shall include the following for each Unit Price item:

1. Completed quantity to date
2. Remaining quantity to date
3. Percentage of total quantity remaining

1.6 UNIT PRICE SCHEDULE

The following unit prices as defined in the specifications are designated for items of work on the basis of unknown quantities or quantities estimated by the Engineer. These unit prices will be used to add or to deduct from the dollar amounts shown, depending on whether the actual amount is greater or less than the estimated amount. UNIT PRICES GIVEN HEREIN SHALL BE FOR ADDITIONAL WORK ONLY. DECREASED WORK SHALL BE AT THE "ADD" PRICE LESS FIFTEEN PERCENT (15%).

The unit prices listed below are **above and beyond** that shown on the Contract Drawings and shall be included by the General Contractor under the appropriate Base Bid Scope of Work. The General Contractor's Schedule of Values will carry each item under the bid amount selected for this project. Should the unit price work not be performed on this project, the total amount, or remaining amount if portions of unit price work are performed, shall be credited to the Owner.

Base Bid Unit Prices

Section	Item	Estimated Quantity (**beyond drawings**)	Unit of Measure	Unit Price Dollar/Cents	Total Amount Dollar/Cents
03 60 00	Repair of spalled concrete roof deck	20	Square Feet	$_____	$_____
03 60 00	Repair of cracked concrete roof deck (less than 3/16")	20	Linear Feet	$_____	$_____
03 60 00	Repair of cracked concrete roof deck (greater than 3/16")	20	Linear Feet	$_____	$_____
04 50 00	Replacement of brick masonry units (to match existing)	20	Each	$_____	$_____
06 10 00	Replacement of deteriorated wood blocking	20	Linear Feet	$_____	$_____
22 30 00	Raise existing gas line as necessary to be 3.5" min. above new finished roof height	60	Linear Feet	$_____	$_____

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

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PAYMENT PROCEDURES

SECTION 01 29 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:

   a. Application for Payment forms with Continuation Sheets.
   b. Submittals Schedule.
   c. Contractor's Construction Schedule.

2. Submit the Schedule of Values to Owner at earliest possible date but no later than the 22nd of the month. Once approved the check will be processed on the 15th of the following month.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:

   a. Project name and location.
   b. Name of Architect applicable.

c. Contractor's name and address.
d. Date of submittal.

2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

a. Related Specification Section or Division.
b. Description of the Work.
c. Name of subcontractor.
d. Name of manufacturer or fabricator.
e. Name of supplier.
f. Change Orders (numbers) that affect value.
g. Dollar value.

1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. Include separate line items under required principal subcontracts for operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training in the amount of 5 percent of the Contract Sum.

4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.

6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

7. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement. Reference Article 9, Payments and Completion, General Conditions of the Contract for Construction, AIA Document A105, for schedules for submission of Application for Payment, etc.

C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.

2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Transmittal: Submit a minimum of two (2) signed and notarized original copies of each Application for Payment to the Owner by a method ensuring receipt within 24 hours.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

F. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary if not final).
4. Products list.
5. Schedule of unit prices.
6. Submittals Schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of building permits.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Certificates of insurance and insurance policies.
12. Initial settlement survey and damage report if required.

G. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

H. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements. See Spec 01 77 00 Closeout Procedures.

2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.

3. Updated final statement, accounting for final changes to the Contract Sum.

4. Evidence that claims have been settled.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

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SHOP DRAWINGS AND SUBMITTALS

SECTION 01 33 00

1.1 DESCRIPTION

This Section contains instructions for submittals and shop drawings required at various stages of the project. The following will be required for all construction components and systems:

A. List of materials stating manufacturer's name and address, as well as material trade name and manufacturer's designation.

B. Manufacturer's Catalog Data ("SPEC DATA").

C. Manufacturer's Installation Instructions.

D. Samples (as specified in the Technical Sections).

E. Material Safety Data Sheets (MSDS).

F. Shop Drawings

1.2 SUBMITTALS

Note: Submit a complete submittal package as specified herein according to the project schedule outlined in the Bid Documents.

A. Bid Submission: Refer to Instructions to Bidders regarding information to accompany Bid Forms.

B. Informational quantities: Provide quantity breakdown for specific portions of the Unit Price work as requested by the Owner. These quantity calculations will be required for allocation of funding prior to award of contract.

C. Contract Submissions: After award of the Contract by the Owner, provide three (3) copies of the following submittals to the Owner:

1. Proposed Construction Schedule for completion of the Work specified in this project manual.

2. Complete materials list with corresponding manufacturer for each product proposed.

3. Shop Drawings.

4. Manufacturer's Technical Literature with system designations and a sample of the product guaranty.

5. Manufacturer's Instructions.

6. Catalog Data ("SPEC-DATA" Sheets).

7. Samples of all materials of construction designated as requiring submittals in the applicable technical section including fasteners and sheet metals.

8. Certificates as approved Applicator by all material manufacturers.

9. List of proposed storage facilities and their location(s).

10. Proposed location(s) of dumpsters.

11. Schedule of Values: Itemize separately labor and materials for each technical section within the Specification as they will be shown on the Application for Payment (use AIA Form G703).

12. Material Safety Data Sheets (MSDS): Provide MSDS for each proposed product prior to start of work.

13. Certificate of Dumping Facilities.

14. Letter of Compliance from all the material manufacturers that all materials proposed for the new construction are acceptable to the material manufacturer for the specified warranties.

15. Certificates as approved Applicator by all material manufacturers.

16. General Contractor's Guarantee Form as provided by the Owner in the Contract Forms to be reviewed by Owner.

17. Certificate of Compliance as provided by the Owner in the Contract Forms.

18. Program for the containment of cleaning chemicals.

D. Weekly Submissions: At the end of each week during construction, submit an updated construction schedule showing the amount of completed new work installed, anticipated future work areas, and anticipated completion dates. Update schedule changes.

E. Close-out Submission: See Section 01 77 00 - Project Close-out for required submittals.

F. Re-submittals: All re-submittals required from the Contractor shall be submitted within five (5) working days of return of original submittals.

G. Permits: Prior to start of construction, the Contractor is to provide the Owner with copies of all building permits, licenses, and other documents required by the General Conditions.

1.3 SHOP DRAWINGS

A. Shop drawings shall be to scale and clearly indicate all components and interfaces.

B. Original Submittal: Submit one (1) reproducible copy and two (2) prints of shop drawings for review within ten (10) calendar days of Contract award.

C. Re-submittal: If re-submittal is required, the original reproducible indicating comments and revisions will be returned to the Contractor upon request. Submit a revised reproducible and two prints for review.

D. Acceptance: Repeat this procedure until acceptance is obtained. One copy of each accepted shop drawing will be returned to the Contractor, at which time the Contractor shall make sufficient copies for the Owner, as well as sufficient copies for his use.

E. Shop Drawings of an engineering nature shall be sent directly to the Engineer for review, with a copy of the transmittal and one print sent to the Owner.

F. Transmittal: All reproducibles shall be transmitted rolled in mailing tubes and not folded.

1.4 RECORD DRAWINGS

A. The Contractor shall provide two copies of all contract drawings showing as-built conditions to the Engineer for approval at the completion of the project. This will be a requisite for final payment.

1.5 SAMPLES

A. Original Submittal: Two (2) samples, unless otherwise specified, of each item for which samples are required shall be furnished for review. The Engineer must indicate that no exceptions are taken prior to delivery of the materials to the project site. Such samples shall be representative of the actual material proposed for use in the project and of sufficient size to demonstrate design, color, texture and finish when these attributes will be exposed to view in the finished work.

B. Re-submittals: All rejected samples will be returned upon request, and any or all re-submittals shall consist of two (2) new samples.

C. Review: Once the Engineer has indicated that no exceptions are taken, one sample so noted will be returned and the Engineer, until completion of the work, will retain the remainder. When requested, all satisfactory samples will be returned for installation, provided their identity is maintained in an approved manner until final acceptance of the project.

D. Important specific samples are specified in Technical Sections of the Specifications. The Contractor is cautioned to quickly provide specified samples.

1.6 CATALOG DATA

A. Submittals: One (1) electronic copy of catalog data are required for the original submittal and each subsequent re-submittal along with shop drawings. If approved or not approved, one (1) electronic copy will be returned so noted. If approved, such additional copies may be requested by the Engineer and shall be furnished without additional cost.

B. Data: Each submittal shall have all pertinent data contained therein that is applicable to the item submitted for approval, adequately and permanently designated.

1.7 MANUFACTURER'S INSTRUCTIONS AND APPROVAL

A. Where in these Specifications an item is called for to be installed in accordance with the manufacturer's directions, specifications or recommendations, the Contractor shall furnish the Engineer with one (1) electronic copy of said directions, specifications or recommendations, before the item is installed.

B. The Contractor shall submit evidence that the materials manufacturers have reviewed the project and proposed materials and that the completed installations will be acceptable for the required warranties:

1.8 CERTIFICATES AND GUARANTEES

A. Certificates of performance, treatment and conformance to specified standards shall be submitted prior to initiating work on the project.

B. Copies of all guarantees required on the project shall be submitted for review and acceptance as to form prior to initiating work on the project.

1.9 IDENTIFICATION

A. Each submittal shall have the pertinent data listed below that is applicable to the item submitted for approval, adequately and permanently labeled on the item.

B. Clearly identify submittals with the following data:

1. Project name and location.
2. Contractor's name and address.
3. Subcontractor's, Vendor's and/or Manufacturer's name and address.
4. Product Identification and Date of Submission.
5. Shop drawing title, drawing number, revision number and date of drawing and revision history.
6. Applicable Contract Drawing(s) and Specification section number.

C. Catalog Data: Identify each separate catalog, brochure or single page submitted as required above.

1. Catalogs or brochures containing multiple items for review need the identification on the exterior and on each specific item clearly circled, flagged or otherwise identified.

2. If one or more of the multiple items are not accepted in any submittal, additional copies may be required to obtain complete approval. Do not commence Work until every submittal is accepted.

1.10 CONTRACTOR'S RESPONSIBILITY

A. Representation: Submittal of any shop drawing or catalog data represents that the Contractor has determined and verified field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data, or will do so, and that he has checked and coordinated each item with other applicable approved shop drawings and the Contract requirements.

B. Deviations: Approval of shop drawings, samples or catalog data by the Owner shall not authorize any deviation from the requirements of the Contract Documents, nor shall such approval relieve the Contractor from responsibility for errors or omissions therein. If shop drawings or submittals deviate, or are intended to deviate from Contract Documents, advise the Owner in writing at the time of their submittal, stating the difference between the Contract requirements and that denoted by the shop drawings or submittal.

C. Commencement: Order, fabricate, and install materials requiring a submittal only after the approval of the submittals related to such items.

D. Acceptance: Project Work, materials, fabrication and installation shall conform to accepted submittals, shop drawings, and catalog data.

E. Manufacturer's Information: Where manufacturer's directions, specifications or requirements are called for, the Contractor shall have the responsibility of determining whether such directions, specifications, or requirements may safely and suitably be employed in the work. Notification to the Owner must be made, in writing, if deviations or modifications are necessary for installation safety or proper operations.

F. Concealed Conditions: If an unspecified or undetailed condition is discovered during the work, the Contractor shall submit scaled shop drawings indicating specific components and configurations planned for use. Provide temporary protection for the duration of the review process. Shop drawings must be approved and accepted by the Owner prior to installation of the related work.

G. Non-Submittal: Failure by the Contractor to submit shop drawings or submittals in ample time for review or resubmission (if required) prior to the commencement of construction shall not affect the completion date of the contract. Materials or methods of construction utilized in the Work by the Contractor without written acceptance by the Owner shall be done at the Contractor's own risk. Such materials or methods shall be subject to rejection by the Owner.

H. Timing: Make submittals to the Owner far enough in advance of scheduled dates of preconstruction meeting, mobilization, execution, or installation to provide time required for reviews, for securing necessary approvals, for possible revisions and re-submittals, and for placing orders and securing delivery.

I. Schedule and allow at least ten working days for review by the Owner following receipt of submittal. Contractor shall be responsible for delays resulting from incomplete submittal packages.

J. Subsequent Reviews: Costs associated with reviews required beyond the first revision review will be paid by Contractor.

K. Submit a complete set of necessary submittals required by the Contract Documents. Partial submittals may be rejected for non-compliance with the Contract Documents.

1.11 CERTIFICATES AND GUARANTEES

A. Certificates of performance, treatment and conformance to specified standards shall be submitted prior to initiating work on the project.

B. Copies of all guarantees required on the project shall be submitted for review and acceptance as to form.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

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TEMPORARY FACILITIES

SECTION 01 50 00

1.1 DESCRIPTION

This Section contains instructions and requirements for the provision and utilization of temporary facilities to protect the Owner's property, the site and construction materials; and daily maintenance and cleanup of the site during the project.

1.2 SET-UP AREAS AND USE OF THE SITE

A. The Owner shall determine the locations of the Contractor's designated set-up areas. The Contractor may not utilize any other locations unless permission is obtained from the Owner.

B. The Contractor shall permit the Owner and Engineer access to the staging, work areas and test areas at any time, as required to perform inspections and review mock-ups. The Contractor shall not move or remove staging or access to the work areas until instructed by the Owner and Engineer to do so. Any staging or access to the work areas removed by the Contractor without approval of Owner and Engineer, shall be reinstalled and set-up at the request of the Owner and/or Engineer at no additional cost to the Owner.

C. Other specific requirements of the Owner will be addressed and outlined at the Pre-Construction meeting to be held prior to the start of work.

D. Contractor shall provide temporary sanitary facilities in a location agreeable to the Owner. Use of the sanitary facilities within the building is not permitted.

E. Owner will assist in controlling occupancy. Contractor shall provide and place portable barricades, as coordinated with the Owner, under work areas inside the buildings.

F. Take precautions necessary and provide equipment, materials and labor to adequately protect previous construction, the building, its contents and occupants, and surrounding landscaped areas from damage due to construction as well as from inclement weather during construction.

1.3 UTILITIES

A. The Owner, through exterior electrical outlets, if operable, will provide electrical service to the Contractor free of charge. Use shall be limited to construction hours. The Contractor and/or subcontractors shall provide their own electrical generator for welding equipment, HEPA vacuum, and grinding equipment. The Owner reserves the right to charge the Contractor(s) for excessive electrical service usage (i.e., wasteful usage). Should charges be considered, the Owner will notify the Contractor in writing of his intent 48 hours in advance.

B. Owner will provide water for construction purposes free of charge through exterior water spigots, if operable. The Owner reserves the right to charge the Contractor for excessive or wasteful use. Should charges be considered, the Owner will notify the Contractor in writing of his intent 48 hours in advance. The Contractor shall provide drinking water.

C. Contractor shall provide all other utilities required by the work.

D. Electrical work, including reinstallation of equipment and other work to be performed by the Contractor, shall be carried out without interference to the building's normal operation. Where work requires interruption of service, the Contractor shall make advance arrangements with the Owner for dealing with such interruption.

E. Ensure proper and safe operation and maintenance of utility systems within the construction limits, whether these are supplied by the Owner's distribution system or otherwise, until the Owner accepts the work. Maintain and operate appurtenances within the construction area that serve the distribution system, subject to periodic inspection by the Owner's operating personnel. Inspection by any representative or personnel of the Owner shall not relieve the Contractor of his responsibilities in connection with operation and maintenance of these facilities and equipment.

1.4 BARRIERS

The Contractor shall install secure temporary fencing, warning lines, barriers and the like, as required by the Owner, to segregate the construction areas from existing facilities, occupants and the public. Access cannot be interrupted in the construction area.

All work areas shall be provided with barriers at any time that the work area is unattended such as at breaks and during lunch.

The Contractor shall provide protection above doorways, sidewalks and interior areas below the construction area. The Contractor shall also be required to conform to OSHA requirements. The Contractor shall provide guard lights on all barriers and all lighting necessary to prevent vandalism of work and storage areas. The Owner is not responsible for Contractor's losses due to damage or theft by vandals.

1.5 CONTAINMENT DURING CONSTRUCTION OPERATIONS

During construction operations, the Contractor is responsible for the containment of all dust, dirt, debris, overspray and run-off resulting from the work. The Contractor shall collect and contain all materials and repair any resulting damage to adjacent surfaces, window finishes, site fixtures or personal property.

1.6 TEMPORARY PROTECTION

A. Provide suitable Owner-approved temporary protection to prevent the entrance of debris, obstructions, and water infiltration into the building. Provide warning signs to reroute personnel around areas of dangerous work. Place warning barriers at roof

perimeters and at deck openings. Clearly label temporary covers over deck openings. Do not permit openings to remain unprotected overnight. Schedule operations to allow for completion of new roofing over a predetermined area of roof within a day's work. Use special care to avoid damaging existing roofing and flashing when working on the roof of the building.

B. Provide temporary tie-ins between existing and new roof systems as specified and detailed. Tie-in construction shall completely prevent interior leaks, migration of moisture from existing to new construction and damage of any type to the facilities. Provide necessary quality control at tie-ins on a daily basis to prevent leaks.

C. Avoid traffic on completed roof areas. Coordinate work to prevent this situation. Should temporary access be required, provide temporary substrate protection for trafficked areas.

D. Protect materials scheduled for reuse from damage by placing them in labeled containers or wrappings stored in a weathertight trailer.

E. Provide temporary protection such as plywood and tarps for streets, drives, curbs, sidewalks, landscaping and existing exterior improvements during all phases of the project.

1.7 DEBRIS REMOVAL

A. The Owner shall designate crane and refuse container locations. This area shall be sectioned off with proper warning lines.

B. Removed materials shall not be thrown freely from the roof but shall be lowered to the ground by crane in suitable containers or in an enclosed chute, in order to reduce the spread of dust and other debris.

C. Supply adequate covered receptacles for waste, debris and rubbish. One receptacle will be allowed on site at a time, and must be immediately removed from the site when full. Clean the project area daily and prior to moving the receptacle to another location on the site. Locations shall be as permitted by the Owner. Disposal shall be off-site in a legal dump authorized to accept construction demolition solid wastes. The Contractor shall be responsible for receptacle-related damage to site grounds.

1.8 VOLATILE MATERIALS

A. The Contractor is reminded that the adhesives, solvents, bitumens, etc., are highly volatile and flammable materials. Do not store these materials, contaminated tools, applicators or rags, on or within the buildings. No overnight storage on the roofs will be allowed. Do not transport materials through the building. Take precautions and closely follow the Specification requirements for fire protection on site during construction.

B. Locate and use flame-heated equipment so as not to endanger the structure, other materials on site, or adjacent property. Do not place flame-heated equipment on the roof. Locate and use flame-heated equipment in specific areas approved by the Owner. Do not relocate flame-heated equipment without prior approval from the Owner.

C. The use of flame-heated equipment or torches on the roof is prohibited unless specifically approved in writing by the Owner.

1.9 FIRE PROTECTION

A. Provide necessary temporary fire protection for the buildings, their contents and materials during construction. Do not store combustibles inside the buildings or on the roofs. Store adhesives, caulks and cleaning solvents away from the building using a method approved by local fire officials. Should cutting, burning or welding be necessary, provide a fire watch during operations and for four hours minimum after completion of the operations.

B. Do not use open flames near adhesives, caulks or cleaning solvents as they will readily ignite. Rags soaked with cleaning solvent shall not be discarded in the dumpsters, but shall be stored in a separate metal receptacle and removed from the site daily.

C. Comply with local fire codes and obtain permits necessary from the local fire department. Provide a copy to the Owner. Provide recently tested, fully charged fire extinguishers around the storage area, rubbish receptacle and two fire extinguishers on the roof within 50 feet of the Work.

1.10 INTERIOR PROTECTION AND RESTORATION

A. Protect and cover fixed items, furniture, equipment, appliances, fixtures, bookcases, etc. within the buildings below the work areas.

B. At the Owner's direction, remove portable furniture, equipment, appliances, fixtures, materials, stock, etc. within the buildings below the work area to an adjacent area for protection.

C. Remove, temporarily support, suspend and protect existing items requiring removal during the installation of the new work and properly replace these items to their original condition and to the Owner's satisfaction. These items include, but are not limited to, suspended ceilings, lighting fixtures, heating and air handing ductwork, electrical conduit, etc.

1.11 NOTIFICATION

Notify the Owner at least 72 hours in advance of the desire to extend, connect, disconnect, or turn on or off HVAC, steam, electric, water or other service from the Owner's supply systems. Authorized representatives of the Owner shall witness the actual operation. Plumbing, heating and electrical work, including installation of equipment and any other work

to be performed by the Contractor, shall be carried out without interference with the Owner's normal operation. Where work requires interruption of a service, make advance arrangements with the Owner for dealing with such interruption. All disconnections, extensions and reconnections of HVAC, steam, electric, water or other service shall be performed by a licensed and certified technician capable of completing the work.

1.12 CRANES AND HOISTING EQUIPMENT

All hoisting equipment and machinery required for the proper and expeditious prosecution and progress of the work shall be furnished, installed, operated and maintained in a safe condition by the Contractor. All costs for hoisting operating services shall be borne by the Contractor including street permits and police details.

1.13 ACCESS TO THE WORK

If the Contractor needs interior building access, he shall provide a request to the Owner with 48 hours notice. Access to the site shall be as directed by the Owner.

Work locations must be closed to the public. Security procedures must be established so that entry to work areas is restricted to authorized personnel only.

1.14 VEHICLES

The Owner shall designate acceptable areas for the locations of the Contractor's vehicles. No other areas may be utilized without the Owner's permission.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

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WEATHER PROTECTION AND MATERIALS STORAGE

SECTION 01 63 00

1.1 GENERAL

A. The Contractor shall take the necessary precautions and provide all equipment, materials and labor necessary to adequately protect the Contract Area, previous construction, the building and its contents and occupants, and surrounding landscape areas from damage due to the construction or inclement weather during construction.

B. No storage on or within the building will be allowed.

C. The Contractor shall provide all access to the work. Staging and other access shall be provided until new work has been accepted by the Owner.

D. The Contractor, workmen and agents will not be permitted within the building except where necessary to install the work. The Owner's prior permission is necessary.

1.2 WEATHER PROTECTION

A. Weather protection shall mean the temporary protection of that work adversely affected by moisture, wind, heat and cold by covering, patching, sealing, enclosing, ventilating, cooling and/or heating. This protection shall be provided for all work areas, the building and its contents, trafficked adjacent areas, and all construction materials and accessories.

B. The cost of heat, fuel and power necessary for proper weather protection shall be the responsibility of the Contractor.

C. Installation of weather protection shall comply with all safety regulations, including provisions for adequate ventilation and fire protection devices.

1.3 FIRE PROTECTION

A. The Contractor shall provide all necessary temporary fire protection for the building, building contents and materials during construction. The Contractor shall provide incombustible protective blankets where necessary to protect surfaces or building contents from damage.

B. At no time shall any combustibles be stored inside the building. All adhesives, caulks and cleaning solvents shall be stored well away from the building in a method approved by local fire officials.

C. Should any cutting, burning or welding be necessary, the Contractor shall provide a fire watch. This watch will continue during the operations and for four hours minimum after completion.

D. At no time shall open flames be present around adhesives, caulks or cleaning solvents as they will readily ignite. Rags soaked with cleaning solvents shall not be discarded in the dumpsters, but shall be stored in a metal receptacle and removed from the site daily.

E. The Contractor shall be required to comply with all local fire codes and shall obtain all permits necessary from the local fire department and provide one (1) copy to the Engineer.

F. The Contractor shall provide recently tested, fully charged fire extinguishers around the storage area, rubbish receptacle and two (2) within 100 feet of the work area or as specifically required by local fire officials.

1.4 MATERIAL STORAGE

A. On-site material storage shall be in enclosed, well- ventilated trailers. Trailers shall not be used for the storage of flammable substances. All flammable substances shall be brought to the site daily and unused materials removed at the end of the workday. All trailers shall be located on-site and locations shall be as accepted by the Owner.

B. Rooftop storage of materials will not be permitted without express written acceptance from the Owner/Engineer. Should such acceptance be provided, storage will be limited and evenly distributed over structural supports.

C. All woodwork shall be stored on elevated piles to allow for air circulation below and tipped in one direction to effectively drain moisture. Lumber shall be completely wrapped, including bottoms, in waterproof, breathable tarps. Tarps shall be tied down to protect against wind blow- off. Should delays in the project be anticipated, all lumber shall be stored in covered storage trailers.

D. In the event that materials are exposed to the elements, they shall be marked as unacceptable and immediately removed from the site. They may not be used.

E. On-site storage of materials are the responsibility of the Contractor. The Owner is not responsible for Contractor's losses due to damage or vandalism.

1.5 ROOF PROTECTION

A. The Contractor is responsible for the prompt repair of any damage to the existing roof systems resulting from the work at the project.

B. The Contractor shall provide adequate ridge hung, padded access ladders to traffic the sloped roof scaffolding.

1.6 NOTIFICATION

If, during the Contract period, the Contractor is notified of insufficient weather protection, he shall, immediately, properly restore the weather protection and repair or replace any damaged unprotected materials and systems. Should the Contractor not effect immediate repair or replacement when notified, the Owner shall have the proper protection installed at the Contractor's expense.

1.7 MANUFACTURER'S INFORMATION

A. The manufacturers of all the materials shall supply written instructions concerning the storage and handling of all supplied materials, including sealants, and accessories. The manufacturer shall also provide information concerning storage and handling of flammable or volatile materials.

B. Storage facilities shall be acceptable to the manufacturer and conform to his written requirements concerning temperature, humidity, ventilation and the like.

C. The "shelf-life" of materials shall be provided with the date of manufacture of all perishables, including volatiles, caulkings and mastics.

D. The Contractor shall supply a copy of all manufacturer's written instructions to the Owner and Engineer as outlined in Section 01 33 00 - Shop Drawings and Submittals. The Contractor shall comply with all storage and handling requests and instructions of the manufacturer.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

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PROJECT CLOSE-OUT

SECTION 01 77 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Warranties.
3. Final cleaning.

B. Related Sections include the following:

1. Division 1 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit copies of specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents for approval prior to final submission.
4. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs.
5. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
6. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
7. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Owner, through Program Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner, through Program Manager will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Owner, through Program Manager, that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
2. Submit a certified copy of Program Manager's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Program Manager. The certified copy of the list shall state that each item has been completed.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Owner, through Program Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner, through Program Manager will certify final Application for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

3. Include the following information at the top of each page:

   a. Facility and Project name.
   b. Date.
   c. Name of Contractor.
   d. Page number.

1.6 WARRANTIES

A. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

   1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.
   2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
   3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Facility and Project name, and name of Contractor.

B. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and anti-pollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturers written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Remove snow and ice to provide safe access to building.
    f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    g. Sweep concrete floors broom clean in unoccupied spaces.
    h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    i. Remove labels that are not permanent.
    j. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    k. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment.
    l. Leave Project clean and ready for occupancy.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

CAST STONE REPLACEMENT

SECTION 03 45 00
(to be included with the Masonry Filed-Sub Bid)

PART 1 - GENERAL

1.1. IN GENERAL

A. Division 1, General Conditions, and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.

B. Refer to Division 1 for additional information.

1.2. RELATED WORK SPECIFIED ELSEWHERE

A. Concrete Repairs – Section 03 60 00
B. Masonry – Section 04 50 00
C. Painting and Coating – Section 09 90 00

1.3. SUMMARY OF WORK

In general, the Contractor shall supply all labor, materials, equipment, temporary protection, tools and appliances necessary for the proper completion of the work in this Section, as required in the Specifications, in accordance with good construction practice, and as required by the materials manufacturer, as amended. The work under this Section generally includes the following:

A. Remove existing precast stone caps at masonry parapet as identified on the Contract Drawings.

B. Create molds and cast new cast stone parapet caps to match the profile, color and texture of existing.

C. All existing and new parapet caps to have the existing coating removed and new coating applied in Coordination with Section 09 90 00 PAINTING AND COATING.

D. Clean and restore all areas affected by the work.

E. Upon completion of the project, all molds generated for the replacement of cast stone components shall be issued to the Owner and stored in an Owner approved location on site.

1.4. REFERENCES

A. Conform to the following minimum reference standards:

2005 Technical Manual by the Cast Stone Institute
PCI Manual for Structural Design of Architectural Precast Concrete

PCI Manual 117-Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products
ANSI/AWS D1.1.
ANSI/ASTM C31
ANSI/ASTM C143
ANSI/ASTM C150
ANSI/ASTM C260
ASTM C33
ASTM C1364
ANSI/ACI 318
Architectural Precast Concrete (Design Manual) by Precast/Prestressed Concrete Institute, 2nd Ed., 1989
Cast Stone Institute Technical Manual 04720 and Cast Stone Institute standard specification (2004).
American Society for Testing and Materials (ASTM):
C33-03 .....Concrete Aggregates
C150-04ae1 .....Portland Cement
C979-99 .....Pigments for Integrally Colored Concrete
C1194-03 .....Compressive Strength of Architectural Cast Stone
C1195-03 .....Absorption of Architectural Cast Stone
C3164-03 .....Standard Specification for Architectural Cast Stone
D2244-02e1 .....Test method for calculation of color differences from instrumentally measured color coordinates

1.5. SUBMITTALS

A. Shop Drawings and Submittals shall be made in accordance with the General Conditions and Section 01 33 00 – Shop Drawings and Submittals.

B. The Contractor shall prepare and submit for approval complete properly marked setting drawings showing: details and sizes of stones: arrangement of joints, bonding, anchoring details, inserts, joint details, connections to adjoining walls or materials, and method of installation and anchoring.

C. Unless otherwise indicated, shop drawings shall provide the following:

1. Provide suitable wash surfaces on all exterior pieces with exposed top surfaces.

2. The shop drawings shall show the setting mark of each stone and its location on the structure. The stone, when delivered, shall bear the same corresponding mark on an exposed surface.

D. The shop drawings shall show proof that the anchor system and all details have been reviewed and approved by a registered Professional Engineer, certified in the Commonwealth of Massachusetts for structural integrity.

E. The Contractor shall verify all dimensions and coordinate the drawings with field conditions. The Contractor shall submit the shop drawings to the Engineer for approval.

F. At the completion of the project, the contractor shall provide final documentation of the cast stone mix design and method of material placement, modifications (if any) to the shop drawings for the As Built Conditions, and all molds that were utilized to generate the replacement units.

1.6. JOB CONDITIONS

A. Materials which are at a temperature other than the recommended application temperature of the manufacturer or applicable standard shall not be applied.

B. The Contractor shall utilize skilled and experienced specialty workers to install the work. Experienced trade workers shall be utilized for all aspects of the work.

C. Provide masking and protection when applying cleaners and primers to prevent staining or damage to surrounding building finishes.

1.7. QUALITY ASSURANCE

A. The Cast Stone shall, as a minimum requirement, meet all standards for Architectural Precast Concrete set by the Precast/Prestressed Concrete Institute (PCI MNL-117) except where more stringent requirements are described herein.

B. Where the requirements for Cast Stone described in this document differ from the minimum PCI Standards, the more stringent standards shall be followed.

1.8. SAMPLES / MOCK-UPS

A. The Contractor shall submit a 12" x 12" Sample for approval of Color and Texture. The sample shall include the approximate profile of a typical replacement unit for confirmation of site line profiles and configurations for discussion. The texture and color of the cured/cleaned sample shall be compared with a minimum of five existing cast stone components for comparison. Approved sample shall be used as reference sample for acceptance of all pieces on project.

B. It is recommended, though not required, that the contractor provide multiple samples for individual color and texture configurations to reduce potential delays in the submittal/review process.

C. Shop Drawings:

i. Cast stone showing exposed faces, profiles, cross sections, anchorage, reinforcing, jointing and sizes.

ii. Setting drawings with setting mark.

D. Certificates: Test results indicating that the cast stone meets specification requirements and proof of plant certification.

1.9. QUALITY ASSURANCE

A. Manufacturer: Must have ten (10) years minimum continuous operating experience and have facilities for manufacturing cast stone as described herein. Manufacturer shall have sufficient plant facilities to produce the shapes, quantities and size of cast stone required in accordance with the project schedule.

B. Manufacturer: Must have a certified plant.

C. Stone setter: Must have ten (10) years experience setting cast or natural building stone.

1.10. DELIVERY/STORAGE

A. Should the cast stone components be manufactured off site, they shall be secured on shipping pallets and protected from damage and discoloration.

B. Protect corners from damage.

C. Number each piece individually to match the shop drawings for coordination when placing them within the building elevations.

D. Store cast stone components on pallets with non-staining, waterproofing covers.

E. Ventilate under covers to prevent condensation on the cast stone components.

F. Prevent contact with dirt.

PART 2 – MATERIALS

2.1 CAST STONE UNITS

A. It is the intent of this Specification Section to utilize products manufactured by the following or an approved equal:

a. Continental Cast Stone East Manufacturing Inc.
b. Northern Design Precast, Inc.

B. The Cast Stone used in this work shall match the control sample. The control sample will be determined during the pre-construction meeting, which will be defined as an existing cast stone component that will be the basis for all samples' color and texture composition.

C. No bug holes or blow holes will be permitted, and all material shall be mixed in a mechanical mixer.

D. The samples shall be approved by the Engineer before the manufacturer shall be required to proceed with the work.

E. New cast stone as supplied shall conform to the requirements of ASTM C 1364 ASTM C1364 - 07 Standard Specification for Architectural Cast Stone and shall meet or exceed the following:

i. Compressive Strength – ASTM C 1194: 6,500 psi minimum for products at 28 days.

ii. Water cement ration shall be .45.

iii. Cement shall be Portland Type I White, meeting ASTM C150, Gray Portland cement will be considered if it will provide an acceptable color match.

iv. Fine aggregates shall be carefully graded and washed sand as required to achieve desired texture and color, meeting ASTM C33, except for gradation.

v. Coarse aggregates shall be carefully graded and washed crushed granite, quartz, limestone or white marble as required to achieve desired texture and color, meeting ASTM C33, except for gradation.

vi. Cast Stone elements shall be colored with approved pigmentation or dyes not to exceed 5% of the total weight of cementitious material, to achieve desired color.

vii. Air entrainment shall be 5-6% using admixture.

viii. Colors – Inorganic iron oxide pigments, ASTM C 979 except that carbon black pigments shall not be used.

ix. Water shall be potable.

F. Color and finish:

i. Color is to match existing as approved by the Owner.

ii. All surfaces intended to be exposed to view shall have a fine-grained texture similar to natural stone, with no air voids in excess of 1/32 in. and the density of such voids shall be less than 3 occurrences per any 1 in 2 and not obvious under direct daylight illumination at a 5 ft. distance.

iii. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 ft distance.

iv. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.

Cure units in a warm curing chamber 1000 F at 95% relative humidity for approximately 12 hours, or cure in a 95% moist environment at a minimum of 700 F for 16 hours after casting. Additional yard curing at 95% relative humidity shall be 350-degree-days (i.r. 7 days at 500 F or 5 days at 700 F) prior to shipping. Form cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

2.2 SUPPLEMENTAL REINFORCING STEEL

A. All supplemental reinforcing steel bars shall match the same size diameter of the original bars' diameter prior to its section reduction. Minimum reinforcement shall be .25% of the cross section area.

B. All supplemental reinforcing steel shall be new deformed billet steel conforming to ASTM 615, Grade 60.

C. All bars shall be cold bent in accordance to the proper radii established by the current ACI and CRSI specifications. Under no conditions shall heat be applied to the bars to obtain bends.

D. Welded Wire Fabric: ASTM A 185 where applicable for wet cast units.

2.03 MIX

A. All Cast Stone used in this work shall have a minimum compressive strength of 6000 PSI and absorption rate of not greater than 6% when tested in accordance with the requirements of this section. Contractor will be required to provide 28 day compression stress samples for testing (minimum of 2 cylinders per 100 cubic yards of material).

B. Mix shall have 5-6% air entrainment.

C. Water/Cement ratio at time of mix shall not exceed .45/1 by weight.

2.04 TOLERANCES

A. Comply with Cast Stone Institute SM Technical Manual.
B. Stone Dimensions - The numerically greater of plus or minus 1/8" in five (5) feet, ¼" in twenty (20) feet or length/360.

C. Setting tolerances - Plus or minus 1/8" out of plane from adjacent unit.

D. Joints, plus – 1/6 in., minus – 1/8 in.

PART 3 – EXECUTION

3.01 GENERAL

A. All cast stone replacement on this project shall be wet cast units; dry tamping replacement will not be permitted.

B. Utilize rotary mixers when fabricating all mortar. Be sure to maintain relative proportions of mortar materials to provide the texture and color to match the existing mortar. Mix all mortar for at least three (3) minutes and not more than five (5) minutes with the minimum amount of water to produce a workable consistency. The maximum allowable air content of cured mortar shall be 12% by volume. Retempering of mortars that have stiffened because of evaporation of water will be allowed in order to provide the proper consistency provided all mortar in a batch is utilized within two (2) hours of initial mixing.

C. Do not leave any partially completed sections exposed to the elements overnight. Provide all devices (including heaters and insulation) necessary to maintain areas at the correct temperature and humidity for proper curing of mortar.

D. Keep covers tight on all evaporative products to prevent premature curing.

E. Do not install the cast stone units until the supporting masonry or concrete has attained minimum allowable design compressive strength should the adjacent components been replaced.

3.02 SETTING

A. All cast stone shall be set by experienced masons, accurately and in accordance with the shop and setting drawings. Unless otherwise noted, every stone shall be set in a full bed of mortar, with all vertical joints flushed full. All anchors and dowels shall be firmly placed and all anchor holes and dowel holes and similar holes completely filled with mortar or non-shrink grout.

B. All anchors, dowels and other anchoring devices shall be furnished by the setting contractor as shown on the approved shop drawings using, whenever possible, standard building stone anchors commercially available in stainless steel Type 302 or 304.

C. When setting with mortar, all stones not thoroughly wet shall be drenched with clear water just prior to setting.

D. Do not use pry bars or other equipment that could damage cast stone components.

E. After each stone has been set, all joints shall be raked to a depth of 3/4" from the face for pointing. The face of each stone shall then be sponged off to remove any splashed mortar or mortar smears.

F. Only the ends of lugged sills and similar stones shall be embedded in mortar. The balance of joint is to be left open until pointing of stone work. Then point on face only to a depth of 3/4".

G. All stones shall be protected from splashing mortar or damage by other trades. Any foreign matter splashed on the stone should be removed immediately, following manufacturer's recommended procedures.

3.03 PATCHING AND CLEANING

A. The repair of chipped or damaged cast stone shall be done only by mechanics skilled in this class of work, with material furnished by the Manufacturer and according to this direction.

B. Before pointing, the face of the cast stone shall be scrubbed with a fibre brush, using soap powder and water and shall then be thoroughly rinsed with clean running water. Any mortar on the face of the cast stone shall be removed. No acids or prepared cleaners shall be used without the approval of the Cast Stone Manufacturer.

END OF SECTION

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CONCRETE REPAIRS

SECTION 03 60 00
(to be included with the Masonry Filed-Sub Bid)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. The General Conditions, and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.

B. Refer to Division 1 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Masonry – Section 04 50 00
B. Elastomeric Roofing and Flashing – Section 07 53 00
C. Plumbing – Section 22 30 00

1.3 SCOPE OF WORK

In general, the General Contractor shall supply all labor, equipment, staging, temporary protection, tools and appliances necessary for the proper completion of the work in this section. All roof top concrete repairs shall be completed and accepted prior to initiating the roof replacement work.

A. Chip out and grout existing concrete substrate around perimeter of existing roof drain bowls as required to remove existing roof drain bowls and install new roof drain bowls. Coordinate this work with the Plumbing Contractor per Section 22 30 00 for limits and work activities.

B. Repair cracked or spalled concrete roof deck under the Unit Price scope of work. There are no known quantities of deteriorated concrete decking. Refer to Section 01 22 00 for additional information.

C. Clean all areas affected by the work.

1.4 JOB CONDITIONS

A. The General Contractor shall supply, install and maintain all shoring, supports, barriers, protection, warning lines, lighting and personnel required to support the structure, fixtures and facilities affected by his work and segregate the work area(s) from pedestrian or vehicular traffic, as well as to prevent damage to the building, occupants and the surrounding landscaped and paved areas.

B. Coordinate the work in this section with the work by other trades to ensure the orderly progress of the work.

C. Materials which have a temperature other than the application temperatures of the manufacturer shall not be applied.

D. Under no circumstances shall the General Contractor remove existing materials and systems to the ground in an uncontrolled manner. Machinery or devices used shall be manufactured for this purpose. Adjacent building and property areas shall be protected from airborne debris.

E. During removal operations, the General Contractor is responsible for the containment of all dust, dirt, debris, overspray and run-off resulting from the work. The General Contractor shall collect and contain all materials and repair any resulting damage to adjacent surfaces, site fixtures or personal property. Specific attention is drawn to the use of chemicals and cleaners.

1.5 REFERENCES

A. "Standard Specifications for Structural Concrete" (ACI 301) by American Concrete Institute, herein referred to as ACI 301, is included in total as specification for this structure except where more stringent requirements are shown of Drawings or specified herein.

B. Comply with provisions of following codes, specifications, and standards except where more stringent requirements are shown on Drawings or specified herein:

1. "Building Code Requirements for Reinforced Concrete" (ACI 318). American Concrete Institute, herein referred to as ACI 318.

2. "Standard Specification for Bonding Hardened Concrete, Steel, Wood, Brick, and Other Materials to Hardened Concrete with a Multi-Component Epoxy Adhesive" (ACI 503.1), American Concrete Institute.

3. "Hot Weather Concreting," reported by ACI Committee 305 (ACI 305R-91).

4. "Cold Weather Concreting" reported by ACI Committee 306 (ACI 306R-88).

5. ICRI: International Concrete Repair Institute.

6. ASTM: American Society of Testing and Materials.

1.6 SUBMITTALS

A. Submittals shall be made in accordance with the General Conditions and Section 01 33 00 – Shop Drawings and Submittals.

1.7 UNIT PRICES

A. There are no known quantities of deteriorated concrete roof decking. In the event that these conditions are encountered upon the removal of the existing roof system, the General Contractor shall carry the additional renovations outlined in Section 01 22 00 under their contract amount. Only those quantities approved by the Owner will be reimbursed.

1.8 CLEAN-UP

A. Site clean-up shall be complete and performed daily to the satisfaction of the Owner.

B. All roof, building (interior and exterior), landscape and parking areas shall be cleaned of all trash, debris and dirt caused by, or associated with, the work.

C. All trash and debris shall be completely removed from the site daily during the work and at the completion of the work. All debris shall be legally disposed of off-site.

PART 2 - MATERIALS

2.1 CONCRETE PATCHING COMPOUND

A. Repair mortar for concrete repairs shall be a polymer modified portland cement based patch mortar. Mortar shall be fast-setting, non-sag material such as Sika Top 123 as manufactured by the Sika Corporation, ThoRoc HB2 manufactured by ChemRex, Inc., Mimic by Conproco or approved equal.

2.2 CONCRETE CRACK REPAIR MATERIALS

A. Liquid epoxy injection resin for sealing cracks in the concrete deck greater than 3/16” shall be ThoRoc LV 300 as manufactured by ThoRoc, Inc. Products of equal or greater material quality as manufactured by Conproco Corporation, Sika Corporation, Webac America and Deneef America will be considered for acceptance. Material shall be suitable for injection where only one side of the crack is visible. Injection ports, surface sealers and other accessory items required for the proper installation of the work shall be as specifically recommended by the injection grout manufacturer.

B. Epoxy for sealing surface cracks in the concrete deck less than 3/16” shall be ThoRoc Hi-Mod Epoxy Gel as manufactured by ThoRoc, Inc. Products of equal or greater material quality as manufactured by Conproco Corporation and Sika Corporation will be considered for acceptance.

PART 3 - EXECUTION

3.1 GENERAL WORKMANSHIP

A. Do not deliver to site or install any material or system that has not been approved. Materials installed without approval may be required to be removed.

B. The prepared roof deck surface must be dry, clean and smooth. Provide dryers, if necessary, to dry deck surfaces prior to installing new work. Open flame devices shall not be used.

C. Comply with the manufacturer's written instructions and these Specifications for all renovations and associated work.

D. Partial or unmarked cans of materials cannot be used.

3.2 CONCRETE SPALL REPAIRS

A. Remove areas of spalled, cracked, loose or otherwise unsuitable concrete from the existing roof deck. Define all repair areas with 1/4" deep saw cut. Undercut or "key" in spall repair edges on at least two opposite sides to mechanically retain the repair. Cuts shall not overlap at corners.

B. Completely remove all dust, grease and other impurities via compressed air and wire brushes, chipping, grinding or other methods as required to achieve an acceptable bonding surfaces.

C. Prepare the surface of the existing concrete to receive the repair mortar. Dampen the existing surface area with clean potable water. Provide a 1/8" minimum aggressive surface profile with fractured aggregate. Tool marks should be visible.

D. Apply primer to all bonding surfaces as recommended by the repair mortar manufacturer.

E. Install repair mortar to properly prepared areas. Mix repair mortar in accordance with the materials manufacturer's instructions. At spall repairs with a depth greater than 1", mix in 3/8" aggregate as required by the mortar manufacturer. Utilize the manufacturer's recommended mix rates.

F. The concrete substrates may require wetting with water prior to installing the repair mortar. Consult with the manufacturer's instructions prior to initiating repairs.

G. Finish the repairs flush with the existing roof surface. Fast setting concrete repair materials shall cure for a minimum of 2 hours prior to the installation of the new roof materials, or as recommended by the materials submitted.

H. The Contractor will be required to provide all temporary protection of the new and existing concrete roof system that will require curing during the installation process. Any damage as a result of improper protection, or the installation of the new roof system prior to the proper cure duration, shall be repaired or replaced at no additional cost to the Owner.

3.3 EPOXY INJECTION REPAIRS

A. Install tape along perimeters of crack to limit the amount of surface sealer which contacts concrete. Spread surface sealer a minimum of 1/2" past the crack termination. The surface sealer shall have a uniform thickness of 1/8" minimum to 3/16" maximum.

B. Inject water into cracks to pre-wet the bonding surfaces. While the interior bonding surfaces are still wet, inject grout until clearly visible at the next entry port indicating that crack void is filled to that point. Pressure of injections of grout shall not exceed 200 psi unless instructed otherwise by the Engineer. Injection will begin at the bottom port or lowest port installed in the crack.

C. Immediately following injection at each entry port, plug port to prevent escape of injected grout.

D. Repeat until crack void is completely filled. Confine any spills and collect with an absorbent material.

E. Allow crack repair material to properly cure as recommended by the material manufacturer.

F. Remove all strippable sealer, tape and associated residue from concrete surfaces, using sharp sided tools such as a putty knife or trowel.

3.4 CLEAN-UP

Prior to acceptance of the masonry work covered in this section, the General Contractor shall perform a thorough clean-up of the work site, building surfaces, landscaping, etc. Any plantings or other items damaged shall be repaired or replaced to the satisfaction of and at no additional cost to the Owner.

END OF SECTION

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MASONRY FILED SUB-BID REQUIREMENTS

SECTION 04 00 01
(Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 IN GENERAL

A. Attention is directed to all Sections of DIVISION 00 – PROCUREMENT/ CONTRACTING REQUIREMENTS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the specifications.

B. Work of this Section requires Filed Sub-Bids and is governed by the provisions of the Massachusetts General Laws (MGL), Public Bidding Law – Chapter 149, Sections 44A to 44J inclusive, as amended and applicable Sections of the MGL, Public Contract Law – Chapter 30.

C. Specification requirements for the Filed Sub-Bid "MASONRY" include all of the following listed Specification Sections, in their entirety:

1. Section 03 45 00 – CAST STONE REPLACEMENT
2. Section 03 60 00 – CONCRETE REPAIRS
3. Section 04 50 00 – MASONRY

D. The work to be completed by the "MASONRY" Filed Sub-Contractor is identified in the Contract Drawings.

Examine all Drawings and other Sections of the Specifications for requirements therein affecting the Work of this Filed Sub-Contract.

E. MASONRY is stipulated as a Filed Sub-Bid under PART E, Item 2 of the FORM FOR GENERAL BID.

F. All Sub-Bids shall be submitted on the FORM FOR SUB-BID furnished by the Awarding Authority, as required by Section 44F of Chapter 149 of the Massachusetts General Laws, as amended, accompanied with the required bid deposit.

G. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the Awarding Authority at a time and place as stipulated in the INVITATION FOR BIDS.

1. The following shall appear on the upper left hand corner of the envelope:

NAME OF SUB-BIDDER: _____

SUB-BID FOR TRADE: _____

H. Specific information relating to sub-bidders is set forth in the Contract Documents, under the heading “INSTRUCTIONS TO BIDDERS”, Including Sub-Bidders” and the attention of sub-bidders is directed thereto.

1.2 EXAMINATION OF SITE AND DOCUMENTS

A. Bidders are expected to examine and to be thoroughly familiar with all contract documents and with the conditions under which work will be carried out. The Awarding Authority (Owner) will not be responsible for errors, omissions and/or charges for extra work arising from General Contractor’s or Filed Sub-Contractor’s failure to familiarize themselves with the Contract Documents or existing conditions. By submitting a bid, the Bidder agrees and warrants that he has had the opportunity to examine the site and the Contract Documents, that he is familiar with the conditions and requirements of both and where they require, in any part of the work a given result to be produced, that the Contract Documents are adequate and that he will produce the required results.

1.3 QUALITY ASSURANCE

A. Company specializing in work described in the above listed individual specification sections with minimum 5 years documented experience.

1.4 SEQUENCING

A. Coordinate work of this Filed-Subcontract with that of other trades, affecting or affected by this work, and cooperate with the other trades as is necessary to assure the steady progress of work.

B. Do not order or deliver any materials until all submittals, required in the listed Specification Sections included as part of this Filed-Subcontract, have been received and approved by the Engineer.

C. Before proceeding with installation work, inspect all project conditions and all work of other trades to assure that all such conditions and work are suitable to satisfactorily receive the work of this Section and notify the Engineer in writing of any which are not. Do not proceed further until corrective work has been completed or waived.

1.5 INSTALLER’S WARRANTY

A. In addition to other specified warranties, both in the Conditions of the Contract and in individual Sections of this Filed Sub-bid, the Filed Sub-Contractor will be held responsible for the satisfactory performance of all products installed under this trade for a period of two years. All deficiencies in products provided under this trade and related components which do not meet the specifications are to be corrected promptly at no expense to the Owner during the warranty period.

PART 2 – PRODUCTS

2.1 SCAFFOLDS AND STAGING

A. Normal access to the roof areas will be provided by the General Contractor for use by all Sub-Contractors. Portable ladders and mobile platforms required for use by this Filed Sub-Contractor, shall be provided by this Filed Sub-Contractor.

2.2 HOISTING MACHINERY AND EQUIPMENT

A. All hoisting equipment, rigging equipment, dumpsters, generators, crane services and lift machinery required for the work by this Filed Sub-Contractor shall be furnished and maintained by this Filed Sub-Contractor. Equipment shall be operated in safe conditions by the Filed Sub-Contractor trained and certified for use of such equipment.

PART 3 – EXECUTION

NOT USED

END OF SECTION

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MASONRY

SECTION 04 50 00
(Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 IN GENERAL

A. The General Conditions and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.

B. Refer to Division 1 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

A. Rough Carpentry – 06 10 00
B. Elastomeric Roofing and Flashing – 07 53 00
C. Thermoplastic Roofing and Flashing – 07 54 00

1.3 SCOPE OF WORK

A. In general, the Contractor shall supply all labor, equipment, staging, temporary protection, tools and appliances necessary for the proper completion of the work in this section.

B. Remove all brick masonry units down to the concrete roof deck curb where indicated in the Contract Documents and as necessary to install new throughwall flashings. Temporarily support masonry where supported above the removed brick masonry. Remove any existing flashings from within exposed masonry cavity. Existing steel lintels above window units are to remain.

C. Remove existing terra cotta parapet caps to be recoated and reinstalled.

D. Remove and dispose of existing precast stone parapet caps to be replicated.

E. Install new through wall flashings as indicated in the Contract Documents. Coordinate the installation of the new flashings with Section 07 53 00 – Elastomeric Roofing and Flashings. Coordinate installation of the flashings with the Roofing Contractor.

F. Install new brick masonry to match existing as indicated on the Contract Drawings.

G. Notify Architect of any cracked or spalled brick masonry for review and approval prior to replacement on a unit price basis, in coordination with Section 01 22 00 Unit Prices.

H. Clean all areas affected by the work with masonry cleaners.

1.4 DIMENSIONS AND QUANTITIES

All dimensions and quantities shall be determined or verified by the Contractor. Quantities to be carried under the base bid work have been shown on the Contract Drawings. The Contract Drawings have been compiled from various sources and may not reflect the actual condition at the moment of construction. The Contractor is cautioned to take all precautions and make all investigations necessary to install the proposed work. The Owner will not consider unfamiliarity with the job conditions as a basis for additional compensation.

1.5 JOB CONDITIONS

A. The Contractor shall utilize skilled and experience specialty workers having a minimum of five (5) years experience in masonry renovation to perform the work. Experienced trade workers shall be utilized for all aspects of the masonry work.

B. Do not leave partially completed sections exposed to the elements overnight. Provide all devices necessary to maintain areas at the correct temperature and humidity for proper curing of mortar.

C. To prevent staining of adjacent construction during the work, immediately remove mortar or coating which comes into contact with exterior surfaces. Protect all building components from damage or staining during construction.

D. Prepare, install, and cure all materials in accordance with these Specifications, the Brick Industry Association (B.I.A.) Technical Notes, and the Manufacturer's Printed Instructions. In the case of a discrepancy, the Specifications will prevail.

E. The Contractor shall supply, install and maintain all shoring, supports, barriers, protection, warning lines, lighting and personnel required to support the structure, fixtures and facilities affected by his work and segregate the work area(s) from pedestrian or vehicular traffic, as well as to prevent damage to the building, occupants and the surrounding landscaped and paved areas.

F. Coordinate the work in this section with the work by other trades to ensure the orderly progress of the work. No brick masonry or repointing work shall be installed until it has been reviewed and approved by the Architect/Engineer for acceptability and by the Owner for acceptability as to appearance, color and texture match.

G. Repoint mortar joints and repair masonry only when air temperature is between 40 and 90°F (4 and 32°C) and is predicted to remain so for at least 7 days after completion of work.

H. Cold Weather Application - (Applies only to rebuilding, no repointing shall be completed when air temperature is less than 40°F) The Contractor shall comply with the following cold weather masonry construction requirements at no change in contract price:

1. The cold weather construction and protection requirements shall be closely followed.

2. Construction materials shall be received, stored, and protected in ways that prevent water from entering the materials.

3. If climatic conditions warrant, temperatures of construction materials should be measured. Frozen sand and wet masonry units must be thawed. Masonry units below 20°F must be heated above 20°F without overheating.

4. Sufficient mortar ingredients should be heated to produce mortar temperatures between 40°F and 120°F. Every effort should be made to produce consecutive batches of mortar with the same temperatures falling within this range. The mortar temperature after mixing and before use should be above 40°F, maintainable either by auxiliary heaters under the mortarboard or by more frequent mixing of mortar batches. Heated mortar on mortarboards should not become excessively hot (greater than 120°F).

5. During below-normal temperatures, masonry should be placed only on sound unfrozen foundations. Masonry should never be placed on a snow or ice-covered surface, because of the danger of movement when the base thaws and the possibility of very little bond being developed between the mortar and the supporting surface.

6. At the end of the day, the top surface of all masonry should be protected to prevent moisture, as rain, snow or sleet, from entering the masonry. This protection must cover the top surface and should extend a minimum of 2 feet down all sides of the masonry.

WORK DAY TEMPERATURE	CONSTRUCTION REQUIREMENT	PROTECTION REQUIREMENT
Above 40ºF	**Normal masonry procedures.**	*Cover walls with plastic or canvas at end of work day to prevent water entering masonry.*
40ºF – 32ºF	**Heat mixing water to produce mortar temperatures between 40°F – 120°F.**	*Cover walls and materials to prevent wetting and freezing. Covers should be plastic or canvas.*
32ºF – 25ºF	**Heat mixing water and sand to produce mortar temperatures between 40ºF – 120ºF.**	*With wind velocities over 15 mph provide windbreaks during day and cover walls and materials at the end of the work day to prevent wetting and freezing.*
25ºF – 20ºF	**Mortar on boards should be maintained above 40ºF.**	*Maintain masonry above freezing for 16 hours using auxiliary heat or insulated blankets.*
20ºF – 0ºF and below	**Heat mixing water and sand to produce mortar temperatures between 40ºF – 120ºF.**	*Provide enclosures and supply sufficient heat to maintain masonry enclosure above 32 F for 24 hours.*

Note: Construction requirements, while work is in progress, are based on *ambient* temperatures. Protections requirements, after masonry is placed, are based on *mean* daily temperatures.

I. Hot Weather Application - The Contractor shall keep the areas being built sufficiently moist at all times during the operations. Mortar mixed and ready for application shall be used within one hour's time and continually remixed to prevent excessive evaporation of moisture from the mortar. Discard all mortar, which has begun to set or is not used within two (2) hours time. Water for tempering shall be available at all times.

J. Under no circumstances shall the Contractor remove existing materials and systems to the ground in an uncontrolled manner. Machinery or devices used shall be manufactured for this purpose. Adjacent building and property areas shall be protected from airborne debris.

K. All areas of existing brick masonry or flashings removed shall be replaced or made secure and weathertight during the same day. No building interiors, whether new or existing shall be left exposed to the weather at the end of each workday.

L. During removal operations, the Contractor is responsible for the containment of all dust, dirt, debris, overspray and run-off resulting from the work. The Contractor shall collect and contain all materials and repair any resulting damage to adjacent surfaces, site fixtures or personal property. Specific attention is drawn to the use of chemicals and cleaners.

M. No brick masonry shall be installed until it has been reviewed and approved by the Owner for acceptability as to appearance and color match.

N. Fully charged, inspected and approved fire extinguishers shall be on site at all times. No cutting, grinding or welding of any kind shall proceed without an approved fully charged fire extinguisher.

O. The general nature, approximate quantity and surface area of the various work items are shown on the Contract Drawings.

1.6 ROOF AND BUILDING PROTECTION

A. The existing roof and building systems shall be totally protected during the renovations. The Contractor is responsible for any damages to the existing building systems.

B. Install canvas over all wall penetrations and over roof systems during brick masonry repair work and cleaning.

C. The Contractor is responsible for the prompt repair of any damage to the building systems resulting from the work at the project at no additional cost to the Owner.

1.7 SUBMITTALS

A. Submittals shall be made in accordance with the General Conditions and Section 01 33 00, Shop Drawings and Submittals.

B. The Contractor shall submit the following items with their submittal package.

1. Methods of removal of materials
2. Temporary protection procedures
3. Staging/set-up procedures
4. Program for containment of cleaning chemicals

C. Submit certificates attesting compliance with the applicable specifications for the grades, types and classes of brick masonry.

D. Submit drawings and written description of shoring procedures masonry rebuilding work, including extent of removals and method of support, to the Engineer.

1. Submit shoring procedures with the seal of a licensed Professional Engineer who has reviewed the drawings and written description.

E. Submit written description of removal procedures and operations sequencing to the Engineer prior to commencement of Work.

F. Proposed method of protection for adjacent building, landscaping, pavement, walkways, site plantings, and related sitework from damage.

1.8 QUALITY ASSURANCE

A. The Contractor shall utilize skilled and experienced specialty workers having a minimum of five (5) years experience in **masonry repairs** to perform the work. Experienced trade workers shall be utilized for all aspects of the masonry work.

1.9 REFERENCE STANDARDS

A. ASTM C144-04 Specification for Aggregate for Masonry Mortar

B. ASTM C150-09 Specification for Portland Cement

C. ASTM C207-06 Specification for Hydrated Lime for Masonry Purposes

D. ASTM C270-10 Standard Specification for Mortar for Unit Masonry

E. ASTM C67-09 Test Methods of Sampling and Testing Brick and Structural Clay Tile

F. ASTM C114-10a Test Methods for Chemical Analysis of Hydraulic Cement

G. ASTM C216-10 Specification for Facing Brick (Solid Masonry Units made from Clay or Shale)

H. BIA (Brick Industry Association) Technical Notes

I. National Park Service (NPS) Technical Preservation Briefs

1.10 TEST AREAS

A. Prior to commencement of demolition operations, the contractor shall be required to perform on-site procedure mock ups for masonry removal and reinstallation to ensure that dust and debris containment is acceptable. No brick masonry work can commence until the means and methods have been approved.

B. Before full-scale work is commenced, execute the following work for trial work areas to be reviewed by the Owner as to acceptability of color, texture and appearance match with the existing construction. Test areas shall be performed at each building location and be subject to approval.

1. 6 square feet of new brick masonry infill
2. 5 linear feet of throughwall flashing

C. Prepare, install and cure all materials in accordance with these specifications and the manufacturer's instructions.

D. Trial areas shall be repeated until acceptable results are obtained. The accepted work shall be a standard for all subsequent work. Areas of masonry repointing and replacement shall be allowed to weather for seven (7) days prior to Owner acceptance.

1.11 EXISTING CONDITIONS

A. Any item which does not match with the original profile may be subject to removal at no additional cost to the Owner.

1.12 CLEAN-UP

A. Site clean up shall be complete and performed daily to the satisfaction of the Owner.

B. All roof, building (interior and exterior), landscape and parking areas shall be cleaned of all trash, debris and dirt caused by, or associated with, the work.

C. All trash and debris shall be completely removed from the site daily during the work and at the completion of the work. All debris shall be legally disposed of off-site.

1.13 DIMENSIONS AND QUANTITIES

All dimensions and quantities shall be determined or verified by the Contractor. The Contract Drawings have been compiled from various sources and may not reflect the actual condition at the moment of construction. The Contractor is cautioned to take all precautions and make all investigations necessary to install the proposed work. The Owner will not consider unfamiliarity with the job conditions as a basis for additional compensation.

1.14 GUARANTEES

Upon completion of the work and prior to final payment, the Contractor shall submit a guarantee of his work as free from defect in materials and workmanship. The guarantee shall be for a period of two (2) years. The guarantee shall be signed by an officer of the Contractor's firm and sealed if a corporation.

PART 2 - MATERIALS

2.1 BRICK MASONRY

A. Replacement brick masonry shall conform to ASTM C 216, Grade SW, Type FBX specifications. Brick shall match existing in size, configuration, color and texture. These units vary and will require confirmation prior to ordering.

B. All brick shall be submitted to the Owner for acceptability as to color and appearance match with the existing brick. The Contractor may be required to submit additional brick samples for approval. No brick shall be purchased or installed until approval by the Owner is obtained. It is anticipated that the selected brick match will require a blend of bricks. As such the Contractor is requested to provide the Owner with brick samples for review within 10 days upon receipt of contract award.

2.2 MORTAR

A. Mortar for rebuilding and pointing brick masonry shall be Type N, conforming to ASTM C270 specifications and shall match the existing in color, texture and appearance. Mortar shall conform to Parts 8 and 11 E of the BIA Technical Notes.

B. Portland cement shall be Type II (Type III may be used only if previously approved) conforming to ASTM C150, specifications.

C. Hydrated lime shall conform to ASTM C207, Type S specifications.

D. Sand shall conform to ASTM C144, amended as follows:

Sieve Size	**% Passing (By Weight)**
#4	100
#8	95-100
#16	70-100
#30	40-75
#50	20-40

#100	10-25
#200	0-10

E. Tinting or coloring agent shall be added to the sand, lime cement to color the fully-cured, in-place mortar to match the physical and chemical characteristics and specified requirements of the Type N mortar.

F. Admixtures - No admixtures shall be allowed.

G. Water shall be clean, potable tap water.

H. Aggregate for grout shall conform to ASTM 404

2.3 THROUGHWALL FLASHING FLASHING AND ACCESSORIES

A. Stainless steel shall be 24 gauge AISI 18-8 type 304, 2D finish. Sheet length shall be 8’ maximum.

B. Self-adhering flashing shall be a 40-mil composite consisting of a self-adhering rubberized asphalt membrane laminated to a high density, cross-laminated polyethylene film, as manufactured by Carlisle Company, York Manufacturing, or approved equal.

C. All accessories, including but not limited to nails, screws and clip strips shall be stainless steel and completely compatible with the surrounding metal to prevent galvanic reaction.

D. Solder for stainless steel shall be pure tin conforming to ASTM B32 or lead-free, high-tin.

E. Termination Bars shall be 1/8” x 1” stainless steel bar with pre-punched holes at 8” on center, such as T1 as manufactured by Hohmann & Barnard, Inc or approved equal.

F. Nails for flashing securement at wood substrates shall be No. 12 Stubbs gauge, large head, threaded shank, galvanized steel nails minimum 1" long.

G. Rivets shall be 3/16" diameter stainless steel as required by the metal being secured.

H. Masonry anchors for use at masonry infill and rebuilding locations shall be stainless steel flexible anchor ties such as #345-BT Flexible Tie as manufactured by Hohmann & Barnard, Inc. or approved equal.

I. Insulation to be installed within cavity of wall at infill and rebuilding locations shall be a rigid foam insulation, 25 psi, conforming to ASTM C578. Insulation shall be 2” thick and have a minimum R-value of R-10.

J. Sheet metal flashings shall be shop fabricated. All breaks, bends and hems shall be uniform, clean, straight lines.

1. Flanges shall be 4" wide minimum.
2. Drip edges shall be hemmed 3/4" wide and break at a 30° angle.
3. Clips shall be 2" wide.
4. All flanges to be covered with roofing or flashing membranes shall have a 1/4" minimum hem on the edge.
5. Blind nailers shall be 4” wide, folded to 2” wide final dimension.

K. Fabrication Schedule:

1. Stainless Steel, 24 gauge
   a. Throughwall Flashing
   b. End Dams
   c. Blind Nailers
   d. Cast-stone Cap Throughwall Flashing
   e. Thimble Flashing
   f. Pan Flashing

2.4 MASONRY CLEANERS

A. Cleaner for newly-installed brick masonry areas shall be Sure-Kleen 101 lime solvent by Pro-So-Co, Inc., Hydroclean HT 455 by Hydrochemical Techniques, Inc. 200 Lime Solvent as manufactured by Diedrich Technologies, or approved equal. The cleaner shall be specifically recommended by the manufacturers for the removal of stains and efflorescence from brick masonry.

B. Masking materials shall be commercially available masking or duct tape of appropriate width. Self-adhesive materials shall be completely strippable, leaving no adhesive residue when removed.

C. Plastic sheet for masking tape areas shall be 4 mil. thick minimum polyethylene sheet of appropriate size to cover the required areas.

2.5 MASONRY TIES

A. Anchors for use at new through wall flashing locations shall be duel leg adjustable pintel, ¼” diameter stainless steel tie such as Series 316 as manufactured by Heckman, D/A 5213 as manufactured by Dur-O-Wall, or approved equal.

B. Anchors for tie back at new masonry walls shall be 12 gauge hot dip galvanized weldable tie with 3/16” pintel such as VBT series in combination with 359-FH tie as manufactured by Dur-O-Wall, or approved equal.

PART 3 – EXECUTION

3.1 GENERAL WORKMANSHIP

A. Follow all applicable local, state and federal requirements regarding construction of scaffolding and protection of the public safety. Specific reference should be made to OSHA Construction Safety Regulations.

B. Set up of scaffolding or similar access and location of on-site storage areas shall be subject to review and approval by the Owner.

C. Do not leave any partially completed sections exposed to the elements overnight. Provide all devices (including heaters and insulation) necessary to maintain areas at the correct temperature and humidity for proper curing of mortar.

D. During freezing weather, the Contractor shall protect all masonry with tarpaulins or other approved material. Masonry materials shall be stacked on platforms and covered, or stored in a manner acceptable to the Owner, to protect them from contact with soil and weather exposure. Materials with stained faces will not be used in the walls.

E. No masonry work shall be executed when the temperature in the work area has dropped below 40 degrees F unless it is rising. The Contractor shall provide heat and maintain the temperature of masonry materials and protect the completed work from freezing. Protection shall consist of heating and maintaining the temperature of masonry materials to at least 40 degrees F, but not more than 100 degrees F, and maintain an air temperature above 40 degrees F on both sides of completed masonry for a period of at least 72 hours.

F. Keep covers tightly sealed on all evaporative products to prevent premature curing.

G. Masonry work including cleaning shall be performed prior to replacement of the roofing beneath. The entire roof adjacent to masonry work must be protected with 1/2” minimum rigid insulation with plywood atop.

H. All debris shall be transported to dumpsters, in locations approved by the Owner, at ground level by enclosed chute or crane and scaling bucket. Uncontrolled dropping of debris to ground level will not be permitted.

I. During the removal of any existing component, the Contractor shall report to the Owner any areas of damaged, deteriorated or otherwise unsuitable framing, wood blocking, or wall materials uncovered during the work. Do not cover unacceptable areas until reviewed by the Owner and Engineer. Provide temporary protection to the area in question.

J. Any wall areas opened for replacement shall receive the new system that day and shall be enclosed with masonry. Should rebuilding of masonry not be completed, temporary weather protection and shoring for the wall shall be provided by the Masonry Contractor at no additional charge to the Owner.

K. The Contractor shall lay-up replacement brick masonry units plumb, level, and true to the lines and dimensions at the existing walls. Chipped or broken units shall not be used. If any such units are placed in the finished wall, they shall be removed and replaced with new units at no additional cost to the Owner.

L. The removal and replacement of individual brick masonry units and repointing are included in the Unit Price Section. Only those additional brick masonry units designated by the Owner will be paid for at the Unit Price. The Contractor must confirm unit price items with the Owner prior to performing the work should compensation be desired. Adjacent bricks damaged or removed as a result of the work will be removed and replaced at no cost to the Owner.

M. Adjacent bricks damaged or removed as a result of the repointing work will be removed and replaced at no cost to the Owner.

N. All shoring of the brick masonry components will be the responsibility, of the masonry Contractor. Maximum spacing of temporary shoring shall be 12" on center. Any damage as a result of insufficient shoring shall be repaired or replaced at no additional cost to the Owner.

O. Refer to Brick Industry Association (BIA) technical notes for standard practice for masonry repointing, rebuilding and repair.

3.2 MASONRY STORAGE

Storage of all masonry shall be in the area designated by the Owner. All stored masonry units shall be covered.

3.3 REMOVAL OF BRICK MASONRY

A. Coordinate the elevation height of the finished roof surface with that of Section 07 53 00 – Elastomeric Roofing and Flashing to confirm the location of the new throughwall flashing heights.

B. Remove brick masonry units in the locations shown on the Contract Drawings. Use hand and power tools to remove masonry. Pneumatic demolition tools are not permitted.

C. Remove maximum four (4) linear foot sections of masonry walls at a time, or as required to prevent deflection or displacement of the existing masonry to remain. Shore the sections as required to prevent displacement.

D. Saw-cut surrounding mortar joints to remove the designated masonry units. Remove adjacent units as required. Provide temporary shoring and protection as necessary.

E. Remove masonry units in a manner so as not to damage sound materials designated to remain.

3.4 TEMPORARY SHORING

A. It is the responsibility of the Contractor to design, erect and maintain all necessary shoring procedures sufficient to comply with applicable regulations, securely support all masonry or other elements left unsupported by the required removals, and permit the work of other trades to proceed.

1. If cracks occur in mortar joints of brick intended to remain, completely stabilize the area with additional shoring or new construction cut out the damaged joint area and repoint it after removal of shoring. Secure the Engineer's approval of repair.

2. Solidly patch all holes (with new mortar) left in mortar by withdrawal of shore fastenings.

3. Completely remove shoring system when no longer needed.

4. Notify the Owner 48 hours in advance of installation of shoring.

5. The maximum spacing of temporary shoring vertical supports shall be twelve (12'') inch on center.

6. The addition of temporary lateral bracing or blocking between vertical shoring elements is required.

7. A sequenced shoring scheme is recommended at all shoring applications. The minimum length of remaining solid masonry wall located between each removed masonry section shall be four (4) feet.

8. Masonry and flashing replacement work must be completed in the same day that existing components are removed, unless adequate temporary weather protection is provided to the satisfaction of the owner and engineer. Submit the intended demolition, shoring and construction sequencing to accommodate this requirement. Submit the means and methods of temporary weather protection to include materials and methods of fastening or securing.

9. Submit the means and methods of temporary protection to low roof areas and their components.

10. Submit the means and methods of temporary covering or masking of wall and roof penetrations, grills, vents and mechanical units.

11. All temporary shoring of the brick masonry components to complete the masonry and flashing repairs will be the sole responsibility of the masonry Contractor. The Contractor must supply, install and maintain all temporary shoring for the duration of the project.

3.5 THROUGHWALL FLASHING INSTALLATION

A. Fabricate new flashing and extend rear leg of flashing 3” minimum up the back of the wall. Secure the rear leg of the flashing to the back-up masonry wall or steel beam with the specified fasteners and termination bar. Provide a full bead of sealant behind the flashing.

B. Form the flashing to shed water. Wrap flashing around corner at every window opening, extending flashing to limits of window sill pan flashing. Provide 2" high end dams at limits of throughwall flashings. Provide completely watertight seams and overlaps. Rivet and solder end dam connections. End dams shall finish 2” high minimum.

C. Overlap adjacent sections of flashing to be soldered 3” minimum. Rivet overlaps and completely envelope rivets in solder.

D. Provide the finished profile for the exposed portion of the flashing as shown on the Contract Drawings.

E. Remove release liner and position self-adhered flashing membrane carefully before pressing in place over the vertical surface of the existing back-up wall or steel beam and stainless steel flashing (8” minimum vertically) and the horizontal surface of the stainless steel flashing. Press firmly in place with a steel hand roller, taking care to avoid air pockets and wrinkles. All seams shall be lapped 3" minimum. Cut bottom edge back 1/2 inch from exterior face of the brick masonry veneer. Secure self-adhered flashing to concrete masonry unit back-up wall or steel beam with pre-punched termination bar at 12" on center. Provide a bead of sealant at the top of the termination bar, tooled to shed water.

F. Install weeps at base of new throughwall flashing at 24” on center, maximum. Weeps are to be set directly on the throughwall flashings without a bed of mortar. Should the weeps be set in the mortar bed, they shall be spaced at 16” on center, max.

3.6 NEW MASONRY WALL CONSTRUCTION AT INFILLS

A. General: Masonry units shall be laid in running bond pattern. Facing courses shall be level with facing courses of the existing brick façade. “tooth” new masonry into the existing at both jamb conditions. This will require that the masonry coursing start at an elevation that will accommodate lining up of new mortar joints. Each unit shall be adjusted to its final position while mortar is still soft and plastic. Units that have been disturbed after the mortar has stiffened shall be removed, cleaned, and re-laid with fresh mortar. Air spaces, cavities, and spaces to be grouted shall be kept free from mortar and other debris. Units used in exposed masonry surfaces shall be free from chipped edges or other imperfections detracting from the appearance of the finished work. Vertical joints shall be kept plumb. Solid units shall be laid in a nonfurrowed full bed of mortar. Mortar will be permitted to

protrude up to 1/2 inch into the space or cells to be grouted. Means shall be provided to prevent mortar from dropping into the space below.

B. Surface Preparation: Surfaces upon which masonry is placed shall be cleaned of laitance, dust, dirt, oil, organic matter or other foreign materials and shall be slightly roughened to provide a surface texture with a depth of at least 1/8 inch.

C. Masonry Wall Installation: Starting courses on footings, solid foundation walls, and where cells are to be filled with grout shall be full bedded in mortar under both face shells and webs. Other units shall be full bedded under both face shells. Head joints shall be filled solidly with mortar for a distance in from the face of the unit not less than the thickness of the face shell. Jamb units shall be of the shapes and sizes to conform with wall units. Solid units may be incorporated in the masonry work where necessary to fill out at corners and elsewhere as approved.

D. Tolerances: Masonry shall be laid plumb, true to line, with courses level. Bond pattern shall be kept plumb throughout. Corners shall be square unless noted otherwise. Except for walls constructed of prefaced concrete masonry units, masonry shall be laid within the following tolerances (plus or minus unless otherwise noted):

1. Variation from the plumb in the lines and surfaces of columns, walls and arises:
    1. In adjacent masonry units: 1/8 inch
    2. In 10 feet: 1/4 inch
    3. In 20 feet: 3/8 inch
    4. In 40 feet or more: 1/2 inch

2. Variations from the level for exposed lintels, sills, horizontal grooves and other conspicuous lines:
    1. In 20 feet: 1/4 inch
    2. In 40 feet or more: 1/2 inch

3. Variation from level for bed joints and top surfaces of bearing walls:
    1. In 10 feet: 1/4 inch
    2. In 40 feet or more: 1/2 inch

4. Variations from horizontal lines:
    1. In 10 feet: 1/4 inch
    2. In 20 feet: 3/8 inch
    3. In 40 feet or more: 1/2 inch

E. Cutting and Fitting: Full units of the proper size shall be used wherever possible, in lieu of cut units. Cutting and fitting, including that required to accommodate the work of others, shall be done by masonry mechanics using power masonry saws. Brick and concrete masonry units may be wet or dry cut. Wet cut units, before being placed in the work, shall be dried to the same surface-dry appearance as uncut units being laid in the wall. Cut edges shall be clean, true and sharp.

F. Jointing: Joints shall be tooled when the mortar is thumbprint hard. Horizontal joints shall be tooled last. Joints shall be brushed to remove all loose and excess mortar. Mortar joints shall be finished as follows:

1. Joints in concealed masonry surfaces shall be flush cut. Flush cut joints shall be made by cutting off the mortar flush with the face of the wall.

2. Joints in exposed (exterior and interior) masonry surfaces shall be tooled slightly concave. Joints shall be tooled with a jointer slightly larger than the joint width so that complete contact is made along the edges of the unit. Tooling shall be performed so that the mortar is compressed and the joint surface is sealed. Jointer of sufficient length shall be used to obtain a straight and true mortar joint.

3. Masonry units shall have mortar joints to match existing mortar joint widths.

G. Embedded Items: Spaces around built-in items shall be filled with mortar. Anchors, ties, accessories, flashing and other items required to be built-in shall be embedded as the masonry work progresses. Anchors, ties and joint reinforcement shall be fully embedded in the mortar. Cells receiving dowels shall be filled with grout.

H. Unfinished Work: Unfinished work shall be stepped back for joining with new work. Toothing may be resorted to only when specifically approved. Loose mortar shall be removed and the exposed joints shall be thoroughly cleaned before laying new work.

3.7 SECUREMENT CLIPS

A. Securement clips shall be 6” long and 2” wide.

B. Space clips at 8” on center and secure with specified fasteners into the brick masonry walls.

C. Bend clips a minimum of 1” over the bottom of the drip edge of flashing and crimp tightly.

3.8 MASONRY CLEANING

A. Totally clean all repaired, or repointed masonry areas of all construction stains and excess mortar. Do not perform any cleaning until mortar joints and adjacent sealants are fully cured.

B. Test the specified cleaners on a small area of masonry wall to determine compatibility with the masonry, window units, sealants, etc. Evidence of discoloration, metallic salts or other detritus shall be grounds for requiring the use of a substitute cleaner.

C. The Contractor will be required to clean the masonry units with the minimum cleaning solution mix ratios as recommended by the cleaner manufacturer. Should the minimum dilution ratios not clean the masonry the Contractor will be required to slightly decrease the dilution rates to clean the surfaces. It is recommended that the Contractor use care when performing the masonry repairs to prevent increasing the mixing solutions.

D. Apply the cleaner at the manufacturer's recommended dilution rate and dwell duration. Pre-wet the wall if the manufacturer so recommends.

E. Allow the cleaner to stand for the manufacturer's recommended dwell period while monitoring to ensure that the surface does not dry. Steel bristle wire brushes are not to be used.

F. Rinse all cleaner from the wall with water applied at the manufacturer's recommended flow and pressure. High pressure washing equipment may be required. Any acid neutralizing agent required by the manufacturer shall be applied as part of this rinse. Ensure that effluent does not accumulate at ground level, and fully rinse all effluent from sidewalks, streets and landscaping each day.

G. The Contractor must provide sufficient site protection to prevent the cleaning effluent from draining into the adjacent storm drains. The Contractor will provide a narrative as to how the site protection will be performed.

3.9 CLEAN-UP

Prior to acceptance of the masonry work covered in this section, the Contractor shall perform a thorough clean-up of the work site, building surfaces, landscaping, etc. Any plantings or other items damaged shall be repaired or replaced to the satisfaction of and at no additional cost to the Owner.

END OF SECTION

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METAL ROOF LADDERS

SECTION 05 51 33

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. The General Conditions and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.

B. Refer to Division 1 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Masonry – Section 04 50 00
B. Metal Wall Panels – Section 07 42 13
C. Elastomeric Roofing and Flashing – Section 07 53 00

1.3 SCOPE OF WORK

In general, the Contractor shall supply all labor, materials, equipment, temporary protection, tools and appliances necessary for the proper completion of the work in this Section, as required in the Specifications and in accordance with good construction practice. The work under this Section generally includes the following:

A. Install new aluminum ladders at locations shown, in conformance with the Commonwealth of Massachusetts State Code and the Contract Documents.

B. Provide all lifts, hoists, manpower, and equipment necessary to complete the work.

1.4 JOB CONDITIONS

A. Provide site specific work/safety plan for the Owner's review and files. Plans shall include, but not be limited to, fall arrest, handling of materials, lead work plans for removal of the existing metals, etc.

B. The building and site will be occupied and in use during the time of construction. The Contractor shall take all precautions to create as little disruption as possible during the course of the work.

C. Coordinate the work in this Section with the work of other trades to ensure the orderly progress of the work.

D. The Contractor shall utilize skilled and experienced specialty workers to install the work. Experienced trade workers shall be utilized for all aspects of the work.

1.5 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A14.3 Ladders - Fixed - Safety Requirements

ANSI H35 Aluminum and Aluminum Alloys

OCCUPATIONAL HEALTH AND SAFETY ASSOCIATION (OSHA)

OSHA 1910.27 – Fixed Ladders.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 325 Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

ASTM E94 Standard Guide for Radiographic Testing

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4 Standard Symbols for Welding, Brazing and Nondestructive Examination

ALUMINUM ASSOCIATION

Aluminum Design Manual

1.6 GENERAL REQUIREMENTS

A. Aluminum fabrication and erection shall be performed by an organization experienced in aluminum work of equivalent magnitude.

B. The Contractor shall be responsible for correctness of detailing, fabrication, and for the correct fitting of structural members. Connections, for any part of the structure not shown on the Contract Drawings, shall be considered simple shear connections and shall be designed and detailed in accordance with pertinent provisions of AISC. Substitution of sections or modification of connection details will not be accepted unless approved by the Engineer. Welding shall be in accordance with AWS D1.1. High-strength bolting shall be in accordance with AISC S329.

1.7 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 – Shop Drawings and Submittals:

A. Drawings: Shop and erection details including members (with their connections) not shown on the contract drawings. Welds shall be indicated by standard welding symbols in accordance with AWS A2.4.

B. Certificates: Certified copies of mill test reports for structural steel, structural bolts, nuts, washers and other related structural steel items.

Certified copies of hot-dip galvanizing applicator's coatings meet or exceed the specified requirements of ASTM A123 and A153, as applicable.

Certified copies of welder qualifications test records showing qualification in accordance with AWS D1.1.

A copy of the AISC certificate indicating that the fabrication plant meets the specified structural steelwork category.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Material shall be stored out of contact with the ground in such manner and location as will minimize deterioration.

1.9 DISSIMILAR MATERIALS

A. Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of bituminous paint or asphalt varnish, or a neoprene gasket.

1.10 WORKMANSHIP

A. Metal work shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces.

B. Welding shall be continuous along the entire area of contact except where tack welding is permitted.

C. Exposed connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, and unless otherwise approved, exposed riveting shall be flush. Where tight fits are required, joints shall be milled. Corner joints shall be coped or mitered, well formed, and in true alignment.

D. Work shall be accurately set to established lines and elevations and securely fastened in place.

E. Installation shall be in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

1.11 ANCHORAGE

A. Anchorage shall be provided where necessary for fastening miscellaneous metal items securely in place.

B. Anchorage not otherwise specified or indicated shall include slotted inserts made to engage with the anchors and expansion shields when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; and lag bolts and screws for wood.

PART 2 - PRODUCTS

2.1 ALUMINUM LADDERS

A. Aluminum alloy products shall conform to ASTM B 209 for sheet plate, ASTM B 221 for extrusions, and ASTM B 26/B 26 M or ASTM B 108/B 108 M for castings. Provide aluminum extrusions at least 1/8” thick and aluminum plate or sheet at least 0.050 inch thick.

B. All accessories such as corners, pipe joints, wall plates, etc. shall be as recommended and supplied by the manufacturer.

C. Rungs are to be Aluminum tube with serrated top not to be less than 18 inches wide, spaced one foot apart, plug welded or shouldered and headed into stringers

D. Fixed ladders must be able to support at least two loads of 250 pounds each, concentrated between any two consecutive attachments.

E. Provide aluminum channel rails. Provide intermediate bent plates not over 36 inches on center for attachment to wall mounting brackets as indicated on the Contract documents.

2.2 WELDED CONNECTIONS

A. All aluminum connections shall be welded in accordance with the AWS D1.2. Standards

B. Welds exposed to view in the finished work shall be uniformly made and shall be ground smooth.

C. Welding rods and bare electrodes shall be selected in accordance with AWS specifications for the metal alloy to be welded.

D. Size and shape welds to develop the full design strength of the parts connected by welds and to transmit imposed stresses without permanent deformation or failure when subject to service loadings.

2.3 FASTENERS AND ANCHORS

A. Use methods for fastening or anchoring metal fabrications to building construction as shown or specified.

B. Where fasteners and anchors are not shown, design the type, size, location and spacing to resist the loads imposed without deformation of the members or causing failure of the anchor of fastener, and suite the sequence of installation.

C. Use material and finish of the fasteners compatible with the kinds of materials which are fastened together and their location in the finished work.

PART 3 - EXECUTION

3.1 FABRICATION

A. Codes and Standards: Comply with the latest provisions of the following:

1. AWS Structural Welding Code-Steel D1.1.

B. Connections:

1. Weld all shop connections, unless otherwise noted on the drawings. Size the connections for 50 percent of the total uniform load capacity of the member as listed in the beam tables of the AISC “Manual of Steel Construction”, unless otherwise noted on the construction documents.

C. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible.

D. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

E. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, welding splatter, burrs and other defects.

F. Bolt field connections, except where welded connections or other connections are indicated.

G. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.

H. Cut, drill or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning.

3.2 LADDER INSTALLATION

A. Secure to the adjacent construction with the bent plates attached to the stringer.

B. Secure through brick and concrete masonry walls with not less than two (2) 1/2" HILTI HIT HY 20 anchors with a 10" minimum embedment at each support bracket.

C. Install support brackets not more than 36" on center.

D. Install brackets as required for securing of ladders.

E. The base of the ladder shall be 8" off the finished floor system.

END OF SECTION

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ROUGH CARPENTRY

SECTION 06 10 00

PART 1 - GENERAL

1.1 IN GENERAL

A. Division 1, General Conditions, and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.

B. Refer to Division 1 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Masonry – Section 04 50 00
B. Metal Wall Panels – Section 07 42 13
C. Elastomeric Roofing and Flashings – Section 07 53 00
D. Temporary Mechanical and Electrical Disconnects – Section 26 10 00

1.3 SCOPE OF WORK

In general, the Contractor shall supply all labor, materials, equipment, temporary protection, tools and appliances necessary for the proper completion of the work in this Section, as required in the Specifications, in accordance with good roofing practice, and as required by the materials manufacturer, as amended. The work under this Section generally includes the following:

A. Replace all wood blocking deemed deteriorated or unsuitable for reattachment on a unit price basis in coordination with Section 01 22 00 – Unit Prices.

B. Install and furnish new wood blocking, wood nailers and exterior grade plywood to accommodate the installation of the new roofing assembly. Install at all locations shown in the Contract Drawings.

C. Actual heights of wood blocking within the roofing assembly shall match the height of the adjacent insulation and cover board. Details including blocking in the drawings are schematic.

D. Install and furnish 1/2” exterior grade plywood backing for all vertical membrane flashing and metal wall panel installation.

E. Coordinate the raising of the existing roof top equipment with Section 26 10 00, and Section 07 53 00.

F. Install structural wood framing at locations to be infilled as identified in the Contract Drawings.

G. Install metal stud framing and gypsum infill at lower Roof Area D to form a 2-hour fire rated assembly. Coordinate work time with the City, as the interior of the school rooms may be occupied during school hours.

H. Install new wood framed box units to house the new vent/exhaust extensions required at Roof Area D. Coordinate with Section 26 10 00 Temporary Mechanical/Electrical Disconnects.

I. Clean and restore all areas affected by the work.

1.4 JOB CONDITIONS

A. All surfaces to receive the new wood blocking shall be thoroughly dry. Should surface moisture such as dew exist, the Contractor shall provide the necessary equipment to dry the surface prior to application. Do not dry with open flames.

B. Coordinate the work in this Section with the work in other sections to ensure watertight conditions and the orderly progress of work.

C. Do not leave any newly installed wood blocking exposed. Cover and protect all newly installed wood daily with the new flashing system.

D. Protect all existing and new wood stored on site to prevent moisture absorption. Use tarps over the wood pile (top, sides and bottom) elevated on pallets (one side lower to shed water).

E. If delays in the project exceeding one (1) week are anticipated due to inclement weather (or due to any other condition), all wood shall be stored in weatherproof box trailers or storage sheds in locations to be designated by the Owner.

F. Conduits may exist at the selected locations below the roof deck. The Contractor shall locate and install all fasteners in a manner to avoid damaging these conduits or any other suspended objects.

1.5 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

1.6 SUBMITTALS

A. Submit manufacturer's data for each item specified in Part of this Section.

B. Shop Drawings and Submittals shall be made in accordance with the General Conditions and Section 01 33 00.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original packages, containers, and bundles bearing brand name and identification of manufacturer or supplier.

1. Deliver and store materials in accordance with Gypsum Association Publications GA-216, GA-238 and GA-801.

B. Store gypsum materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior gypsum panels until installation areas are enclosed and conditioned.

C. Do not install gypsum panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - MATERIALS

2.1 DIMENSIONAL LUMBER FOR BLOCKING

A. All dimensional lumber shall be construction grade Douglas Fir, Hem-Fir or Southern Yellow Pine, formed to the dimensions shown on the Detail Drawings and as required for proper installation of the new work. All new exterior perimeter woodwork, nailers and wood blocking used on the building shall be minimum 6" wide, except where otherwise detailed. Wood shall have maximum moisture content of 19% by weight on a dry weight basis. Wood shall not be pressure treated.

2.2 PRESSURE TREATED WOOD FOR STRUCTURAL FRAMING

A. Pressure treated wood members used for placement against masonry shall be pressure treated with ACQ preservative, or approved equal, to minimum retention of 0.25 to 0.40 PCF in accordance with AWPA C2. Pressure treated lumber shall be southern pine, grade no. 1 or 2, and must be stamped by a recognized grading agency and kiln dried.

B. Use fully nailed metal connectors (USP, Simpson, or equal), joist or beam hangers when joists or beams frame into other joists or beams. Provide metal post caps and bases for all posts.

2.3 PLYWOOD

A. Plywood for wall or curb sheathing shall be APA Grade C-D, Exterior, minimum 1/2” thick, except where otherwise indicated.

B. Plywood shall not be pressure treated. Plywood shall have maximum moisture content of 19% by weight on a dry weight basis.

2.4 FASTENERS AND ANCHORS FOR WOOD BLOCKING

A. In general, all fasteners, anchors, nails, straps and other accessories shall be of stainless steel, galvanized steel or fluorocarbon coated steel. Galvanizing shall be hot dip in accordance with ASTM A153 Specifications. Electro-galvanized items shall not be used.

B. Fasteners for securing wood blocking or plywood to wood blocking shall be galvanized annular threaded ring shank nails. Fasteners shall be of sufficient length to penetrate the receiving member 1-1/2" minimum, except full depth into plywood.

C. Fasteners for securing plywood to concrete or brick masonry surfaces shall be 1/4" diameter hammer drive anchors with zinc-alloy sheaths and stainless steel inserts as manufactured by Star Fasteners, Rawl, OMG or approved equal. Anchors shall be of sufficient length to penetrate the receiving substrate 1-1/2" minimum.

D. Fasteners for securing wood blocking to concrete substrates shall be one piece, fluorocarbon coated, 1/4” diameter flat head anchors such as Rawl Drives by the Rawl Plug Company or approved equal, with a minimum 1-1/2” embedment into the substrate.

2.5 NON-LOAD-BEARING STEEL FRAMING, GENERAL

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
2. Protective Coating: manufacturer's standard corrosion-resistant zinc coating, unless otherwise indicated.

2.6 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Steel Studs and Runners: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.0312 inch.

B. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch-deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.

3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

   a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

      1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
      2) Steel Network Inc. (The); VertiClip Series.
      3) Superior Metal Trim; Superior Flex Track System (SFT).

C. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

   1. Minimum Base-Metal Thickness: 0.0312 inch.

D. Cold-Rolled Channel Bridging: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges.

   1. Depth: 1-1/2 inches.
   2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.

E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

   1. Minimum Base Metal Thickness: 0.0312 inch.
   2. Depth: 1-1/2 inches.

F. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission.

   1. Configuration: Asymmetrical or hat shaped.

G. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches wall attachment flange of 7/8 inch, minimum bare-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

H. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

I. Isolation Strip at Exterior Walls: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

2.7 INTERIOR GYPSUM BOARD

A. Moisture and Mold-Resistant Type: ASTM C 1396/C 1396M. With moisture and mold-resistant core and paper surface.

1. Thickness: 5/8 inch, Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10.
4. Product: Subject to compliance with requirements, provide one of the following:
   a. Certainteed; ProRoc Moisture and Mold Resistant with M2Tech.
   b. LaFarge; Mold Defense.
   c. National Gypsum; Gold Bond XP.
   d. USG; Mold Tough.

2.8 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

2.9 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Acoustical Sealant: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Acoustical Sealant for Exposed and Concealed Joints:

a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

3. Acoustical Sealant for Concealed Joints:

a. Ohio Sealants, Inc.; Pro-Series SC-170 Rubber Base Sound Sealant.
b. Pecora Corp.; BA-98.
c. Tremco, Inc.; Tremco Acoustical Sealant.

PART 3 - EXECUTION

3.1 EXAMINATION OF INFILL AREAS

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION OF INFILL AREAS

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION OF INFILL AREAS GENERAL

A. Installation Standard: ASTM C 754. Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on doorframes; install runner track section (for cripple studs) at head and secure to jamb studs.

    a. Install two studs at each jamb, unless otherwise indicated.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

    a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
6. Curved Partitions:

    a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs. For tight radii, hinged track is acceptable.
    b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches o.c.

D. Direct Furring: Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

3.5 APPLYING INTERIOR GYPSUM BOARD

A. Single-Layer Application:

1. On partitions/walls, apply gypsum panels to minimize end joints.
2. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below:
1. GA Level 4: Panel surfaces that will be exposed to view (typical panels).

3.7 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or exhibit mold growth. Repair of damaged panels in place is not acceptable.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.8 GENERAL FOR WOOD BLOCKING

A. Do not deliver to the site or install any material or system that has not been approved. Items installed without approval may be required to be removed.

B. Prepared surfaces must be clean and dry. Fill, chip or grind as required to provide a smooth, uniform surface.

C. Refer to FM Data Sheet 1-49 concerning spacing requirements for perimeter blocking anchorage. All anchors and fasteners that attach wood blocking to the structure shall have their spacing halved for an 8' length away from all exterior comers of the perimeter.

D. All butt joints in woodwork shall be flush to provide a smooth, uniform line with no irregularities. Built-up blocking shall have butt joints staggered 4' minimum layer to layer. The minimum length of any individual piece of woodwork shall be 2'. All lengths of woodwork shall have a minimum of 2 fasteners. Layers of wood blocking at corners shall be interlocked to provide additional stability.

E. During removal and replacement of woodwork, the Contractor shall report to the Engineer any deck areas, existing wood blocking designated to remain, or structural supports that are deteriorated or unsuitable. Do not cover unacceptable areas until reviewed by the Engineer, but provide temporary protection to the area in question.

F. The perimeter wood blocking shall be installed at a consistent, even height throughout that roof area to provide a flush transition from insulation to blocking and provide an even and continuous line for metal fascia installation.

3.9 ROOF PERIMETER BLOCKING

A. At roof perimeters, the wood blocking and plywood shall be installed as detailed. Provide 6” nominal wide blocking at roof perimeters unless otherwise detailed.

B. Height of blocking will vary per roof area depending on thickness of tapered insulation. It is the design intent to provide consistent blocking and fascia heights per roof area. Fascia and blocking heights will depend on the maximum thickness of insulation at the roof edge per individual roof area. Separate roof areas can have varying fascia heights from other roofs. Insulation thickness will be determined in accordance with the approved tapered insulation plan.

C. All butt joints in woodwork shall be flush to provide a smooth, uniform line with no irregularities. Built-up blocking shall have butt joints staggered 4’-0” minimum layer to layer. The mini9munm length of any individual piece of woodwork shall be 2’-0”. All lengths of woodwork shall have a minimum of 2 fasteners. Layers of wood blocking at corners shall be interlocked to provide additional stability.

D. During removal and replacement of woodwork, the Contractor shall report to the Engineer any existing wood blocking designated to remain, or structural supports which are deteriorated or unsuitable. Do not cover unacceptable areas until reviewed by the Engineer, but provided temporary protection to the area in question.

3.10 FASTENING OF WOODWORK

A. All existing woodwork to be reused shall be resecured with the specified fasteners spaced 24" on center maximum.

B. Wood blocking to wood blocking connections shall be made using the specified nails spaced 12" on center maximum and staggered off the centerline of the woodwork being secured. Nails shall be of sufficient length to penetrate the receiving member 1-1/2" minimum.

C. Wood blocking at roof perimeter and expansion joint shall be fastened directly to the concrete roof decks with the specified fasteners spaced 18" on center maximum, staggered off the centerline of the woodwork being secured.

D. Plywood shall be fastened to vertical masonry surfaces with the specified fasteners spaced 8" on center vertically and 16" on center horizontally.

END OF SECTION

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METAL WALL PANELS

SECTION 07 42 13

PART 1 – GENERAL

1.1 IN GENERAL

A. The General Conditions, and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.

B. Refer to Division 1 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Concrete Repairs – Section 03 60 00
B. Masonry – Section 04 50 00
C. Metal Roof Ladders – Section 05 51 33
D. Rough Carpentry – Section 06 10 00
E. Elastomeric Roofing and Flashings – Section 07 53 00
F. Temporary Mechanical/Electrical Disconnects – Section 26 10 00

1.3 SCOPE OF WORK

In general, the Contractor shall supply all labor, materials, equipment, temporary protection, tools, and appliances necessary for the proper completion of the work in this Section, as required in the Specifications, in accordance with good roofing practice, and as required by the materials manufacturer, as amended. The work under this Section generally includes the following:

A. The Contractor shall provide all scaffolding, lifts, cranes and equipment necessary to perform the work.

B. Install air/vapor retarder, plywood, metal wall panels and associated flashings where indicated in the Contract Drawings.

C. Clean and restore all areas affected by the work.

D. Coordinate with all other trades to complete the required work.

1.4 SUBMITTALS

A. Product Data: Include manufacturer's product specifications, standard details, certified product test results, and general recommendations, as applicable to materials and finishes for each component and for total panel assemblies.

B. Shop Drawings: Show layouts of panels, details of corner conditions, joints, panel profiles, supports, anchorage, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work.

C. Samples for Initial Selection: Manufacturer's color charts or chips showing the full range of colors, textures, and patterns available for wall panels with factory-applied finishes.

D. Samples for Verification: Provide sample panels 12 inches long by actual panel width, in the profile, style, color, and texture indicated. Include clips, caps, battens, fasteners, closures, and other exposed panel accessories.

1.5 QUALITY ASSURANCE

Installer Qualifications: Engage an experienced installer who has completed metal wall panel projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance for a minimum of 5 years.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver panels and other components so they will not be damaged or deformed. Package panels for protection against damage during transportation or handling.

B. Exercise care in unloading, storing, and erecting wall panels to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store panels to ensure dryness. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Field cutting sheet metal by torch is not permitted. All field cuts shall be de-burred.

E. Immediately remove all strippable films from panel surfaces if exposed in direct sunlight.

1.7 PROJECT CONDITIONS

Field Measurements: Verify location of structural members and openings in substrates by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.8 WARRANTY

A. Special Finish Warranty: Submit a written warranty, signed by manufacturer, covering failure of the factory-applied exterior finish on metal wall panels within

the specified warranty period and agreeing to repair finish or replace wall panels that show evidence of finish deterioration. Deterioration of finish includes, but is not limited to, color fade, chalking, cracking, peeling, and loss of film integrity.

B. Finish Warranty Period: 15 years from date of Substantial Completion.

PART 2 - MATERIALS

2.1 METAL PANELS AND PRE-FORMED FLASHINGS

A. Aluminum for construction of all sheet metal wall panels, closures, corners and associated flashings shall be of 3004 aluminum alloy, H36 temper or equivalent, 0.040" and 0.050" thick factory painted aluminum. Finish for all exposed painted aluminum flashings shall be as described in paragraph 2.05 of this Section. Panel surface shall be smooth.

B. Exterior wall panels shall have one 12" wide (visible surface) raised rib with a minimum depth of 1". Each 12" wide panel shall have 2 stiffening folds centered in the rib. Panels shall have interlocking side laps to conceal securements.

C. Termination bars shall be 1/8" x 1" aluminum bar with pre-punched holes at 8" on center.

D. All accessories, including but not limited to nails, screws and clip strips shall be copper, brass, stainless steel or galvanized steel and completely compatible with the surrounding metal to prevent galvanic reaction.

E. Rivets shall be 3/16" diameter aluminum or stainless steel as required by the metal being fastened.

F. Sheet metal panel, closures, corners and flashings shall be shop fabricated. All breaks, bends and hems shall be uniform, clean, straight lines.

1. Inside and outside corners shall be 4" wide (visible surface)
2. Drips shall be hemmed 3/4" wide and break at a 30° angle.
3. Clips shall be 2" wide.
4. All horizontal flashing joints shall have 6" wide cover and backer plates.

Fabrication Schedule:

1. Aluminum, painted finish (.050)
   1) Closures
   2) Closure Cleat
   3) Jamb Closure
   4) Hook Strip with Drip Edge

2. Aluminum, painted finish (.040)

a. Wall Panels
b. Closure
c. Counterflashing
d. Cover Plates
e. Inside Corners
f. Outside Corners

3. Aluminum mill finish (.050)
   a. Continuous Hook strip
   b. Cleat

2.2 FASTENERS

A. In general, fasteners, straps and other hardware shall be stainless steel or hot-dip galvanized steel. Galvanizing shall be per ASTM A 153 specifications. Electro-galvanizing will not be accepted.

B. Fasteners for securing metal wall panels to masonry block walls shall be 1/4" diameters, 1-3/4" length, stainless steel, self-tapping flat head screw. Fasteners shall be Kwik-Con II Masonry Screw Anchor System as manufactured by HILTI or approved equal.

C. Fasteners for securing sheet metal flashings to concrete shall be minimum 1-1/2" long flat head stainless steel drive pins in zinc sheaths. Drive pins shall be Metal HIT anchors as manufactured by HILTI or approved equal.

2.3 AIR VAPOR RETARDER

A. Air barriers for covering concrete block walls shall be air and water-resistant commercial wrap such as Tyvek by Dupont, Typar by Reemay, Barricade by Simplex or approved equal.

B. Polyurethane or latex based adhesive for holding the air barriers in place shall be as recommended by the commercial wrap manufacturer for adhesion to brick masonry and concrete surfaces.

C. Tape for sealing air barrier laps and seams shall be as recommended by the air barrier manufacturer.

2.4 SEALANT AND ACCESSORIES

A. Exterior sealant shall be two-part polyurethane base conforming to ASTM C920, Type M, Grade NS, Class 25, uses NT, M, A and O as manufactured by Tremco, Sonneborne or Pecora. Color shall match the metal panel color.

B. Sealant required for incidental sheet metal and flashing work where sealant will not be exposed, shall be one part acrylic conforming to Fed. Spec. TT-S-230 such as "Mono" by Tremco or approved equal.

C. Cleaners and primers shall be as recommended by the manufacturer of the sealant.

D. Bond breaker tape shall be self adhesive polyethylene tape as recommended by the sealant manufacturer.

E. Backer rod shall be continuous length, closed cell polyethylene foam, as recommended by the sealant manufacturer. Backer rod shall be compressible, resilient, non-waxing, non-extruding and non-staining. Backer rod shall be of sufficient size to be compressed 30% of maximum joint width and shall be totally compatible with the sealant, primer and substrates. Backers shall conform to the requirements of ASTM C 962 - Type A, ASTM D 1622, ASTM D 1623 and ASTM D 5249 such as Green Rod by Nomaco, Sonofoam by Sonneborn, ITP soft type backer rod or approved equal.

2.5 FINISH

Finish for all exposed aluminum surfaces shall be a Resin-Based Coating- Hylar 5000, or Kynar 500. Paint dry film thickness shall be not less than 1.0 mils +/- 0.2 mils. Surface preparation and coating shall conform to AAMA 2605 Specifications. Durability: Provide coating field tested under normal range of weather conditions for a minimum of 15 years without significant peel, blister, flake, chip, crack, or check in finish; without chalking in excess of a chalk rating of 8 according to ASTM D 4214; and without fading in excess of 5 Hunter units.

Aluminum color shall be selected by the Owner and may include “premium” colors.

2.6 PLYWOOD

Refer to Section 06 10 00 – ROUGH CARPENTRY for plywood material.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine substrates and conditions for compliance with requirements indicated for conditions affecting performance of metal panel walls.

B. Do not proceed with wall panel installation until unsatisfactory conditions have been corrected.

C. Promptly remove protective film, if any, from exposed surfaces of metal panels. Strip with care to avoid damage to finish.

3.2 AIR/VAPOR RETARDER INSTALLATION

A. Install air/vapor retarder to the entire wall area to be covered with the sheet metal cladding. Adhere air barrier to the wall surface with the manufacturers recommended polyurethane adhesive. Set air barriers into the adhesive and smooth out to remove all wrinkles. Overlap all side and end laps 3" minimum. All seams are to be taped with the air barrier manufacturer's recommended tape.

B. Air/vapor retarder shall be properly flashed at all edges and penetrations as recommended by the air barrier manufacturer.

3.3 PLYWOOD INSTALLATION

A. Plywood shall be installed in Coordination with Section 06 10 00 ROUGH CARPENTY.

3.4 PANEL INSTALLATION

A. Prior to performing panel installation ensure that all mechanical/electrical disconnections have been performed in accordance with the Owners requirements.

B. Anchor panels and other components of the work securely in place, with provisions for thermal and structural movement. Secure panels to the masonry walls with the specified fasteners through the folded leg of the panel sheet at 24" on center. Fastener spacing should be a minimum of 12" for foundations, roof, corners or termination points.

C. Provide full bed of sealant in the fold of the metal panel prior to inserting the flange of the corresponding sheet. Sealant shall run the full height of the vertical panel. Provide drops of sealant at all fasteners heads.

D. Install all components required for a complete wall panel assembly including pan flashings, sill flashings, trim, inside and outside corner units, clips, cleats, flashings and similar items as required.

E. Backer plates shall be installed at the splice of all horizontal flashings. Set flashing over backer plate in a full bed of sealant. Install cover plates at each flashing joint with a full bed of sealant flashing and cover plate surfaces.

F. Shim and align panel units within installed tolerance of 1/4 inch in 20 feet on level, plumb, and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles. Panel shall be installed in a manner that will allow for thermal movement without deforming the face of the panel or adjacent panels and trim. The open edges of panel seams shall face away from main entrances or prominent elevations.

G. It is the intent of this specification to provide continuous panels from the roof to the foundation line with no horizontal seams. At elevations where the height of the building exceeds possible limits of panel fabrication construct horizontal

seams as shown on the contract drawings. Fill fold of seam with a full bead of sealant prior to installing the next panel. Where horizontal seams are required they shall be all in the same line.

H. To make a cut parallel to the ribs, score the panel deeply with a sharp utility knife and bend back-and-forth along the score, breaking the metal off cleanly. For cuts across the ribs, use straight-cut snips, electric or pneumatic shears, a portable profile shear, or an electric nibbler. Circular saw cutting may be performed with a metal cutting blade (a finetooth hardwood blade, or a standard combination blade reversed in the saw). Light oil or soap on the blade should be added to aid cutting.

3.5 COUNTERFLASHING INSTALLATION

A. Fabricate new counterflashing to the dimensions and shapes shown on the Contract Drawings and as specified herein. Counter flashing shall be installed a minimum of 12” above the finished roof surface.

B. Secure counter flashing with the membrane flashing with termination bars secured at 8” on center.

C. Secure the counterflashings with clips spaced 8” on center

3.6 SEALANT INSTALLATION

A. Install sealant where shown on the Contract Drawings and as required for the proper completion of the work.

B. Clean and prime substrates in strict accordance with sealant manufacturer’s requirements.

C. Precondition sealants to a temperature between 60 and 70 degrees or as required by the manufacturer. Apply sealant to clean dry surfaces only when the ambient temperature is between 60 and 85 degrees F.

D. Ensure all work by others occurring at sealant joint locations has been completed prior to the start of sealant installation.

E. Clean all substrates to receive the joint sealant using the manufacturers recommended cleaners and surface preparation techniques.

F. Ensure all existing sealants and other materials have been removed down to clean sound original substrates. Saw-cut, wire brush, chip, or grind as required to achieve suitable substrates for sealant installation.

G. All bonding surfaces shall be cleaned with a minimum of two applications of solvent followed by wiping with clean white rags. Solvent shall be applied with brushes and

wiped from substrate with rags while it is still wet. Additional application shall be performed if dirt remains after two applications until all dirt is removed.

H. Joint primer shall be applied to all properly prepared, cleaned and dry substrates. Primer shall be approved by the sealant manufacturer for each substrate and shall be completely compatible with the existing materials and proposed sealants and accessories.

I. Primer shall be applied prior to application of joint backer, bond breaker or sealant.

J. Joint backer shall be installed in all joints as detailed. Joint backing shall be installed with approximately 30% compression at 70 degrees F. Do not stretch, twist, tear or puncture joint backing. Butt joint backings tightly at intersections.

K. Joint backing shall be installed at the required depth so as not to exceed the joint width/depth ratio recommended for the sealant.

L. Bond breaker tape shall be installed at locations where backer rod cannot be utilized to achieve the designated joint depth and where shown on the Contract Drawings. Sealant shall adhere only to the sides of the joint and not to the back so as to eliminate three- sided adhesion.

M. Two-part polyurethane sealant shall be thoroughly mixed including tinting agent in accordance with the manufacturer's printed instructions. Sealant shall have a minimum application life of three (3) hours after mixing.

N. Unless otherwise required by the sealant manufacturer, the sealant shall be mixed for a period of 6 minutes minimum with a slow speed electrical drill and mixing paddle. The sides of the container shall be repeatedly scraped to ensure adequate mixing.

O. Sealant shall be applied to clean, dry, joints by knife, trowel, manual or air pressure caulking guns using proper nozzle sizes.

P. Sealant shall be forced into the joint to completely fill the void and achieve full "wet-out" of the bonding surfaces. Force sealant into the joint and against the sides of the joint. Avoid pulling sealant from sides. All joint sealant shall be immediately tooled to assure full adhesion. Sealant shall be dry tooled, straight, uniform, smooth and neatly finished to the profiles detailed. No soaps, wetting of slicking agents will be allowed.

Q. Provide weep holes at sill locations spaced 24" on center as shown on the Contract Drawings

3.7 CLEANING AND PROTECTING

A. Damaged Units: Replace panels and other components of the work that have been damaged or have deteriorated beyond successful repair by finish touchup

or similar minor repair procedures. Repaired panels must be accepted by the Owner.

B. Cleaning: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.

3.8 BLIND NAILER

A. Fabricate and install blind nailer flashing with a 2" minimum leg inserted behind the metal. Fasten flashing through leg of blind nailer.

B. Fold blind nailer with ½" hemmed edge over metal and fastener.

C. Provide continuous beads of sealant at back and leading edges. Refer to the detail for additional information.

3.9 CLEANING AND PROTECTING

C. Damaged Units: Replace panels and other components of the work that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures. Repaired panels must be accepted by the Owner.

D. Cleaning: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.

END OF SECTION

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ELASTOMERIC ROOFING AND FLASHINGS

SECTION 07 53 00

PART 1 – GENERAL

1.1 IN GENERAL

A. The General Conditions, and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.

B. Refer to Division 1 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Concrete Repairs – Section 03 60 00
B. Masonry – Section 04 50 00
C. Metal Roof Ladders – Section 05 51 33
D. Rough Carpentry – Section 06 10 00
E. Metal Wall Panels – Section 07 42 13
F. Plumbing – Section 22 30 00
G. Temporary Mechanical/Electrical Disconnects – Section 26 10 00

1.3 SCOPE OF WORK

In general, the Contractor shall supply all labor, materials, equipment, temporary protection, tools, and appliances necessary for the proper completion of the work in this Section, as required in the Specifications, in accordance with good roofing practice, and as required by the materials manufacturer, as amended. The work under this Section generally includes the following:

A. Supply all shoring and protection necessary to protect the building areas, building systems and landscape areas.

B. The Contractor shall provide all scaffolding, lifts, cranes, and equipment necessary to perform the work.

C. The Contractor shall remove and replace the existing designated roof system(s) as indicated throughout the Contract Documents.

D. Remove the existing roof membrane assemblies, including but not limited to roof membrane, membrane flashings, sheet metal flashings, insulations, baseboards and associated components down to the roof deck.

E. Coordinate concrete deck repairs and wood blocking installation with the Contractor(s).

F. Install self-adhered vapor retarder directly to existing concrete roof deck. The concrete surface shall receive primer prior to application of vapor retarder.

G. Install insulation on all designated Roof Areas.

H. Install blind nailers to terminate all vertical edges of flashings as required.

I. Install fully adhered elastomeric roof membrane over cover board. Install new roof membrane flashings, sheet metal flashings, and associated components at rising walls, and roof penetrations.

J. Coordinate the replacement of the existing metal roof ladder with Section 05 51 33 – Metal Roof Ladders.

K. Install Roofing Manufacturer approved walkway pads.

L. Coordinate with Section 04 50 00 – Masonry for the installation and tie-in of roof system to new throughwall flashings at rising brick masonry walls (work by the Masonry Filed-Sub Contractor).

M. Coordinate with Section 22 30 00 – Plumbing for the removal and replacement of existing clamping rings, drain bowls, and drain strainers at all roof drains (work by the Plumbing Filed Sub-Contractor).

N. Strip in all field seams with EPDM. Two ply stripping to be used by applying a 5" wide strip of flashing over which a 9" wide strip is to be applied. Uncured membrane shall be utilized where required by the manufacturer or by detail conditions. Stripping shall be continuous over the entire seam and extend onto the field membrane 4" minimum.

O. Clean and restore all areas affected by the work.

1.4 JOB CONDITIONS

A. Coordinate the work in this Section with the work in other sections to ensure a watertight condition and the orderly progress of work.

B. Remove only as much existing roofing as can be replaced and made weathertight each day, including all flashing work.

C. Roofing shall not be applied when ambient temperature is less than 40 degrees F unless approved in writing by the Engineer and membrane manufacturer.

D. All surfaces to receive the new insulation, membrane, or flashings shall be thoroughly dry. Should surface moisture such as dew exist, the Contractor shall provide the necessary equipment to dry the surface prior to application. Do not dry with open flames.

E. All new and temporary construction, including equipment and accessories, shall be secured from wind damage or blow-off.

F. Temporary waterstops shall be installed at the end of each day's work and shall be removed before proceeding with the next day's work. Water stops shall be compatible with all materials and shall not emit dangerous or incompatible fumes.

G. The Contractor is cautioned that oil and penta-based materials and preservatives are not compatible with compounded rubber membranes.

H. The building will be open to normal use during the time of construction. The Contractor shall take all precautions to create as little disruption as possible during the course of the work.

I. All areas of existing deck exposed and repaired each day shall receive the new insulation and roof membranes, including flashing membranes, in the same day's operation. No decking, whether new or existing, shall be left exposed to the weather at the end of each workday.

J. Fully charged, inspected and approved fire extinguishers shall be on site at all times. No cutting, grinding or welding of any kind shall proceed without an approved fully charged fire extinguisher.

1.5 SUBMITTALS

A. A sample roofing system warrantee and letter of confirmation from the roof membrane manufacturer stating that the Contract Documents have been reviewed and that there are no exceptions to the Specifications and Contract Drawings shall be submitted. The roofing system must meet or exceed a UL 790, Class A and Factory Mutual Class **1-60** and be in conformance with all local and state building codes and is accepted by the manufacturer for the required warranty.

B. Provide a letter of approval from the insulation manufacturer and membrane manufacturer that the proposed insulation system is compatible with the specified adhesive system for uplift and will achieve the specified warranty.

C. The Contractor shall submit the following procedural items with their submittal package:

1. Methods of removal of materials
2. Temporary protection procedures
3. Fire watch procedures (if needed)
4. List of local emergency numbers
5. Staging/set-up procedures
6. Schedule of roof renovations

D. The Contractor shall submit the following samples with their submittal package:

1. Manufacturer's literature and sample warranties

E. Provide the manufacturer's product and installation literature for each item listed in Part 2 and other material anticipated for use on the project, for approval. Shop drawings are required indicating any anticipated changes.

F. The Contractor shall submit shop drawing plans indicating the insulation attachment pattern and locations, as required by the roof manufacturer.

G. The Contractor shall submit shop drawing plans indicating the new tapered insulation and roof cricket layout.

1.6 WARRANTY AND GUARANTEE

A. Roofing Contractor's Guarantee: Upon completion of the work, and prior to final payment, the Contractor shall submit a Guarantee of his work to be free from defect in materials and workmanship. This Guarantee shall be for a period of two (2) years, and shall be signed by a Principal of the Contractor's firm, and sealed if a corporation. In the event any work related to the roofing, flashing, or metal work is found to be defective within two years of substantial completion, the roofing contractor shall remove and replace such at no additional cost to the Owner. The roofing Contractor's warranty obligation shall run directly to the building Owner, and a copy of the roofing signed warranty shall be sent to the roofing system's manufacturer.

1. The duration of the Roofing Contractor's two-year warranty shall run concurrent with the roofing system's manufacturer's 20-year warranty.

B. Roofing Systems Manufacturer's Warranty: The roofing manufacturer shall guarantee roof areas to be in a watertight condition and free from seam separation and the delamination of the roofing system components, for a period of 20 years, from the date of final acceptance of the roofing system. The warranty shall be a 20-year no dollar limit, non-prorated total system labor, and material warranty, for wind speeds up to 75 miles per hour. The total system warranty shall include all roofing materials, related components, and accessories including, but not limited to the baseboard, vapor retarder, insulation board, cover board, roofing membrane, membrane flashings, fasteners, adhesives and termination metals and roof drain assemblies. The manufacturer shall repair leaks and defects, in materials and workmanship as promptly after observation as weather and site conditions permit.

PART 2 – MATERIALS

2.1 ROOFING AND FLASHING MEMBRANES

A. Roofing membrane shall be 0.060" thick non-reinforced compounded rubber sheet elastomer (EPDM), as manufactured by Firestone, Carlisle SynTec Systems, Inc., or Versico Incorporated.

B. Stripping shall be 6" wide semi-cured EPDM self-adhering seam cover strips (minimum thickness: 60 mils).

C. The elastomeric sheet membrane shall have the following minimum properties:

PHYSICAL PROPERTY	**TEST METHOD**	**SPECIFICATIONS**
Tolerance on Nominal Thickness, %	ASTM D 412	+/- 10
Tensile Strength, min, psi	ASTM D 412	1600
Elongation, Ultimate, min, %	ASTM D 412	465
Tear Resistance, min, lbs/in	ASTM D 624 (Die C)	200
Factory Seam Strength, min	Modified ASTM D 816	Membrane Rupture
PHYSICAL PROPERTY	**TEST METHOD**	**SPECIFICATIONS**
Resistance to Heat Aging Properties after 4 weeks @ 240°F		
Tensile Strength, min, psi	ASTM D 412	1450
Elongation, Ultimate, min, %	ASTM D 412	280
Tear Resistance, min, lb/in	ASTM D 624	215
Linear Dimensional Change, max, %	ASTM D 1204	-0.5
Ozone Resistance Condition after exposure to 100 pphm Ozone in air for 168 hours @ 104°F (40°C) Specimen is at 50% strain	ASTM D 1149	No Cracks
Brittleness Temp., max deg. F	ASTM D 746	-49
Resistance to Water Absorption After 7 days immersion @ 158°F (70°C) Change in mass, max %	ASTM D 471	2.0
Water Vapor Permeability max, perm-mils	ASTM E 96 (Proc. B or BW)	0.03

PHYSICAL PROPERTY	TEST METHOD	SPECIFICATIONS
Resistance to Outdoor (Ultraviolet) Weathering Xenon-Arc, 4000 hours exposure, 176°F (80°C) black panel temperature	ASTM D 26	No Cracks No Crazing
Sheet Composition	ASTM D 297	
Weight percent of polymer that is EPDM, min, %		100
Weight percent of sheet that is EPDM polymer, min, %		30

D. Factory fabricated membrane seams shall be step tapered to achieve a smooth transition across the seam. Seams shall be vulcanized.

E. Flashing membrane to be used at corners of walls or penetrations shall be of the same manufacturer as the roof membrane and shall be 0.060" thick uncured elastomer completely compatible with all other components used in the new roofing system. Cured membrane specified in 2.01B shall be used at straight flashing runs. Seams shall be stripped-in with uncured membrane.

F. All materials and accessories used to install the roofing and flashing membrane systems shall be of the same manufacturer as the sheet membrane. These materials include, but are not limited to, the following:

1. Surface cleaners and primers
2. Bonding adhesive
3 Splicing cement
4. Lap Sealant
5. Mastics
6. Caulkings and sealants
8. Pipe seals
9. Walkway Pad
10. Membrane termination strips, bars, plates and fasteners.

G. All membrane manufacturer's required details shall be considered a part of this project and incorporated into the project details by the Contractor.

2.2 ROOF INSULATION

All roof insulations proposed for this project shall be approved in writing by the membrane manufacturer for use with their membrane and as required to achieve the required roofing warranty.

A. Tapered and flat stock isocyanurate insulation shall be skinned with factory-applied fiberglass bituminous felt as manufactured by Celotex, Johns Manville, Firestone, or as supplied by the membrane manufacturer as required to meet membrane

manufacturer's requirements. The isocyanurate insulation board shall conform to ASTM Specification C 1289, Type II, Class 1, Grade 3 (25 psi minimum).

1. The isocyanurate insulation shall have an area weighted aged R-Value of 20 at as required to meet the Long Term Thermal Resistance (LTTR) value in accordance with ASTM C518 and the Building Code of the City of Manchester N.H. Amended September 2, 2014 and IBC 2000 Edition Note that tapered insulation more than 1" above the thinnest spot is not allowed to be factored into the average insulation value. (Not including drain sump areas).

2. Tapered insulation shall be as required to provide a minimum 1/4" per foot slope to drainage system; 1/2" per foot at crickets, drain sumps and around mechanical rooftop units; and meet the required LTTR value in accordance with ASTM C518 as described above.

3. The isocyanurate insulation board size shall be a minimum of 2'x2' if close to roof edge or 4'x4' if located in field of roof square and of uniform dimension.

4. Isocyanurate insulation shall be approved in writing by the insulation and membrane manufacturer that the methods of attachment are covered under the membrane manufacturer's labor and material warranty. Copies of the written acceptance shall be forwarded to the Engineer.

B. Tapered edge strips:

1. Tapered edge strips shall be 18" wide and 1-5/8" thick, tapering to a feathered edge.

2. Tapered edge strips shall consist of either wood fiberboard or isocyanurate insulation.

   a. Wood fiberboard shall be high density, non-asphalt impregnated and conform to ASTM C208 specifications.
   b. Isocyanurate insulation tapered edge strips shall meet ASTM C1289, Type II, Class 1, Grade 3 specifications.

C. Insulation for use at hot pipe shall be minimum 2" thick Thermal Ceramics Cerablanket, capable of withstanding temperatures of 2400 degrees F minimum, as manufactured by Kaowood Thermal Ceramics, Ferrawool – F11400 as manufactured by Ferralloy, Inswool HP Blanket as manufactured by Empire Refractory, or approved equal.

2.3 COVER BOARD

Cover board insulation shall be 1/2" minimum thick, glass mat faced, or high density isocyanurate insulation board as required by the roofing manufacturer. The boards shall be a maximum of 4' x 8' in size and approved in writing by the membrane manufacturer. A copy

of the written acceptance shall be forwarded to the Engineer. Cover board insulation shall conform to ASTM C1289 Type II specifications. Compressive strength shall be greater than 100 psi in accordance with ASTM D2126. Water absorption shall be 3.0% or less in accordance with ASTM C209.

2.4 COLD ADHESIVE FOR COVERBOARD AND INSULATION BOARD SECUREMENT

Adhesive to adhere the insulation boards and cover board systems shall be considered low volatile compounds (VOC), two component, cold-process, asbestos free, low-rise polyurethane foam adhesive conforming to ASTM D276, D2556, D1875, D429, D816, D1876, D412. Adhesive shall meet the required FM Global rating and shall be approved in writing by the membrane manufacturer and included as part of the warranty coverage. Adhesive shall be I.S.O. stick as manufactured by Firestone, Insta-Stik Professional Roofing Adhesive as manufactured by Insta-Foam Products, Inc., Olybond by Olympic or an approved equal.

2.5 SELF-ADHERED VAPOR RETARDER

Self-adhering vapor retarder shall be 32 mil minimum composite consisting of rubberized asphalt and polyethylene, polypropylene, or polyester sheet as required by the membrane manufacturer such as V-Force Vapor Barrier Membrane as manufactured by Firestone, 725TR as manufactured by Carlisle Syntec, Versico 725 as manufactured by Versico, or approved equal as required by the manufacturer to receive the warranty requirements. Utilize compatible primer for concrete deck.

2.6 FASTENERS

A. In general, fasteners, straps and other hardware shall be copper, brass, stainless steel or hot-dip galvanized steel. Galvanizing shall be per ASTM A 153-82 specifications.

B. All accessories, including, but not limited to nails, screws, clips, fastening strips, etc. shall be completely compatible with the material being fastened to prevent galvanic reaction and premature deterioration.

C. Nails for membrane and flashing terminations shall be No. 12 Stubbs gauge, large head, threaded shank, hot dip galvanized roofing nails of sufficient length to penetrate the wood blocking 1-1/4” minimum.

D. Fasteners for terminating roof membrane and flashing at concrete or masonry walls shall be minimum 1-1/2” long drive pins in zinc sheaths as manufactured by Star, Rawl or approved equal. Embedment into masonry shall be 1-1/4”, minimum.

E. Fasteners for securement of flashings, and hook strips to wood blocking and plywood substrates shall be galvanized annular threaded ring shank nails. Fasteners shall be of sufficient length to penetrate the substrate 1-1/4” minimum, except full depth of plywood.

F. Insulation, and Peel Stop Fasteners: #15, self-drilling, self-tapping screws of sufficient length to penetrate the metal roof decking by 1 inch., with a fluorocarbon coating in conformance with FM 4470 specifications, installed through minimum 3-inches diameter (nominal), 26 gauge galvalume coated steel stress plates, as recommended by the insulation and membrane manufacturers or an accepted substitute.

2.7 SHEET METAL AND PREFORMED FLASHINGS

A. Aluminum shall be 3003 Alloy, H-14 temper, mill finished, anodized or baked enamel finished aluminum, 0.040" and 0.050" thick. Baked enamel and anodized finished sheets shall be finished on both sides. Color(s) and finish to be selected by the Owner.

B. Stainless steel shall be 24 gauge AISI 18-8 type 304, 2D finish. Sheet length shall be 8' maximum. Note, stainless steel is anticipated only to be used as a storm hood at hot pipe locations.

C. All accessories, including but not limited to nails, screws and clip strips shall be copper, brass, stainless steel or galvanized steel and completely compatible with the surrounding metal to prevent galvanic reaction.

D. Termination bars shall be 1/8" x 1" copper or stainless steel with pre-punched holes at 6" on center, or as required by the membrane manufacturer.

E. Rivets shall be 3/16" diameter copper or stainless steel as required by the metal being secured.

F. Sealant required incidental to sheet metal and flashing work shall be one-part acrylic conforming to Fed. spec. TT-S-230 such as "Mono" by Tremco or approved equal.

G. Sheet metal flashings shall be shop fabricated. All breaks, bends, and hems shall be uniform, clean, straight lines.

1. Flanges shall be 4" wide minimum and hemmed.
2. Drip edges shall be hemmed 3/4" wide and break at a 30° angle.
3. Clips shall be 2" wide.
4. All flanges to be covered with roofing or flashing membranes shall have a 1/4" minimum hem on the edge.
5. All sheet metal joints shall have 6" wide cover and backer plates.
6. Blind nailers shall be 4" wide, folded to 2" wide final dimension.
7. All aluminum joints shall be adequately overlapped, back-sealed and riveted.

8. Fascia reveals shall not exceed 8". Fascia requiring a greater vertical face than 8" shall be fabricated as a two-piece system with each face of equal exposure.

9. Maintain equal fascia height around entire perimeter of roof area.

H. Fabrication Schedule:

1. Coated Aluminum (0.040")
   a. Cover plates

2. Coated Aluminum (0.050'')
   a. Edge Metal Fascia
   b. Blind Nailers
   c. Surface Mounted Reglet Flashing
   d. Clips

3. Mil Finish Aluminum (0.040'')
   a. Backer plates

4. Stainless Steel
   a. Fan Unit Skirt Flashing
   b. 2" wide clips
   c. Hose clamps

5. Mil Finish Aluminum (0.050'')
   b. Hook Strips

2.8 SEALANTS AND ACCESSORIES

A. Sealant for sheet metal flashings and other exposed locations shall be a one-part polyurethane conforming to ASTM C920-87, Type S, Grade NS, Class 25, Uses NT, M, A, and O such as manufactured by Tremco, BASF-Sonneborn, Sika Corp., or approved equal.

B. Color(s) shall be selected by the Owner from the approved manufacturer's color chart. Colors shall be the manufacturer's available premium colors such as "Color Pak" by Tremco or approved equal.

C. Primer shall be non-staining type as manufactured or recommended by the sealant manufacturer for each substrate.

D. Substrate cleaner shall be non-corrosive and non-staining as recommended by the sealant manufacturer. Cleaner shall be totally compatible with the sealant for each substrate.

E. Bond breaker tape shall be pressure-sensitive tape as recommended by the sealant manufacturer.

F. Masking material shall be commercially available masking tape of appropriate width or other material recommended by the sealant manufacturer. Self-adhesive masking materials shall be of low tack and completely strippable, leaving no adhesive residue behind when removed.

2.9 WALKWAY PADS

A. Walkway pads shall be a black, molded rubber walkway pad with slip resistant surface and factory rounded corners. Size shall be 30" by 30" and 3/16" in thickness.

B. Adhesive and primers shall be as recommended by the manufacture.

2.10 EXPANSION JOINTS

A. Insulation for use at expansion joints shall be a fibrous, glass type batt, non-faced, roll insulation as manufactured by Owens-Corning Fiberglass or approved equal.

B. Foam rod as required for expansion joints shall be a closed cell, high density, neoprene foam tube of the size required and as recommended by the membrane manufacturer.

2.11 SLEEPERS

A. Wood sleepers shall be construction grade Spruce/Pine/Fir; and shall be 4”x4” nominal dimensions, except where otherwise detailed. Sleepers shall be pressure treated.

B. Sleepers used to support conduits, waterlines, gas lines, etc. shall be 10” long by 4” wide and 4” high roof top sleeper support with polyethylene closed cell foam base and galvanized finish cover. Sleepers shall be capable of supporting 50 lbs loads and designed to shed water from the sleeper.

2.12 COLD-ADHERED SBS MODIFIED BITUMEN FLASHING

A. Two-ply stripping flashing membrane shall consist of one ply of asphalt coated sheet and one ply of the manufacturer’s premium, granular surfaced SBS modified bitumen membrane, 12” installed over 9” adhered in solvent free mastic. Base ply sheet shall consist of glass mat impregnated and coated with high quality SBS modified bitumen such as Paradiene 20 as manufactured by Siplast, and Stressbase as manufactured by Garland Company. Thickness of modified bitumen membrane shall be not less than 120 mils. Sheet reinforcement shall be glass fiber reinforcement. Fiberglass membrane shall be a non-shrinking, vinyl coated, woven glass mesh membrane, with a minimum weight of 1.32 lb/100ft sq.

PART 3 - EXECUTION

3.1 GENERAL WORKMANSHIP

A. Do not deliver to site or install any material or system that has not been approved by the Engineer or Owner. Materials installed without approval may be required to be removed at no additional cost to the Owner.

B. The prepared roof deck surface must be dry, clean and smooth. Provide dryers, if necessary, to dry deck surfaces prior to installing new work. Open flame devices shall not be used.

C. Maintain temporary protection of the new and existing roof system throughout the duration of the project. The roof system will be cleaned to the satisfaction of the Owner and Engineer prior to final payment. All areas of stained membrane will be cut out and replaced by the Contractor at no additional cost to the Owner. Multiple patches in close proximity will not be acceptable and will require one large patch.

D. Comply with the manufacturer's written instructions and these specifications for all roof repairs and associated work. Flashing shall be installed along with the membrane to assure weather tight termination.

E. Do not cut any material with a solvent or dilutant unless specifically instructed by the manufacturer in writing.

F. Keep covers tightly sealed on all canned and evaporative products to prevent premature curing.

G. Partial or unmarked cans or rolls of materials cannot be used.

H. Do not store rolls of membrane or flashings on the roof without the written consent of the Engineer and Owner.

I. Refer to the publication, "Copper and Common Sense" by Revere Copper and Brass and all recommendations of the Sheet Metal and Air Conditioning Contractors National Association concerning methods and materials to be used in the fabrication and construction of sheet metal flashings.

3.2 REMOVAL OF EXISTING SYSTEM

A. Remove existing elastometric roof membrane, insulation, base flashing, and associated components in their entirety down to existing roof decks. Cut existing membrane and insulation along straight lines. Remove roofing system and insulation without damaging the roof deck.

B. Remove existing elastometric roof membrane, base flashings, termination bars, and associated components (including existing wood blocking) in their entirety down to existing masonry wall.

C. Scrape and clean the existing roof deck, walls and penetration surfaces. Notify the Owner and Engineer of any areas of unsuitable roof deck or associated components.

D. Sequence work to minimize building exposure between demolition and new roof materials installation. Install temporary roofing and flashing as necessary to maintain a watertight condition throughout the course of the work. Remove temporary work prior to installation of permanent roof system materials. Only remove as much roofing and flashings as can be made weathertight the same day with the new work. Arrange each day's termination point to prevent interruption of roof top drainage.

E. Remove existing drain bowls, strainers, clamping rings, and drain bowls from the existing drain assemblies; Coordinate with Section 22 30 00 - Plumbing.

F. Temporarily support exposed duct work.

G. Remove, disconnect, store, and reinstall existing rooftop mechanical equipment in preparation for new roof system. Removals, lengthening/shortening, and reinstallations of mechanical equipment including mechanical/electrical connections are to be performed by licensed tradesmen. Refer to Section 26 10 00 for Temporary Mechanical/Electrical Disconnect specifications. Costs for mechanical/electrical work shall be included in the Contractor's bid price.

H. Remove existing mechanical equipment support curbs in preparation for installing new curbs at unit locations as indicated.

3.3 REMOVAL OF EXISTING WOOD BLOCKING

A. Remove and dispose of all existing wood blocking and all blocking scheduled to be removed and replaced in accordance with the Contract Drawings and this Specification.

B. During removal and replacement of woodwork, the Contractor shall report to the Owner and Engineer any existing wood blocking designated to remain, or structural supports which are deteriorated or unsuitable. Do not cover unacceptable areas until reviewed by the Engineer, and provide temporary protection to the area in question.

3.4 DECK PREPARATION

A. Allow moist deck sections to dry prior to application of roof insulation. Open flames are strictly prohibited from the roof areas.

B. Clean deck surfaces using brooms, air spray, or other means necessary to provide a clean, smooth, uniform deck.

3.5 INSTALLATION OF SELF-ADHERED VAPOR RETARDER

A. Apply manufacturer's approved primer to prepared substrate in accordance with the manufacturer's written instructions. The substrate must be clean, dry and free of dust, grease or other contaminants.

B. Self-Adhered vapor barrier must be installed on the same day as the primer application. Allow primer to dry completely and install the vapor retarder. Do not install when it is raining, snowing, or on wet/humid surfaces. Install in temperatures 32F and above.

C. Unroll self-adhered vapor barrier on the substrate without adhering for alignment. Overlap each preceding sheet by 3 inches lengthwise following the reference line and by 6 inches at each end. Stagger end laps by at least 12 inches. Do not immediately remove the release sheet.

D. Once aligned, peel back a portion of the release sheet and press the membrane onto the substrate for initial adherence. Hold self-adhered vapor barrier tight and peel back the release sheet by pulling diagonally.

E. Use a 75 lb. roller to press the self-adhered vapor barrier down into the substrate including the laps. Finish by aligning the edge of the roller with the lower end of the side laps and rolling up the membrane. Do not cut the membrane to remove air bubbles trapped under the laps. Squeeze out air bubbles by pushing the roller to the edge of the laps.

3.6 INSTALLATION OF INSULATION SYSTEM

A. The multi-layer insulation system shall be installed on properly prepared, clean, dry surfaces.

B. Allow moist vapor barrier sections to dry prior to application of roof insulation. Open flames are strictly prohibited from the roof areas. Ensure that vapor barrier surface and joints are clean of all debris and roofing materials.

C. Insulation boards shall be free of defects including but not limited to, broken corners, improperly adhered facers, excessive moisture, dimensional irregularities, and the like. Defective insulation boards shall be marked and immediately removed from the site.

D. The concrete roof deck shall receive the self-adhered vapor retarder system prior to the installation of the insulation system.

E. Install the insulation boards in adhesive atop the properly installed vapor barrier. Stagger all end joints to the middle of the long dimension of adjacent insulation boards and stagger insulation layer to layer.

1. Ensure that boards are totally adhered prior to application of roof membrane.

    a. Adhesive bead spacing shall be 12" O.C. – Field; 6" O.C. – Perimeter; and 4" O.C. – Corners, minimum, unless designated otherwise by the manufacturer.

F. Install one or more layers of insulation under area of roofing to achieve required thickness.

G. The minimum dimension of cut insulation boards shall be 12" with a minimum surface area of 2 square feet. Maximum size of insulation board is 4' x 8'. Only full sized insulation boards shall be used at roof perimeters and corners.

H. All insulation boards shall be installed tightly butted to adjacent insulation or wood blocking. If gaps greater than 1/8" exist between the boards, the board shall be cut out and replaced.

I. Insulation boards set in cold-process adhesive shall immediately be "walked-in" to assure full embedment. Poorly adhered boards shall be removed and replaced at no additional cost to the Owner.

J. Provide insulation crickets at high points of roof top penetrations to prevent ponding water and provide positive slope toward the drainage system. Set crickets in adhesive prior to setting cover boards, or as otherwise required by the roof membrane manufacturer to maintain the specified warranty.

K. Utilize tapered edge strips and fillers at drain locations. Step taper the surrounding insulation system down to the drain bowl location. Provide maximum sumps in conjunction with the tapered insulation system. Tie-in locations shall have a minimum sump of 4' x 4'.

3.7 COVER BOARD INSTALLATION

A. Install coverboard in cold adhesive applied in strict accordance with the adhesive manufacturer's written instructions to achieve the required warranty.

B. Install the coverboard and immediately "walk" the system into place to spread the adhesive for maximum contact. **Stagger all end joints** to the middle of the long dimension of adjacent boards, 24" minimum. Continue to "walk" the coverboard every 5 to 7 minutes until firm adhesion is achieved. Ballast the boards to prevent cupping. Redistribute ballast to ensure full bonding of the system.

C. Ensure that the boards are totally adhered prior to application of roof membrane.

1. Adhesive bead spacing shall be 12" O.C. – Field; 6" O.C. – Perimeter; and 4" O.C. – Corners, minimum, unless designated otherwise by the manufacturer.

3.8 ADHERED MEMBRANE INSTALLATION

It is the intent of this Specification Section to provide the Owner with a new, fully adhered membrane, 100% bonded to the insulation, of sufficient bond strength to resist FM1-60 field uplift pressures as defined in FM Data Sheet 1-28, current edition.

A. Refer to Section 06 10 00 – Rough Carpentry, regarding the installation of wood blocking and similar accessory woodwork. Be sure all loose or deteriorated bituminous substances are removed with the original system. Clean any items designated to remain of all remaining bitumen.

B. Inspect surface of insulation prior to installation of roof membrane. Insulation surface shall be clean and smooth with no excessive surface roughness. Contaminated surfaces or unsound surfaces such as broken or delaminated boards or insulation voids shall be removed and disposed. Cover boards shall be swept and blown clean of all dust prior to applying bonding adhesives.

C. Install fully adhered elastomeric roofing on all roof areas designated to receive such. Install membrane system in accordance with the recommendations and requirements of the membrane material's manufacturer, as amended in these Specifications. Follow manufacturer requirements concerning application rates for cleaners, solvents, adhesives and similar materials. The application rates for these items given in these Specifications are to be considered nominal and the actual rates will vary from manufacturer to manufacturer.

D. Position roofing membrane without stretching over the insulation. Lay sheets in a shingle fashion. Allow the membrane to relax for minimum one-half hour before bonding. Fold the sheet back onto itself so that one-half of the underside of the sheet is exposed. It is essential that the fold in the sheet be smooth, with no wrinkles or buckles, because these could cause wrinkles in the sheet during installation. Apply the bonding adhesive in accordance with the manufacturer's published instructions to both the sheet and the substrate, using a 9" plastic core paint roller. Apply the bonding adhesive evenly avoiding globs and puddles. Correct application of the bonding adhesive will render approximately 60 square feet per gallon of finished surface coverage. This is a contact type adhesive and includes coating for the membrane and coating on the substrate. Allow the adhesive to dry until tacky; the adhesive must not string or stick to a dry-finger touch. Roll the coated membrane into the adhesive, being careful to avoid wrinkles. Brush down the bonded half of the sheet with a push broom to achieve maximum contact. Fold back the unbonded half of the sheet and repeat the bonding procedure. No wrinkles shall be allowed in the completed application. Wrinkled sheets shall immediately be removed and replaced and not patched. Do not apply bonding adhesive in areas that are to be spliced to flashings or adjacent sheets. Apply all sheets in the same manner, lapping adjacent sheet a minimum of 6".

E. Splice adjacent sheets in accordance with the manufacturer's written instructions using the manufacturer's double sided seam tapes (minimum 6" tape). Totally clean areas to be spliced of all talc, dirt and other foreign substances using clean rags with manufacturer's splice wash cleaner or other manufacturer's recommended cleaner. Clean all seam areas at least twice in two separate applications with new rags and cleaner each time. Change the rags and cleaner frequently. It is imperative that these seam areas be totally clean. Install manufacturer's in-seam sealant to cleaned seams as recommended by the membrane manufacturer. Apply seam tape for the full width (minimum 6") of the lap splice. Totally clean the completed splice for a distance of 1" on either side of the edge of the top sheet using clean rags and cleaner. Apply a continuous bead of lap sealant to the edge of the spliced sheet and feather out bead using preformed trowel. Lap sealant must be set daily as the work progresses.

F. Nail off membrane, after relaxing, adhering and splicing, along all perimeters and around all flashing units. Membrane shall be nailed off with the hook strip flange or termination bar along perimeters as detailed. The membrane at all flashing locations shall be nailed off 6" on center maximum with the specified roofing nails through tin discs. In areas where no metal flanges are installed (such as at roof to wall details), the nailing shall be reduced to 4" on center maximum. All nailing shall be held back 2" from the edge of the membrane. Vertical nailers, when used, shall be fastened 8" on center. Extend membrane behind vertical nailers and secure through it.

G. Temporary waterstops shall be constructed to provide a 100% watertight seal utilizing a raised temporary waterstop at the end of each day's work. Sweep back and totally clean the gravel and flood coat from the existing roof and set a 2" x 4" stud atop the prepared area in sealant or materials recommended by the membrane manufacturer. Where stopping work on the new system, maintain the stagger of the insulation joints by installing partial fillers. Carry the new membrane up and over 2" x 4" waterstop. Seal the edge of the new membrane onto the old membrane in a continuous heavy application of sealant or materials recommended by the membrane manufacturer. Weight the membrane down in the sealant with a 2" x 10" wood member with ballast on top. Ballast should be approximately 20 pounds per linear foot. When work is resumed, remove all sealant, membrane, insulation fillers, etc. from the area of the waterstop. Do not reuse any of the materials in the new work. If inclement weather occurs while a temporary waterstop is in place, the Contractor shall provide the labor necessary to monitor the situation in order to maintain a watertight condition.

3.9 PEEL STOPS

A. Install continuous peel stop (1"x 1/8" aluminum bar) 4'-0" offset at perimeter of roof or as required by the roof manufacturer. Mechanically fasten 12 inch O.C.

B. Strip-in with manufacturer's membrane flashing and provide gaps at 8 inch O.C. to allow drainage.

3.10 WATERSTOPS

A. All flashings shall be installed concurrently with the roof membrane in order to achieve a watertight condition as the work progresses. When a situation arises where a break in the day's work occurs in the central area of a roof, a temporary waterstop shall be constructed to provide a 100% watertight seal utilizing a raised temporary waterstop. Sweep back and totally clean the existing roof and set a 2" x 4" stud atop the prepared area in roof cement as recommended by the membrane manufacturer. Where stopping work on the new system, maintain the stagger of the insulation joints by installing partial fillers.

B. Carry the new membrane up and over 2" x 4" waterstop. Seal the edge of the membrane in a continuous heavy application of roof cement. Weight the membrane down in the sealant with a 2" x 10" wood member with ballast on top. Ballast should be approximately 20 lb./l.f. When restarting work, remove all sealant, membrane, insulation fillers, etc. from the work area. Do not reuse any of the material in the new work. Cut off contaminated EPDM membrane and dispose of immediately. If inclement weather occurs while a temporary waterstop is in place, the Contractor shall provide the labor necessary to monitor the situation to maintain a water tight condition.

3.11 MEMBRANE FLASHING

All flashings shall be installed concurrently with the roof membrane in order to maintain a watertight condition as the job progresses. The Contractor shall arrange his schedule, as much as practical, to install complete distinct roof areas each which, once flashed, will then be installed completely. No temporary membrane flashings shall be allowed without the prior written approval of the Engineer. Approval will only be for specific locations on specific dates.

A. Ensure that all air intakes and air handling units have been shut off or temporary protected to prevent adhesive fumes from infiltrating the building.

B. Ensure that all substrates are free from contaminates prior to the installation of the new flashing membranes. Install the manufacturers' buffer or protection sheets as required.

C. Cured membrane shall be used for flashing purposes as much as practical. Uncured sheets are to be used at vent pipes, inside and outside corners, seams in flashings or at any other location where forming of membrane flashings is required.

D. Flashing sheet shall be spliced to the membrane first, and then bonded to the mating surface. Totally clean the roof membrane area to receive flashing sheet using new, clean rags and manufacturer's splice wash cleaner. All talc, dirt, excess bonding adhesive and other foreign material shall be totally cleaned from the roof membrane sheet. Clean all seam areas at least twice in two separate applications with new rags and cleaner each time. After cleaning, apply splicing

cement to both the underside of the flashing sheet and the prepared roof membrane for a width of minimum 6". Be sure cement is not on bonding adhesive areas.

E. Apply bonding adhesive to surface of wood, metal, masonry or other material or surface to be flashed. Also apply bonding adhesive to flashing membrane making sure bonding adhesive is not applied to splice area of flashing and using longest possible lengths of flashing membrane. Apply bonding adhesive using rollers or brushes 100% to all surfaces at a smooth, uniform rate, free of holidays, light spots, globs or similar irregularities, at the manufacturer's application rate. Allow two surfaces of adhesive to dry to a tacky condition, such that adhesive does not stick or string when touched with a dry finger. After bonding adhesive has set on both surfaces, roll flashing onto surface carefully to prevent wrinkles, fishmouths, bridging or similar flaws. Unless otherwise detailed, top of membrane flashings must be minimum 8" above the surface of the roof membrane, 3" minimum above the bottom of metal counterflashings, and minimum 3" past the limits of nail heads or other fasteners. Membrane flashings shall extend the full width of horizontal metal flashing flanges (i.e., gravel stops). After setting, roll membrane into place using a 2" wide steel roller and heavy hand pressure. Roll 100% of the surface to assure total adhesion with no wrinkles or bridging. After rolling, splice vertical or side laps of flashing sheet using minimum 6" wide splices and splicing cement. After applying splicing cement to both mating surfaces of the flashing sheet vertical laps and allowing it to become tacky, roll splice in place as described above.

F. Inside and outside corners and other changes in direction of flashing sheets shall not be butt-type splices at the point of direction change. All flashing sheets shall be jointed past the change in direction. Inside vertical corners shall be folded with no cuts in the sheet at the corner. Folds shall be "pig's ear" type on flashing sheets entering a corner. Splice shall be made 16" minimum away from corner. Outside vertical corners, such as around curb units, shall extend a minimum of 2" around the corner for each flashing sheet. Contour flashing sheets in place with light pressure. Flashing sheet may be heated, if ambient temperature is below 60 degrees F, in order to work them in place. Heating shall be done with heat lamp or air gun. No open flames can be used. All flashings shall be installed in accordance with the approved shop drawings and manufacturer's instructions, unless amended. Flashings shall be turned up and over the tops of curbs as much as practical.

G. Membrane flashing terminating on a vertical surface shall be mechanically fastened to the substrate.

1. On wood surfaces, termination bars and flashings shall be secured with the specified large head roofing nails spaced 6" on center maximum or as specifically required by the membrane manufacturer.

2. On masonry surfaces, termination bars and flashings shall be secured using the specified drive pins through predrilled holes spaced 8" on center maximum or as specifically required by the membrane manufacturer.

H. Strip in all metal flanges such as gravel stops and vents with EPDM. Two ply stripping to be used by applying a 5” wide strip of flashing over which a 9” wide strip is to be applied. Uncured membrane shall be utilized where required by the manufacturer or by detail conditions. Stripping shall be continuous over the entire flange and extend onto the membrane 6” minimum.

I. Strip in all roof to wall terminations where new membrane will terminate below the existing membrane wall cladding with EPDM. Uncured membrane shall be utilized where required by the manufacturer or by detail conditions. Stripping shall be continuous over the entire flange and extend onto the membrane 3” minimum on each side of the lap.

J. The Contractor shall flash all roof drains with the new roof system. Extend membrane 1/2” minimum inside clamping ring with a continuous full bead of water cut-off mastic under the membrane.

K. Lap sealant shall be applied daily along all edges of membranes which terminate on the horizontal, gravel stops and similar locations. After proper installation of membrane flashings, clean the area of the lap with the manufacturer’s recommended cleaner and apply continuous bead of lap sealant to all seams, including vertical laps of the flashings. Feather the sealant bead using the preformed trowel. Should uncaulked seams be found to have weathered beneath ponding conditions, the Contractor will be required to strip-in these seams with 6” stripping as required by the Owner.

3.12 WALKWAY PADS

A. Install membrane manufacturer’s protection mat on the roof surface in locations designated by the Owner.

3.13 SHEET METAL FLASHINGS - GENERAL

A. Sheet metal flashings shall be as specified herein. Refer to the recommendations of the Sheet Metal and Air Conditioning Contractors National Association concerning methods and materials to be used in the fabrication and construction of sheet metal flashings.

B. Form and fabricate sheets, seams, strips, cleats, integral flashings, and other components of the sheet metal flashings to profiles, patterns, shown and as required for permanently leak proof construction configurations.

C. It is the intent of this Specification to utilize the most effective joint configuration possible to properly install strong, weathertight metal flashings. Comply with the following standards unless otherwise specified when fabricating metal components to be joined:

1. Prefabricate corners of edge metal, counterflashings and skirt flashing in one-piece sections with minimum lengths of 18-inches in each dimension from the corner whenever possible.

2. Whenever one-piece construction is not possible, solderable metals shall utilize interlocked, crimped, and fully soldered seams and joints.

3. Seams and joints of non-solderable metals shall be interlocked, riveted and completely filled with sealant.

4. Provide sheet metal closure components at transitions to rising walls and similar changes in plane for edge metal, expansion joint covers and other termination flashings. Fully crimp and seal closures to continuous blind nailed cleats.

D. Comply with Military Specification MIL-S-6872B entitled, "General Specifications for Soldering Process" when forming soldered joint. Use conduction soldering methods. Areas to be joined shall be cleaned of all oil, grease, pencil marks, paint, dirt or other foreign substances. Remove all burrs using files, grinding stones or other methods. Hold parts in place using clamps, jigs and supports or by self-fixturing. If parts are tack-soldered to hold them in place, the area of tack-soldering shall be reworked into the final soldering. Parts cannot move during the soldering process.

E. Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating, by applying rubberized asphalt underlayment to each metal surface, or by other permanent separation as recommended by manufacturer’s or dissimilar metals.

3.14 EDGE METAL FASCIA

A. Pre-formed sheet metal flashings shall be formed and installed as indicated in the detail drawings

B. All metal flashings shall be fastened into solid wood nailers with two rows of the specified fasteners, 4 inches on center, staggered.

C. Flashings shall be installed to provide adequate resistance to bending and allow normal thermal expansion and contraction.

D. Install backer plates under the edge metal.

E. Adjacent sheets of flashings shall be spaced ¼’’ apart and joints covered with 6” wide sheet metal cover plates. Should alternate scope of work be accepted then cover with 2’’ wide aluminum tape with a 4’’ wide strip of thermoplastic flashing membrane hot air welded over the joint, or as recommended by the manufacturer.

F. Edge Metal/Fascia flashing systems shall be installed to all roof perimeter edges as shown in the detail drawings.

G. Hook new edge metal/fascia to aluminum hook strips. Secure continuous hook strips at 6'' on center minimum with nailed into wood blocking.

H. Backer plates shall be installed behind all fascia-flashing joints. Set flange on roof and nail off with fascia flashing flange.

I. Sealant shall be applied with full beads between backer plates to fascia flashing joint.

J. Fascia flashing flange shall be nailed off over membrane 3'' on center staggered, minimum.

K. Provide blind nailers at exposed ends where fascias meet rising walls as necessary and other locations as required to provide an aesthetic watertight termination of metal flashings.

3.15 SKIRT/COUNTER METAL FLASHING

A. Install sheet metal skirt and counter flashings where indicated. Skirt metal flashings shall be fastened with the specified fasteners.

B. For clip-on counter flashings, crimp top vertical edge to existing counter flashing, which has been trimmed to receive clip-on flashing.

C. All fasteners shall be concealed. Secure low edge of flashing using clips spaced 8" on center maximum. Secure clip to substrate with specified fastener and fully crimp to low edge.

3.16 CONTINUOUS CLEATS AND HOOK STRIPS

A. Form continuous cleats/hook strips with ¾-inch kicks, bent out at a 30° angle to the face or wall. Height and profile of continuous cleats/hook strips shall be as indicated on the Detail Drawings.

B. Secure continuous cleats/hook strips to wood blocking with the specified fasteners spaced at 4-inches on center – staggered.

C. Provide 1/8-inch butt joints between hook strip sections.

3.17 SECUREMENT CLIPS

A. Secure clips to substrate with the specified fasteners at minimum 6 inches on center, or as indicated on the Detail Drawings.

B. Bend clips a minimum of 1-inch over bottom drip edge of flashing and crimp tightly.

3.18 BLIND NAILERS

A. Fabricate and install blind nailers flashing with a 2" minimum leg inserted behind membrane or sheet metal fascia. Fasten flashing through leg of blind nailers.

B. Fold blind nailers with ½" hemmed edge over membrane and fastener.

C. Provide continuous beads of sealant at back and leading edges. Refer to the detail for additional information.

3.19 HOT PIPE

A. Install the specified pipe insulation prior to installing flashings and wood blocking. Refer to the Detail Drawings for proper orientation.

B. Secure cone flashing flange to the wood blocking.

C. Install thermoplastic flashing and weld to cone flange and roof membrane and up cone 2" minimum.

D. It is extremely important that the wood blocking be held back a minimum of two (2) inches from the pipe insulation as the pipe exhausts high temperature gases that could create a fire hazard.

3.20 UNIT CURBS

A. Wood blocking shall be installed to provide curbs to support units as required to raise units 8" minimum above the roof surface as shown on the Detail Drawings.

B. Mechanical and electrical work requiring extension in order to raise and support units shall be completed by a licensed tradesman provided by the Roofing Sub-Contractor.

3.21 SLEEPERS

A. Pre-manufactured sleepers shall be installed over manufacturer's walkway pads.

3.22 EXPANSION JOINTS

A. Construct expansion joints as detailed using cured elastomeric roof membrane.

B. Install new wood blocking and trim existing wood blocking as shown on the Detail Drawings and described in Section 06 10 00, Rough Carpentry.

C. Install loop of membrane as required to support fiberglass batt insulation as detailed.

D. Fill void created by the loop of membrane and wood blocking with batt insulation.

E. Install foam tube atop looped membrane and wood blocking. Butt all ends of foam rod to prevent voids. Adhere in place with splice cement if required.

F. Install cured membrane over the foam tube and extend onto adjacent membrane areas 6" minimum. Strip-in all seams with uncured membrane.

G. Install sheet metal per detail.

3.23 SEALANTS – GENERAL

A. Do not leave any partially completed sections exposed to the elements overnight.

B. Comply with the manufacturer's written instructions and these Specifications pertaining to sealant installation.

C. Do not cut any material with a solvent or dilutant unless approved by the Engineer in writing.

D. Keep covers tightly sealed on all evaporative products to prevent premature curing.

3.24 CLEAN-UP

A. All adjacent areas, both interior and exterior, damaged or stained by the installation of the roofing work shall be repaired and cleaned of all dust, debris and any other materials to the Owner's satisfaction.

B. The Contractor shall not demobilize the site until the completed work is toured by the Owner and Engineer. Any unsatisfactory items observed will be reported in "punch-list" form. These items shall be corrected immediately by the Contractor prior to demobilization from the job site.

C. All scaffolding, barriers, temporary facilities and the like shall be removed upon completion of the work. Areas damaged as a result of the Contractors equipment shall be restored to their original condition, all to the satisfaction of the Owner.

3.25 HOT PIPE

E. Install the specified pipe insulation prior to installing flashings and wood blocking. Refer to the Detail Drawings for proper orientation.

F. Secure cone flashing flange to the wood blocking.

G. Install thermoplastic flashing and weld to cone flange and roof membrane and up cone 2" minimum.

H. It is extremely important that the wood blocking be held back a minimum of two (2) inches from the pipe insulation as the pipe exhausts high temperature gases that could create a fire hazard.

END OF SECTION

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DOORS AND HARDWARE

SECTION 08 10 00

PART 1 - GENERAL

1.1 IN GENERAL

A. The General Conditions, and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.

B. Refer to Division 1, Sections 01 10 00 – 01 70 00 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Rough Carpentry – 06 10 00
B. Elastomeric Roofing and Flashing – Section 07 53 00

1.3 SCOPE OF WORK

In general, the Contractor shall supply all labor, equipment, temporary protection, tools and appliances necessary for the proper completion of the work in this Section, as required in the specification and in accordance with good construction practice.

The work generally includes the following:

A. At roof access door, remove and replace existing door leaf, frame, hardware and threshold as required to raise threshold height a minimum of 8” off of new finished roof elevation and of type described herein.

B. Provide field painting of factory-primed door leaf and frame.

C. Clean and restore all areas affected by work to the condition prior to commencement of construction operations.

1.4 JOB CONDITIONS

A. Building and site will be occupied and in use during construction. Take all precautions necessary to protect persons and property and create as little disruption as possible.

B. Materials which have a temperature other than application temperatures of manufacturer shall not be applied.

C. All new and temporary construction, including equipment and accessories, shall be secured from damage or vandalism.

D. Provide all necessary temporary protection and barriers to segregate work area and to prevent damage to adjacent areas.

1.5 SUBMITTALS

A. Submittals shall be made in accordance with Section 01 33 00 – Shop Drawings and Submittals.

B. Product Data: Manufacturer's specifications and installation instructions for each product specified.

PART 2 - PRODUCTS

2.1 DOORS AND FRAMES

A. Gauges

1. Gauges shown on the drawings or specified herein are U.S. Standard for ferrous metals, and Brown and Sharpe for non-ferrous metals. Gauges and thickness of materials shown conform to the requirement specified for the particular item; and where these requirements are not specified in detail, the materials shall be suitable for the intended use of the item.

B. Hollow Metal Door

1. Metal door shall be 1-3/4" thick, flush type and constructed of new prime quality cold-rolled or hot-rolled stretcher-leveled steel. The face plates for doors shall be formed from 14 gauge G90 galvanized bonderized steel conforming to ASTM A924. Door width shall be as required to fit within the masonry opening.

2. Door shall have continuous internal reinforcing channels or Z-shaped members of 14 gauge steel, full height of door, spaced not more than 6 inches on center and spot welded to face sheets 3 inches on center. Doors with continuous truss sheets 3 inches on center both vertically and horizontally will also be accepted. Provide 14 gauge stile channels and 14 gauge horizontal stiffener channels at top and bottom of doors welded to face sheets. All hollow portions of doors shall be completely filled and insulated with mineral rock wool or fully bonded polystyrene or approved equal and shall have a minimum R-Value of R-8 for the door. Exposed joints shall be fully welded and ground smooth. Interlocking joints or seams will not be permitted on door faces or edges. Doors shall have 14 gauge flush top and bottom channels welded to face sheets, 14 gauge, sealed against water

3. Door shall be prepared and reinforced to receive door hardware in accordance with the approved door hardware schedule and template.

4. Where surface mounted hardware is to be applied, doors shall have reinforcing plates only. All drilling and tapping shall be done in the field.

5. Minimum gauge for hardware reinforcing plates shall be as follows:

Hinge and pivot reinforcements	7 gauge
Reinforcements for lock face, flush bolts, concealed holders, concealed or surface mounted closers	12 gauge
Reinforcements for all other Surface-mounted hardware	14 gauge

6. All welds and joints shall be ground smooth. Doors shall be thoroughly cleaned, filled and sanded prior to painting. All welds and areas of fabrication damage shall be treated with a cold galvanizing compound.

7. Hollow metal doors shall be manufactured by Curries, Ceco Doors, Steelcraft, or equal.

2.2 PRIMERS, PAINTS AND COATINGS

A. The door and frame shall be primed in factory with one coat of baked-on rust inhibiting prime paint, compatible with the galvanizing and capable of passing 120-hour salt spray test in accordance with ASTM B 117 and a 250-hour humidity test in accordance with ASTM D 1735 and ANSI A-151.1-19.

2.3 HARDWARE

A. Hardware shall conform to the requirements specified herein.

B. All hardware shall be best grade, entirely free from imperfections in manufacture and finish. Qualities, weights and sizes specified herein are the minimum that will be accepted.

C. Where the exact types of hardware specified are not adaptable to the finished shape or size of the members requiring hardware, furnish suitable types having the same operation and quality as the type specified, subject to the Owner's Representative approval.

D. All hardware must be through-bolted.

E. Architectural door trim shall be lever handles conforming to BHMA A156.6.

F. Door closer shall be ANSI 156.4, Grade 1 Certified.

1. Closer shall have aluminum alloy bodies, forged steel arms, and separate valves for adjusting backcheck, closing and latching cycles and adjustable spring to provide up to 50% increase in spring power.

2. Closer shall be furnished with parallel arms mounting on all doors opening and shall be mounted to permit 180 degrees door swing wherever wall conditions permit. Closers shall not be installed on exterior side of doors; where possible install closers on door for optimum aesthetics.

G. Continuous hinges shall be in accordance with BHMA A156.26, extra heavy duty extruded aluminum, pinless continuous geared hinge leaves joined by continuous extruded aluminum channel cap, such as SL18 by Select. Finish to be clear anodized aluminum.

H. Kick plate for interior application shall be Type J102 stainless steel. Width of plates shall be 2 inches less than door width. Height shall be 10 inches. Edges of metal plates shall be beveled.

I. All cylinders shall be mortise device with construction core locks.

J. Weatherstripping:

1. Threshold weather-stripping shall be solid neoprene type. Sill protection sweep shall be interior mounted.

2. Perimeter weather-stripping shall be thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing.

3. Silencers shall be made of rubber (similar to Hager style 307D). Provide three for each single door and two for each pair of doors.

K. Threshold to be Rabbeted Style, minimum 5” deep, maximum ½” high and equal to the door dimension with integral neoprene weather-stripping set. The threshold configuration shall be as detailed in the Contract Drawings.

1. Exterior sealant for use beneath exterior door thresholds shall be applied in a full bed of trowel grade rubberized asphalt mastic.

2. Fasteners for securing fasteners to concrete or masonry substrates shall be flat head type, 1/4” diameter, self tapping masonry screws. Shank shall be of sufficient length to penetrate the substrate 2” minimum.

L. Finish of all hardware items shall be ANSI Code 630, Satin Chromium Plated (US26D) unless otherwise noted.

M. Exposed fasteners shall be stainless steel as recommended by the hardware manufacturers for each hardware item specified.

2.4 FIELD FINISHING

A. Paint Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable

B. Acceptable Manufacturers (Exterior Steel Coatings):

1. Tnemec Company, Incorporated (Zinc 95).
2. Rust-Oleum Industrial Coatings
3. Sherwin-Williams Co. (Sherwin-Williams).
4. or approved equal.

C. Exterior Metal Primer:

1. Primer for use over galvanized and other ferrous metal surfaces such as new and existing metal door frames shall be a direct to metal (DTM) primer, rust inhibitive in nature and shall be specifically manufactured and recommended by the paint manufacturer for the surface being painted.
2. Galvanized metal wash primer shall be an oil and grease emulsifier.

D. Where manufacturer does not recommend a separate primer formulation on substrate indicated, use paint specified for finish coat.

E. Coatings to be applied to properly prepared existing rusted structural steel shall be a cold galvanizing compound with not less than 92% zinc content by weight in dry film.

F. Exterior Finish Coats (Field Applied Paint):
1. Exterior Semi-Gloss Acrylic Direct to Metal Polyurethane Enamel (if self-priming), or Exterior Full-Gloss Alkyd Enamel.
2. Or as otherwise recommended by paint manufacturer for application over galvanized and other ferrous metal surfaces.

PART 3 - PRODUCTS

3.1 GENERAL

A. Do not deliver to site or install any material or system that has not been reviewed and accepted for use on project.

B. Comply with written instructions of manufacturer and these Specifications.

C. Handle and store materials so as to prevent damage.

D. All work shall be made weathertight and building secure at end of each day.

3.2 FRAME AND DOOR INSTALLATION

A. Door shall be installed without forcing or distortion so that sills and heads are level and jambs are plumb. Joints between metal door frame and metal members shall be set in mastic of type recommended by door manufacturer to provide completely watertight joints. Excess mastic shall be removed before hardening. After installation each door shall be checked for proper operation and adjusted as

necessary. Metal surface shall be cleaned and any staining or discoloring of finish shall be restored or unit replaced.

B. Door Anchorage: Door anchorage shall be according to manufacturer's written instructions, but in no case less than that required to sustain the required structural wind load.

C. Anchors: Anchors shall be equally spaced around as required to secure structural load, but in no case less than six anchors be used on a jamb and not less than three anchors used on head. Set fasteners through wood blocks placed between door jambs and wall framing. Alternately, factory applied steel spacers may be used.

3.3 HARDWARE INSTALLATION

A. All hardware will be installed by qualified tradesmen, skilled in the application of commercial grade hardware. For technical assistance if necessary, installers may contact the manufacturer's representative for the item in question, as listed in the hardware schedule.

B. Hardware shall be located in accordance with DHI-04. When approved, slight variations in locations or dimensions will be permitted.

C. Door-closing device shall be installed and adjusted in accordance with the templates and printed instructions supplied by the manufacturer of the devices.

D. Adjust and check each operating item of hardware to insure proper operation or function. Replace units which cannot be adjusted to operate freely and smoothly.

3.4 HARDWARE SCHEDULE

Qty.	**Description**	**Finish US/ANSI/BHMA**
1	Continuous Hinge	US26D/652
1	Mortise Lockset with Construction Core	US32D/630
2	Closer	US28/689
2	Kickplate	US32D/630
2	Weatherstrip set	
2	Brush Seal	
1	Threshold	US27/627, 673A

END OF SECTION

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INSULATED TRANSLUCENT PANEL SKYLIGHT SYSTEM

SECTION 08 95 00
(Alternate No. 1)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. The General Conditions and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.

B. Refer to all Sections within DIVISION 01 - GENERAL REQUIREMENTS for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Rough Carpentry – Section 06 10 00
B. Elastomeric Roofing and Flashing – Section 07 53 00

1.3 SCOPE OF WORK

In general, the Contractor shall supply all labor, materials, equipment, temporary protection, tools and appliances necessary for the proper completion of the work in this Section, as required in the Specifications, in accordance with good construction practice, and as required by the materials manufacturer, as amended. The work under this Section generally includes the following:

A. Supply all shoring and staging as required to perform the work described herein.

B. Remove the existing skylight assembly and all associated components. The Contractor shall employ the services of a Licensed Abatement Contractor to perform all removal of all hazardous materials at this site.

C. Provide and install new insulated translucent panel skylights where indicated on the Contract Drawings.

D. Clean and restore all areas affected by the work.

1.4 JOB CONDITIONS

A. All surfaces to receive new flashings shall be thoroughly dry. Should surface moisture such as dew exist, the Subcontractor shall provide the necessary equipment to dry the surface prior to application. No open flames shall be permitted on the roof at any time.

B. Equipment required to hoist materials to the openings and to lower debris removal from the building shall be supplied, maintained, and operated by the Subcontractor.

C. Remove rubbish and debris from the project site daily; do not allow accumulations inside or outside the building.

D. The Contractor shall coordinate to remove only as much translucent panel area and associated components as can be completely replaced or temporarily protected and secured in a given day's work, including all flashings and associated components as required to maintain the building in a watertight, secure condition throughout the duration of the project.

E. Cover sidewall areas with canvas tarps where existing panel system is discarded into refuse containers via trash chutes. Plastic or "poly" tarps shall not be used.

F. The Contractor shall provide protection of entrance ways, sitework, plantings, landscaping, building surfaces and similar items to protect from damage. Items damaged as a result of the work in this section shall be repaired or replaced by the Contractor to the satisfaction of and at no additional cost to the Owner.

G. The Contractor will only be allowed access to the building with prior notification from the Owner to complete the work. Access will require a minimum of 48 hours notice.

1.5 SUBMITTALS

A. Provide a letter of approval from the translucent panel system manufacturer that the proposed system will achieve the specified warranty.

B. Submit shop drawings for review by the Architect/Engineer.

C. Provide all manufacturer product and installation literature for approval. Include construction details, material descriptions, profiles, and finishes of components.

D. Provide the manufacturer's color charts showing the full range of colors available for factory-finished aluminum.

E. When requested, provide samples for each of the required exposed finishes in the same thickness and material to be used.

F. Manufacturer's literature for all fasteners and anchors as described under this section shall be submitted. Indicate sizes of fasteners to be used.

G. Submit product test reports from a qualified independent testing agency. The results must indicate that the specified window panel system complies with the project performance requirements based on comprehensive testing of the current products.

1. Test reports required are:

a. Flame Spread and Smoke Developed (UL 723) – Submit UL Card
b. Burn Extent (ASTM D-635)
c. Color Difference (ASTM D-2244)
d. Abrasion/Erosion Resistance (ASTM D-4060)
e. Impact Strength (UL 972)
f. Bond Tensile Strength (ASTM C-297 after aging by ASTM D-1037)
g. Bond Shear Strength (ASTM D 1002)
h. Beam Bending Strength (ASTM E 72)
i. Insulation U-Factor (NFRC 100)
j. NFRC System U-Factor Certification (NFRC 700)
k. Solar Heat Gain Coefficient (NFRC)
l. Condensation Resistance Factor (AAMA 1503)
m. Air Leakage (ASTM E 283)
n. Water Penetration (ASTM E 331)
o. Structural Performance (ASTM E 330)

H. Submit a temporary site protection plan for the Owner to review and comment on.

1.6 QUALITY ASSURANCE

A. Manufacturer's Qualifications

1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope and location. At least three of the projects shall have been in successful use for ten years or longer.

2. Panel system must be listed by the International Code Council – Evaluation Service (ICC-ES) which requires quality control inspections and fire, structural and water infiltration testing of sandwich panel systems by an approved agency.

3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components and production sandwich panels for conformance with AC04 “Sandwich Panels” or AC177 “Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems” as regulated by the ICC-ES.

B. Installer’s Qualifications: Installation shall be by an experienced installer, which has been in the business of installing specified curtainwall and skylight systems for at least two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope and type.

C. Performance Requirements: The manufacturer shall be responsible for the configuration and fabrication of the complete curtainwall and skylight panel systems.

1. Include structural analysis data signed and sealed by a qualified professional engineer responsible for their preparation or the supervision of their preparation.

2. Standard panel system shall have less than 0.01cfm/ft² air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and, structural testing by ASTM E 330.

3. Design Loads:
Wind: 44 psf

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver panel system, components and materials in manufacturer's standard protective packaging.

B. Store panels on the long edge; several inches above the ground; blocked and under cover in accordance with manufacturer's storage and handling instructions.

1.8 WARRANTY

A. Upon completion of the work and prior to final payment, the translucent wall panel manufacturer’s 10 year limited warranty shall be provided for the following conditions:

1. Delamination affecting structural strength.

2. Covering separation of faces from grid core.

3. Chipping and fading of painted finishes

4. Color change in excess of 8 Delta E units caused by normal weathering.

B. The translucent wall panel manufacturer’s 20-year limited warranty shall be provided against reinforcing fiberbloom.

PART 2 - MATERIALS

2.1 TRANSLUCENT PANELS AND ACCESSORIES

A. Translucent panels shall be 2-3/4” thick, thermally broken, glass fiber reinforced polymer faced sandwich panels with integral aluminum grid core.

B. Face Sheets:

1. Exterior and Interior Face Sheets

   a. The exterior face sheet shall have a permanent glass veil erosion barrier to provide maximum long-term resistance to reinforcing fiber exposure. Plastic surface films are not acceptable.

   b. Exterior and Interior face sheets shall be uniform in strength, impenetrable by hand held pencil and repel an impact minimum of 70 ft. lbs. without fracture or tear when impacted by a 3-1/4" diameter, 5 lb. free-falling ball per UL 972.

   c. Exterior and Interior face sheets shall be a minimum of .070" thick and color to be selected by owner from Manufacturer's standard color chart.

   d. Interior face sheets shall be Underwriters Laboratories (UL) listed with a flame spread rating no greater than 50 and smoke developed no greater than 250 when tested in accordance with UL 723.

   e. Interior face sheets shall have burn extent, as determined by ASTM D 635, no greater than 1".

C. The translucent wall panels shall have a "U" factor of 0.23 and light transmission of 15%.

D. Closure system shall be thermally broken extruded 6063-T6 and 6063-T5 aluminum, that screw clamp-tite. All battens and perimeter closures to be supplied with 300 series stainless steel screws.

E. Grid Core shall me a thermally broken composite of aluminum and fiberglass for maximum thermal efficiency. Grid core shall be formed in the "Verti-Kal" grid core pattern with ten-inch nominal spacing or approved equal.

2.2 FINISHES

A. Finish for translucent panel frames and all exposed metal flashings shall be a Floropolymer Resin-Based Coating. Paint dry film thickness shall be not less than 1.0 mils +/- 0.2 mils. Surface preparation and coating shall conform to AAMA 2604 Specifications. Color to be selected from Manufacturer's standard color chart by Owner.

2.3 SEALANT AND ACCESSORIES

A. Exterior sealant shall be two-part polyurethane base conforming to ASTM C920, Type M, Grade NS, Class 25, uses NT, M, A and O as manufactured by Tremco, Sonneborne or Pecora. Color shall match the translucent panel frame color.

B. Interior caulking shall be one-part, odorless, neutral cure silicone compound as manufactured by Tremco, PRC or Pecora. Color shall match the translucent panel frame color.

C. Cleaners and primers shall be as recommended by the manufacturer of the caulking.

D. Bond breaker tape shall be self adhesive polyethylene tape as recommended by the sealant manufacturer.

E. Sealants shall be in accordance with manufacturer's installation instructions.

2.4 FASTENERS AND ANCHORS:

A. In general, all fasteners, anchors, nails, straps and other accessories shall be of stainless steel, galvanized steel or fluorocarbon coated steel. Galvanizing shall be hot dip in accordance with ASTM A153 Specifications. Electro-galvanized items shall not be used.

B. Fasteners for securing wood blocking to wood blocking shall be galvanized annular threaded ring shank nails. Fasteners shall be of sufficient length to penetrate the receiving member 1-1/4" minimum, except full depth into plywood.

C. Fasteners for securing plywood to masonry or concrete surfaces shall be 1/4" diameter hammer drive anchors with zinc-alloy sheaths and stainless steel inserts as manufactured by Star Fasteners, Rawl, or approved equal. Anchors shall be of sufficient length to penetrate the receiving substrate 1-1/4" minimum.

D. Fasteners for securing wood blocking to metal framing shall be No. 14 self drilling, self tapping screws. Fasteners shall be long enough to penetrate the receiving substrate 5/8 inch minimum to 1-1/4 inch maximum.

2.5 MISCELLANEOUS

A. Self-adhered flashing shall be a butyl rubber based, modified bitumen self-adhering membrane such as Grace Ultra, as manufactured by W.R. Grace Construction Products or approved equal. Modified bitumen shall be high temperature products for use under sheet metal components with release-paper backing, minimum 30 mils thick.

B. Mastic and primer for self-adhering flashing sheets shall be as approved by the membrane manufacturer. Temporary UV protection and corner fillets shall be as recommended by the membrane manufacturer.

C. Materials for use as a barrier between dissimilar metals shall be either self-adhered flashing membrane as described above in Part A or bituminous mastic.

PART 3 - EXECUTION

3.1 GENERAL WORKMANSHIP

A. Do not deliver to site or install any material or system that has not been approved. Materials installed without approval may be required to be removed.

B. Examine the existing substrates, supporting structure and installation conditions. Do not proceed with panel erection until all unsatisfactory conditions have been corrected.

3.2 REMOVAL OF EXISTING SYSTEM/PREPARATION

A. Coordinate the removal of the existing skylight assembly with that of the roofing work so temporary protection can be supplied should the work extend overnight.

B. Remove skylight and all associated clips, fasteners, hardware and flashing from the masonry walls. in addition, remove existing interior translucent skylight from within the stair well, also including clips, fasteners and flashings.

C. Report any areas of unsound masonry as a result of skylight removal.

3.3 FLASHING INSTALLATION

A. Prior to installing flashings coordinate the installation of wood blocking, plywood and shims with Section 06 10 00 – Rough Carpentry.

B. Install flashings to all properly prepared window openings prior to installation of windows.

C. All flashings shall be shop fabricated. All bends, breaks and hems shall be clean straight lines. Form flashings to the shapes and configurations shown on the Contract Drawings.

D. All sill flashings shall turn up 2" minimum at the backs and ends. Sill flashings shall run continuously across existing sills neatly trimmed and turned up at jamb locations. All seams shall be sealed and overlapped 3" minimum. Set flashings in a full bed of sealant. Where the sill flashings turn up between the back of the window frame and the attachment angle, provide a full bead of sealant between the window frame, sill flashing and attachment angle. Install a layer of self adhered modified bitumen membrane onto sill flashing where contact with aluminum occurs. Coordinate sill flashing heights, configuration, and waterproofing with the roofing and masonry sections.

E. All jamb flashings shall run continuous from head to sill and shall overlap turned up sill flashings. Neatly trim jamb flashings to closely fit the profile of the heads and sills. Provide sealant at intersections with heads and sills.

3.4 TRANSLUCENT PANEL INSTALLATION

A. Confirm that adjacent construction, sill and jamb flashing installation is complete prior to installation of translucent panel.

B. Panels shall be installed without forcing or distortion so that sills and heads are level and jambs are plumb. Frames shall be securely anchored into the supporting construction. Joints between metal frames and metal members shall be set in mastic of the type recommended by the panel manufacturer to provide completely watertight joints. Excess mastic shall be removed before hardening. Metal surfaces shall be cleaned and any staining or discoloring of the finish shall be restored or the unit replaced.

C. Translucent panel frames shall be secured with the specified fasteners. Panels shall not be secured to the substrates through the horizontal flanges of any sill flashings. Provide sealant at all fastener locations and attachment covers.

D. Install continuous aluminum cover strips as shown on the Contract Drawings. Cut ends shall finish smooth and square with lightly filed corners to remove sharp edges.

E. The contractor shall erect panel systems in strict accordance with approved shop drawings. Assemble frame systems as recommended by the panel manufacturer.

F. Install head, jamb and sill members over full beds of sealant against masonry, concrete or sheet metal flashings. Secure members to existing construction with the specified fasteners spaced at 8 inches on center maximum.

G. Set panels into receiver assemblies using manufacturer's supplied or approved sealant or sealant tape. Apply a continuous bead of sealant along all wall panel perimeters.

3.5 CLEAN-UP

A. All floor and adjacent areas, both interior and exterior, damaged or stained by the installation of the panel work shall be repaired and cleaned of all dust, debris and any other materials to the Owner's satisfaction.

B. The contractor shall not demobilize the site until the completed work is toured by the Owner and Engineer. Any unsatisfactory items observed will be reported in "punch-list" form. These items shall be corrected immediately by the Subcontractor prior to demobilization from the job site. Final payment will not be made until all punch list items are complete and guarantees have been received.

C. All scaffolding, barriers, temporary facilities and the like shall be removed upon completion of the work. Areas damaged as a result of the Subcontractors equipment shall be restored to their original condition, all to the satisfaction of the Owner.

D. Refer to the Close-Out Procedures described in Division One for additional information.

END OF SECTION

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PAINTING AND COATING

SECTION 09 90 00

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. The General Conditions, and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.

B. Refer to Division 1 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Cast Stone Replacement – Section 03 45 00
B. Masonry – Section 04 50 00
C. Rough Carpentry – Section 06 10 00

1.3 SCOPE OF WORK

In general, the Contractor shall supply all labor, materials, equipment, temporary protection, tools and appliances necessary for the proper completion of the work in this Section, as required in the Specifications, in accordance with good construction practice, and as required by the materials manufacturer, as amended. The work under this Section generally includes the following:

A. Remove existing loose coating by hand at all existing parapet caps to remain prior to the specified coating removal procedures.

B. Remove coating and underlying paint from all parapet caps to remain. Coating removal shall be performed with a chemical stripper. Mechanical means of coating removal may be required. Power-wash the surfaces once coating is removed. The Contractor shall take extreme caution during coating removal procedures.

C. Collect all run off from coating removal operations.

D. Rinse all surfaces where coatings have been removed with a neutralizer prior to performing masonry repairs.

E. Coordinate with Section 03 45 00 – Cast Stone Replacement and Section 04 50 00 – Masonry to perform repairs as shown on the Contract Drawings.

F. Upon completion of all cast stone, concrete and masonry repairs, recoat all existing and new parapet caps.

G. Perform mock-ups and adhesion tests as specified in Section 1.10 to determine the most appropriate coating materials and aesthetics. Sand may be required to provide textured finish to match existing.

H. Paint newly installed interior gypsum wall infill to match the existing wall colors.

I. Clean and restore all areas affected by the work.

1.4 JOB CONDITIONS

A. The Contractor shall supply, install and maintain all barriers, protection, warning lines, lighting and personnel required to segregate the work area(s) and to prevent damage to the buildings, their occupants and the surrounding landscaped and paved areas. All applicable OSHA and D.L.W.D. requirements shall be observed by the Contractor.

B. Materials that are at a temperature other than the recommended application temperatures of the manufacturer or applicable standard shall not be applied.

C. Liquid materials such as solvents and adhesives shall be stored and used away from open flames, sparks and excessive heat.

D. The Contractor shall provide and equip as much labor force as is necessary to complete the project within the Contract period and in accordance with the Contract Documents without sacrificing workmanship quality.

E. The Contractor shall coordinate with the maintenance staff the daily shutdown of all air intake units in the work areas or possibly affected by the construction fumes, odors or air-borne debris. The Contractor will install plastic sheeting and duct tape over the removed equipment opening prior to initiating work each day. The plastic sheeting shall be removed by the Contractor at the end of each work day.

F. Any open ducts, grills, thermostats, electric boxes or similar fixtures and items which can be soiled or affected by the work shall be masked, protected and cleaned by the Contractor at no additional cost to the Owner.

1.5 SUBMITTALS

A. Submit digital copies of manufacturer's specifications and two (2) sets of the manufacturer's full range of color and texture chip samples. The coating color and texture shall be selected by the Owner.

B. Submit manufacturer's material safety data sheets for chemical strippers, cleaners, coatings, solvents and other potentially hazardous materials. Material safety data sheets shall be provided to the Owner and shall be contained within an accessible binder on site.

1.6 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

INTERNATIONAL CONCRETE REPAIR INSTITUTE – CONCRETE SURFACE PROFILE (ICRI – CSP)

ICRI – CSP 2 to 3 Zec Wheel Grinding

1.7 PACKAGING, LABELING, AND STORAGE

A. Paints and coatings shall be in sealed containers that legibly show the contract specification number, designation name, formula or specification number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name and address of manufacturer. Pigmented coatings shall be furnished in containers not larger than 5 gallons. Paints and thinners shall be stored in accordance with the manufacturer's written directions, and as a minimum, stored off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors, and at temperatures between 40° to 95°F. Volatile liquids will not be stored on site without prior approval from the Owner.

1.8 LICENSES

A. Licenses: Maintain current licenses as required by applicable state or local jurisdictions for the removal, transporting, disposal or other regulated activity relative to the Work of this Contract.

1.9 WARRANTY

A. Work shall be left complete, free from defects and hereby warranted that it will not discolor, face, craze or peel off within a period of two (2) years after acceptance. Repair all work developing imperfections in that time at no expense to the Owner.

1.10 TEST AREAS

A. Before full-scale work is commenced, execute the following work for trial work areas to be reviewed by the Owner, Engineer and coating manufacturer. Test areas shall be subject to approval.

1. 5 linear feet of parapet cap (existing) and 5 linear feet of parapet cap (new) – minimum of five trials, as many as required to achieve acceptable results. Coatings at trials (a) through (c) below shall be pull tested once cured to determine sufficient adhesion has been achieved. The coating manufacturer shall be present for pull tests. Trials shall include:
   a. Two trials using a primer as recommended by the coating manufacturer
   b. Two trials without using a primer
   c. Two trials using crack or high porosity pre-treatment as recommended by the coating manufacturer.
   d. Two trials with different color/texture options using the pre-treatment, primer or no-primer, as requested by the coating manufacturer provide best adhesion. Owner shall select the color.

B. Prepare, install and cure all materials in accordance with these specifications and the manufacturer's instructions.

C. Trial areas shall be repeated until acceptable results are obtained. The accepted work shall be a standard for all subsequent work.

1.11 QUALITY ASSURANCE

A. Prior to application of new coatings, the Contractor shall submit the existing coating to the new coating manufacturer for testing of chemical compatibility. Although it is the design intent to remove all existing coating from the exterior building components, areas may remain which cannot be accessed fully. Therefore, the new coating must be chemically compatible with the existing coating in the case where both are installed.

1.12 AVAILABILITY OF TRAINED PERSONNEL

B. There shall be a sufficient number of trained and qualified workers, foremen and superintendents to accomplish the Work within the required schedule. Since general repainting of components or replacement work activities cannot start prior to the successful preparation of work surfaces, it is imperative that a sufficient number of trained personnel be engaged throughout the process. No untrained or unqualified person shall be employed to speed up completion of the Work.

PART 2 - MATERIALS

2.1 GENERAL REQUIREMENTS

A. The Contractor shall deliver all materials and equipment to the site in the original containers bearing the name of the manufacturer, and details for proper storage and usage.

B. Unloading and temporary storage sites and transfer routes must be reviewed and accepted in advance by the Owner.

C. Damaged or deteriorated materials may not be used and must be promptly removed from the site.

D. All materials, tools, and equipment must comply, at a minimum, with the Specification and relevant Federal, State and local codes.

2.2 MATERIALS, TOOLS, AND EQUIPMENT

A. HEPA-Filtered Exhaust Machines: Supply the required number of air filtration units to the site in accordance with these Specifications.

B. Polyethylene Sheet: Provide flame resistant polyethylene film that conforms to requirements set forth by the National Fire Protection Association Standard 701,

Small Scale Fire Test for Flame-resistant Textiles and Films. Provide largest size possible to minimize seams, 6.0 mils thick as required, frosted or black as indicated.

C. Wet Scraping Tools: Flat and curved paint scrapers to remove peeling paint. Other tools include putty knives, stiff bristle brushes, nylon bristle brushes, and natural or synthetic fiber brushes. Spray bottles and sponges attached to the scrapers to keep surface wet during scraping. Equipment shall be tested at test areas prior to full scale work. The equipment shall not damage the substrate during use.

2.3 PAINT STRIPPER

A. Paint stripper shall be a product that is safe for historic cast stone masonry, can remove multiple layers of latex and oil based paints, and will cling to vertical and irregular surfaces. As noted in the Test Area section of this specification, the selection of the product to be utilized for the coating stripper is subject to the results of the mock up.

B. Multiple applications and variable dwell time will be required as part of the mock up phase, and shall be repeated until acceptable results are achieved. Previous testing experienced 2+ hours of dwell time prior to power washing and mechanical removal. Note that power washing for extended periods of time (over 5 minutes) will not be allowed.

C. Accessories such as laminated paper (for installation over select stripper materials), and neutralizer shall be provided as recommended by the manufacturer.

D. Phenolphthalein for pH testing of cleaned surfaces.

2.4 MASONRY COATING

A. Coating shall be a water-repellent, breathable, non-elastomeric, acrylic coating which has anti-carbonation protection such as Sikagard 670W as manufactured by Sika, or approved equal. Color shall be selected by the Owner during the mock up phase. It is the design intent to match the existing coating with respect to color and texture.

B. Coating shall be compatible for application at cast stone and concrete.

C. Coating shall be applied to a mil thickness as recommended by the coating manufacturer, minimum two (2) coats. Additional coats may be required to provide manufacturer recommended thickness and acceptable aesthetics, as approved by the Owner.

D. Primer to be tested during the mock-up phase and potentially throughout subsequent work upon approval shall be as recommended by the coating manufacturer for use at porous areas of concrete, such as Sikagard 552W Primer as manufactured by Sika Corporation.

E. Cracks shall be pre-flashed with detail strip pre-treatment of crack-bridging acrylic coating such as Sikagard 550W Elastocolor as manufactured by Sika Corporation.

F. Sand samples to provide textured finish to match the existing texture shall be submitted by the Contractor for Owner's approval prior to full scale work.

2.5 PAINT MATERIALS FOR GYPSUM SHEATHING

A. Primer for new and existing gypsum board substrates, shall be latex undercoat such as manufactured by Benjamin Moore, California Products, Inc. Tnemec Company, Inc., Popcorn Interior Texture Paint as manufactured by Behr, or approved equal.

B. Paint for new and existing gypsum board at wall and ceiling locations shall be as manufactured by Benjamin Moore, California Products, Inc. Tnemec Company, Inc., or approved equal. Color and finish shall be required to match existing, or as selected by the Owner.

PART 3 - EXECUTION

3.1 GENERAL

A. Surfaces to receive coatings shall meet the requirements established by the manufacturer of the coating and these specifications.

B. Surfaces to receive coatings shall be examined and recoating shall not be started until defects have been corrected.

C. Verify that all repairs and sealants have cured for the specified time prior to applying new coatings.

D. Accessible areas in which coating is being done shall be properly identified with "Wet Paint" signs or closed to pedestrian traffic until coatings are dry.

E. Install polyethylene sheeting below areas of work and on all building openings.

F. Provide adequate ventilation during removal and recoating procedures.

3.2 WORKMANSHIP

A. Employ skilled mechanics to ensure the very best workmanship. Quality workmanship is required for removal and recoating procedures. The cast stone, concrete and masonry substrates is in varying condition and extreme caution shall be taken when removing the existing coating as to not damage the substrates. Materials to be applied by craftsmen experienced in the use of the particular product involved.

B. All surfaces shall be properly smoothed. All surfaces shall be properly prepared, clean and dry when a coating is applied. Any bare or abraded spots in base coats shall be touched up before next coat is applied.

C. Protection against fire shall be taken and all oily rags or waste must be removed from the building each day.

D. Color of each coat of paint shall be reviewed and accepted by the Owner as it goes on and prior to subsequent applications. Unless otherwise noted, all surfaces to be painted shall receive one prime coat or pre-treatment (if chosen by Owner during mock up phase) and two finish coats, or as required to provide an acceptable and uniform appearance.

3.3 ENVIRONMENTAL CONDITIONS

A. Air and surface temperatures shall be a minimum of 40°F during the stripping process of the coatings, and remain a minimum of 40°F for 24 hours after completion of the stripping to prevent freezing of water in the façade substrates.

B. Air and surface temperatures shall be between 50°F and 100°F during application of new coatings.

C. Relative humidity shall not be higher than 80%, and surface temperature shall be a minimum of 5°F above the dew point.

D. Wind velocity shall be less than 15 MPH for exterior stripping and coating with no visible atmospheric dust.

E. Open fires are prohibited from the work site.

F. Surfaces to be coated shall be fully dried, cured or otherwise set to receive the coatings prior to application.

3.4 PROTECTION OF AREAS AND SPACES

A. Prior to coating removal and recoating applications, remove, mask or otherwise protect, lighting fixtures, spigots, electrical conduits and junction boxes, louvers, windows, ducts, public and private property, and other such items not to be coated that are in contact with surfaces to be coated. Following completion of coating, workmen skilled in the trades involved shall reinstall removed items. Restore surfaces contaminated by coating materials to original condition and repair any damaged items at no cost to the Owner.

3.5 SURFACE PREPARATION AND COATING REMOVAL

A. In order to avoid possible pedestrian exposure to chemical stripper and to prevent possible contamination of areas outside the demarcated work area, the effluent from the chemical stripper and power washing shall be collected.

B. Prior to use of approved chemical stripper, remove all loose paint, atmospheric staining, environmental growth, and efflorescence from the wall surfaces utilizing approved paint scrapers, putty knives or brushes. If damage to the substrate is observed from scraping operations, a softer brush such as synthetic fiber brush shall be used.

C. Brush, roll or spray apply the approved chemical stripper to the cast stone, concrete or brick surfaces. Follow the application requirements recommended by the manufacturer.

D. After the stripper has been on the masonry for the approved dwell time, peel off the laminate paper if applicable and rinse the stripper off of the wall utilizing a pressure of 300 to 500 psi, maximum. Supplement the rinsing with a wood or plastic scraper.

E. When all existing coating is removed, or no additional coating is sufficiently softened to be removed without additional stripper reapplication, test the pH of the substrate and apply neutralizer if required. Rinse the neutralizer with water and retest the substrate. Substrates shall have a pH level as approved by the coating manufacturer for recoating, and several neutralization cycles may be required to achieve this pH.

F. A minimum of one pH test shall be taken per every 50 square feet of coating stripping and recorded on an Elevation Drawing. Tests shall be submitted to the coating manufacturer for acceptance with documentation submitted to the Engineer.

G. Upon completion of the paint removal, all substrates shall be allowed to dry completely prior to repair and recoating operation.

3.6 APPLICATION OF MASONRY COATING

A. All materials shall be applied in accordance with the manufacturer's recommendations.

B. Upon completion of all existing coating and paint stripping, façade repairs and additional cleaning, allow the building to dry for a minimum of 48 hours. Confirm all cast stone and masonry repair work is complete.

C. Allow concrete and masonry repairs to fully cure, as recommended by the repair material manufacturer, prior to applying new coating.

D. Based on the approved mock up, utilize a brush or a long nap roller to apply waterproof coating to a uniform thickness of 6 mils for the first coat, or as recommended by the coating manufacturer. Dabbing will be required to fill natural fissures and kiln cracks in the masonry components.

E. Allow first coat to dry for 2-4 hours, or as required by the manufacturer, prior to application of a second coat. Apply the second coat at a uniform thickness of 4 mils, or as recommended by the manufacturer.

F. Any cavities or voids will require additional tough up prior to demobilization.

G. Protect coating for a minimum of 6 hours from moisture, and allow 48 hours for complete drying.

3.7 CEAN-UP

A. Prior to acceptance of the coating work covered in this Section, the Contractor shall perform a thorough clean-up of the work site, building surfaces, landscaping, etc. Any plantings or other items damaged shall be repaired or replaced to the satisfaction of and at no additional cost to the Owner.

END OF SECTION

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PLUMBING FILED SUB-BID REQUIREMENTS

SECTION 22 00 01
(Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 IN GENERAL

A. Attention is directed to all Sections of DIVISION 00 – PROCUREMENT/ CONTRACTING REQUIREMENTS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the specifications.

B. Work of this Section requires Filed Sub-Bids and is governed by the provisions of the Massachusetts General Laws (MGL), Public Bidding Law – Chapter 149, Sections 44A to 44J inclusive, as amended and applicable Sections of the MGL, Public Contract Law – Chapter 30.

C. Specification requirements for the Filed Sub-Bid "PLUMBING" include all of the following listed Specification Sections, in their entirety:

1. Section 22 30 00 – PLUMBING

D. The work to be completed by the "PLUMBING" Filed Sub-Contractor is identified in the Contract Drawings.

Examine all Drawings and other Sections of the Specifications for requirements therein affecting the Work of this Filed Sub-Contract.

E. PLUMBING is stipulated as a Filed Sub-Bid under PART E, Item 2 of the FORM FOR GENERAL BID.

F. All Sub-Bids shall be submitted on the FORM FOR SUB-BID furnished by the Awarding Authority, as required by Section 44F of Chapter 149 of the Massachusetts General Laws, as amended, accompanied with the required bid deposit.

G. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the Awarding Authority at a time and place as stipulated in the INVITATION FOR BIDS.

1. The following shall appear on the upper left hand corner of the envelope:

NAME OF SUB-BIDDER: _____

SUB-BID FOR TRADE: _____

MASONRY

H. Specific information relating to sub-bidders is set forth in the Contract Documents, under the heading “INSTRUCTIONS TO BIDDERS”, Including Sub-Bidders” and the attention of sub-bidders is directed thereto.

1.2 EXAMINATION OF SITE AND DOCUMENTS

A. Bidders are expected to examine and to be thoroughly familiar with all contract documents and with the conditions under which work will be carried out. The Awarding Authority (Owner) will not be responsible for errors, omissions and/or charges for extra work arising from General Contractor’s or Filed Sub-Contractor’s failure to familiarize themselves with the Contract Documents or existing conditions. By submitting a bid, the Bidder agrees and warrants that he has had the opportunity to examine the site and the Contract Documents, that he is familiar with the conditions and requirements of both and where they require, in any part of the work a given result to be produced, that the Contract Documents are adequate and that he will produce the required results.

1.3 QUALITY ASSURANCE

A. Company specializing in work described in the above listed individual specification sections with minimum 5 years documented experience.

1.4 SEQUENCING

A. Coordinate work of this Filed-Subcontract with that of other trades, affecting or affected by this work, and cooperate with the other trades as is necessary to assure the steady progress of work.

B. Do not order or deliver any materials until all submittals, required in the listed Specification Sections included as part of this Filed-Subcontract, have been received and approved by the Engineer.

C. Before proceeding with installation work, inspect all project conditions and all work of other trades to assure that all such conditions and work are suitable to satisfactorily receive the work of this Section and notify the Engineer in writing of any which are not. Do not proceed further until corrective work has been completed or waived.

1.5 INSTALLER’S WARRANTY

A. In addition to other specified warranties, both in the Conditions of the Contract and in individual Sections of this Filed Sub-bid, the Filed Sub-Contractor will be held responsible for the satisfactory performance of all products installed under this trade for a period of two years. All deficiencies in products provided under this trade and related components which do not meet the specifications are to be corrected promptly at no expense to the Owner during the warranty period.

PART 2 – PRODUCTS

2.1 SCAFFOLDS AND STAGING

A. Normal access to the roof areas will be provided by the General Contractor for use by all Sub-Contractors. Portable ladders and mobile platforms required for use by this Filed Sub-Contractor, shall be provided by this Filed Sub-Contractor.

2.2 HOISTING MACHINERY AND EQUIPMENT

A. All hoisting equipment, rigging equipment, dumpsters, generators, crane services and lift machinery required for the work by this Filed Sub-Contractor shall be furnished and maintained by this Filed Sub-Contractor. Equipment shall be operated in safe conditions by the Filed Sub-Contractor trained and certified for use of such equipment.

PART 3 – EXECUTION

NOT USED

END OF SECTION

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PLUMBING

SECTION 22 30 00
(Filed Sub-Bid Required)

PART 1 – GENERAL

1.1 IN GENERAL

A. The General Conditions and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.

B. Refer to Division 1 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Concrete Repairs – Section 03 60 00
B. Elastomeric Roofing and Flashings – Section 07 53 00
C. Thermoplastic Roofing and Flashing – Section 07 54 00

1.3 SCOPE OF WORK

In general, the Contractor shall supply all labor, materials, equipment, temporary protection, tools and appliances necessary for the proper completion of the work in this Section, as required in the Specifications and in accordance with good construction practice. The work under this Section generally includes the following:

A. Provide all temporary protection, lifts, hoists, manpower and equipment to protect the building and its components.

B. Remove all existing roof drains, clamping rings, strainers and bowls from all roof areas and prepare opening for new drain systems.

C. Install new cast-iron roof drain bowls, clamp rings, and strainers. Install new drain bowl collar extensions to accommodate the required minimum 2” of insulation.

D. Clean all low slope roof drain systems from roof level to the point where it exits the building to achieve a free-flowing system. Perform at beginning of roofing operations and after substantial completion.

E. Coordinate to replace, patch, seal, and repair all existing construction assemblies removed, damaged, or cut to allow for the installation of the new drain bowl assemblies. Repaired areas shall match the surrounding existing construction.

F. Install vent pipe extensions where required to meet a minimum height of 18-inches, and a maximum height of 24-inches from the height of the new roof system to the top of the vent pipe. Coordinate with Section 07 53 00 Elastomeric Roofing and Flashing.

G. Raise existing gas line to a minimum of 3.5 inches above the new finished roof height in coordination with Section 01 22 00 Unit Prices.

1.4 JOB CONDITIONS

A. Schedule and execute all work without exposing the building interiors to inclement weather. Protect all new and existing roof work, the building and its contents from staining and damages. Segregate all work areas from the building occupants.

B. The Contractor is cautioned to take all necessary precautions and make all investigations necessary to install the work. The Owner will not consider unfamiliarity with the job conditions as a basis for additional compensation.

C. The plumbing work shall be coordinated with the roof work in such a manner that no interior portions of the building are left exposed to the elements at the end of a day's work.

D. The Contractor shall provide all the necessary warning lines required to segregate the work areas and to protect the occupants from plumbing operations.

E. The Contractor shall provide all roof top protections for new and existing roofs as it relates to the plumbing operations.

F. Interior access may be required to perform the plumbing work, which will include the removal and replacement of the existing ceiling tiles.

G. The plumbing shall be performed by licensed tradesmen.

1.5 SUBMITTALS

The Contractor shall submit project literature and samples for the items listed in this section in accordance with Section 01 33 00 – Shop Drawings and Submittals.

PART 2 - MATERIALS

2.1 ROOF DRAINS AND ASSEMBLIES

A. Replacement roof drains shall be minimum 12" diameter coated cast iron with 4" pipe sizes, or as required to match the existing diameter bottom outlet, large sump, extended collar and wide roof flange, as manufactured by Jay R. Smith Manufacturing Co., Series 1010-E-W, Josam, Zurn, Wade, Smith or approved equal. Replacement drain outlet diameters shall match the existing. Drain assemblies shall have non-puncturing cast iron clamping ring. All roof drain assemblies shall be installed with underdeck clamps and sump pans. Drain strainers shall be cast iron, vandal resistant, of suitable size and configuration as provided by the drain manufacturer.

B. New clamping rings shall be coated cast iron as manufactured by JR Smith or approved equal. New clamping rings and drain dome strainers shall be cast iron, vandal resistant, of suitable size and configuration as provided by the clamping ring manufacturer.

C. Drain bowl to leader pipe connections shall be no-hub outlet.

D. All accessories necessary for the proper installation of the new drain bowl and accessories, including but not limited to, cast iron clamping rings, cast iron strainers, stainless steel hardware, shall be of the same manufacturer as the drain bowls and be completely compatible with the existing piping and surrounding materials. Drain sump caulking shall be as recommended by the supplier.

2.2 INSULATION

Insulation for new drain bowl assemblies and drain pipe shall be preformed and skinned fibrous glass, minimum 1" thick, of sufficient size to fit fixtures and piping, such as fiberglass ASJ/SSL-11 pipe insulation by OCF, with factory-applied jackets, or approved equal. Fittings shall be mitered of the same material. Joints shall be taped as recommended and supplied by the manufacturer of the insulation.

PART 3 - EXECUTION

3.1 GENERAL

A. All work in this Section shall be coordinated with the roof replacement work. All required work at drain locations shall be properly protected at all times from equipment and traffic.

B. All flashing-in of the roof drains and membrane repairs as a result of the plumbing work shall be the responsibility of and provided under Section 07 54 00 – Thermoplastic Roofing and Flashing.

C. The Contractor is cautioned to investigate all existing conditions and materials of construction. All replacement items, including but not limited to clamps and strainers must be completely compatible and match the existing system.

D. Clean all new drain assemblies thoroughly of dust, dirt, debris and bituminous materials prior to the installation of the replacement membrane system.

3.2 REMOVAL OF EXISTING ROOF DRAIN COMPONENTS

A. Remove the existing designated roof drain components from the existing drain bowl assemblies so as to cause minimum damage to the roof deck and existing plumbing components.

B. The Contractor shall provide all interior and roof deck protection.

3.3 REPLACEMENT ROOF DRAIN COMPONENTS

A. Install all replacement roof drains such that the bowl flange with clamping ring elevated 2-inches above deck level. See detail drawings for assembly position.

B. Should it be required, complete all cuts through the existing deck so as to cause minimum damage to the deck and associated building components. Cut shall be the minimum size possible. Methods of deck removal shall be submitted by the Contractor and approved by the Engineer prior to demolition. The Contractor shall provide all interior and rooftop protection.

C. Make all drain to leader connections watertight and of sufficient strength. Place drain outlet tube within existing leader pipe and overlap at least 1".

D. All drains installed shall be completed and flashed in the same day's operation.

E. Check all roof drain and leader pipe joints with a water test once roofing and flashing are complete and prior to installing drain system insulation to check for leaks. Repair all leaks to the satisfaction of the Owner.

3.3 VENT PIPE EXTENSIONS

A. It is the intent of the project to cut, or extend all existing vent pipes to provide an 18" minimum clearance height from the finished roof surface to the top of the pipe coordinate the finished roof height with that of Section 07 53 00 and Section 07 54 00. The configuration varies, and will be strongly dependent on the final tapered insulation heights of the new roof system.

B. Field configurations will be required. Any vent pipe which will provide a minimum 8" flashing height under the no-hub connector, may simply be extended so that a pipe flashing detail may be installed.

C. Any vent pipe which will not provide the 8" flashing height due to their current low height, shall be cut within the insulation layer and extended in conjunction with the roof installation.

3.4 INSULATION

A. Fibrous glass pipe insulation with factory-applied jackets shall be installed on all drain bowl assemblies and leader ties installed under this Contract, in accordance with the manufacturer's written specifications.

B. All insulation joints shall be taped with materials recommended and supplied by the insulation manufacturer.

C. Drain bowl insulation shall be cut clean and matched to the pipe insulation, with all joints properly taped, mitered and sealed.

D. If any sections of the existing roof drainage system are observed to be uninsulated, this situation shall be reported to the Engineer and Owner.

3.5 CLEANING OF DRAINAGE SYSTEM

A. Prior to roofing operations and after the new replacement roof system has been installed, clear all roof drain leader piping of debris and clogs such that the system is free-flowing.

B. The Contractor shall notify the Engineer and Owner a minimum of 72 hours in advance prior to cleaning the drainage system, in order to allow the Engineer and Owner to be present during the cleaning operations.

C. The Contractor shall clear the existing leader pipe with “Roto-rooter” type equipment from the roof deck level to the point where the leader pipe exits the building, or 75 feet minimum. Flush the drain line with water upon completion of the cleaning.

3.6 CLEAN-UP

All floor and adjacent areas, both interior and exterior, damaged or stained by the installation of the plumbing work shall be repaired and cleaned of all dust, debris and any other materials to the Owner's satisfaction.

3.7 WATER TESTS

Perform water tests on roof drain assemblies, including leader piping. Notify the Owner 48-hours minimum prior to water tests in order that the Owner/Owner’s representative may witness testing. Using a ¾-inch garden hose run water into the drainage components for thirty minutes. Inspect all drainage components for leakage and repair as required. Inform Owner of test findings.

END OF SECTION

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TEMPORARY MECHANICAL/ELECTRICAL DISCONNECTS

SECTION 26 10 00

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

A. Division 1, General Conditions, and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.

B. Refer to Division 1 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Rough Carpentry – Section 06 10 00
B. Elastomeric Roofing and Flashing – 07 53 00
C. Thermoplastic Roofing and Flashing – Section 07 54 00

1.3 SCOPE OF WORK

In general, the Contractor shall supply all labor, materials, equipment, temporary protection, tools and appliances necessary for the proper completion of the work in this Section, as required in the Specifications and in accordance with good construction practice. The work under this Section generally includes the following:

A. Provide all temporary protection, lifts, manpower, and equipment to protect the building and its components.

B. Temporarily disconnect, remove, and support existing roof top fans, vents and mechanical ventilation equipment. Fans and equipment shall be re-installed and reconnected after installation of roofing and flashing of roof curbs. Provide electrical extensions, mechanical ductwork extensions, and roof curb extensions as required to extend the equipment above the new roof surface.

1. The following is the scope of work required where the existing exhaust fans and mechanical equipment located on the roof must be disconnected, removed and reconnected.

a. Prior to temporarily lifting of any existing exhaust fans and mechanical equipment, the contractor shall test the exhaust fans and mechanical equipment to ensure they are functioning properly and report any problems to the owner.

b. The Contractor shall coordinate all interruptions of power to existing exhaust fans and mechanical equipment with the Owner prior to any work. Note, the Owner does not have the technical support to

perform renovations at the site, and therefore, all renovations, including the interruption and reconnecting of the power, will be borne by the Contractor.

c. The Contractor shall ensure that the power to existing exhaust fans and mechanical equipment is turned off. The Mechanical contractor shall use lockout / tag-out procedures to ensure that the power is not turned on.

d. The Contractor shall temporarily disconnect, remove, and support the existing roof-mounted exhaust fans, mechanical equipment, ductwork and wiring and reconnect the same, as required by job condition, after installation of a new roof and flashing of the roof curbs.

e. The Contractor shall coordinate the heights of the existing mechanical unit curbs and fan curbs with that of the new insulation height to confirm which of the units will require raising and new duct and electrical extensions as required.

f. The Contractor shall turn power back on to the exhaust fans and mechanical equipment after work has been completed by all other trades.

g. After the existing exhaust fans and mechanical equipment have been reconnected, the Contractor shall test the exhaust fans and mechanical equipment to ensure they are functioning properly and report any problems to the Owner.

C. Remove and replace the designated mechanical curbs to provide a water tight condition; note, the existing curbs have been modified with exposed wood blocking on the exterior, to support the existing fan hood.

D. Remove existing louvers indicated at Roof Area D and install vent/exhaust extensions as required to maintain the existing louver opening size and terminate as required above the new roof membrane. Coordinate with Section 06 10 00 Rough Carpentry for wood blocking to be installed around new vent/exhaust extensions.

E. Coordinate the work in this section with the appropriate trades to insure the proper work sequence.

1.4 JOB CONDITIONS

A. Schedule and execute all work without exposing the building interiors to inclement weather. Protect all new and existing roof work, the building and its contents from staining and damages. Segregate all work areas from the building occupants.

B. Notify the Owner at least 48 hours in advance of doing any interior demolition work so that the Owner may remove any portable items, such as furniture, from the area. Fixed items will not be removed and are to be protected by the Contractor.

C. The Contractor shall be responsible for shutting down, removal, temporary support, proper reinstallation with ductwork and electrical extensions as required, and turning on of each mechanical unit by the end of the workday as it relates to the removal and reinstallation of the mechanical equipment. If the mechanical unit is found operational prior to the shutdown procedures, and does not operate upon completion of the work and restarting the equipment, the Contractor will be responsible for repairing/replacing said unit at no additional cost to the Owner.

D. The Contractor is cautioned to take all necessary precautions and make all investigations necessary to install the work. The Owner will not consider unfamiliarity with the job conditions as a basis for additional compensation.

E. The Contractor shall provide a minimum of two (2) weeks notice prior to shutting down any mechanical services.

1.5 SUBMITTALS

A. The Contractor shall submit project literature and samples for the items listed in this section in accordance with Section 01 33 00 – Shop Drawings and Submittals.

B. Submit proposed lead times of materials and coordination efforts associated with replacement of units.

C. Submit proposed temporary shoring details and methods of re-attachment.

PART 2 – MATERIALS

2.1 FASTENERS AND ACCESSORIES

A. In general, fasteners shall be stainless steel. All accessories, including, but not limited to nails, screws, clips, fastening strips, etc. shall be completely compatible with the material being fastened to prevent galvanic reaction and premature deterioration.

B. Fasteners for securing fan and vent unit covers and termination bars to existing wood construction shall be stainless steel hex head self-drilling screws. At fan and vent unit cover resecurement use stainless steel capped EPDM washers of the next larger size than the existing fastener.

PART 3 – EXECUTION

3.1 GENERAL

A. All work in this Section shall be coordinated with roof replacement work.

B. All flashing-in of the mechanical work shall be the responsibility of and provided by the Roofing Contractor under Section 07 53 00 – Elastomeric Roofing and Flashings and Section 07 54 00 – Thermoplastic Roofing and Flashings.

C. The Contractor is cautioned to investigate all existing conditions and materials of construction.

D. Follow all applicable local, state, and federal requirements regarding construction of scaffolding and protection of the public safety for the work items included in this section. Specific reference should be made to OSHA Construction Safety Regulations. Provide warning lines, barricades, and similar items as required to restrict pedestrian access to hazardous areas. Job site safety shall be the Contractor's responsibility.

3.2 REINSTALLATION OF EQUIPMENT

A. Coordinate the heights of the existing mechanical unit curbs and fan curbs with that of the tapered insulation height to confirm which of the units will require raising and new electrical and duct extensions as required. Refer to Section 07 54 00 – Thermoplastic Roofing and Flashings for coordination issues.

B. Extend electrical conduits and wiring, and mechanical systems and ductwork as required due to the increased roof insulation height.

C. Rooftop unit installation shall be coordinated to prevent exposing the interior to inclement weather. Utilize stainless steel capped EPDM washers at all fastener locations.

END OF SECTION

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City of Lowell - Law Department

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February 21, 2018

City Manager Kevin J. Murphy
Mayor William Samaras
Members of the Lowell City Council

Re: Timeline on Eminent Domain Process

Dear City Manager Murphy, Mayor Samaras, and Members of the City Council,

I write in response to your request that the Law Department provide a timeline and anticipated steps required to take the property at 75 Arcand Drive via eminent domain pursuant to M.G.L. c. 79. Please note that this assessment has been provided as a general overview for the eminent domain process. Should you have any specific legal questions regarding the eminent domain process or potential litigation, such communications should be discussed with counsel in executive session.

I. Pre-Taking Steps

Before acquiring property through eminent domain, the taking authority must first take appropriate preliminary steps, which include performing the appropriate background research, conducting the necessary appraisals of the property, establishing the fair-market value of the property, making the necessary arraignments to relocate tenants, and securing the necessary funding to provide the award to the prior owners:

1. The City Council, as the taking authority, should make and pass a motion as soon as possible directing the City Manager to take all appropriate steps necessary to effectuate an eminent domain taking of all land necessary for the Lowell High School project. The motion both sets the process in motion, demonstrates the City's intention to move forward, and provides initial notice to affected parties of the City's intent.

2. The City must retain professional appraisers to establish the fair-market value of the property when it is taken via eminent domain. Under M.G.L. c. 79, §7A, an award of damages cannot be made unless the taking authority has performed at least one appraisal of the fair-market value of the property taken. Best practices strongly recommend that a minimum of two independent appraisers be retained to provide the City with an accurate and impartial evaluation of value. The appraisers should be retained through the impartial bidding and services procurement process under M.G.L. c. 30B.

3. The Department of Planning and Development (DPD) would prepare a title examination of the property which identifies all current owners of the property and ascertains any defects in title. The examination should also determine the presence of other legal interests on the property, such as easements.

4. The City Engineer's Office would prepare a complete legal description of the property to be taken via eminent domain. The description must include all required meets and bounds for the property in conformance with all recorded deeds, as well as buildings, fixtures, landmarks, and prominent environmental features such as trees and landscaping.

5. The City Engineer's Office would prepare a Taking Plan to establish how the property would be taken, secured, and managed throughout the eminent domain process.

6. The City's Chief Financial Officer must secure a funding source from which the *pro tanto* award to the prior owners would be derived. The City cannot take property via eminent domain unless it provides reasonable compensation to the owners. U.S. Const. Amend. V and XIV; Mass. Cont., Part the First, Art. X.

7. The City's CFO should also establish a separate interest bearing account into which all funds offered by the City as an award for the eminent domain taking will be deposited and from which funds will be drawn.

8. The City must perform an assessment on the relocation and assistance costs for the former owners. A person whose property is taken by eminent domain is also entitled to be paid reasonable costs of moving his personal property to another location of the Commonwealth, within certain limitations. M.G.L. c. 79, §6A. Furthermore, no acquisition involving the displacement of occupants of dwelling or business units shall be made until the Bureau of Relocation in the Massachusetts Department of Housing and Community Development qualifies a relocation advisory agency to provide relocation assistance to the occupants to be displaced. M.G.L. c. 79A, §2; 760 CMR 27.02. The City must therefore reach out to the Department of Housing and Community Development as soon as possible to determine what necessary steps it must follow.

9. If the property to be taken contains more than five dwelling units or business units, the City must submit to the Bureau of Relocation a plan that provides advance notice or assistance for displaced parties. The displacing agency shall submit a relocation plan to the Bureau at least 45 days before the anticipated date of property acquisition or project commencement. 760 CMR 27.03(1). Displacement of legal occupants shall not proceed until the Bureau approves the relocation plan and any applicable appropriate conditions or restrictions. 760 CMR 27.03(5).

10. If the property taken contains less than six dwelling or business units, the displacing agency shall not be required to submit any relocation plan, but shall instead provide a relocation assistance program, set forth under M.G.L. c 79A, §6, as well as pay any moving costs for displaced occupants as set forth under M.G.L. c. 79A, §7.

II. The Order of Taking

In order to take the property via eminent domain, the City Council must vote to adopt an Order of Taking. The Order of Taking must accurately describe the property, state the interest in the land taken, indicate whether the property is being taken in fee or in easement or right, and state the purpose behind the taking. M.G.L. c. 79, §1. The Order of Taking must also list trees, structures, or other landscaping. Id.

1. The City must provide proper notice to the parties of the eminent domain proceeding prior to the vote on the order of taking. Under M.G.L. c. 79, §5C, no property can be taken via eminent domain unless notice of such intent is provided to the property owner at least thirty days prior to the date of the actual taking. However, the provisions of this section "shall not apply to takings on behalf of the commonwealth, county, **city** or town" (emphasis added). Thus, compliance with the notice requirements under the Open Meeting Law would likely be deemed sufficient.

2. After a public hearing, the City Council would then vote on the Order of Taking. Additionally, the City Council should also simultaneously vote to authorize the *pro tanto* award of damages to the owners of the property at this meeting as well.

3. Upon approval of the Order of Taking, a certified copy must be recorded at the Middlesex North Registry of Deeds within thirty days of the approval M.G.L. c. 79, §3. Upon recording of the Order of Taking, ownership of the property vests with the City on behalf of the reason the taking was made. Id. Recording also vests the previous owners' right to damages, both *pro tanto* or otherwise. Id.

4. Immediately after the right to damages vests, the City must act promptly to pay the *pro tanto* damages owed to the previous owners. Any payment of damages must be issued within sixty days after the right to damages vests or within fifteen days of a demand made upon them. M.G.L. c. 79, §7B. Thus, having the City Council authorize payment at the same time as approving the Order of Taking ensures that prompt offer of payment can be made within the strict statutory timeline.

III. Post-Order of Taking

1. Immediately after the right to damages vests (recording the Order of Taking) the City shall give notice to every person, including every mortgagee of record, whose property have been taken or is otherwise entitled to damages. M.G.L. c. 79, §7C. Notice must be in writing and shall describe the purpose and extent of the taking, the amount of damages awarded, the time and place they can obtain payment, the time within they may petition for an award if not damages have been awarded, and the time within which he may petition the Superior Court to determine damages pursuant to M.G.L. c. 79, §14. Notice may be served by personal service, or by leaving an attested copy thereof at the last and usual place of abode of the person to be notified if he is a resident of the commonwealth, by any person authorized to serve civil process, or notice may be given to persons within or without the commonwealth, by registered mail or other suitable means.

2. After notice is provided, the City will receive its *pro tanto* forms back from owners that wish to receive the payment. The City should have releases drafted and send letter to mortgage companies to receive payoffs for the sale of the property if applicable.

3. The Assessor's Office should obtain pro-forma real estate taxes and final water and sewer bills.

4. A new deed will be drafted for the property and will be circulated to the appropriate departments to obtain the required signatures.

5. The new deed will then be recorded at the Registry of Deeds, along with any applicable mortgage discharges.

6. The City must also implement its relocation plan to the extent one is required by the Bureau of Relocation.

IV. Vacating the Property

1. No person in the possession of property taken by eminent domain is required to vacate the property until four months after notice of the taking has been given pursuant to M.G.L. c. 79, § 7C. M.G.L. c. 79, §8B.

2. In the event the person refuses to allow the city or town to take possession of the property after thirty days written notice sent to him by registered mail or posted on the property, the taking authority may issue its warrant to the sheriff of the county, or his deputy, directing him to make entry and take possession of the property on behalf of the city or town. The sheriff or his deputy will thereupon execute such a warrant, using whatever force is necessary for the purposes. M.G.L. c. 79, §3.

3. A person whose property is taken by eminent domain is also entitled to be paid reasonable costs of moving his personal property to another location of the Commonwealth, with certain limitations. M.G.L. c. 79, §6A.

4. Furthermore, no acquisition involving the displacement of occupants of dwelling or business units shall be made until the Bureau of Relocation in the Massachusetts Department of Housing and Community Development qualifies agency to provide relocation assistance to the occupants to be displaced. M.G.L. c. 79A, §2. Any taking authority shall provide relocation assistance and payments upon undertaking a project which results in displacement of occupants by the acquisition of real property. M.G.L. c. 79A, §3. Displacement of more than five dwelling or business units requires the taking authority provide the Bureau of Relocation with a relocation plan for those displaced. M.G.L. c. 79A, §4. Displacement of the occupants of less than six dwelling or commercial units only requires the provision of a relocation assistance program as set forth in M.G.L. c. 79A, §6, as well as payment of relocation costs under M.G.L. c. 79A, §7.

V. Hypothetical Calendar/Timeline

The following is a hypothetical timeline of the eminent domain process. This timeline assumes that the date of the City Council's vote on the Order of Taking would take place on the first available Tuesday in June, which would be June 5, 2018. This timeline is neither meant to be exhaustive nor definitive, but designed to aid the City Council in anticipating general timelines and milestones.

- February, 2018 and ongoing up to Order of Taking.
  - City issues M.G.L. c. 30B bids for independent appraisers.
  - Applicable City departments perform all required pre-taking research on property.
  - City contacts Bureau of Relocation in the Massachusetts Department of Housing and Community Development to develop relocation plan.
  - City secures necessary funds for taking and prepares interest bearing account to deposit award in.
- April 20, 2018.
  - Last day for City to provide Bureau of Relocation a relocation plan if required under M.G.L. c. 79A. 760 CMR 27.03(1). Taking cannot proceed unless approved by Bureau.
- May, 2018.
  - Notice of public meeting provided to all affected parties of eminent domain taking. (30 day notice requirement under M.G.L. c. 79, §5C "shall not apply to takings on behalf of the commonwealth, county, city or town." However, advanced notice to parties beyond that required by Open Meeting Law advised.)
- **June 5, 2018**.
  - **City Council holds public hearing and votes on Order of Taking and authorizes *Pro Tanto* Award of damages to owners.**
- July 5, 2018.
  - Last day for City to record certified copy of Order of Taking with Middlesex North Registry of deeds.
- August 6, 2018.
  - Last day City must provide notice of eminent domain taking and award of damages (assuming recording date of July 5, 2018.)
- September 6, 2018.
  - Last day when City must provide any payment of damages. (60 days after recording of taking. Right to damages vests upon recording of taking. Alternatively, payment must issue within fifteen days of demand made upon them.) M.G.L. c. 79, §7B.
- November 5, 2018.
  - Last day of four month period where tenants are not required to vacate property. (Note: Does not take into account timelines set forth in any relocation plan if required).

VI. Conclusion

I hope this assessment is of help and assistance to you. Please contact the Law Department should you have any additional questions.

Sincerely,

Elliott J. Veloso
Assistant City Solicitor

cc. Christine P. O'Connor, City Solicitor

City of Lowell - Law Department

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April 24, 2018

Alicia Caritano
Senior Associate
Perkins Eastman
20 Ashburton Place, Floor 8
Boston, Massachusetts 02108

Re: Air Rights for Proposed Pedestrian Bridges – Lowell High School

Dear Ms. Caritano:

Per your request, the following is an assessment as to the status of proposed air rights for the proposed construction of pedestrian bridges over the Merrimack Canal as part of the Lowell High School ("LHS") project. Please note that this assessment is only based on current information and shall not be construed as a definitive assessment of air rights. This assessment may be subject to revision based on new findings or developments.

Current proposals for the renovation of LHS call for the demolition of two preexisting pedestrian bridges that currently connect between LHS's original 1922 Building and the Lord Building. These pedestrian bridges extend over the Merrimack Canal, Lucy Larcom Park (258 Merrimack St; Lowell, Massachusetts 01852), and a railroad/trolley track. These would be replaced by the construction of two new two-tiered pedestrian bridges. The southernmost pedestrian bridge ("South Bridge") would be constructed in the same location as the previous bridge. The northernmost pedestrian bridge ("North Bridge") would be relocated from its present location to one closer to the South Bridge.

The City's current research into the pedestrian bridges through the Middlesex North Registry of Deeds found that the City entered into a Deed of Easement with the Proprietors of the Locks and Canals on the Merrimack River, recorded in the Middlesex North Registry of Deeds as Bk. 2416, Pg. 509. The Deed of Easement grants to the City of Lowell "an easement for the purpose of installation, construction, maintenance, and repair of an overhead pedestrian bridge approximately 19 feet over and above the Merrimack Canal" in a particular bounded area, which is shown in a plan recorded in Book of Plans 130, Plan 80. No record has been found so far of a similar easement over the trolley tracks in this area. The new location where the Northern Bridge is proposed to be relocated is one which that City has no current easement for.

At an April meeting between City officials and representatives of Perkins Eastman, the City's Historic Board Administrator indicated that current air rights over the Merrimack Canal were currently owned by the Massachusetts Department of Conservation and Recreation ("DCR") as successor in interest of Proprietors of Locks and Canals on Merrimack River The air rights over the trolley tracks are currently owned by the United States National Park Service ("NPS"), conveyed in a deed recorded in the Middlesex North Registry of Deed as Bk 17476, Pg. 194. NPS's air rights are subject in applicable part to "Easement to City of Lowell to maintain overhead bridge over the parcel dated October 22, 1979, and recorded in Book 2405, Page 382, NDRD" and "4. Easement to City of Lowell to maintain overhead bridge over the parcel dated even with this deed and recorded herewith."

The City has reached out to counsel for the Massachusetts Division of Capital Asset Management and Maintenance (DCAM) to discuss necessary steps for the securing of air rights over the Merrimack Canal and Lucy Larcom Park. DCAM counsel advised the city that easement over the Merrimack Canal would be secured through DCR. Easement rights over the trolley tracks would be secured from the National Park Service. DCAM also noted that obtaining air rights parkland implicates Article 97 of the Massachusetts Constitution, requiring the passage of special legislation. DCAM counsel noted that the City has secured such legislation in the past in the Hamilton Canal District and offered assistance in furthering the process. The City is currently coordinating the appropriate state agencies to secure the necessary legislation and easements required. The City is in communication with the National Park Service regarding what steps would be necessary for securing potential new easements over the trolley tracks. The City is currently assessing the potential schedules for obtaining such easements.

Sincerely,

Elliott J. Veloso
Assistant City Solicitor

cc. Eileen Donoghue, City Manager
Christine P. O'Connor, City Solicitor