

CITY OF MARLBOROUGH MEETING POSTING

Meeting Name: City Council Finance Committee

Date: March 12, 2018

Time: 7:00 PM

Location: City Council Chamber, 2nd Floor, City Hall, 140 Main Street

Agenda Items to be addressed:

RECEIVED
CITY CLERK'S OFFICE
CITY OF MARLBOROUGH

2018 MAR -1 A 10:11

02-26-2018 – **Order No. 18-1007178**: Communication from the Mayor for a bond authorization request in the amount of \$56,418,338.00 for the purpose of paying the cost of a proposed new K-5 elementary school for 610 students to be constructed on a portion of land located on Poirier Drive.

THE LISTING OF TOPICS THAT THE CHAIR REASONABLY ANTICIPATES WILL BE DISCUSSED AT THE MEETING IS NOT INTENDED AS A GUARANTEE OF THE TOPICS THAT WILL HAVE BEEN DISCUSSED. NOT ALL TOPICS LISTED MAY IN FACT BE DISCUSSED, AND OTHER TOPICS NOT LISTED MAY ALSO BE BROUGHT UP FOR DISCUSSION TO THE EXTENT PERMITTED BY LAW.

The public should take due notice that the Marlborough City Council may have a quorum in attendance due to Standing Committees of the City Council consisting of both voting and non-voting members. However, members attending this duly posted meeting are participating and deliberating only in conjunction with the business of the Standing Committee.

Electronic devices, including laptops, cell phones, pagers, and PDAs must be turned off or put in silent mode upon entering the City Council Chamber, and any person violating this rule shall be asked to leave the chamber. Express authorization to utilize such devices may be granted by the President for recordkeeping purposes.



IN CITY COUNCIL

Marlborough, Mass., FEBRUARY 26, 2018

ORDERED:

That the new elementary School Project which includes the following bond, be and is herewith refer to **FINANCE COMMITTEE AND ADVERTISE BOND.**

That the City of Marlborough appropriate the amount of Fifty-Six Million, Four Hundred Eighteen Thousand, Three Hundred and Thirty-Eight Dollars (\$56,418,338) for the purpose of paying the cost of a proposed new K-5 Elementary School to be constructed in Marlborough, MA on an existing athletic field located on a portion of land on Poirier Drive, which land is owned by the City of Marlborough and known and numbered on the Assessors Map of the City of Marlborough as Map 30 Parcel 12, including the payment of all costs incidental or related thereto (the "Project"), which school facility shall have an anticipated useful life as an educational facility for the instruction of school children for at least 50 years, and for which the City of Marlborough may be eligible for a grant from the Massachusetts School Building Authority ("MSBA"), said amount to be expended under the direction of the School Building Committee. To meet this appropriation, the Comptroller/Treasurer is authorized to borrow said amount under M.G.L. Chapter 44, or pursuant to any other enabling authority. The City of Marlborough acknowledges that the MSBA's grant program is a non-entitlement, discretionary program based on need, as determined by the MSBA, and any project costs the City of Marlborough incurs in excess of any grant approved by and received from the MSBA shall be the sole responsibility of the City of Marlborough; provided further that any grant that the City of Marlborough may receive from the MSBA for the proposed Project shall not exceed the lesser of (1) sixty-seven and seventy-one hundredths percent (67.71%) of eligible approved project costs, as determined by the MSBA, or (2) the total maximum grant amount determined by the MSBA, and that, if invited to collaborate with the MSBA on said Project, the amount of borrowing which is authorized pursuant to this vote shall be reduced by any grant amount set forth in the Project Funding Agreement that may be executed between the City of Marlborough and the MSBA.

ADOPTED

ORDER NO. 18-1007178



RECEIVED
CITY CLERK'S OFFICE
CITY OF MARLBOROUGH
2018 FEB 22 A 11:05

City of Marlborough

Office of the Mayor

140 Main Street
Marlborough, Massachusetts 01752
Tel. (508) 460-3770 Facsimile (508) 460-3698 TDD (508) 460-3610
www.marlbrough-ma.gov

Arthur G. Vigeant
MAYOR

Nicholas J. Milano
EXECUTIVE AIDE

Patricia Bernard
EXECUTIVE SECRETARY

February 22, 2018

City Council President Edward J. Clancy
Marlborough City Council
140 Main Street
Marlborough, MA 01752

Re: New Elementary School Project

Honorable President Clancy and Councilors:

Please find enclosed for your review, a bond authorization request in the amount of \$56,418,338 for a new K-5 elementary school for 610 students located on Poirier Drive. This request is the culmination of a multiyear process to determine the best long-term school project for the City of Marlborough. This project will achieve several crucial goals, including reducing overcrowding at the elementary school level, while also returning fifth graders to Marlborough's elementary schools where they belong.

We are partnering with the Massachusetts School Building Authority (MSBA) on this project. Pending approval by the MSBA Board of Directors on April 10, 2018, we will secure grant funding from the MSBA to reduce this project's costs for our taxpayers.

If the MSBA approves this project in April, Marlborough will have 120 days after their approval to secure local funding authorization. I have provided you with this request now so that the City Council has ample time to review this proposal.

There have been several major changes to this project since I presented the project to you in September, most crucially the procurement of a new project architect.

The School Building Committee and I chose to enter the MSBA Model School Program. This program allows communities to utilize a model school already constructed and in use in another Massachusetts school district. After a competitive procurement process, we hired Mount Vernon Group to use the elementary school design they designed first for New Bedford and then for Athol.

The use of this model school design means that the proposed new school will be a different design from what we previously presented to you, but one that still conforms to the educational program that Marlborough Public Schools administration and staff teach.

The new design also means that there are changes to how the school project will fit on Poirier Drive. The original design had parking on the "Red field" with the building on the "White" field.

Now, both the school facility and parking will be located on the Red Field. We also plan to perform a thorough renovation of the white field as part of this project.

The most significant change from the original design that we were working on is the drastic reduction in projected cost. While we were still in the preliminary stages of the process with the former design, the costs that I presented to you in September estimated a total of \$67.5 million for the new school.

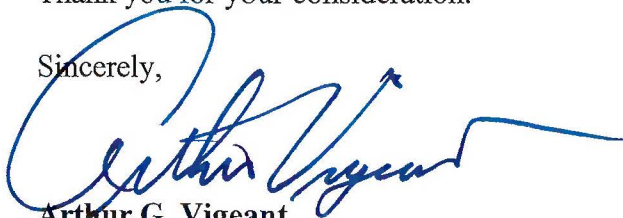
I'm pleased to submit to you our revised budget. Our maximum total estimated cost for this design and the amount I am requesting your approval for is \$56,418,338. Not all costs are reimbursable by the MSBA. This means that although our reimbursement rate with incentive points included is 67.71, the MSBA will not reimburse a full 67 percent of the costs. We currently project that the MSBA's maximum grant will be \$30,129,753, but this is subject to review by the MSBA. Marlborough's total share is approximately \$26,288,585. Again, while our total project budget figure will not increase, the amount the MSBA may contribute is subject to change. I will update the City Council if there are any changes to the grant amount.

This is the biggest investment that we will be making together in Marlborough's future. I firmly believe that the goals of this project, which include bringing the 5th grade down to the new four elementary schools from the 1LT Charles W. Whitcomb School will have a lasting impact on educational outcomes for our children.

There are many facets to this project. I have enclosed additional supporting information, but, I look forward to meeting with you to discuss in detail. I will be available along with the Marlborough Public Schools administration, Mount Vernon Group, and my financial team to answer any questions you may have.

Thank you for your consideration.

Sincerely,



Arthur G. Vigeant
Mayor

Enclosures

List of enclosed documents:

- Draft vote language
- Project Budget
- Site plan, facility photos, and other documentation:
 1. Site Plan
 2. Preliminary Site Analysis
 3. Floor Plan for the First Floor
 4. Floor Plan for the Second Floor
 5. East and West Elevations
 6. North and South Elevations
 7. Photo of the Lincoln Elementary School in New Bedford
 8. Photo of the Lincoln Elementary School in New Bedford
 9. Photo of the Lincoln Elementary School in New Bedford
 10. Photo of the Lincoln Elementary School in New Bedford
 11. Photo of the Community Elementary School in Athol
 12. Photo of the Community Elementary School in Athol
 13. Interior photo of the Community Elementary School in Athol – classroom
 14. Interior photo of the Community Elementary School in Athol – classroom
 15. Interior photo of the Community Elementary School in Athol – media center
 16. Interior photo of the Community Elementary School in Athol
 17. Interior photo of the Community Elementary School in Athol – courtyard
 18. Interior photo of the Community Elementary School in Athol – cafetorium
 19. Project Schedule
- Traffic Study Report
- Educational Space Summary

ORDERED:

That the City of Marlborough appropriate the amount of Fifty-Six Million, Four Hundred Eighteen Thousand, Three Hundred and Thirty-Eight Dollars (\$56,418,338) for the purpose of paying the cost of a proposed new K-5 Elementary School to be constructed in Marlborough, MA on an existing athletic field located on a portion of land on Poirier Drive, which land is owned by the City of Marlborough and known and numbered on the Assessors Map of the City of Marlborough as Map 30 Parcel 12, including the payment of all costs incidental or related thereto (the "Project"), which school facility shall have an anticipated useful life as an educational facility for the instruction of school children for at least 50 years, and for which the City of Marlborough may be eligible for a grant from the Massachusetts School Building Authority ("MSBA"), said amount to be expended under the direction of the School Building Committee. To meet this appropriation, the Comptroller/Treasurer is authorized to borrow said amount under M.G.L. Chapter 44, or pursuant to any other enabling authority. The City of Marlborough acknowledges that the MSBA's grant program is a non-entitlement, discretionary program based on need, as determined by the MSBA, and any project costs the City of Marlborough incurs in excess of any grant approved by and received from the MSBA shall be the sole responsibility of the City of Marlborough; provided further that any grant that the City of Marlborough may receive from the MSBA for the proposed Project shall not exceed the lesser of (1) sixty-seven and seventy-one hundredths percent (67.71%) of eligible approved project costs, as determined by the MSBA, or (2) the total maximum grant amount determined by the MSBA, and that, if invited to collaborate with the MSBA on said Project, the amount of borrowing which is authorized pursuant to this vote shall be reduced by any grant amount set forth in the Project Funding Agreement that may be executed between the City of Marlborough and the MSBA.

ADOPTED
In City Council
Order No 18-
Adopted

Approved by Mayor
Arthur G. Vigeant
Date:

Total Project Budget

Marlborough
Elementary School Project

School Building Committee Reviewed on:

2/21/2018

Total Project Budget: All costs associated with the project are subject to 963 CMR 2.16(5)	Estimated Budget	Scope Items Excluded from the Estimated Basis of Maximum Facilities Grant or Otherwise Ineligible	Estimated Basis of Maximum Total Facilities Grant ¹	Estimated Maximum Total Facilities Grant ¹
Feasibility Study Agreement				
OPM Feasibility Study	\$155,000	\$0	\$155,000	
A&E Feasibility Study	\$807,200	\$0	\$807,200	
Environmental & Site	\$30,000	\$0	\$30,000	
Other	\$7,800	\$0	\$7,800	
Feasibility Study Agreement Subtotal	\$1,000,000	\$0	\$1,000,000	\$677,100
Administration				
Legal Fees	\$15,000	\$15,000	\$0	\$0
Owner's Project Manager				
Design Development	\$125,000	\$0	\$125,000	
Construction Contract Documents	\$175,000	\$0	\$175,000	
Bidding	\$47,000	\$0	\$47,000	
Construction Contract Administration	\$880,000	\$0	\$880,000	
Closeout	\$40,000	\$0	\$40,000	
Extra Services	\$15,000	\$0	\$15,000	
Reimbursable & Other Services	\$0	\$0	\$0	
Cost Estimates	\$0	\$0	\$0	
Advertising	\$3,000	\$0	\$3,000	
Permitting	\$0	\$0	\$0	
Owner's Insurance	\$50,000	\$0	\$50,000	
Other Administrative Costs	\$0	\$0	\$0	
Administration Subtotal	\$1,350,000	\$15,000	\$1,335,000	\$903,929
Architecture and Engineering				
Basic Services				
Early Site Package	\$200,000	\$0	\$200,000	
Construction Contract Documents	\$1,178,392	\$0	\$1,178,392	
Bidding	\$80,000	\$0	\$80,000	
Construction Contract Administration	\$620,000	\$0	\$620,000	
Closeout	\$63,000	\$0	\$63,000	
Other Basic Services	\$0	\$0	\$0	
Basic Services Subtotal	\$2,141,392	\$0	\$2,141,392	
Reimbursable Services				
Construction Testing	\$100,000	\$0	\$100,000	
Printing (over minimum)	\$30,000	\$0	\$30,000	
Other Reimbursable Costs	\$20,000	\$0	\$20,000	
Hazardous Materials	\$0	\$0	\$0	
Geotech & Geo-Env.	\$60,000	\$0	\$60,000	
Site Survey	\$45,000	\$0	\$45,000	
Wetlands	\$40,000	\$0	\$40,000	
Traffic Studies	\$0	\$0	\$0	
Architectural/Engineering Subtotal	\$2,436,392	\$0	\$2,436,392	\$1,649,681
CM & Risk Preconstruction Services				
Pre-Construction Services	\$0	\$0	\$0	\$0
Site Acquisition				
Land / Building Purchase	\$0	\$0	\$0	
Appraisal Fees	\$0	\$0	\$0	
Recording fees	\$0	\$0	\$0	
Site Acquisition Subtotal	\$0	\$0	\$0	\$0
Construction Costs				
SUBSTRUCTURE				
Foundations	\$1,726,416	\$0		
Basement Construction	\$0	\$0		
SHELL				
SuperStructure	\$4,288,148	\$0		
Exterior Closure	\$4,533,265	\$0		
Exterior Walls	\$0	\$0		
Exterior Windows	\$0	\$0		
Exterior Doors	\$0	\$0		
Roofing	\$1,695,254	\$0		

Total Project Budget

Marlborough
Elementary School Project

School Building Committee Reviewed on:

2/21/2018

Total Project Budget: All costs associated with the project are subject to 963 CMR 2.16(5)	Estimated Budget	Scope Items Excluded from the Estimated Basis of Maximum Facilities Grant or Otherwise Ineligible	Estimated Basis of Maximum Total Facilities Grant ¹	Estimated Maximum Total Facilities Grant ¹
INTERIORS				
Interior Construction	\$3,574,619	\$0		
Staircases	\$128,263	\$0		
Interior Finishes	\$2,150,515	\$0		
SERVICES				
Conveying Systems	\$131,100	\$0		
Plumbing	\$1,493,450	\$0		
HVAC	\$5,032,350	\$0		
Fire Protection	\$606,187	\$0		
Electrical	\$3,587,477	\$0		
EQUIPMENT & FURNISHINGS				
Equipment	\$946,200	\$0		
Furnishings	\$1,137,880	\$0		
SPECIAL CONSTRUCTION & DEMOLITION				
Special Construction	\$0	\$0		
Existing Building Demolition	\$0	\$0		
In-Bldg. Hazardous Material Abatement	\$0	\$0		
Asbestos Cont'g Floor Mat'l Abatement	\$0	\$0		
Other Hazardous Material Abatement	\$0	\$0		
BUILDING SITEWORK				
Site Preparation	\$1,918,840	\$0		
Site Improvements	\$1,646,547	\$0		
Site Civil / Mechanical Utilities	\$640,435	\$0		
Site Electrical Utilities	\$308,000	\$0		
Other Site Construction	\$2,750,000	\$0		
Scope Excluded Site Cost		\$4,781,332		
Construction Trades Subtotal	\$38,294,946	\$4,781,332		
Contingencies (Design and Pricing)	\$3,560,000	\$444,485		
D/B/B Sub-Contractor Bonds	\$431,000	\$53,813		
D/B/B Insurance	\$512,000	\$63,926		
D/B/B General Conditions	\$3,120,000	\$389,549		
D/B/B Overhead & Profit	\$1,174,000	\$146,580		
GMP Insurance	\$0	\$0		
GMP Fee	\$0	\$0		
GMP Contingency	\$0	\$0		
Escalation to Mid-Point of Construction	\$740,000	\$92,393		
Overall Excluded Construction Cost		\$4,751,347		
Construction Budget	\$47,831,946	\$10,723,425	\$37,108,521	\$25,126,179
Alternates				
Ineligible Work Included in the Base Project	\$0	\$0	\$0	
Alternates Included in the Total Project Budget	\$0	\$0	\$0	
Alternates Excluded from the Total Project Budget	\$0	\$0	\$0	
Subtotal to be Included in Total Project Budget	\$0	\$0	\$0	\$0
Miscellaneous Project Costs				
Utility Company Fees	\$75,000	\$0	\$75,000	
Testing Services	\$0	\$0	\$0	
Swing Space / Modulers	\$0	\$0	\$0	
Other Project Costs (Mailing & Moving)	\$40,000	\$10,000	\$30,000	
Misc. Project Costs Subtotal	\$115,000	\$10,000	\$105,000	\$71,096
Furnishings and Equipment				
Furniture, Fixtures and Equipment	\$915,000	\$0	\$915,000	
Technology	\$720,000	\$0	\$720,000	
FF&E Subtotal	\$1,635,000	\$0	\$1,635,000	\$1,107,059
Soft Costs that exceed 20% of Construction Cost		\$0		

Total Project Budget

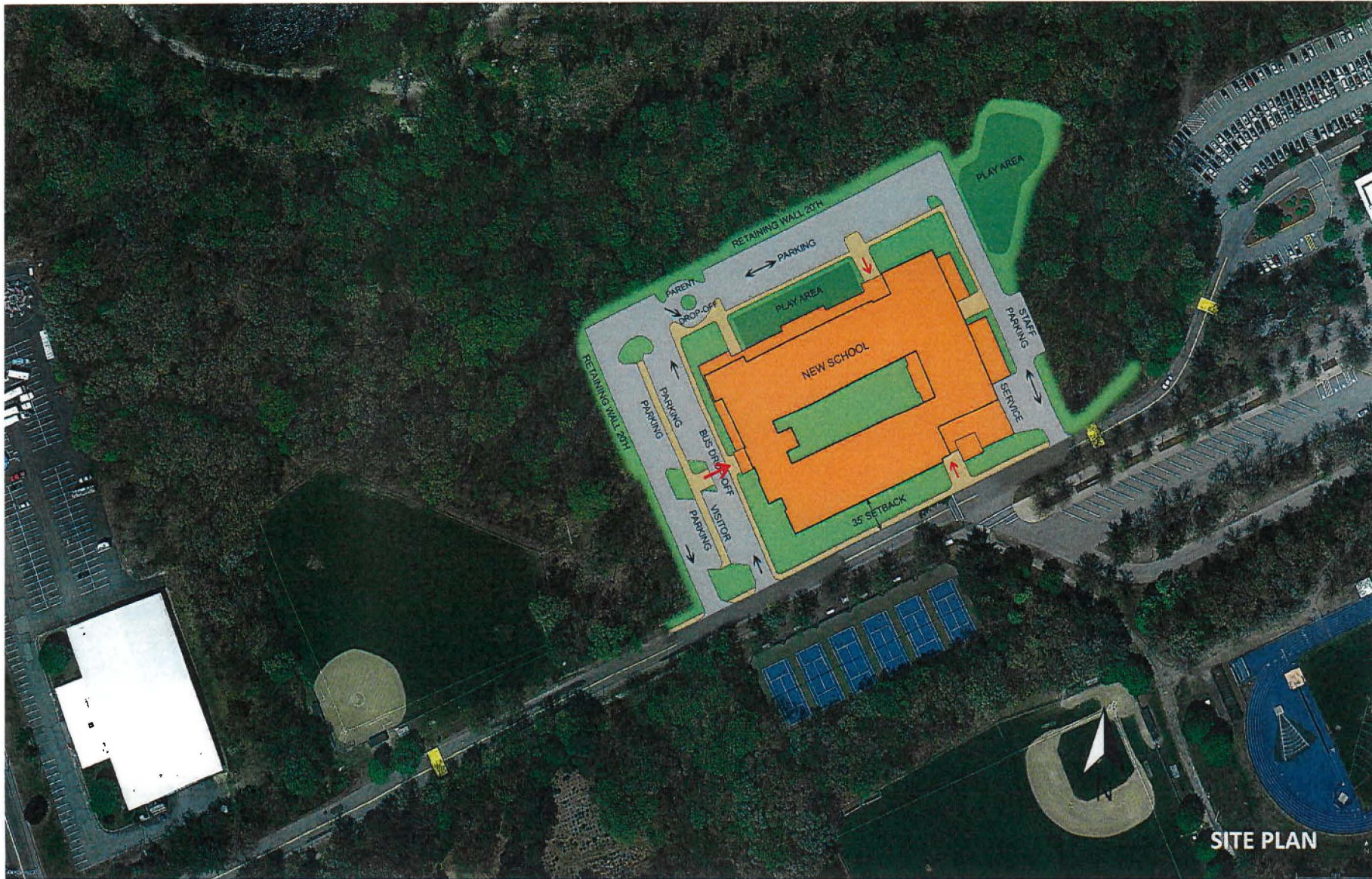
Marlborough
Elementary School Project

School Building Committee Reviewed on:

2/21/2018

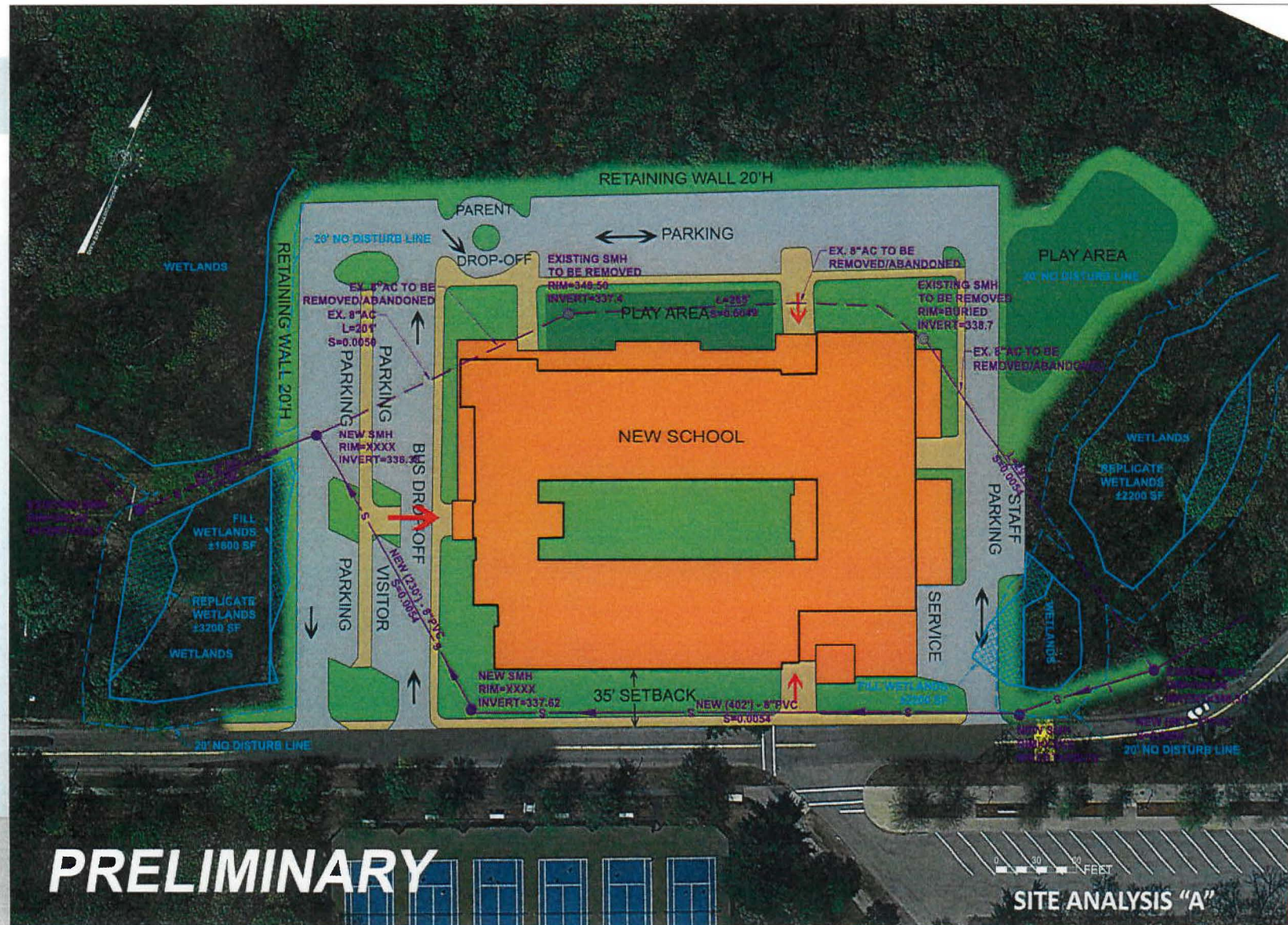
Total Project Budget: All costs associated with the project are subject to 963 CMR 2.16(5)	Estimated Budget	Scope Items Excluded from the Estimated Basis of Maximum Facilities Grant or Otherwise Ineligible	Estimated Basis of Maximum Total Facilities Grant ¹	Estimated Maximum Total Facilities Grant ¹
Project Budget	\$54,368,338	\$10,748,425	\$43,619,913	\$29,535,042.92

Board Authorization		64.08 Reimbursement Rate Before Incentive Points
Design Enrollment	610	3.63 Total Incentive Points
Total Building Gross Floor Area (GSF)	111,437	67.71% MSBA Reimbursement Rate
Total Project Budget (excluding Contingencies)	\$54,368,338	<p>NOTES</p> <p>This template was prepared by the MSBA as a tool to assist Districts and consultants in understanding MSBA policies and practices regarding potential impact on the MSBA's calculation of a potential Basis of Total Facilities Grant and potential Total Maximum Facilities Grant. This template does not contain a final, exhaustive list of all evaluations which the MSBA may use in determining whether items are eligible for reimbursement by the MSBA. The MSBA will perform an independent analysis based on a review of information and estimates provided by the District for the proposed school project that may or may not agree with the estimates generated by the District using this template.</p> <p>1. Does not include any potentially eligible contingency funds and is subject to review and audit by the MSBA.</p> <p>2. The proposed demolition of the _____ School is expected to result in the MSBA recovering a portion of state funds previously paid to the District for the _____ project at the existing facilities completed in _____. The MSBA will perform an independent analysis based on a review of information and estimates provided by the District for the proposed school project that may or may not agree with the estimated cost recovery generated by the District and its consultants using this template.</p> <p>3. Pursuant to Section 3.20 of the Project Funding Agreement and the applicable policies and guidelines of the Authority, any project costs associated with the reallocation or transfer of funds from either the Owner's contingency or the Construction contingency to other budget line items shall be subject to review by the Authority to determine whether any such costs are eligible for reimbursement by the Authority. All costs are subject to review and audit by the MSBA.</p>
Scope Items Excluded or Otherwise Ineligible	\$10,748,425	
Third Party Funding (Ineligible)	\$0	
Estimated Basis of Maximum Total Facilities Grant ¹	\$43,619,913	
Reimbursement Rate	67.71%	
Est. Max. Total Facilities Grant (before recovery) ¹	\$29,535,043	
Cost Recovery ²	\$0	
Estimated Maximum Total Facilities Grant ¹	\$29,535,043	
Construction Contingency ³	\$1,650,000	
Ineligible Construction Contingency ³	\$1,171,681	
"Potentially Eligible" Construction Contingency ³	\$478,319	
Owner's Contingency ³	\$400,000	
Ineligible Owner's Contingency ³	\$0	
"Potentially Eligible" Owner's Contingency ³	\$400,000	
Total Potentially Eligible Contingency ³	\$878,319	
Reimbursement Rate	67.71%	
Potential Additional Contingency Grant Funds ³	\$594,710	
Maximum Total Facilities Grant	\$30,129,753	
Total Project Budget	\$56,418,338	

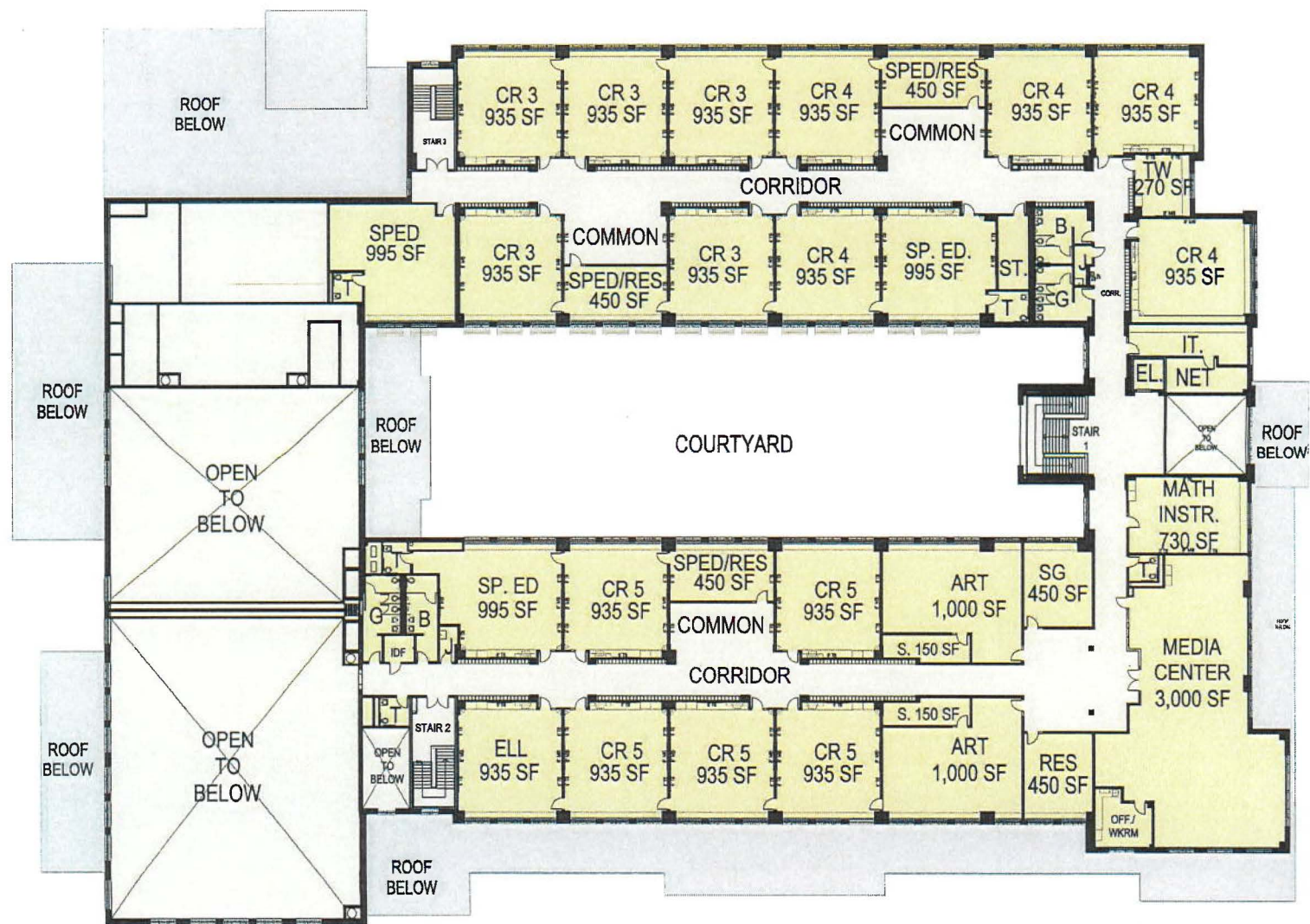


SITE PLAN

MVG







SECOND FLOOR



WEST ELEVATION



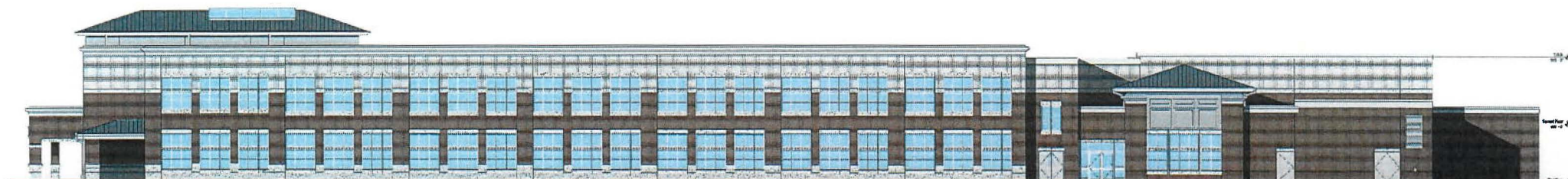
EAST ELEVATION

ELEVATIONS





NORTH ELEVATION



SOUTH ELEVATION

ELEVATIONS





MVG











Indoor Environments





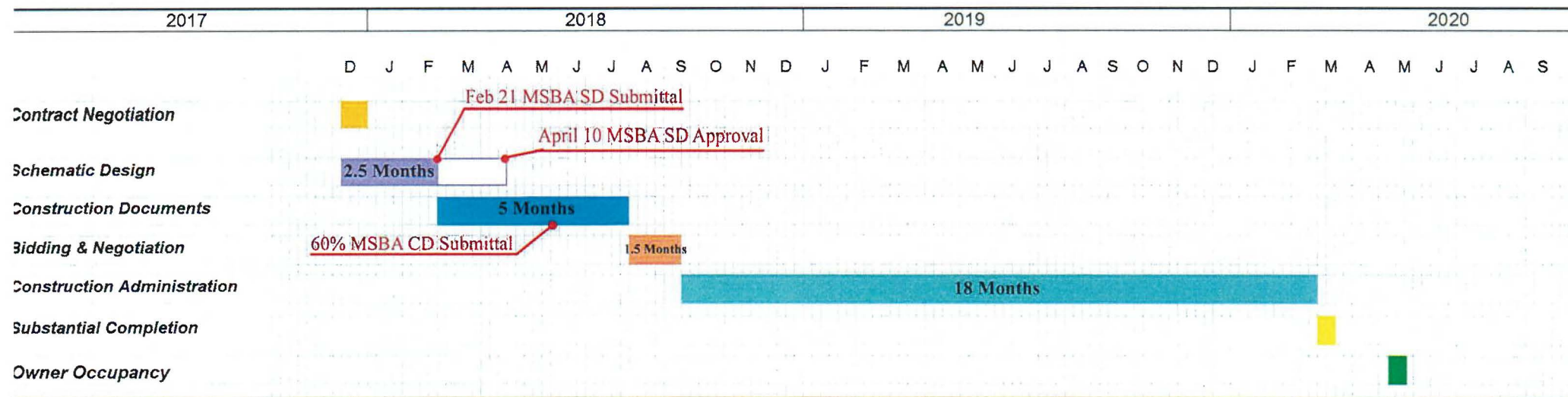








Accelerated Schedule





Richer Elementary School Marlborough, MA

Transportation Impact Study

October 27, 2017

Prepared for:

Lamoureux Pagano Architects
108 Grove Street, Suite 300
Worcester, MA 01605

Submitted by:

Nitsch Engineering
2 Center Plaza, Suite 430
Boston, MA 02108

Nitsch Project #11969.

TABLE OF CONTENTS

1	INTRODUCTION	4
2	EXISTING CONDITIONS	7
	2.1 Study Area Roadways	7
	2.2 Study Area Intersections	8
3	SAFETY ANALYSIS	13
	3.1 Crash Data	13
	3.2 Intersection Crash Rates	14
4	EXISTING TRAFFIC CONDITIONS	15
	4.1 2017 Traffic Count Data	15
	4.2 Seasonal Adjustment	16
5	FUTURE NO-BUILD TRAFFIC CONDITIONS	18
	5.1 Background Growth	18
	5.2 No-Build Traffic Volumes	18
6	FUTURE CONDITIONS	20
	6.1 Proposed Trip Generation	20
	6.2 Proposed Elementary School on Poirier Drive Site	21
7	OPERATIONS ANALYSIS	27
	7.1 Level of Service Criteria	27
	7.2 Capacity Analysis	27
	7.3 2017 Existing Capacity Analysis	27
	7.4 2024 No-Build Capacity Analysis	29
	7.5 2024 Build Capacity Analysis	29
	7.6 Traffic Signal Warrant Methodology	32
	7.7 2024 Mitigated Conditions Capacity Analysis	32
8	CONCLUSIONS AND RECOMMENDATIONS	34
	8.1 Conclusions	34
	8.2 Recommendations	35

LIST OF TABLES

Table 1 - Crash Summary	13
Table 2 - Automatic Traffic Recorder (ATR) Summary	15
Table 3 - Vehicle Travel Speeds	16
Table 4 - Proposed Trip Generation.....	20
Table 5 – Sight Distance Criteria.....	22
Table 6 - Proposed Sight Distance Evaluation	23
Table 7 - Level of Service Criteria.....	27
Table 8 – Level of Service Summary - 2017 Existing Conditions.....	28
Table 9 – Level of Service Summary - 2024 No-Build Conditions.....	30
Table 10 – Level of Service Summary - 2024 Build Conditions.....	31
Table 11 – Level of Service Summary - 2024 Build Conditions - Mitigated	33

LIST OF FIGURES

Figure 1 – Locus Map.....	5
Figure 2 – Existing Conditions.....	6
Figure 3 – Intersection Locations	12
Figure 4 – 2017 Existing Volumes.....	17
Figure 5 – 2024 Future Volumes - No-Build	19
Figure 6 – Trip Distribution	24
Figure 7 – Trip Assignments	25
Figure 8 – 2024 Future Volumes - Build	26

1 INTRODUCTION

Nitsch Engineering has been retained by Lamoureux Pagano Architects (LPA) to prepare a qualitative assessment of safety, traffic circulation, and traffic access/egress, associated with the feasibility study and schematic design for the proposed Richer Elementary School project located in Marlborough, Massachusetts.

The Project includes construction of a new elementary school building and grounds on the site adjacent to the existing Marlborough High School, located at 431 Bolton Street in Marlborough.

The report describes the project area, presents traffic counts (taken in 2017), and analyzes existing and future traffic operating efficiency. The traffic data is used to determine the traffic circulations, overall operations, and to evaluate the traffic impacts of the proposed school.

The standards used for analysis conform to the 2009 edition of the Manual on Uniform Traffic Control Devices (MUTCD) and the 2010 edition of the Highway Capacity Manual.

The following conditions are analyzed in this report:

- Existing Conditions 2017;
- Future 2024 No-Build;
- Future 2024 Build; and
- Future 2024 No-Build with Mitigation;

Figure 1 is the Locus Map showing the new school and the surrounding roadway network.

Figure 2 shows the existing conditions of the school site.



Figure 1: Locus Map
 Richer Elementary School
 Marlborough, MA



Figure 2: Existing Conditions

Richer Elementary School
Marlborough, MA

2 EXISTING CONDITIONS

2.1 Study Area Roadways

To examine the existing conditions, we studied and collected data at the following roadways:

1. Bolton Street (Route 85);
2. Hudson Street;
3. Poirier Drive;
4. Union Street;
5. Thresher Drive;
6. Stevens Street; and
7. Lafreniere Drive.

Bolton Street (Route 85)

Bolton Street (Route 85) is classified by the Massachusetts Department of Transportation (MassDOT) as a rural major connector or urban minor arterial and runs in the north-south directions. Bolton Street is present between the Hudson Town line at its north terminus and Maple Street/John Street in Marlborough at its south terminus. The posted speed limit along the roadway is 35 miles per hour. The land use along Bolton Street is primarily residential. The roadway is within the jurisdiction of the City of Marlborough.

Hudson Street

Hudson Street is classified by MassDOT as a local roadway and runs in the northeast-southwest directions. Hudson Street is present between Bolton Street at its east terminus and Mechanic Street at its southwest terminus in Marlborough. The roadway within the study area does not have a posted speed limit. The land use is primarily residential or open space. The roadway is within the jurisdiction of the City of Marlborough.

Poirier Drive

Poirier Drive is classified by MassDOT as a local roadway and runs in the east-west directions. Poirier Drive is present between Bolton Street at its west terminus and Lafreniere Drive at its east terminus in Marlborough. The posted speed limit along the roadway is 10 miles per hour. The roadway is within the jurisdiction of the City of Marlborough.

Union Street

Union Street is classified by MassDOT as an urban collector or rural minor collector rural major connector or urban minor arterial and runs in the east-west directions. Union Street is present between Hudson Street in Marlborough at its west terminus and Stevens Street in Marlborough at its east terminus. The posted speed limit along the roadway is 25 miles per hour. The land use along Union Street is primarily residential. The roadway is within the jurisdiction of the City of Marlborough.

Thresher Drive

Thresher Drive is classified by MassDOT as a local roadway and runs in the south-north directions. Thresher drive is present between Union Street at its south terminus and Whitcomb Middle School at its north terminus in Marlborough. The roadway within the study area does not have a posted speed limit. The roadway is within

the jurisdiction of the City of Marlborough.

Stevens Street

Stevens Street is classified by MassDOT as an urban collector or rural minor collector rural major connector or urban minor arterial and runs in the northeast-southwest directions. Stevens Street is present between Hosmer Street in Marlborough at its northeast terminus and E. Main Street in Marlborough at its southwest terminus. The posted speed limit along the roadway is 30 miles per hour, but reduces to 20 miles per hour at the study area. The land use along Stevens Street is primarily residential. The roadway is within the jurisdiction of the City of Marlborough.

Lafreniere Drive

Lafreniere Drive is classified by MassDOT as a local roadway and runs in the south-north directions. Lafreniere Drive is present between Stevens Street at its south terminus and Poirier Drive at its north terminus in Marlborough. The roadway within the study area does not have a posted speed limit. The roadway is within the jurisdiction of the City of Marlborough.

2.2 Study Area Intersections

To examine the existing conditions, we included the following intersections in the study area. The intersection locations are shown in Figure 3.

1. Bolton Street (Route 85) at Hudson Street;
2. Bolton Street (Route 85) at Poirier Drive;
3. Bolton Street (Route 85) at Union Street
4. Union Street at Thresher Drive;
5. Union Street at Stevens Street; and
6. Stevens Street at Lafreniere Drive.

Bolton Street (Route 85) at Hudson Street

Bolton Street (Route 85) and Hudson Street intersect as a four-way signalized intersection with Bolton Street approaching from the south and north, Hudson Street approaching from west, and Navin Arena driveway approaching from east. Crosswalks are present at all approaches.

From the south, Bolton Street is a two-way roadway with one lane in each direction, separated by a double yellow centerline. The approach to the intersection consists of two lanes. The left lane permits a left turn only movement that transitions to the west on Hudson Street, and the right lane permits a through movement and a right turn that transitions to the east onto Navin Arena driveway. Bolton Street is approximately 42 feet wide at the intersection. Bituminous concrete sidewalks are present on both sides of Bolton Street.

From the north, Bolton Street is a two-way roadway with one lane in each direction, separated by a double yellow centerline. The approach to the intersection consists of two lanes. The left lane permits a left turn only movement that transitions to the east on Navin Arena driveway, and the right lane permits a through movement and a right turn that transitions to the west onto Hudson Street. Bolton Street is approximately 42 feet wide at the intersection. Bituminous concrete sidewalks are present on both sides of Bolton Street.

From the west, Hudson Street is a two-way roadway with one lane in each direction, separated by a double yellow centerline. The approach to the intersection consists of two lanes. The left lane permits a through movement and a left turn that transitions to the north to Bolton Street, and the right lane permits a right only movement that transitions to south to Bolton Street. Hudson Street is approximately 50 feet wide at the intersection. Bituminous concrete sidewalk is present on north side of Hudson Street.

From the east, Navin Arena driveway is a two-way roadway with one lane in each direction, separated by a raised bituminous concrete median. The approach to the intersection consists of one lane to permit through, left, and right movements that transition to the west on Hudson Street and south and north on Bolton Street. The Driveway is approximately 40 feet wide at the intersection. No sidewalks are present at this approach.

The semi actuated traffic signal operates in four phases. The following movements are permitted or protected, as noted, during each of the phases.

First phase:

- Bolton Street southbound, permitted phase for left-turn onto Navin Arena; and
- Bolton Street northbound, permitted phase for left-turn onto Hudson Street.

Second phase:

- Bolton Street northbound, protected phase for left-turn onto Hudson Street.

Third phase (if actuated):

- Hudson Street eastbound; and
- Navin Arena driveway westbound

Fourth phase:

- Exclusive pedestrian phase for crossing Bolton Street northbound, Bolton Street southbound, Hudson Street eastbound, and Navin Arena westbound.

Bolton Street (Route 85) at Poirier Drive

Bolton Street (Route 85) and Poirier Drive intersect as a three-way unsignalized intersection, with Bolton Street approaching from the north and south, and Poirier Drive approaching from the east. Bolton Street operates freely with no control. Poirier Drive approach is "STOP" controlled. A crosswalk is present at the south side of the intersection.

At the intersection, Bolton Street is approximately 39 feet wide and contains one travel lane in each direction. Poirier Drive is approximately 28 feet wide and contains one travel lane in each direction. Continuous bituminous concrete sidewalks are present on both sides of Bolton Street, and the south side of Poirier Drive.

Bolton Street (Route 85) at Union Street

Bolton Street (Route 85) and Union Street intersect as a four-way signalized intersection with Bolton Street approaching from the south and north, and Union Street approaching from east and west. Crosswalks are present at the southbound, eastbound and westbound approaches.

From the south, Bolton Street is a two-way roadway with one lane in each direction, separated by a double yellow centerline. The approach to the intersection consists of two lanes. The left lane permits a left turn only movement that transitions to the west on Union Street, and the right lane permits a through movement and a right turn that transitions to the east onto Union Street. Bolton Street is approximately 36 feet wide at the intersection. Cements concrete sidewalks are present on both sides of Bolton Street.

From the north, Bolton Street is a two-way roadway with one lane in each direction, separated by a double yellow centerline. The approach to the intersection consists of two lanes. The left lane permits a left turn only movement that transitions to the east on Union Street, and the right lane permits a through movement and a right turn that transitions to the west onto Union Street. Bolton Street is approximately 40 feet wide at the intersection. Bituminous concrete sidewalks are present on both sides of Bolton Street.

From the west, Union Street is a two-way roadway with one lane in each direction, separated by a double yellow centerline. The approach to the intersection consists of one lane to permit through, left, and right movements that transition to the east on Union Street and south and north on Bolton Street. Union Street is approximately 38 feet wide at the intersection. Bituminous concrete sidewalk is present on both sides of Union Street.

From the east, Union Street is a two-way roadway with one lane in each direction, separated by a double yellow centerline. The approach to the intersection consists of one lane to permit through, left, and right movements that transition to the west on Union Street and south and north on Bolton Street. Union Street is approximately 32 feet wide at the intersection. Bituminous concrete sidewalk is present at the north side of Union Street.

The pre-timed traffic signal operates in three phases. The following movements are permitted or protected, as noted, during each of the phases.

First phase:

- Bolton Street southbound, permitted phase for left-turn onto Union Street; and
- Bolton Street northbound, permitted phase for left-turn onto Union Street.

Second phase:

- Exclusive pedestrian phase for crossing Bolton Street southbound, Union Street eastbound, and Union Street westbound.

Third phase (if actuated):

- Union Street eastbound; and
- Union Street westbound

Union Street at Thresher Drive

Union Street, and Thresher Drive intersect as a three-way unsignalized intersection, with Union Street approaching from the east and west, and Thresher Drive approaching from the north. Union Street operates freely with no control. Thresher Drive operates under "STOP" control. A crosswalk is present at the north side of the intersection.

At the intersection, Union Street is approximately 31 feet wide and contains one travel lane in each direction. Thresher Drive is approximately 28 feet wide and contains one travel lane in each direction. Continuous bituminous concrete sidewalks are present on both sides of Union Street and the east side of Thresher Drive.

Union Street at Stevens Street

Union Street, and Stevens Street intersect as a three-way "ALL STOP" controlled intersection, with Union Street approaching from the west, and Stevens Street approaching from the north and south. A crosswalk is present at the north side of the intersection, across Stevens Street.

At the intersection, Union Street is approximately 41 feet wide and contains one travel lane in each direction. Stevens Street is approximately 43 feet wide and contains one travel lane in each direction. Continuous bituminous concrete sidewalks are present on the north side of Union Street and the east side of Stevens Street.

Stevens Street at Lafreniere Drive

Stevens Street, and Lafreniere Drive intersect as a three-way unsignalized intersection, with Stevens Street approaching from the northeast and southwest, and Lafreniere Drive approaching from the north. Stevens Street operates freely with no control. Lafreniere Drive operates under "STOP" control. Crosswalks are present at the west of the intersection across Stevens Street and north of the intersection across Lafreniere Drive.

At the intersection, Stevens Street is approximately 26 feet wide and contains one travel lane in each direction. Lafreniere Drive is approximately 22 feet wide and contains one travel lane in each direction. Continuous bituminous concrete sidewalks are present on north side of Stevens Street and the west side of Lafreniere Drive.



Figure 3. Intersection Locations
 Richer Elementary School
 Marlborough, MA

3 SAFETY ANALYSIS

3.1 Crash Data

Nitsch Engineering reviewed the crash data available from MassDOT for the three most recent years available – 2012 to 2014 – for the study intersections. A summary of the crashes, including the severity and the manner of collision are shown in Table 1.

Table 1 - Crash Summary

Location	Number of Crashes			Severity				Manner of Collision					Percent During	
	Year	Total Crashes	Average	PD ^a	PI ^b	NR ^c	F ^d	A ^e	RE ^f	HO ^g	Other ^h	Incl. Ped-Bike ^j	Peak Hours ^k	Wet/Icy Conditions
Bolton St at Hudson St	2012	2	1.00	2	0	0	0	2	0	0	0	0	0%	0%
	2013	0		0	0	0	0	0	0	0	0	0	0%	0%
	2014	1		1	0	0	0	0	1	0	0	0	0%	0%
Bolton St at Poirier Dr	2012	3	6.33	2	0	1	0	0	1	0	2	0	0%	0%
	2013	8		8	0	0	0	3	3	0	2	0	0%	0%
	2014	8		6	1	1	0	3	2	0	3	0	63%	0%
Bolton St at Union St	2012	7	6.33	4	3	0	0	2	4	1	0	0	0%	0%
	2013	6		6	0	0	0	2	2	0	2	0	0%	0%
	2014	6		5	1	0	0	2	3	0	1	0	0%	0%
Union St at Thresher Dr	2012	2	1.33	1	1	0	0	1	0	0	1	0	50%	0%
	2013	2		2	0	0	0	0	1	0	1	0	50%	50%
	2014	0		0	0	0	0	0	0	0	0	0	0%	0%
Union St at Stevens St	2012	1	1.33	1	0	0	0	0	0	0	1	0	0%	0%
	2013	2		2	0	0	0	1	0	0	1	0	0%	50%
	2014	1		1	0	0	0	0	1	0	0	0	0%	0%
Stevens St at Lafreniere Dr	2012	0	0.00	0	0	0	0	0	0	0	0	0	0%	0%
	2013	0		0	0	0	0	0	0	0	0	0	0%	0%
	2014	0		0	0	0	0	0	0	0	0	0	0%	0%
Total	ALL	49	2.7	41	6	2	0	16	18	1	14	0	20%	16%

^aProperty Damage Only; ^bPersonal Injury Only (non-Fatal Injury); ^cNot Reported; ^dFatality; ^eAngle; ^fRear end; ^gHead on; ^hSideswipe, opposite direction; sideswipe, same direction, single vehicle crash, rear-to-rear, not reported, unknown, etc.; ^jIncludes pedestrian or cyclist; ^kOccurred between 7-9am or 4-6pm

A total of 49 crashes were reported within the study areas for the six locations from 2012 to 2014. In terms of severity, 41 of the crashes involved property damage, six reported personal injury, and two were not reported. In terms of manner of collision, 16 of the crashes were angle collisions, 18 were rear-end, one was head on, and 14 were of other type. None of the crashes involved a pedestrian. Approximately 20% of the crashes occurred during the peak hours of 7:00 to 9:00 AM or 4:00 to 6:00 PM and 16% occurred during wet/icy conditions. Analyzing the crash data, as most crashes were of angle or rear-end type, the crashes were most likely caused by driver carelessness or inattentiveness.

3.2 Intersection Crash Rates

The intersection crash rate is recognized as an effective tool to measure the safety of intersections. For intersections, crash rates are expressed by the number of crashes per million entering vehicles (MEV). As of March 2016, the average statewide crash rate for unsignalized intersections is 0.58 per MEV and 0.77 for signalized intersections. For District 3, which includes the City of Marlborough, the rate for unsignalized intersections is 0.65 crashes per MEV and 0.90 for signalized intersections.

The intersection of Bolton Street and Hudson Street experienced a crash rate of 0.16 per MEV, which is far below both the District 3 and statewide averages for signalized intersections.

The intersection of Bolton Street and Poirier Drive experienced a crash rate of 0.80 per MEV, which is above both the District 3 and statewide averages for unsignalized intersections.

The intersection of Bolton Street and Union Street experienced a crash rate of 0.90 per MEV, which is equal to the District 3 average, and above the statewide average for signalized intersections.

The intersection of Union Street and Thresher Drive experienced a crash rate of 0.33 per MEV, which is below both the District 3 and statewide averages for unsignalized intersections.

The intersection of Union Street and Stevens Street experienced a crash rate of 0.34 per MEV, which is below both the District 3 and statewide averages for unsignalized intersections.

The intersection of Stevens Street at Lafreniere Drive experienced a crash rate of 0.00.

Intersection crash rate worksheets can be found in Appendix A-3.

4 EXISTING TRAFFIC CONDITIONS

4.1 2017 Traffic Count Data

Automatic Traffic Recorder (ATR) Data

Nitsch Engineering retained Accurate Counts (AC) of North Reading, Massachusetts to conduct 48-hour Automatic Traffic Recorder (ATR) vehicle traffic counts throughout the study area, from Wednesday, September 20, to Thursday September 21, 2017. Table 2 summarizes the ATR data. A copy of the raw traffic count data is included in Appendix A-1.

Table 2 - Automatic Traffic Recorder (ATR) Summary

LOCATION	PERIOD	ADT ^a		PEAK HOUR TRAFFIC				K factor ^d
		VOLUMES (vpd) ^b	DIRECTIONAL DISTRIBUTION	PERIOD	VOLUMES (vph) ^c	DIRECTIONAL DISTRIBUTION		
Bolton Street (Route 85) south of Poirier Drive	Weekday	17,737	52% NB	Morning	1,293	50.1% NB		0.07
				Evening	1,535	54% SB		0.09
Stevens Street North of Union Street	Weekday	3,531	55% SB	Morning	419	53% NB		0.12
				Evening	346	53% SB		0.10

^a Average Daily Traffic; ^b Vehicles per day; ^c Vehicles per hour; ^d Percent of daily traffic

Turning Movement Count (TMC) Data

AC collected Turning Movement Counts (TMC) data for the study area intersections outside of the proposed Elementary School access and egress points on Wednesday, September 20, 2017 from 7:00 AM to 9:00 AM and 1:30 PM to 3:30 PM to capture both the school morning and afternoon peak periods. The TMC data included bicycle and pedestrian counts.

The peak hours within the study area were established as 7:15 AM to 8:15 AM during the weekday morning period and 2:15 PM to 3:15 PM during the afternoon period. The 2017 existing traffic volumes are shown in Figure 4.

Vehicle Travel Speeds

AC measured vehicle travel speeds at the ATR locations at the time of the traffic count. The 85th percentile speed, meaning the speed at which 85% of the vehicles are at or below, is noted because of its importance in determining appropriate roadway speed limits and for calculating required sight distance. The speed data is shown in Table 3.

Table 3 - Vehicle Travel Speeds

INTERSECTION	POSTED SPEED (MPH ^a)	85th PERCENTILE SPEED (MPH ^a)
Bolton Street (Route 85) south of Poirier Drive		
Northbound	35	39
Southbound	35	38
Stevens Street North of Union Street		
Northbound	School Zone 20	41
Southbound	School Zone 20	37
a = Miles per hour		
Note: 85th Percentile Speeds were averaged between the full two days of data collected		

4.2 Seasonal Adjustment

Nitsch Engineering researched data from MassDOT to establish if any seasonal adjustment to the traffic counts was necessary. We researched and used the MassDOT's 2013 Weekday Seasonal Adjustment Factors, which is the latest data set available. The data compares monthly traffic volumes from different types of roadways across the Commonwealth to compare the traffic volumes from each individual month to the annual average. During the month of September on urban arterials and collectors, traffic volumes are approximately 7% higher than an average month. Additionally, the counts were performed while school was in full session, so the traffic counts represent the average condition with respect to traffic within the study area. Therefore, we made no adjustment to the collected volumes. The Weekday Seasonal Adjustment Factors are included in Appendix A-2

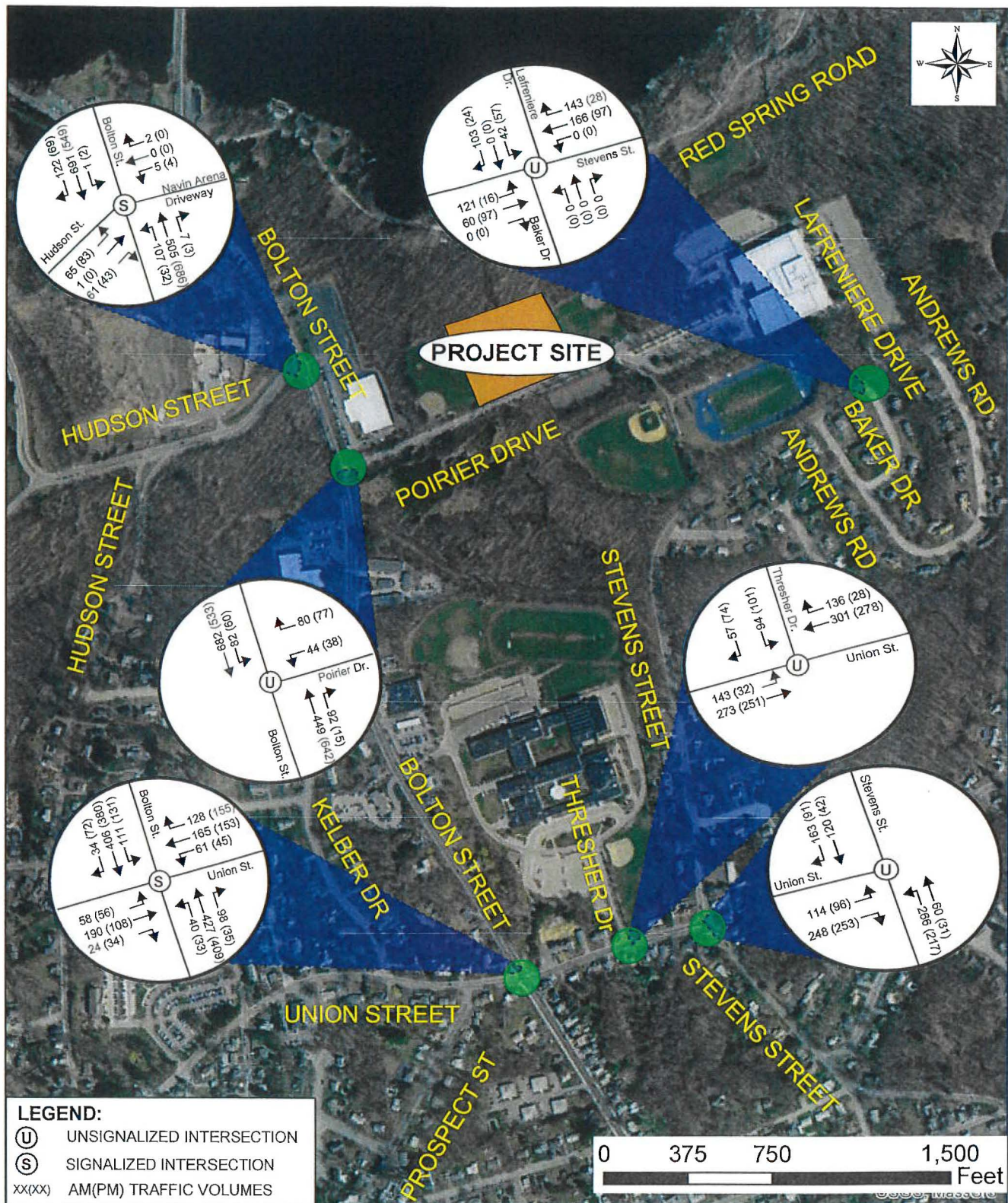


Figure 4. 2017 Existing Volumes
 Richer Elementary School
 Marlborough, MA

5 FUTURE NO-BUILD TRAFFIC CONDITIONS

5.1 Background Growth

Nitsch Engineering used the previous 10-year data from MassDOT count station #4151, located on Mechanic Street, approximately one mile west of Bolton Street, to calculate the background traffic growth. The average Annual Growth Rate has decreased over the past 10 years. However, to be conservative, we used an annual background traffic growth factor of 1%, which is also consistent with recent MassDOT projects in eastern Massachusetts. The calculations are included in Appendix A-2.

5.2 No-Build Traffic Volumes

The 2024 No-Build Traffic Volumes are shown in Figure 5 and are derived by applying the traffic growth rate of 1% per year over the seven-year design horizon to project the 2024 traffic counts.



Figure 5. 2024 Future Volumes - No Build
 Richer Elementary School
 Marlborough, MA

6 FUTURE CONDITIONS

We examined the proposed future conditions with respect to the feasibility of constructing a new Elementary School building and grounds on the Poirier Drive site.

6.1 Proposed Trip Generation

Nitsch Engineering used the Institute of Transportation Engineers (ITE) publication Trip Generation, 9th Edition to estimate the vehicle trip rates for the proposed Elementary School. The School will consist of 610 students, and approximately 90 staff. Trip generation rates for the Elementary School were based on Land Use Code (LUC) 520 (Elementary School). We used the Number of Students as the independent variable to base the ITE trip generation rates.

LUC 520 – Elementary School

Trip Generation per Student – Average rate 0.45, AM Peak hour of Generator 55% entering, 45% exiting

Trip Generation per Student – Average rate 0.28, PM Peak hour of Generator 45% entering, 55% exiting

The vehicle trips associated with the student enrollment were calculated by the ITE trip generation rates to determine the proposed drop-off and pick-up rates. Table 4 summarizes the total Site generated trips during the morning and evening peak hours.

Table 4 - Proposed Trip Generation

		NUMBER OF STUDENTS	
		610	
		AVG. RATE	TRIPS
		0.45	275
		%	
AM	ENTERING	55	151
	EXITING	45	124
		AVG. RATE	TRIPS
		0.28	171
		%	
PM	ENTERING	45	77
	EXITING	55	94

As shown in Table 6, the proposed Elementary School at Poirier Drive site would result in approximately 275 additional entering and exiting trips during the weekday morning drop-off and approximately 171 additional entering and exiting trips during the weekday afternoon pick-up. The increase also accounts for vehicular traffic

associated with teachers and staff at the new school, as well as the additional student drop-off and pick-up during adverse weather.

6.2 Proposed Elementary School on Poirier Drive Site

A sketch plan of the redevelopment of the Proposed Elementary School on the Poirier Drive Site is shown in Appendix A-4. The sketch plan shows the proposed driveway location of the school on an existing base map with the site location and outline.

Site Layout

For the construction of the new Elementary School building and grounds on the Poirier Drive site, the building would be constructed orientated east-west on the north side of Poirier Drive, opposite the High School athletic fields, located approximately one fifth of a mile west of the High School.

Parking

Parking would be provided onsite west of the proposed school building. In all, approximately 150 parking spaces are proposed.

Sight Distance

Stopping Sight Distance (SSD) is the length of the roadway ahead that is visible to the driver and should be sufficiently long to enable a vehicle traveling at or near the design speed to stop before reaching a stationary object in its path. Stopping sight distance is the sum of the distance traversed by the vehicle from the instant the driver sights an object necessitating a stop to the instant the brakes are applied and the distance needed to stop the vehicle from the instant brake application begins.

Intersection Sight Distance (ISD) is the length of the leg of the departure sight triangle along the major road in both directions for a vehicle stopped on the minor road waiting to depart. The critical departure sight triangles for the proposed Elementary School driveway are for traffic approaching from either the left or right for left turns from the driveways onto Poirier Drive. The methods for determining the sight distances needed by drivers approaching intersections are based on the same principles as stopping sight distance, but incorporate modified assumptions based on observed driver behavior at intersections.

The SSD and ISD values associated with a given design speed are shown in Table 5. The site distance evaluations for the Poirier Drive Site are shown in Table 6.

Table 5 – Sight Distance Criteria

DESIGN SPEED	DESIGN STOPPING SIGHT DISTANCE VALUE ¹ (SSD)	RECOMMENDED INTERSECTION SIGHT DISTANCE VALUE ² (ISD)
(MPH)	(FT)	(FT)
15	80	170
20	115	225
25	155	280
30	200	335
35	250	390
40	305	445
45	360	500
50	425	555
55	495	610
60	570	665
65	645	720
70	730	775
75	820	830
80	910	885
Source: <i>A Policy on Geometric Design of Highways and Streets</i> , AASHTO, Washington DC (2011)		
¹ Design value based on a grade of less than 3%, a brake reaction distance predicted on a time of 2.5 seconds and a deceleration rate of 11.2 ft/s ²		
² Recommended value based on Case B1 - a stopped passenger car to turn left onto a two-lane highway with no median and grades 3% or less		

The posted speed limit for Poirier Drive is 10 MPH. To be conservative a 20 MPH speed was used to calculate the minimum sight distance to be conservative.

At Poirier Drive at the Proposed Elementary School Driveway the SSD's exceed the minimum values as well as the ISD for right turning vehicles onto Poirier Drive.

Table 6 - Proposed Sight Distance Evaluation

INTERSECTION	POSTED SPEED (MPH)	85th PERCENTILE SPEED (MPH)	MINIMUM (FEET) ^{1,2}	MEASURED (FEET)	OBSTRUCTION
<i>Poirier Drive at Proposed Driveway</i>					
Stopping Sight Distance:					
Poirier Drive Eastbound	10	20	115	500	Vertical curve
Poirier Drive Westbound	10	20	115	252	Horizontal curve
Intersection Sight Distance:					
Looking to the right from Proposed Site Driveway	10	20	225	520	Vertical curve
Looking to the left from Proposed Site Driveway	10	20	225	270	Horizontal curve, utility pole
Source: A Policy on Geometric Design of Highways and Streets, AASHTO, Washington DC (2011)					
¹ Table 3-1. Stopping Sight Distance on Level Roadways					
² Table 9-6. Design Intersection Sight Distance - Case B1, Left Turn from Stop					

Vehicle Access/Egress, Circulation, Bus and Parent Pick-Up/Drop-Off

Vehicle access and egress will occur at the designated parental pick-up/drop-off north of the school. Vehicles will arrive through the curb cut to parking lot located west of the school on Poirier Drive and proceed to the designated section adjacent to North Entrance.

Ten full size buses will be used for pick-up/drop-off of students receiving special education services. The bus pick-up/drop-off will occur at the designated bus loop located south of the school. The access to the bus loop will be provided by two curb cuts on Poirier Drive that form a one-way counter-clockwise parent pick-up/drop-off loop adjacent to South Entrance.

Five mini-buses will be used for additional and/or special student pick-up/drop-off. Mini-buses will arrive through the curb cut to parking lot located west of the school on Poirier Drive and proceed to the designated delineated section adjacent to West Entrance.

Trip Distribution, Diversion, and Assignment

The trips to/from the Poirier Drive Site will be distributed and assigned based on the exiting travel patterns and logical travel routes, which are based on the existing roadway network both within the City of Marlborough and the surrounding region. The Trip Distribution Percentages specific to the Poirier Drive Site are shown in Figure 6. The resultant trip assignment volumes for both the weekday morning and weekday afternoon peak hours were calculated by multiplying the trip distribution by the trip generation from Table 4, and are shown in Figure 7 for the weekday morning and the weekday afternoon peak hours.

Proposed 2024 Build Volumes

For the Poirier Drive Site, the corresponding trip assignment volumes were added to the 2024 No-Build Volumes to yield the 2024 Build Volumes. The 2024 Build Volumes for the Poirier Drive Site are shown in Figure 8.

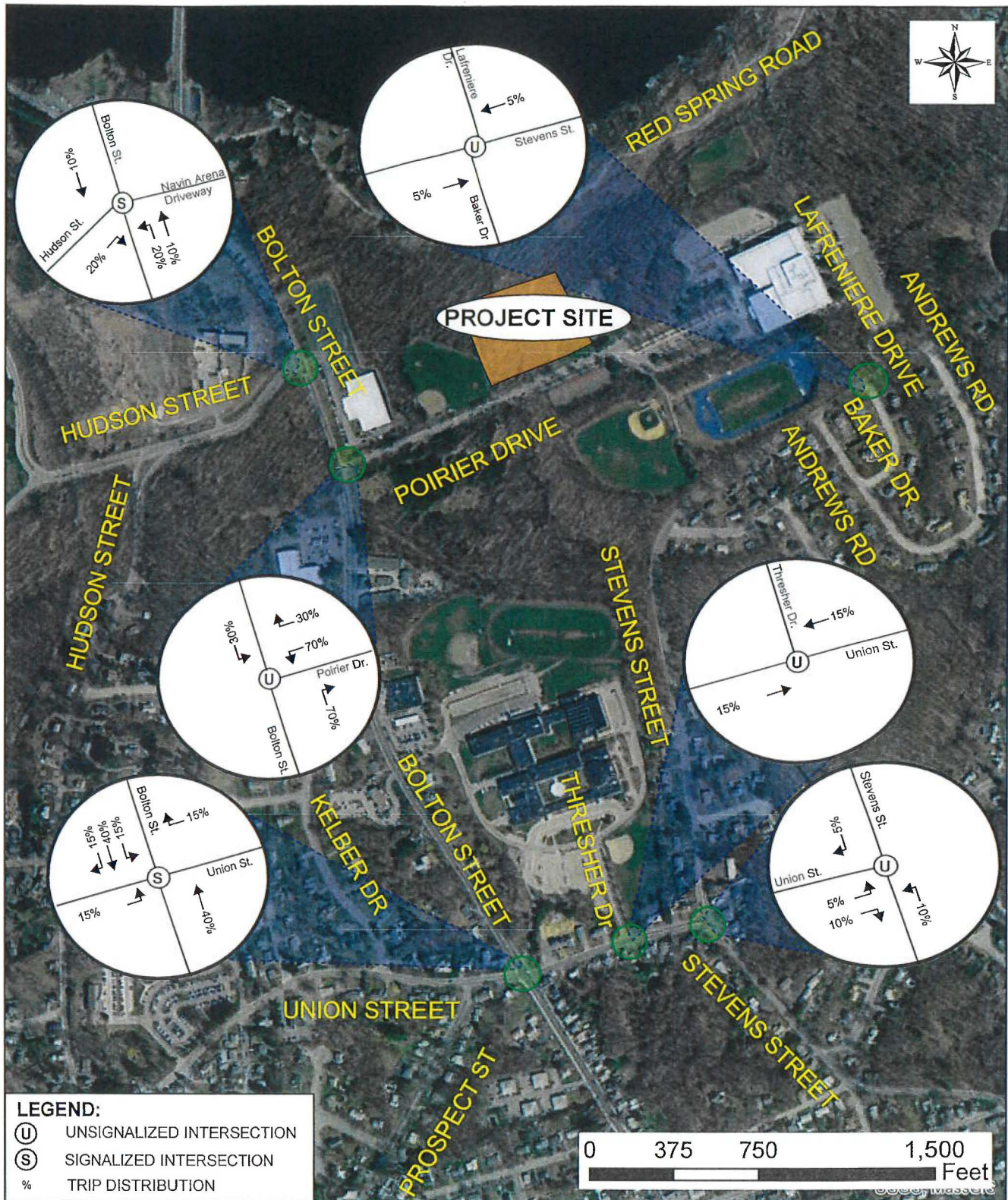


Figure 6. Trip Distribution
 Richer Elementary School
 Marlborough, MA

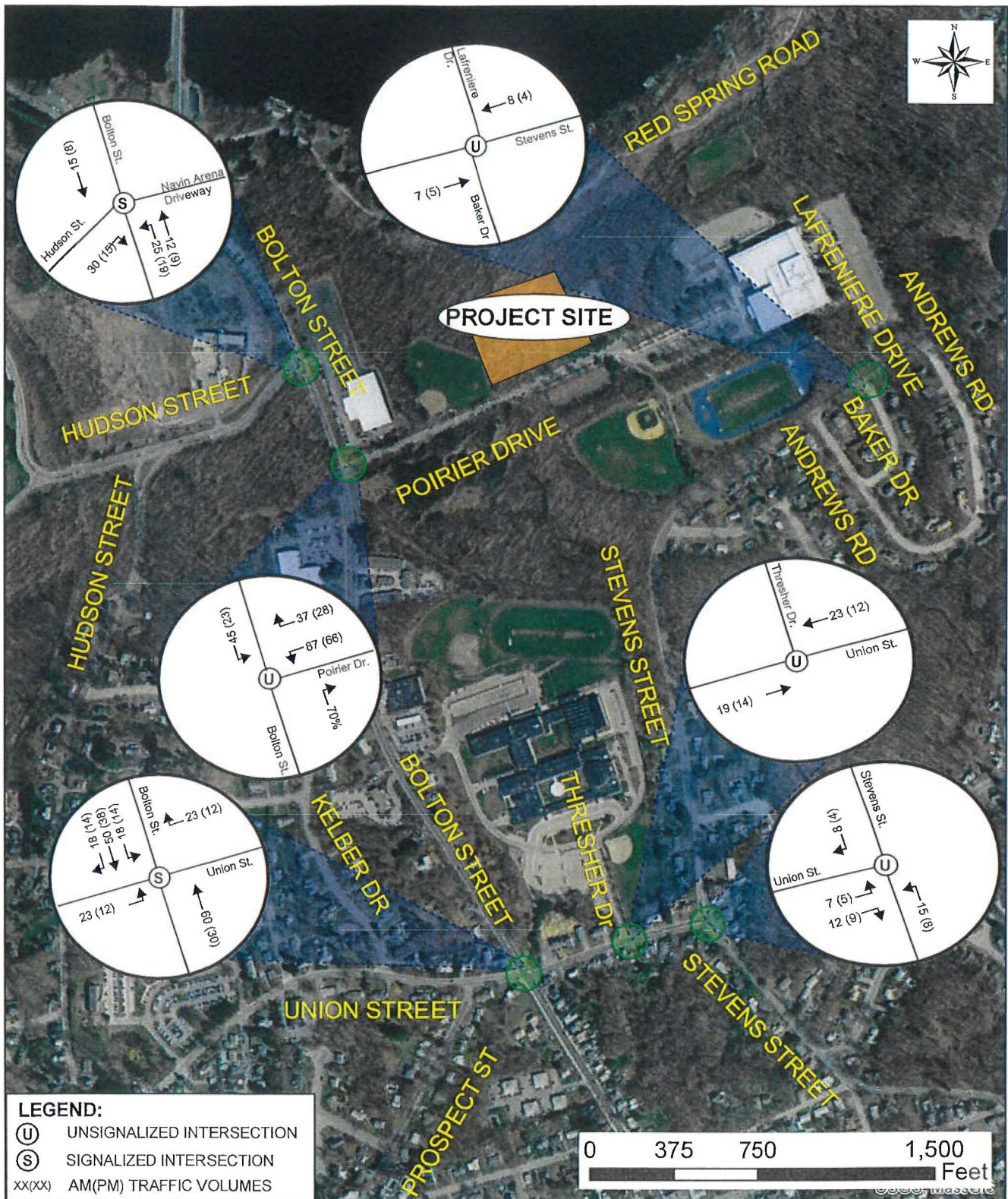


Figure 7. Trip Assignments
 Richer Elementary School
 Marlborough, MA



Figure 8. 2024 Future Volumes - Build
 Richer Elementary School
 Marlborough, MA

7 OPERATIONS ANALYSIS

7.1 Level of Service Criteria

Level of Service (LOS) is a qualitative measure describing operational conditions within a traffic stream. Six LOS criteria are used to describe the quality of traffic flow for any type of facility controls. LOS A represents the best operating conditions and LOS F represents the worst operating conditions. Nitsch Engineering analyzed the levels of service for the intersections using Synchro 8 software, which is based on the traffic operational analysis methodology of the Highway Capacity Manual¹ (HCM). The methodology for signalized intersections assesses the effects of signal type, timing, phasing, progression, vehicle mix, and geometrics on control delay. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Table 7 summarizes the relationship between LOS and average control delay for signalized and unsignalized intersections.

Table 7 - Level of Service Criteria

SIGNALIZED INTERSECTIONS		UNSIGNALIZED INTERSECTIONS		
Level of Service	Control Delay (seconds/vehicle)	Level of Service by Volume-to-Capacity (v/c) Ratio		Control Delay (seconds/vehicle)
		v/c ≤ 1.0	v/c > 1.0	
A	0 to 10	A	F	0 to 10
B	>10 to 20	B	F	>10 to 15
C	>20 to 35	C	F	>15 to 25
D	>35 to 55	D	F	>25 to 35
E	>55 to 80	E	F	>35 to 50
F	>80	F	F	>50

Source: 2010 Highway Capacity Manual, Transportation Research Board, Washington D.C. 2010

7.2 Capacity Analysis

Nitsch Engineering performed traffic analyses to evaluate traffic operations for the 2017 Existing Conditions, 2024 No-Build Conditions, and 2024 Build Conditions – Richer Elementary School at Poirier Drive Site during the weekday morning and weekday afternoon peak hours at the study intersections. The analyses depict the volume-to-capacity (v/c) ratio, vehicle delay, LOS, and the 50th/95th percentile vehicle queues.

7.3 2017 Existing Capacity Analysis

Nitsch Engineering analyzed the 2017 Existing Conditions traffic operations at the study intersections based on the existing traffic counts performed by AC in September 2017. The Level of Service Summary is shown in Table 8. The analysis worksheets are provided in Appendix A-6.

¹ Highway Capacity Manual, 2010 Edition, Transportation Research Board (TRB), Washington, D.C.

Table 8 – Level of Service Summary - 2017 Existing Conditions

INTERSECTION	MOVEMENT	WEEKDAY MORNING PEAK HOUR					WEEKDAY EVENING PEAK HOUR				
		V/C ¹	DELAY ²	LOS ³	50th Q ⁴	95th Q ⁵	V/C ¹	DELAY ²	LOS ³	50th Q ⁴	95th Q ⁵
Bolton Street at Hudson Street	Hudson St EB - LT	0.50	59.4	E	51	96	0.54	58.8	E	64	112
	Hudson St EB - R	0.26	6.2	A	0	21	0.17	1.6	A	0	3
	Navin Arena WB -LTR	0.03	0.2	A	0	0	0.03	42.2	D	3	13
	Bolton St NB - L	0.40	22.2	C	27	55	0.08	8.9	A	8	22
	Bolton St NB - TR	0.43	9.9	A	172	281	0.59	13.3	B	284	462
	Bolton St SB - L	0.00	14.0	B	0	3	0.01	15.0	B	1	5
	Bolton St SB - TR	0.85	32.5	C	546	899	0.66	23.5	C	348	543
	Overall	0.85	24.4	C			0.66	19.8	B		
Bolton Street at Poirier Drive	Bolton St NB - TR	0.35	0.0	A	-	0	0.42	0.0	A	-	0
	Bolton St SB - LT	0.09	2.3	A	-	7	0.07	1.9	A	-	6
	Poirier Dr WB -LR	0.77	73.0	F	-	126	0.57	41.7	E	-	79
Bolton Street at Union Street	Union St EB - LTR	0.89	58.3	E	140	285	0.71	40.5	D	93	193
	Union St WB - LTR	0.98	71.4	E	176	354	0.87	46.9	D	162	319
	Bolton St NB - L	0.16	15.6	B	13	34	0.14	15.3	B	10	30
	Bolton St NB - TR	0.71	23.8	C	218	339	0.60	20.7	C	174	271
	Bolton St SB - L	0.61	33.4	C	45	125	0.53	25.6	C	50	112
	Bolton St SB - TR	0.59	20.5	C	172	267	0.61	20.7	C	176	276
	Overall	0.98	38.4	D			0.87	29.2	C		
Union Street at Thresher Drive	Union St EB - LT	0.14	4.1	A	-	12	0.03	1.1	A	-	2
	Union St WB - TR	0.28	0.0	A	-	0	0.2	0.0	A	-	0
	Thresher Dr SB-LR	0.55	31.1	D	-	78	0.38	16.3	C	-	43
Union Street at Stevens Street	Union St EB - LR	0.59	15.7	C	-	-	0.49	11.9	B	-	-
	Stevens St SB - TR	0.46	12.7	B	-	-	0.2	9.0	A	-	-
	Stevens St NB-LT	0.56	15.9	C	-	-	0.39	11.6	B	-	-
Stevens Street at Lafreniere Drive	Stevens St EB - LT	0.38	16.1	C	-	44	0.13	9.2	A	-	11
	Stevens St WB-TR	0.11	4.5	A	-	9	0.06	5.8	A	-	5
	Lafreniere Dr. SB - LR	0.41	20.6	C	-	48	0.16	12.9	B	-	14

¹ Volume to Capacity Ratio; ² Vehicle Delay, measured in seconds; ³ Level Of Service; ⁴ 50th Percentile Queue (in feet); ⁵ 95th Percentile Queue (in feet) based upon 22 feet per vehicle; * = Defacto Left Lane; # = volume exceeds capacity, queue may be longer; m = 95th percentile queue is metered by upstream signal; ~ = Volume exceeds capacity, queue is theoretically infinite

7.4 2024 No-Build Capacity Analysis

Nitsch Engineering analyzed the 2024 No-Build Conditions traffic operations at the study intersections. The 2024 No-Build Condition represents the 2017 Existing Conditions and projects a traffic increase at the rate of 1% per year between 2017 and 2024. The Level of Service Summary is shown in Table 9. The analysis worksheets are provided in Appendix A-6.

7.5 2024 Build Capacity Analysis

Nitsch Engineering analyzed the 2024 Build Conditions traffic operations at the study intersections for the construction of a new Richer Elementary School on the Poirier Drive site. The 2024 Build Conditions represents the 2024 No-Build Conditions traffic volumes with added Trip Assignment Volumes for the proposed Elementary School on the Poirier Drive Site. The Level of Service Summary is shown in Table 10. The analysis worksheets are provided in Appendix A-6.

Table 9 – Level of Service Summary - 2024 No-Build Conditions

INTERSECTION	MOVEMENT	WEEKDAY MORNING PEAK HOUR					WEEKDAY EVENING PEAK HOUR				
		V/C ¹	DELAY ²	LOS ³	50th Q ⁴	95th Q ⁵	V/C ¹	DELAY ²	LOS ³	50th Q ⁴	95th Q ⁵
Bolton Street at Hudson Street	Hudson St EB - LT	0.52	59.5	E	55	100	0.56	59.0	E	69	119
	Hudson St EB - R	0.27	7.0	A	0	25	0.18	2.4	A	0	6
	Navin Arena WB - LTR	0.03	0.2	A	0	0	0.03	41.5	D	3	13
	Bolton St NB - L	0.56	41.3	D	35	100	0.10	9.8	A	9	24
	Bolton St NB - TR	0.48	11.3	B	194	315	0.65	15.8	B	326	534
	Bolton St SB - L	0.00	14.0	B	0	3	0.01	15.5	B	1	5
	Bolton St SB - TR	0.96	46.3	D	633	1008	0.74	27.7	C	394	617
	Overall	0.96	33.3	C			0.74	22.8	C		
Bolton Street at Poirier Drive	Bolton St NB - TR	0.37	0.0	A	-	0	0.45	0.0	A	-	0
	Bolton St SB - LT	0.10	2.5	A	-	8	0.08	2.1	A	-	7
	Poirier Dr WB - LR	1.19	211.7	F	-	224	0.76	70.6	F	-	123
Bolton Street at Union Street	Union St EB - LTR	0.98	78.9	E	155	319	0.79	48.5	D	102	220
	Union St WB - LTR	1.08	99.2	F	221	394	0.94	58.1	E	180	355
	Bolton St NB - L	0.19	16.5	B	14	38	0.16	15.3	B	11	31
	Bolton St NB - TR	0.76	26.1	C	242	375	0.64	20.7	C	192	297
	Bolton St SB - L	0.76	51.2	D	52	152	0.64	25.6	C	57	147
	Bolton St SB - TR	0.63	21.6	C	189	293	0.66	20.7	C	194	302
	Overall	1.08	49.4	D			0.94	33.8	C		
Union Street at Thresher Drive	Union St EB - LT	0.16	4.3	A	-	14	0.03	1.2	A	-	2
	Union St WB - TR	0.30	0.0	A	-	0	0.21	0.0	A	-	0
	Thresher Dr SB - LR	0.67	42.1	E	-	108	0.43	18.0	C	-	52
Union Street at Stevens Street	Union St EB - LR	0.64	17.5	C	-	-	0.53	13.0	B	-	-
	Stevens St SB - TR	0.50	13.8	B	-	-	0.22	9.4	A	-	-
	Stevens St NB - LT	0.57	16.5	C	-	-	0.43	12.4	B	-	-
Stevens Street at Lafreniere Drive	Stevens St EB - LT	0.43	17.7	C	-	53	0.13	9.3	A	-	12
	Stevens St WB - TR	0.12	4.5	A	-	10	0.07	5.8	A	-	6
	Lafreniere Dr. SB - LR	0.47	23.8	C	-	61	0.18	13.4	B	-	16

¹ Volume to Capacity Ratio; ² Vehicle Delay, measured in seconds; ³ Level Of Service; ⁴ 50th Percentile Queue (in feet); ⁵ 95th Percentile Queue (in feet) based upon 22 feet per vehicle; * = Defacto Left Lane; # = volume exceeds capacity, queue may be longer; m = 95th percentile queue is metered by upstream signal; ~ = Volume exceeds capacity, queue is theoretically infinite

Table 10 – Level of Service Summary - 2024 Build Conditions

INTERSECTION	MOVEMENT	WEEKDAY MORNING PEAK HOUR					WEEKDAY EVENING PEAK HOUR				
		V/C ¹	DELAY ²	LOS ³	50th Q ⁴	95th Q ⁵	V/C ¹	DELAY ²	LOS ³	50th Q ⁴	95th Q ⁵
Bolton Street at Hudson Street	Hudson St EB - LT	0.52	59.5	E	55	100	0.56	59.0	E	69	119
	Hudson St EB - R	0.39	12.9	B	0	48	0.24	5.5	A	0	20
	Navin Arena WB - LTR	0.03	0.2	A	0	0	0.03	41.5	D	3	13
	Bolton St NB - L	0.70	53.0	D	59	157	0.16	10.9	B	14	33
	Bolton St NB - TR	0.49	11.4	B	200	324	0.66	16.1	B	333	546
	Bolton St SB - L	0.00	14.0	B	0	3	0.01	15.5	B	1	5
	Bolton St SB - TR	0.97	49.7	D	658	1036	0.75	28.1	C	401	629
	Overall	0.97	36.0	D			0.75	22.9	C		
Bolton Street at Poirier Drive	Bolton St NB - TR	0.44	0.0	A	-	0	0.48	0.0	A	-	0
	Bolton St SB - LT	0.17	4.2	A	-	15	0.12	2.9	A	-	10
	Poirier Dr WB - LR	5.24	Error	F	-	>800	2.05	562.0	F	-	492
Bolton Street at Union Street	Union St EB - LTR	1.29	183.1	F	221	382	0.95	75.3	E	114	257
	Union St WB - LTR	1.13	113.3	F	241	419	0.96	63.5	E	187	369
	Bolton St NB - L	0.25	18.6	B	14	40	0.20	17.3	B	11	33
	Bolton St NB - TR	0.84	31.5	C	285	489	0.68	23.1	C	210	324
	Bolton St SB - L	1.23	182.8	F	94	207	0.78	46.8	D	69	181
	Bolton St SB - TR	0.73	24.6	C	229	354	0.73	24.4	C	225	349
	Overall	1.29	78.7	E			0.96	40.2	D		
Union Street at Thresher Drive	Union St EB - LT	0.16	4.2	A	-	14	0.03	1.1	A	-	2
	Union St WB - TR	0.31	0.0	A	-	0	0.22	0.0	A	-	0
	Thresher Dr SB - LR	0.71	48.7	E	-	120	0.44	18.8	C	-	55
Union Street at Stevens Street	Union St EB - LR	0.69	20.4	C	-	-	0.56	13.7	B	-	-
	Stevens St SB - TR	0.53	14.9	B	-	-	0.23	9.6	A	-	-
	Stevens St NB - LT	0.66	20.2	C	-	-	0.45	12.8	B	-	-
Stevens Street at Lafreniere Drive	Stevens St EB - LT	0.45	18.1	C	-	57	0.14	9.3	A	-	12
	Stevens St WB - TR	0.12	4.6	A	-	11	0.07	5.9	A	-	6
	Lafreniere Dr SB - LR	0.49	25.3	D	-	65	0.19	13.7	B	-	17

¹ Volume to Capacity Ratio; ² Vehicle Delay, measured in seconds; ³ Level Of Service; ⁴ 50th Percentile Queue (in feet); ⁵ 95th Percentile Queue (in feet) based upon 22 feet per vehicle; * = Defacto Left Lane; # = volume exceeds capacity, queue may be longer; m = 95th percentile queue is metered by upstream signal; ~ = Volume exceeds capacity, queue is theoretically infinite

7.6 Traffic Signal Warrant Methodology

To quantify if additional mitigation would be necessary at the Richer Elementary School on the Poirier Drive Site, based on the student population, or at the access and egress points to the Poirier Drive, we performed a Traffic Signal Warrant Analysis for Bolton Street at Poirier Drive.

We performed the warrants based on the procedures outlined in the *Manual on Uniform Traffic Control Devices*² (MUTCD), 2009 edition. The MUTCD indicates nine separate conditions under which a traffic signal warrant can be met, and they are shown below.

1. Warrant 1: Eight-Hour Vehicular Volume;
2. Warrant 2: Four-Hour Vehicular Volume;
3. Warrant 3: Peak Hour;
4. Warrant 4: Pedestrian Volume;
5. Warrant 5: School Crossing;
6. Warrant 6: Coordinated Signal System;
7. Warrant 7: Crash Experience;
8. Warrant 8: Roadway Network; and
9. Warrant 9: Intersection Near A Grade Crossing.

Given the criteria set forth in the MUTCD and the assumptions above, the Peak Hour Warrant for the intersection of Bolton Street at Poirier Drive traffic signal warrant was met. The intersection also experienced a crash rate of 0.80 per MEV, which is above both the District 3 and statewide averages for unsignalized intersections. This demonstrates that this intersection can benefit from the installation of a semi-actuated traffic signal system. We believe that this and the recommendations outlined in Section 8.2 would represent the best return on investment with regards to handling the estimated traffic to and from the new Richer Elementary School. The Traffic Signal Warrant Analysis is included in Appendix A-5.

7.7 2024 Mitigated Conditions Capacity Analysis

Nitsch Engineering analyzed the 2024 Mitigated Conditions traffic operations at the study intersections for construction of a new Richer Elementary School on Poirier Drive site. The 2024 Mitigated Conditions represents the 2024 Build Conditions traffic volumes with the addition of an exclusive left-turn lane to Poirier Drive at the intersection of Bolton Street at Poirier Drive. The Level of Service Summary is shown in Table 11. The analysis worksheets are provided in Appendix A-6.

² Manual on Uniform Traffic Control Devices for Streets and Highways, 2009 Edition, Federal Highway Administration

Table 11 – Level of Service Summary - 2024 Build Conditions - Mitigated

INTERSECTION	MOVEMENT	WEEKDAY MORNING PEAK HOUR					WEEKDAY EVENING PEAK HOUR				
		V/C ¹	DELAY ²	LOS ³	50th Q ⁴	95th Q ⁵	V/C ¹	DELAY ²	LOS ³	50th Q ⁴	95th Q ⁵
Bolton Street at Hudson Street	Hudson St EB - LT	0.52	59.5	E	55	100	0.56	59.0	E	69	119
	Hudson St EB - R	0.39	12.9	B	0	48	0.24	5.5	A	0	20
	Navin Arena WB -LTR	0.03	0.2	A	0	0	0.03	41.5	D	3	13
	Bolton St NB - L	0.70	53.0	D	59	157	0.16	10.9	B	14	33
	Bolton St NB - TR	0.49	11.4	B	200	324	0.66	16.1	B	333	546
	Bolton St SB - L	0.00	14.0	B	0	3	0.01	15.5	B	1	5
	Bolton St SB - TR	0.97	49.7	D	658	1036	0.75	28.1	C	401	629
	Overall	0.97	36.0	D			0.75	22.9	C		
Bolton Street at Poirier Drive	Bolton St NB - TR	0.59	9.5	A	172	312	0.69	12.0	B	145	372
	Bolton St SB - L	0.38	10.0	B	29	76	0.33	10.3	B	12	50
	Bolton St SB - T	0.61	10.4	B	203	359	0.52	8.4	A	93	215
	Poirier Dr WB -LR	0.78	42.4	D	119	206	0.63	20.5	C	44	100
	Overall	0.78	15.2	B			0.69	11.8	B		
Bolton Street at Union Street	Union St EB - LTR	1.29	183.1	F	221	382	0.95	75.3	E	114	257
	Union St WB - LTR	1.13	113.3	F	241	419	0.96	63.5	E	187	369
	Bolton St NB - L	0.25	18.6	B	14	40	0.20	17.3	B	11	33
	Bolton St NB - TR	0.84	31.5	C	285	489	0.68	23.1	C	210	324
	Bolton St SB - L	1.23	182.8	F	94	207	0.78	46.8	D	69	181
	Bolton St SB - TR	0.73	24.6	C	229	354	0.73	24.4	C	225	349
	Overall	1.29	78.7	E			0.96	40.2	D		
Union Street at Thresher Drive	Union St EB - LT	0.16	4.2	A	-	14	0.03	1.1	A	-	2
	Union St WB - TR	0.31	0.0	A	-	0	0.22	0.0	A	-	0
	Thresher Dr SB-LR	0.71	48.7	E	-	120	0.44	18.8	C	-	55
Union Street at Stevens Street	Union St EB - LR	0.69	20.4	C	-	-	0.56	13.7	B	-	-
	Stevens St SB - TR	0.53	14.9	B	-	-	0.23	9.6	A	-	-
	Stevens St NB-LT	0.66	20.2	C	-	-	0.45	12.8	B	-	-
Stevens Street at Lafreniere Drive	Stevens St EB - LT	0.45	18.1	C	-	57	0.14	9.3	A	-	12
	Stevens St WB-TR	0.12	4.6	A	-	11	0.07	5.9	A	-	6
	Lafreniere Dr. SB - LR	0.49	25.3	D	-	65	0.19	13.7	B	-	17

¹ Volume to Capacity Ratio; ² Vehicle Delay, measured in seconds; ³ Level Of Service; ⁴ 50th Percentile Queue (in feet); ⁵ 95th Percentile Queue (in feet) based upon 22 feet per vehicle; * = Defacto Left Lane; # = volume exceeds capacity, queue may be longer; m = 95th percentile queue is metered by upstream signal; ~ = Volume exceeds capacity, queue is theoretically infinite

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

Nitsch Engineering has been retained by Lamoureux Pagano Architects (LPA) to prepare a qualitative assessment of safety, traffic circulation, and traffic access/egress, associated with the feasibility study and schematic design for the proposed Richer Elementary School project located in Marlborough, Massachusetts.

The Project includes construction of a new elementary school building and grounds on the site adjacent to the existing Marlborough High School, located at 431 Bolton Street in Marlborough.

The report describes the project area, presents traffic counts (taken in 2017), and analyzes existing and future traffic operating efficiency. The data was used to determine the traffic circulations, overall operations, and to evaluate the traffic impacts of the proposed school.

The standards used for analysis conform to the 2009 edition of the Manual on Uniform Traffic Control Devices (MUTCD) and the 2010 edition of the Highway Capacity Manual.

The following conditions were analyzed in this report:

- Existing Conditions 2017;
- Future 2024 No-Build;
- Future 2024 Build; and
- Future 2024 Build - Mitigated

We examined the future conditions, as well as site circulation with respect to the projected student drop-off and pick-up at the new Richer Elementary School at the Poirier Drive site. This would result in an increase in traffic volumes within the study area during the weekday morning drop-off and weekday afternoon pick-up, totaling approximately 275 additional trips (entering and exiting) during the weekday morning drop-off, and approximately 171 additional trips (entering and exiting) during the weekday afternoon pick-up. The parking lot 40 visitor spaces, and the curb at the car loop can accommodate approximately 5 vehicles. An approximately 600 feet long pull out lane along southerly side of Poirier Drive can also accommodate additional 30 vehicles.

We anticipate that the following summarizes the vehicular circulation at the new Reicher Elementary School at the Poirier Drive site during morning drop-off and afternoon pick-up periods:

- During the morning drop-off, the parents (approximately 124 vehicles) will arrive between 7:30 and 8:00 AM. They will drop-off their children at the car loop and exit the school. Our analysis indicate that during the morning drop-off, the 95th Percentile Queue length on the Poirier Drive for the left and right turns to Bolton Street will be 206 feet (approximately ten vehicles), and the 95th Percentile Queue length on Bolton Street for the left turn to Poirier Drive will be 76 feet (approximately four vehicles).
- During the afternoon pick-up, the parents (approximately 77) will start arriving between 2:30 and 3:00 PM. The parking lot can accommodate approximately 80 vehicles to park, and 10 vehicles can park along the car loop curb line without spilling out of the car loop and blocking the driveway. Once the parents have picked up their children, they will proceed to exit the parking lot and the school. Our analysis indicates that during the afternoon pick-up, the 95th Percentile Queue length on Poirier Drive for the left and right turn to Bolton Street will be 100 feet (approximately five vehicles), and the 95th Percentile Queue length on Bolton Street for the left turn to the Poirier Drive will be 50 feet (approximately two vehicles).

The existing roadway network contains heavy traffic volumes and delays during the weekday morning peak hours, as the Richer Elementary School pick-up and drop-off traffic overlaps slightly with the peak hour of the commuter traffic, as well as Marlborough High School and Whitcomb Middle School. Construction of the Richer Elementary School at Poirier Drive site may add impacts to the off-site intersections. To mitigate the impacts, minor geometric improvements and signal installation may be necessary. Nitsch Engineering has outlined recommendations to improve traffic conditions based on the estimated increase in traffic volumes due to the Richer Elementary School construction.

8.2 Recommendations

Based on the proposed Richer Elementary School at Poirier Drive Site, Nitsch Engineering offers the following recommendations:

- Install a semi-actuated traffic signal system at the intersection of Bolton Street (Route 85) at Poirier Drive.
- Designate an exclusive left-turn lane at Bolton Street (Route 85) southbound approach to intersection at Poirier Drive.
- Designate the area as a School Zone under State and local statute, and install the appropriate School Zone signs, which can also act as traffic calming devices.
- Enhance pedestrian experience along Bolton Street and Poirier Drive, by considering improvements if needed to the sidewalks to accommodate safe walks to school and provide advanced warning signing of school entering and exiting traffic.
- Install ADA accessible crosswalks where needed.
- Evaluate installing exclusive turning lanes at Bolton Street for school traffic.

Proposed Space Summary- Elementary Schools

Richer Elementary School Poirier Road, Marlborough, MA		Existing Conditions		
ROOM TYPE	ROOM NFA ¹	# OF RMS	area totals	
CORE ACADEMIC SPACES				0
<i>(List classrooms of different sizes separately)</i>				
Pre-Kindergarten w/ toilet				
Kindergarten w/ toilet				
General Classrooms - Grade 1-5				
ELL				
Common Area				
SPECIAL EDUCATION				0
<i>(List rooms of different sizes separately)</i>				
Self-Contained SPED				
Self-Contained SPED - toilet				
Self-Contained SPED				
Self-Contained SPED - toilet				
Self-Contained SPED				
Self-Contained SPED - toilet				
Resource Room				
Small Group Room / Reading				
OT/PT				
Daily Living Skills/Health				
Daily Living Skills - toilet				
ELA Math Specialist				
Sped Suite Chair Suite				
ART & MUSIC				0
Art Classroom - 25 seats				
Art Workroom w/ Storage & kiln				
Music Classroom / Large Group - 25-50 seats				
Music Practice / Ensemble				
Music Storage				
HEALTH & PHYSICAL EDUCATION				0
Gymnasium				
Gym Storeroom				
Health Instructor's Office w/ Shower & Toilet				
MEDIA CENTER				0
Media Center / Reading Room				
DINING & FOOD SERVICE				0
Cafeteria / Dining				
Stage				
Chair / Table / Equipment Storage				
Chair / Table / Equipment Storage				
Kitchen				
Staff Lunch Room				
MEDICAL				0
Medical Suite Toilet				
Nurses' Office / Waiting Room				
Nurses' Office / Waiting Room				
Examination Room / Resting				
Examination Room / Resting				

PROPOSED								
Existing to Remain/Renovated			New			Total		
ROOM NFA ¹	# OF RMS	area totals	ROOM NFA ¹	# OF RMS	area totals	ROOM NFA ¹	# OF RMS	area totals
		0			35,780			35,780
								950
			1,200	5	6,000	1,200	5	6,000
			935	25	23,375	935	25	23,375
			935	3	2,805	935	3	2,805
			600	6	3,600	600	6	3,600
		0			11,800			11,800
			995	1	995	995	1	995
			60	1	60	60	1	60
			1,000	3	3,000	1,000	3	3,000
			60	3	180	60	3	180
			980	1	980	980	1	980
			60	1	60	60	1	60
			480	5	2,400	480	5	2,400
			465	2	930	465	2	930
			935	1	935	935	1	935
			965	1	965	965	1	965
			85	1	85	85	1	85
			730	1	730	730	1	730
			480	1	480	480	1	480
		0			3,800			3,800
			1,000	2	2,000	1,000	2	2,000
			150	2	300	150	2	300
			1,200	1	1,200	1,200	1	1,200
			75	0	0	75	0	0
			300	1	300	300	1	300
		0			6,300			6,300
			6,000	1	6,000	6,000	1	6,000
			150	1	150	150	1	150
			150	1	150	150	1	150
		0			3,415			3,415
			3,415	1	3,415	3,415	1	3,415
		0			8,141			8,141
			4,400	1	4,400	4,400	1	4,400
			1,000	1	1,000	1,000	1	1,000
			148	1	148	148	1	148
			255	1	255	255	1	255
			1,910	1	1,910	1,910	1	1,910
			428	1	428	428	1	428
		0			700			700
			60	1	60	60	1	60
			160	1	160	160	1	160
			180	1	180	180	1	180
			120	1	120	120	1	120
			180	1	180	180	1	180

Date: Enter Date Enter Submittal			
MSBA Guidelines (refer to MSBA Educational Program & Space Standard Guidelines)			
ROOM NFA ¹	# OF RMS	area totals	Comments
	27	26,900	
1,200		-	1,100 SF min - 1,300 SF max
1,200	5	6,000	1,100 SF min - 1,300 SF max
950	22	20,900	900 SF min - 1,000 SF max
		7,550	
950	5	4,750	900-1,300 SF equal to surrounding classrooms
60	5	300	
500	3	1,500	1/2 size Genl. Clrm.
500	2	1,000	1/2 size Genl. Clrm.
		5,000	
1,000	2	2,000	assumed schedule 2 times / week / student
150	2	300	
1,200	2	2,400	assumed schedule 2 times / week / student
75	4	300	
		6,300	
6,000	1	6,000	6000 SF Min. Size
150	1	150	
150	1	150	
		3,415	
3,415	1	3,415	
		8,141	
4,575	1	4,575	2 seatings - 155SF per seat
1,000	1	1,000	
403	1	403	
1,910	1	1,910	1600 SF for first 300 + 1 SF/student Add'l
253	1	253	20 SF/Occupant
		610	
60	1	60	
250	1	250	
100	3	300	

Proposed Space Summary- Elementary Schools

Richer Elementary School Poirier Road, Marlborough, MA		Existing Conditions	
ROOM TYPE	ROOM NFA ¹	# OF RMS	area totals
ADMINISTRATION & GUIDANCE			0
General Office / Waiting Room / Toilet			
Teachers' Mail and Time Room			
Duplicating Room			
Records Room			
Principal's Office w/ Conference Area			
Principal's Office w/ Conference Area			
Principal's Secretary / Waiting			
Assistant Principal's Office			
Supervisory / Spare Office			
Conference Room			
Guidance Office			
Interpreters Office			
Guidance Storeroom			
Teachers' Work Room			
CUSTODIAL & MAINTENANCE			0
Custodian's Office			
Custodian's Workshop			
Custodian's Storage			
Recycling Room / Trash			
Receiving and General Supply			
Storeroom			
Network / Telecom Room			

PROPOSED								
Existing to Remain/Renovated			New			Total		
ROOM NFA ¹	# OF RMS	area totals	ROOM NFA ¹	# OF RMS	area totals	ROOM NFA ¹	# OF RMS	area totals
		0			2,755			2,755
			455	1	455	455	1	455
			100	1	100	100	1	100
			150	1	150	150	1	150
			110	1	110	110	1	110
			190	1	190	190	1	190
			185	1	185	185	1	185
			125	1	125	125	1	125
			120	1	120	120	1	120
			120	1	120	120	1	120
			250	1	250	250	1	250
			150	2	300	150	2	300
			200	1	200	200	1	200
			35	0	0	35	0	0
			225	2	450	225	2	450
		0			2,210	0	0	2,210
			150	1	150	150	1	150
			375	1	375	375	1	375
			375	1	375	375	1	375
			400	1	400	400	1	400
			303	1	303	303	1	303
			407	1	407	407	1	407
			200	1	200	200	1	200

Date: Enter Date Enter Submittal			
MSBA Guidelines (refer to MSBA Educational Program & Space Standard Guidelines)			
ROOM NFA ¹	# OF RMS	area totals	Comments
		2,595	
455	1	455	
100	1	100	
150	1	150	
110	1	110	
375	1	375	
125	1	125	
120	1	120	
120	1	120	
250	1	250	
150	2	300	
35	1	35	
455	1	455	
		2,210	
150	1	150	
375	1	375	
375	1	375	
400	1	400	
303	1	303	
407	1	407	
200	1	200	

Proposed Space Summary- Elementary Schools

Richer Elementary School Poirier Road, Marlborough, MA		Existing Conditions	
ROOM TYPE	ROOM NFA ¹	# OF RMS	area totals
OTHER			0
Other (specify)			
Total Building Net Floor Area (NFA)			0
Proposed Student Capacity / Enrollment			
NON-PROGRAMMED SPACES			
Other Occupied Rooms (list separately)			
Staff Lunch			
IT Workroom			
Unoccupied MEP/FP Spaces			
Unoccupied Closets, Supply Rooms & Storage Rooms			
Toilet Rooms			
Circulation (corridors, stairs, ramps & elevators)			
Remaining ³			
Total Building Gross Floor Area (GFA) ²			
Grossing factor (GFA/NFA)			#DIV/0!

PROPOSED								
Existing to Remain/Renovated			New			Total		
ROOM NFA ¹	# OF RMS	area totals	ROOM NFA ¹	# OF RMS	area totals	ROOM NFA ¹	# OF RMS	area totals
		0			0	0	0	
					0	0	0	
		0			74,901			74,901
	% of GFA	0		% of GFA	36,529		% of GFA	36,529
#DIV/0!				0%			#DIV/0!	
#DIV/0!				0%	315		#DIV/0!	3
#DIV/0!				0%	200		#DIV/0!	2
#DIV/0!				0%			#DIV/0!	
#DIV/0!				1%	1,400		#DIV/0!	1,4
#DIV/0!				1%	655		#DIV/0!	6
#DIV/0!				2%	2,415		#DIV/0!	2,4
#DIV/0!				18%	19,830		#DIV/0!	19,8
#DIV/0!	0			11%	11,714		#DIV/0!	11,7
					111,430			
	#DIV/0!				1.49			0.0

Date: Enter Date		Enter Submittal	
MSBA Guidelines (refer to MSBA Educational Program & Space Standard Guidelines)			
ROOM NFA ¹	# OF RMS	area totals	Comments
		0	
		62,721	
		610	
			Non-Programmed space areas are required to be included in the following submittals:
			Schematic Design Submittal
			Design Development Submittal
			60% Construction Documents
			90% Construction Documents
			Final Construction Documents
		88,450	
		1.41	

¹ Individual Room Net Floor Area (NFA)

Includes the net square footage measured from the inside face of the perimeter walls and includes all specific spaces assigned to a particular program area including such spaces as non-communal toilets and storage rooms.

² Total Building Gross Floor Area (GFA)

Includes the entire building gross square footage measured from the outside face of exterior walls

³ Remaining

Includes exterior walls, interior partitions, chases, and other areas not listed above. Do not calculate this area, it is assumed to equal the difference between the Total Building Gross Floor Area and area not accounted for above.

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: Mount Vernon Group Architects

Name of Principal Architect: Dennis Daly

Signature of Principal Architect:

Date: 2/18/2018