ARROWSTREET

MEDFIELD MUNICIPAL BUILDING CAPITAL PLAN & DECARBONIZATION STUDY

20 YEAR MASTERPLAN

APRIL 2025

PREPARED FOR

TOWN OF MEDFIELD, MA

ARROWSTREET

Medfield Municipal Building Capital Plan & Decarbonization Study

20 Year Masterplan
December, 2024

I. OVERVIEW

Executive Summary

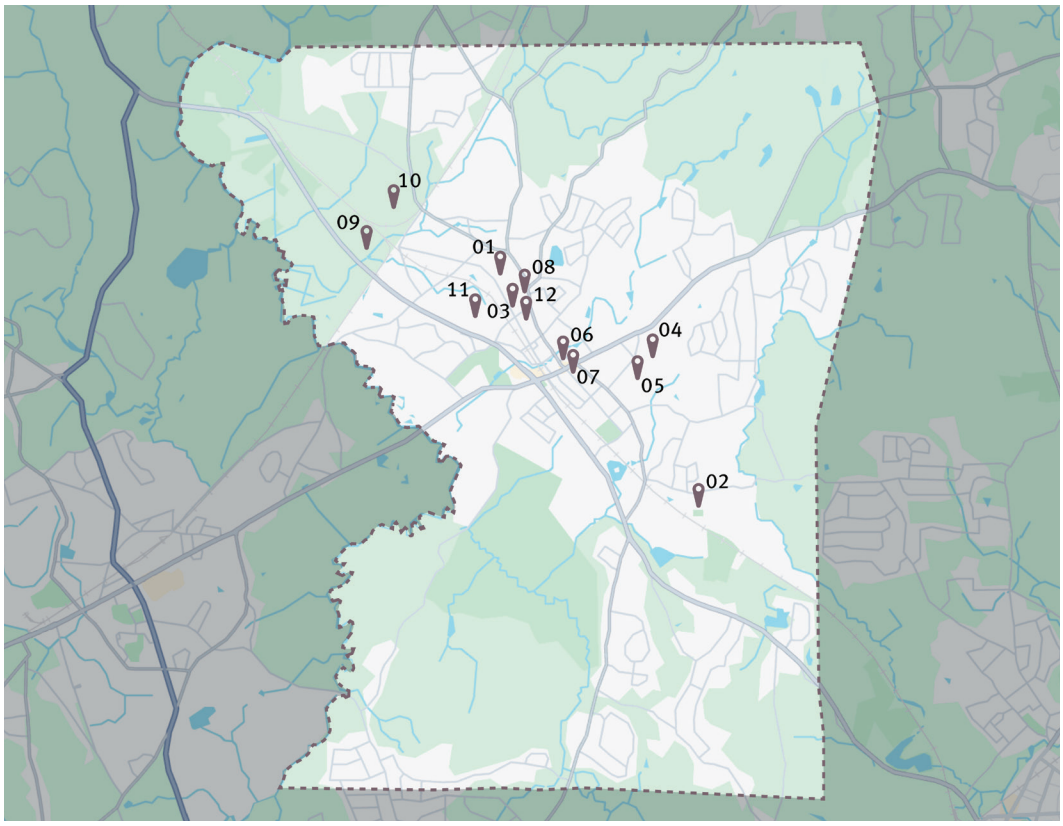
The Medfield Municipal Building Capital Plan & Decarbonization Study is intended to capture the current condition of the Town's municipal building inventory, develop recommendations for capital repairs and maintenance for the next 20 years, and propose solutions for how to electrify the existing building stock. This study was overseen by Benjamin Jachowicz, the Project Manager for the Town of Medfield, Massachusetts, who summarized capital projects that the Town has undertaken since the previous study, facilitated site tours, and provided project documentation for review. Preliminary recommendations were reviewed with the Town for feedback prior to pricing.

CONSULTANT TEAM

Arrowstreet Inc.: Architecture & Planning
GGD Consulting Engineers, Inc.: MEP/FP Engineering
RSE Associates Inc.: Structural Engineering
enviENERGY Studio: Energy and Solar Capacity
Code Red: Code Consulting
PM&C: Cost Estimating

The Town of Medfield has twelve (12) buildings that were included in this study:

1. Memorial School
2. Ralph Wheelock School
3. Dale Street School
4. Thomas Blake Middle School
5. Medfield High School
6. Medfield Town House
7. Medfield Public Library
8. Pfaff Building (Medfield Parks & Recreation)
9. Medfield Transfer Station
10. The Center at Medfield (Council on Aging)
11. Department of Public Works
12. Public Safety Building



Locus Map of the Building Locations Included in Study

OBJECTIVES

This report is in alignment with the Town of Medfield's 20-Year Buildings Stabilization Plan (20-Year Plan) which aims to develop cost-effective energy efficiency strategies, including transitioning from fossil fuel burning HVAC equipment, utilizing alternative/renewable energy resources, monitoring and reporting energy use, promoting healthy indoor environments and air quality, and consider climate resiliency objectives to reduce maintenance and foster public safety.

RECOMMENDATIONS

This report outlines all capital repairs/replacement neccessary over the next 20 years until 2045 based on the observed conditions of each building. Each recommendation was cost estimated for that individual item. Savings may be seen if multiple items in the same category are performed at the same time. The table on the next page is the summary of pricing by priority. Detailed back up for each building can be found in Section II.

BUILDING SPECIFIC RECOMMENDATIONS

Pfaff Building

This building is well past its useful life and is in need of a major renovation or upgrade. The team observed immediate repairs concerning potential structural issues during the review for this study. We recommend limited occupancy of this building at this time and have relayed these findings and recommendations to the Town prior to the issuance of this report.

Dale St. School

This building is well past its useful life and is in need of a major renovation or upgrade. While we have outlined capital projects for this building there are other significant educational considerations. The Town of Medfield has submitted this project for the second time to the Massachusetts School Building Authority after a failed town vote in 2021.

Medfield Public Library

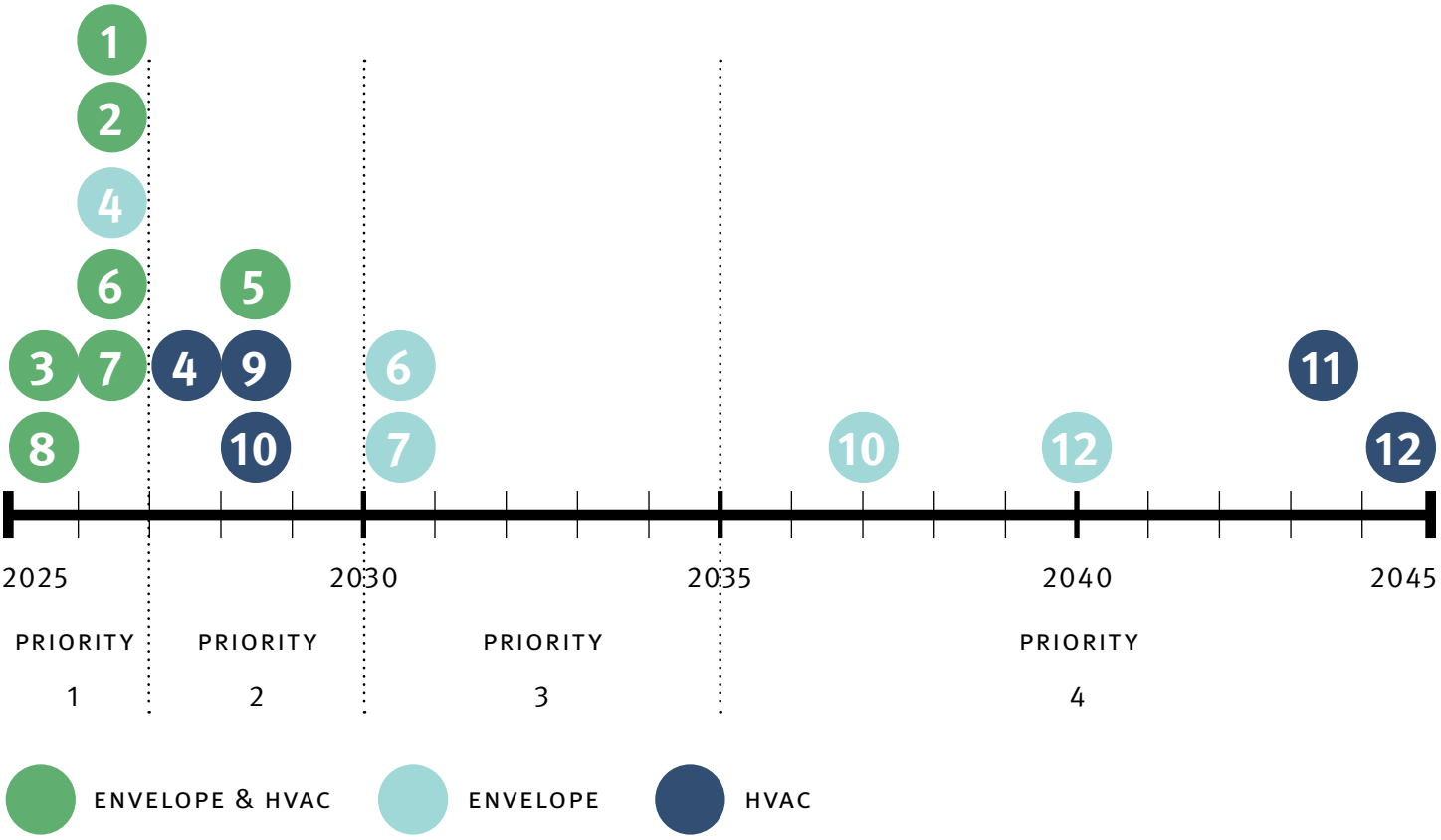
This building has experienced wide spread water leakage in the oldest portion of the building. We recommend mold testing be performed before any repair work is done so that if necessary remidiation can occur with the repair work.

RECOMMENDATIONS TIMELINE

The timeline on the next page lays out envelope upgrades (roofing and/or window replacement) projects in light blue, HVAC projects in dark blue, and combined HVAC and envelope upgrade projects in green for the buildings. Alignment to years is approximate and represents a potential ordering and prioritization of projects to address the major capital needs for HVAC and envelope.

We do not recommend replacing HVAC equipment with electric options prematurely. This replacement should occur close to the anticipated end of life of the existing equipment. However, when equipment is switched we recommend pairing necessary envelope upgrades with that work because an air-tight thermally improved envelope is neccessary for heating and cooling systems to operate efficiently and minimize utility cost.

TIMELINE FOR UPGRADES TO BUILDINGS



COST SUMMARY

		PRIORITY 1	PRIORITY 2	PRIORITY 3	PRIORITY 4	PRIORITY 5	TOTAL	ADDITIONAL FOR ELECTRIFICATION
1	Memorial School	$7,107,485	$3,739,288	$319,540		$116,000	$11,282,313	$8,903,921
2	Wheelock School	$9,219,060	$3,560,056	$3,992,830	$7,385	$1,131,000	$17,910,331	$6,284,924
3	Dale St. School	$13,911,403	$2,162,285	$1,022,250			$17,095,938	$7,768,255
4	Blake Middle	$13,516,437	$3,386,090	$2,702,252	$130,500	$116,000	$19,851,279	$13,818,907
5	High School	$4,806,735	$26,388,747	$2,762,145			$33,957,627	$13,019,492
6	Town House	$239,420	$2,000,779	$1,737,198			$3,977,396	$2,294,335
7	Public Library	$1,661,307	$784,739	$1,387,082			$3,833,182	$1,461,136
8	Pfaff Building	$3,769,837	$1,485,710	$203,000			$5,458,546	
9	Transfer Station	$12,325	$257,595	$23,551			$293,471	
10	Council on Aging	$50,727	$1,034,640	$740,544	$839,133	$61,371	$2,726,415	
11	Dept Public Works	$407,450	$543,198	$13,050	$2,068,425		$3,032,123	$4,791,097
12	Public Safety	$57,275	$40,600	$51,308	$177,002	$2,033,690	$2,359,875	$3,202,180
Totals		**54,759,460**	**45,383,780**	**14,954,750**	**3,222,444**	**$3,458,062**	**121,778,495**	**$61,544,247**

Process Overview

The work occured in two phases, a discovery phase and a recommendation phase. The team visited each of the twelve (12) buildings with the intent to:

- Determine the existing conditions of each building, with emphasis on the building envelope and MEP systems.
- Identify necessary capital repairs to be considered within the next ten years.
- Provide building electrification opportunities based on system condition and/or required capital repairs.

DISCOVERY PHASE

During the discovery phase, the team referenced previous studies, reports, and drawings provided by the Town of Medfield. These documents provided a basis to understand work that had been completed in recent years, and the current efficiency and energy usage by the buildings.

The following relevant documents were reviewed as part of this study:

- Medfield Energy Audits by Energy Management Associates, Inc. dated June 2024
- The 2021 Town of Medfield Self-Evaluation and Transition Plan
- Town of Medfield Municipal Facilities Evaluation and Capital Plan dated October 6, 2017
- Roof Condition Survey Report by Russo Barr Associates dated January 30, 2017
- The Town of Medfield Energy Reduction Plan dated November 2016
- Medfield Library HVAC Report by Keyes North Atlantic, Inc. dated February 08, 2012
- Evaluation of Existing Dale St. School Facility by Arrowstreet Inc. dated 2020
- Medfield Middle School Weatherization and VFD Proposal by Northern Energy Services
- Town of Medfield Warrant Reports (2017-2024)
- Property Assessment Cards
- Partial or Full Drawing sets for the following buildings:
  - » Memorial School plans by Design Partnership of Cambridge dated 2002
  - » Ralph Wheelock School plans by KLQ, Inc. dated July 16, 1968
  - » Dale Street School renovation plans by KLQ, Inc. dated June 12, 1996
  - » The Center at Medfield plans by Graham/Meus Architecture dated March 9, 2004
  - » Department of Public Works as-built drawings by Castagna Construction dated December 18, 2014
  - » Public Safety Building as-built drawings by G&R Construction dated December 20, 2016

The team began by compiling the available documentation and previous recommendations made in the 2017 Town of Medfield Municipal Facilities Evaluation and Capital Plan. Previous recommendations that were addressed and/or work completed since 2017 were removed while recommendations that have not been addressed since 2017 and are still relevant have remained on the list. Additional recommendations for accessibility barriers identified in the most recent round of Title II assessments, included in the 2021 Self-Evaluation and Transition Plan were also added to the list of recommendations.

Arrowstreet and GGD then visited each of the properties to observe and evaluate the existing building conditions with a primary focus on the building envelope (exterior finishes, fenestration, joints, and sealants), MEP building systems (electrical and lighting, HVAC, plumbing, and fire protection), and interior finishes. Consideration was also given to potential improvements related to building and life/safety codes. RSE reviewed the Pfaff Building, Wheelock School, Dale St School, High School and Town Hall.

ENERGY & EMISSIONS ASSESSMENT

Of the twelve (12) buildings in this study, only the Transfer Station is already electrified and fossil fuel free. Eleven (11) buildings were studied for electrification.

Refer to Energy & Emission Reductions in Section III for a more detailed methodology. Anticipated reduction in energy use was determined through benchmarking based on recommendations, no energy modeling was performed. The associated emissions for the existing and reduced energy use of each building was then determined based on fuel source.

SOLAR CAPACITY ANALYSIS

Buildings with the inability to support rooftop PV and those with historical context were not included in the PV assessment.

The following buildings have or are in process to have PV installed:

- Thomas Blake Middle School
- Medfield High School
- Memorial School parking canopy
- Department of Public Works
- Public Safety Building

Each building's structural capacity to accommodate rooftop solar was analyzed at a high level based on the building's construction type and age to estimate if any reserve capacity exists. It is assumed that PV panels are supported with ballast with an allowance of 15 psf. Mechanically attached systems could also be considered, but additional wind and snow loads would apply and need to be analyzed.

Not Recommended

These building structures are not likely to have any reserve capacity to support a rooftop PV array and were not studied for PV.

- Dale St. School
- Town House
- Public Library
- Pfaff Building
- Transfer Station

Not Recommended w/o Additional Analysis and/or Improvements

These building structures are potential candidates for rooftop PV, but require additional structural analysis in order to confirm. This would include an engineering analysis of roof structure and connections and applicable live/dead loads. Based on this analysis, structural members or connections may need to be reinforced to support additional loads imposed by a rooftop PV array.

- Memorial School
- Wheelock School
- Blake Middle School

Likely Possible

These building structures are more likely to have the reserve capacity to accommodate a rooftop PV array. Engineering analysis of the structure would be required to determine and quantify the reserve capacity. If it is determined that roof framing members do not have adequate capacity, it may be feasible to support a PV array on a dunnage steel platform supported by existing structural columns.

- Medfield High School
- Council on Aging

FACILITY REPORT

Each building includes a summary and recommendation report in Section II that outlines the existing condition and presents capital and electrification recommendations. These are cataloged in the following format for each of the buildings:

Cover Page

A. Building Name & Cover Photo

B. Facility Information

- Address
- Building Use
- Year Built
- Major Renovation
- Building Area Gross Square Feet
- Assessed Value
- On-site Combustion
- Capacity for Solar

C. Location Map

D. Energy and Emissions Summary Table

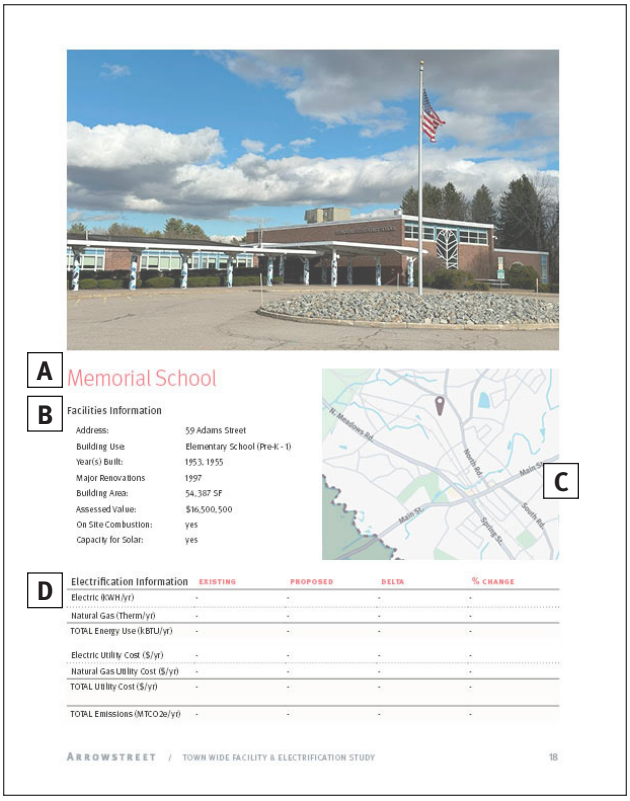
- Existing, Proposed, and Change in Energy Use
- Existing, Proposed, and Change in Utility Cost
- Existing, Proposed, and Change in Emissions [1]

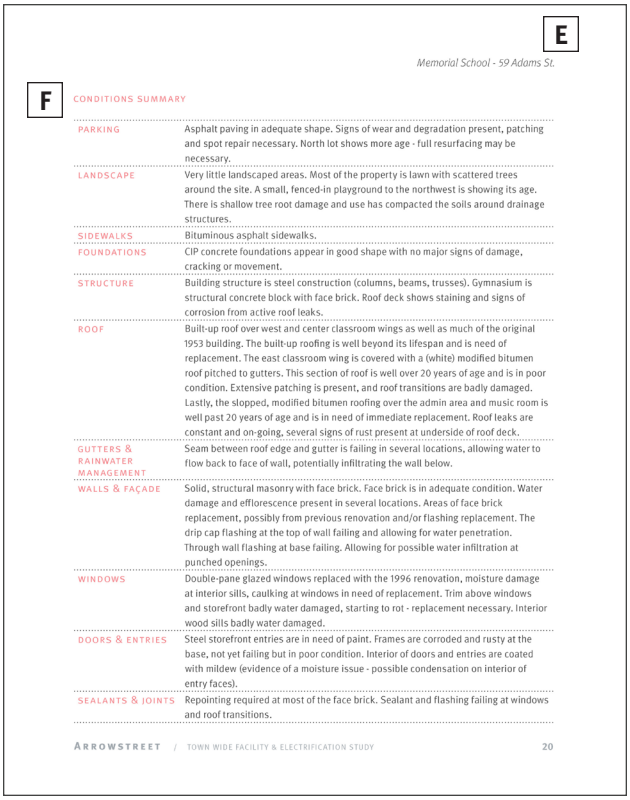
Conditions Summary Pages

E. Building Identification Label

F. Condition narratives covering the following topics:

- Parking
- Landscape
- Sidewalks
- Foundations
- Structure
- Roof
- Gutters & Rainwater Management





1 Proposed emissions will continue into the future until the electrical grid is 100% renewable (expected to be in 2050). Refer to Carbon Emissions in section III for more information.

- Exterior Walls, Windows, Doors
- Joints & Sealants
- Flooring
- Walls
- Ceilings
- Stairs & Vertical Circulation
- Plumbing, Water Distribution, Sanitary Waste
- Electrical Systems & Lighting
- Heating, Cooling, & Ventilation (HVAC)
- HVAC Controls
- Fire Protection & Sprinklers

Recommendations Pages

G. Building Identification Label

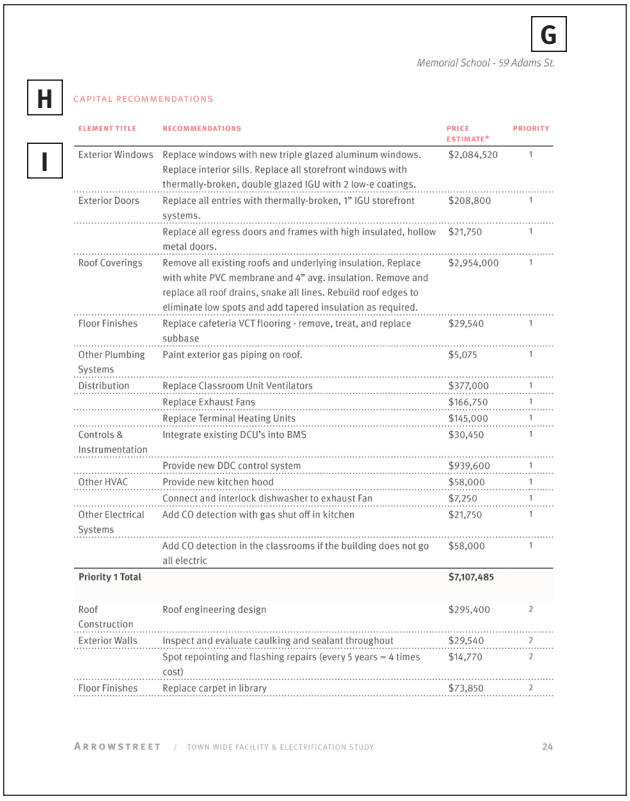
H. Recommendations Type (Capital or Electrification): With the exception of Pfaff Building, Transfer Station, and Council on Aging, the "Capital Recommendations" section includes a non-electrified business as usual HVAC option. Mechanical and electrical items needed for the HVAC electrification option are listed under "Electrification Recommendations."

I. List of Recommendations with the following information:

- Element Title
- Recommendations with descriptions
- Price Estimate: Current pricing including all markups.
- Priority: Recommendations are sorted with highest priority first.

Priority Description

- Priority 1 - Currently Critical (1-2 yrs)
  - » Conditions require immediate action to correct a safety hazard, stop accelerated deterioration, return a facility to operation, or correct an environmental hazard
- Priority 2 - Potentially Critical (3-5 yrs)
  - » Conditions will soon become critical if not addressed. Conditions include intermittent operations, rapid deterioration, potential life safety hazards, and environmental non-compliance
- Priority 3 - Necessary, Not Yet Critical (6-9 yrs)
  - » Conditions require attention to preclude predictable deterioration or potential downtime and damage if the condition continues to be deferred.
- Priority 4 - Recommended (10-19 yrs)
  - » Conditions are a sensible improvement to existing conditions and would improve the overall usability and/or reduce maintenance costs.
- Priority 5 - 20+ yrs or Grandfathered
  - » Conditions do not meet existing codes or standards but are 'grandfathered' in their current condition. No action is required at this time unless substantial work is undertaken in contiguous area, certain existing condition may require correction.



ABBREVIATIONS

The following abbreviations are used throughout the report

AHU	Air Handling Unit
DX	Direct Expansion
EA	Each
EUI	Energy Use Intensity
GHG	Green House Gases
GSF	Gross Square Feet
kBTU	Kilo-British Thermal Units
KG	Kilograms
KWH	Kilowatt Hours
LF	Linear Feet
MMBTU	Metric Million British Thermal Units
MTCO2e	Metric Tons of Carbon Dioxide Equivalent
PSF	Pounds per Square Foot
PV	Photo-Voltaic
RTU	Rooftop Unit
SF	Square Feet
YR	Year

1,000 kBTU = 1 MMBTU

1 KWH = 3.412 kBTU

1,000 kg CO2e = 1 MTCO2e

Assumptions & Limitations

This report is the compilation and cumulation of provided documentation, visual observations, and feedback from the Town of Medfield. The future use of this document is subject to the assumptions and limitations contained herein. This report and provided recommendations are the composite of the available data, conclusions gathered from visual observation and reported conditions by town staff. Destructive investigation and testing was not conducted as part of this study. Therefore, concealed conditions are not included in this study and should be investigated at each building as needed. Potential hazardous materials were observed in some buildings. It is not possible to quantify hazardous materials from the methodology employed. It is recommended to employ a hazardous materials testing study to quantify the scope and risk associated with such potential materials prior to undertaking a major renovation or removal of materials.

This study did not address or look at the programmatic or space utilization needs of the buildings.

RECOMMENDATION ASSUMPTIONS

Timing recommendations are constrained by two factors. The first being that the team recognizes that it takes time to procure a design team, prepare bid documents, bid, and construct a capital renovation or repair project.

Non-electrified buildings may have envelope and HVAC systems that would require replacement within the next five years. It is recommended that these items be replaced as fossil fuel free systems. These types of improvements are listed in the capital recommendations section for this reason. The remaining buildings have systems that can be improved after 2030 and are listed in the electrification recommendations as these are not critical or necessary at this time.

The following expected life spans were used to determine replacement schedule for existing equipment.

- Furnace with DX cooling: 15 yrs
- Boilers: 30 yrs
- Rooftop AHUs: 25 yrs
- Ductless mini splits: 15 yrs
- Roofing: 30 yrs
- Wood/Fiberglass/Vinyl windows: 30 yrs
- Aluminum windows: 25 yrs

PRICING ASSUMPTIONS

Pricing for recommended repairs, improvements, and/or electrification strategies is conceptual and does not capture detailed design issues. Some volatility inherent in forecasting construction pricing is to be expected, particularly as the scope of the recommendation gets refined from conceptual level to detailed design.

Recommendations are priced in todays dollars, projects undertaken in future years should be appropriately escalated. Pricing is for anticipated construction cost and does not include design and engineering costs, testing, or other soft costs. Pricing also does not include procurement of potential solar PV generation or any potential structural upgrades or reinforcement required to support rooftop PV.

PV GENERATION ASSUMPTIONS

The rooftop area of each building was modeled based on the existing drawings provided or if no plans then aerial photos, taking into account slope and orientation. Rooftop solar energy generation potential was analyzed using the National Renewable Energy Laboratory's (NREL) PVWatts Calculator. Input assumptions used were:

- Only roof surfaces that are tilted and oriented in an optimal manner to generate a minimum of 17 kWh/sf (58 kBTU/sf) were considered
- Only roof surfaces greater than 100 sf were considered to be suitable for PV installation
- Roof surface available for PV coverage: 70%
- Active PV cell area of PV coverage: 90%

- PV module type: Standard
- Cell material: Crystalline silicon
- Module nominal efficiency: 19%
- Module cover: glass with anti-reflective coating
- Temperature coefficient of power: -0.37%/°C
- Array type: Roof mounted
- Inverter loss factor: 0.96
- Shading loss: 0%
- Snow loss: 0%
- Total system losses: 11.42%
- DC to AC factor: 0.85

CODE ASSUMPTIONS

A detailed code evaluation of all potential code issues at the existing buildings was not performed. Issues raised by previous reports, including accessibility, have been carried forward if the condition continues to apply. In addition, recommendations were evaluated at a high level to identify potential major triggers that fall into the following categories: fire alarm or sprinkler upgrades, structural upgrades, energy code requirements, egress and life safety requirements, and fire rating requirements. Most of the buildings are anticipated to fall into a Level 2 Alteration with no work area due to only modification of the HVAC and envelope systems but no anticipated floor area or programmatic changes.

Sprinklers

Retroactive installation of an automatic Sec. sprinkler system is governed by both (1) MGL Ch. 148 Sec. 26G and (2) the requirements of Chapter 8 of the Massachusetts Existing Building Code (MEBC).

Massachusetts General Law Ch. 148 Sec. 26G requires every building or structure, including major alterations thereto, which totals more than 7,500 GSF to be protected throughout with an automatic sprinkler system. Note that the 7,500 SF threshold includes “the sum total of the combined floor areas for all levels, basements, sub-basements, and additions, in aggregate, measured from the outside walls, irrespective of the existence of interior fire resistive walls, floors and ceilings”.

An advisory document published by the Sprinkler Appeals Board in 2009 expands upon the application of this MGL to existing buildings. An existing building is required to be protected with sprinklers where all the following four (4) conditions are satisfied:

01. Building gross area is more than 7,500 SF.
02. Sufficient water and water pressure exist to serve the system. This should be verified by the project’s sprinkler design engineer of record, however, it is recommended that it be assumed adequate coverage is provided unless proven otherwise.
03. The nature of work to the building is considered as “major”, including any one or more of the following.
    - » The demolition or reconstruction of existing ceilings or installation of suspended ceilings.
    - » The removal and/or installation of sub flooring, not merely the installation or replacement of carpeting or finished flooring.
    - » The demolition and/or reconstruction or repositioning or walls or stairways or doors.
    - » The removal or relocation of a significant portion of the building’s HVAC, plumbing, or electrical systems involving the penetration of walls, floors, or ceilings.
04. The scope of work is proportional to the cost/benefit of sprinkler installation. To evaluate whether this is satisfied, the advisory document lists either of the following as thresholds for requiring sprinkler protection.
    - » Work affects 33% or more of the total gross square footage.
    - » The total cost of the work (excluding cost to install a sprinkler system) is equal to or greater than 33% of the assessed value of the building, as of the date of permit application.

It is the conclusion of the advisory document that if any of the buildings within the scope of this project meets the conditions of items 1 through 4, then it is

reasonable to conclude that the alterations and modifications are considered as major, thus requiring sprinkler protection. However, ultimately it is the determination of the local fire code official to determine whether the renovation is considered as "major" or not.

Based on the above trigger requirements of lacking a current automatic fire protection, building size, assumed water pressure, and recommendations in excess of 33% of the asses value of the building, the only potential structure that would be affected by this law is

- Wheelock School
- Pfaff Building

In addition to the above, the MEBC Chapter 8 also governs automatic sprinkler requirements for work classified as a Level 2 alteration. A Level 2 alteration is defined as:

> *A work area that is 50% or less of the total building area consisting of the reconfiguration of space, the addition or elimination of any doors or windows, the reconfiguration or extension of any system, or the installation of any additional equipment.*

MEBC Section 804.2.2 would require automatic sprinkler protection to be provided throughout the work area where all of the following condition exist:

01. The work area contains exits and corridors that serve an occupant load greater than 30.
02. The work are is required to be provided with automatic sprinkler protection in accordance with 780 CMR Chapter 9 as applicable to new construction.
03. The work area exceeds 50% of the floor area. Work area is defined as:

    That portion or portions of a building consisting of reconfigured spaces as indicated on the construction documents.

In general, it is not anticipated that the recommendations in this report will trigger these conditions, as it is not anticipated for there to be work area associated with reconfiguring spaces.

Structural Upgrades

Detailed structural analysis and any potential upgrades are triggered when alterations either reduce the structural capacity of a load carrying element, increase the stress of structural elements more than 5%, or result in a prohibited structural irregularity as defined in Chapter 8 of the MEBC. It is not anticipated that any of the recommendations would trigger reducing the structural capacity or introducing prohibited structural irregularities.

Re-roofing projects are anticipated to be able to accommodate the additional insulation required without exceeding 5% of the existing stress on the structural members. If this 5% of additional stress is exceeded, detailed analysis of the structural members will be required. This may be an ideal time to evaluate the roof for additional PV loads and determine if there is an optimal balance between potential additional loads and potential reinforcement required.

Energy Code Requirements

Any component of the envelope, mechanical, electrical, or plumbing system will individually need to comply with the applicable energy code provisions at the time of the project, the current code is 2023 MA Stretch Energy Code. Envelope upgrades such as re-roofing, window replacement, exterior wall alteration, and over-cladding projects are required to meet the energy code provisions for u-factor, SHGC, and air leakge. Mechanical, electrical, and plumbing system alterations will be required to comply with the energy code as well. Detailed analysis for energy code compliance was not performed, but it is assumed that the recommendations can be designed in compliance.

Repair, reconstruction, or renewal of any part of an existing building for the purpose of its maintenance or to correct damage, has exceptions in the energy code. Historic structures that can demonstrate that

compliance with a provision would threaten, degrade or destroy the historic form, fabric, or function of the building are not required to comply with that energy code provision.

Egress Requirements

In general, it is not anticipated that occupancy will change, that floor areas will significantly alter, or programmatic factors that would affect egress would be affected by the recommendations. Buildings with non-compliant stairs or other egress components have been flagged in the specific building sections. In addition, if conditions are cited as "hazardous" by the building official, this would be another potential trigger for additional scope.

Fire Rating Requirements

Level 2 and 3 alterations as defined by the MEBC, trigger requirements for fire rating the vertical opening connecting two or more floors. There are a number of exceptions to reduce or eliminate this rating, however, these should be evaluated on a project by project basis. In addition, if conditions are cited as "hazardous" by the building official, this would be another potential trigger for additional scope.

Accessibility Scoping

Accessibility requirements can be triggered by two codes, the Massachusetts Architectural Access Board Regulations (521 CMR) and the 2010 ADA standards. The requirements of 521 CMR are limited to buildings or portions thereof that are open to the public. Employee-only spaces are exempt from these requirements.

521 CMR Section 3.3 contains the following scoping requirements for projects in existing buildings. The costs referred to in the scoping requirements below are cumulative for all projects to the building within a rolling 36-month period:

01. If the work is less than $100,000, then only the work being performed is required to comply with 521 CMR.
02. If the work costs more than $100,000 but is less than 30% of the full and fair cash value of the building then in addition to the work being performed, the following accessible features are also required to be provided in the building:
    - » Accessible entrance
    - » Accessible toilet room
    - » Accessible drinking fountain (if provided)
    - » Accessible public telephone (if provided)
03. If the work, plus the cost of all work within the past 36-months, costs more than 30% of the full and fair cash value of the building, then all public portions of the building are subject to the requirements of 521 CMR. Full and fair cash value is defined as the assessed value of the property not including the land (521 CMR 5.38).

The 2010 ADA Standards require altered portions of an existing building to be readily accessible to and usable by individuals with disabilities to the maximum extent feasible (ADA 35.151(b)). Further, alterations to primary function areas should be made such that the level of accessibility, including the path of travel to the space, is made accessible to the maximum extent feasible. When determining if the upgrade is feasible, the ADA requirements state that the upgrade to the path of travel is disproportionate to the project when the cost to perform the work exceeds 20% of the cost of the alteration to the primary function area.

Spaces and elements within employee work areas are required to be designed and constructed so that individuals with disabilities can approach, enter, and exit the employee work area (ADA 203.9). Elements within employee work areas are not required to be fully accessible, however consideration should be given to designing employee work areas as accessible at the outset of the project in order to accommodate the potential needs of future employees.

Where discrepancies exist between the ADA and 521 CMR, the regulation that provides the greater level of accessibility must be followed. Though 521 CMR does

not regulate employee only areas, Title II makes it clear that employee-only areas are required to comply with the 2010 ADA Standards.

Work surfaces for use by other than employees, conference rooms, break rooms, dining surfaces are required to be provided with tables, chairs, stations, etc. that are accessible. At least 5% of all elements, but not less than one, are required to be accessible in accordance with ADA Section 902 (ADA 226.1).

The following buildings include a single upgrade or a priority category recommendation that alone would trigger 521 CMR Section 3.3 case 3.

- Wheelock School
- Blake Middle School
- High School
- Town House
- Public Library
- Pfaff Building
- Council on Aging
- Department of Public Works

II. CONDITION SUMMARIES & RECOMMENDATIONS

Memorial School

Facilities Information

Address:	59 Adams Street
Building Use:	Elementary School (PK-1)
Year(s) Built:	1953, 1955
Major Renovations	1997
Building Area:	54,387 SF
Assessed Value:	$16,500,500
On Site Combustion:	yes
Capacity for Solar:	yes

Electrification Information	EXISTING	PROPOSED	% CHANGE
Electric (KWH/yr)	363,346	681,360	88%
Natural Gas (kBTU/yr)	2,576,550	0	-100%
TOTAL Energy Use (kBTU/yr)	3,816,288	2,324,801	-39%
Electric Utility Cost ($/yr)	$46,690	$87,555	88%
Natural Gas Utility Cost ($/yr)	$28,182	$0	-100%
TOTAL Utility Cost ($/yr)	$74,872	$87,555	17%
TOTAL Utility Cost w/ PV ($/yr)	$57,512	$65,527	14%
TOTAL Emissions (MTCO2e/yr)	230	121	-47%
TOTAL Emissions w/ PV (MTCO2e/yr)	119	23	-81%

CONDITIONS SUMMARY

PARKING	Asphalt paving in adequate shape. Signs of wear and degradation present, patching and spot repair necessary. North lot shows more age - full resurfacing may be necessary. A solar canopy is planned to be installed over the parking area.
LANDSCAPE	Very little landscaped areas. Most of the property is lawn with scattered trees around the site. A small, fenced-in playground to the northwest is showing its age. There is shallow tree root damage and use has compacted the soils around drainage structures.
SIDEWALKS	Bituminous asphalt sidewalks.
FOUNDATIONS	CIP concrete foundations appear in good shape with no major signs of damage, cracking or movement.
STRUCTURE	Building structure is steel construction (columns, beams, trusses). Gymnasium is structural concrete block with face brick. Roof deck shows staining and signs of corrosion from active roof leaks.
ROOF	Built-up roof over west and center classroom wings as well as much of the original 1953 building. The built-up roofing is well beyond its lifespan and is need of replacement. The east classroom wing is covered with a (white) modified bitumen roof pitched to gutters. This section of roof is well over 20 years of age and is in poor condition. Extensive patching is present, and roof transitions are badly damaged. Lastly, the slopped, modified bitumen roofing over the admin area and music room is well past 20 years of age and is in need of immediate replacement. Roof leaks are constant and on-going, several signs of rust present at underside of roof deck.
GUTTERS & RAINWATER MANAGEMENT	Seam between roof edge and gutter is failing in several locations, allowing water to flow back to face of wall, potentially infiltrating the wall below.
WALLS & FAÇADE	Solid, structural masonry with face brick. Face brick is in adequate condition. Water damage and efflorescence present in several locations. Areas of face brick replacement, possibly from previous renovation and/or flashing replacement. The drip cap flashing at the top of wall failing and allowing for water penetration. Through wall flashing at base failing. Allowing for possible water infiltration at punched openings.
WINDOWS	Double-pane glazed windows replaced with the 1996 renovation, moisture damage at interior sills, caulking at windows in need of replacement. Trim above windows and storefront badly water damaged, starting to rot - replacement necessary. Interior wood sills badly water damaged.
DOORS & ENTRIES	Steel storefront entries are in need of paint. Frames are corroded and rusty at the base, not yet failing but in poor condition. Interior of doors and entries are coated with mildew (evidence of a moisture issue - possible condensation on interior of entry faces).
SEALANTS & JOINTS	Repointing required at most of the face brick. Sealant and flashing failing at windows and roof transitions.

CONDITIONS SUMMARY - CONT.

FLOORING	VCT flooring throughout corridors and classrooms - racking and wear present throughout. Carpet in admin/office area in good condition. Quarry tile in kitchen in adequate condition. Rubberized flooring over concrete in gymnasium, worn but in adequate condition.
WALLS	Painted GWB throughout the interior in good condition with normal wear. Some areas exposed, painted masonry. Settlement/structural cracks present in cafeteria and gymnasium. Some areas of exposed masonry show signs of water infiltration and damage (difficult to say if more water damage is present behind GWB).
CEILINGS	2x4 Acoustic ceiling tile throughout (w/ false 2x2 tile pattern). Water staining throughout. Tile is mismatched due to constant tile replacement from active roof leaks. Large sections of tile missing in kitchen to allow active leaks to dry. 2x4 tiles are sagging in several locations. ACT tiles within cloud in cafeteria are dirty, showing signs of mildew.
OTHER	Mildew along the edges of wall pads in gymnasium - suggesting moisture issues throughout building.
PLUMBING FIXTURES	Fixtures are vitreous china and stainless steel. All fixtures appear to be functioning properly.
WATER DISTRIBUTION	There is a 4-inch domestic water service with a 2-inch water meter. There is no reduced pressure backflow preventer on the service. Distribution piping is copper tubing with either soldered or press type joints and fittings. Hot Water is produced by two natural gas fired water heater with a separate 120 gallon indirect storage tank. The hot water regulated by a thermostatic mixing valve. The hot water system is recirculated.
SANITARY WASTE	Cast iron is used for sanitary and storm drainage. Where visible, the cast iron pipe appears to be in good condition. Smaller pipe sizes appear to be copper.
OTHER	An elevated pressure gas service is provided to the building. Gas meter is located on the exterior. Natural gas is provided to heating boilers, domestic water heaters, kitchen cooking equipment, and HVAC rooftop equipment. Gas piping is black steel with threaded or welded joints depending on pipe size. Gas piping appears to be in good condition.
ELECTRICAL SERVICE & DISTRIBUTION	The 1000A, 277/480V, 3-phase, 4-wire service is fed from a utility-owned pad-mounted transformer with primary and secondary feeds below grade. The main circuit breaker is a Siemens SBS 1200A frame with a 1000A rated plug and ground fault protection, and includes a C.T. section for the utility meter. The main switchboard is rated at 1200A, providing 14W/SF. Downstream are 277/480V 3-phase panelboards with circuit breakers, dry-type step-down transformers, and 120/208V 3-phase branch circuit panelboards. Loads are divided by type: lighting, power, mechanical, and emergency. Overall, the distribution system is in good condition.

CONDITIONS SUMMARY - CONT.

LIGHTING & POWER	The lighting is in fair condition but outdated, with some LED upgrades, though most of the building uses fluorescent fixtures. Lighting controls with occupancy sensors are present, managed by an ILC Light Master system. Classrooms have pendant indirect/direct fluorescent fixtures, while exterior LED lighting appears dark-sky compliant. Site and exterior lighting are in fair condition. Electric rooms are being used for janitorial storage, violating code, which may be flagged by inspectors. Classroom projectors lack nearby receptacles, requiring extension cords in wire mold. The kitchen lacks current GFCI protection.
COMMS & SECURITY	The building has a multimode fiber optic backbone with Category 5e cabling. IT rooms are properly conditioned, grounded, and fed with emergency power, with rack-mounted UPS. Systems include a Sapling central clock, Telecore XL classroom intercom, Coax wiring, and a Vertical Wave analog phone system. The school also has an intrusion and access control system, Avigilon CCTV cameras (interior and exterior), and Alphone intercoms at key entry points. Systems are in fair condition and can remain if they operate properly and meet school needs.
EMERGENCY POWER	Generator is Diesel fired Kohler 80KW 277/480V within a weatherproof sound attenuated enclosure. The enclosure and tank are starting to show signs of corrosion. There are two Transfer switches one that serves life safety loads and one that serves optional standby. The system is code compliant.
OTHER	The fire alarm system has been upgraded to an AutoCall 4100ES with voice evacuation. The fire alarm system is up to date and code compliant. Transmission of alarms is accomplished via AES intellinet wireless transmitter. There was no CO detection noted in the classrooms or in the kitchen
HVAC SUPPLY & GENERATION	The school is heated by a natural gas boiler plant with two Smith 28A series, gas-fired, hot water boilers, operating in a primary and backup setup. Combustion air is supplied by a roof-mounted, gas-fired make-up air unit. The Library and Main Office are heated and cooled by a Trane rooftop unit with a hot water coil and DX cooling, distributing air through ceiling-mounted supply ducts and low wall return registers. The Gymnasium is heated by a rooftop unit with a hot water coil and high-mounted spiral supply ducts, low wall return registers, and a high-mounted exhaust fan. The Cafeteria is heated by a rooftop unit with a hot water coil, ceiling supply ducts, high wall return ducts, and low wall exhaust connected to a roof fan. The kitchen has a dedicated gas-fired make-up air unit and an upblast exhaust fan for the hood. The dishwasher fan should be directly ducted but currently is not.
DISTRIBUTION	Hot water is distributed to the building through (2) base mounted end suction pumps. Hot water is distributed to terminal heating units and hot water coils throughout the building using a combination of schedule 40 black steel and copper piping. The pumps operate on a lead / lag schedule. The expansion tank and air separator appear to be in good condition. The system has a chemical feeder and a glycol feeder installed.

CONDITIONS SUMMARY - CONT.

UNIT SOURCES	Classrooms are heated and ventilated by wall type classroom unit ventilators with hydronic heating coils. The units are provided with built in controls, supply fans, filter, hydronic coils and an outside air louver for ventilation. Low wall exhaust registers are installed to offset the outside air rates of the unit ventilators. (2) classrooms have air conditioning with dx coils in the unit ventilator with refrigeration piping to outside the room to a pad mounted condensing unit. Corridors and vestibules are served by hot water cabinet unit heaters, and convectors. Rooms served by RTU's and ceiling unit ventilators have supplemental fin tube radiation. Toilet rooms are provided with ceiling exhaust and electric or hydronic baseboard heat.
CONTROLS	The existing BMS system is a mix of a new Johnson DDC controls and pneumatic / Pneumatic electric thermostats. There are also electric baseboard heaters installed that have only local control. DCU's installed all have only local control. These units are stand alone and have no communication with the BMS system.
OTHER	The building utilizes roof mounted exhaust fans. The fans are mounted on the roof with exhaust distribution ductwork installed above the ceiling. Not all fans were operating at the time of survey. Fans appear to be past their reasonable life and should be replaced. The kitchen hood has roof leaks above and the lights on the hood are filled with water. Controls should be replaced with new. DCU's are installed in Elec rooms, MDF / IDF rooms, and Data rooms to provide AC to offset the heat from these spaces.
FIRE PROTECTION	Building is fully protected with an automatic sprinkler system. The fire service is 6-inch. Service includes a 4-inch double check valve assembly. There is one 4-inch wet alarm valve and one 4-inch dry alarm valve. The wet type system includes two zones. Fire Department connection is a 4-inch Storz type. Piping is black steel with coupling or threaded joints depending on pipe size. Sprinkler heads are semi-recessed pendent type in ceiling areas and upright type in non-ceiling areas. In general the system appears to be in good condition.

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	COST ESTIMATE	PRIORITY
Exterior Windows	Replace windows with new triple glazed aluminum windows. Replace interior sills. Replace all storefront windows with thermally-broken, double glazed IGU with 2 low-e coatings.	$2,084,520	1
Exterior Doors	Replace all entries with thermally-broken, 1" IGU storefront systems.	$208,800	1
	Replace all egress doors and frames with high insulated, hollow metal doors.	$21,750	1
Roof Coverings	Remove all existing roofs and underlying insulation. Replace with white PVC membrane and 4" avg. insulation. Remove and replace all roof drains, snake all lines. Rebuild roof edges to eliminate low spots and add tapered insulation as required.	$2,954,000	1
Floor Finishes	Replace cafeteria VCT flooring - remove, treat, and replace subbase	$29,540	1
Other Plumbing Systems	Paint exterior gas piping on roof.	$5,075	1
Distribution	Replace Classroom Unit Ventilators	$377,000	1
	Replace Exhaust Fans	$166,750	1
	Replace Terminal Heating Units	$145,000	1
Controls & Instrumentation	Integrate existing DCU's into BMS	$30,450	1
	Provide new DDC control system	$939,600	1
Other HVAC	Provide new kitchen hood	$58,000	1
	Connect and interlock dishwasher to exhaust Fan	$7,250	1
Other Electrical Systems	Add CO detection with gas shut off in kitchen	$21,750	1
	Add CO detection in the classrooms if the building does not go all electric	$58,000	1
Priority 1 Total		**$7,107,485**	
Exterior Walls	Inspect and evaluate caulking and sealant throughout	$29,540	2
	Spot repointing and flashing repairs (every 5 years = 4 times cost)	$14,770	2
Floor Finishes	Replace carpet in library	$73,850	2
Ceiling Finishes	Replace ACT throughout once roof replacement is complete. Replace damaged/corroded ceiling tile grid.	$709,750	2
Other Plumbing Systems	Replace exterior wall hydrants	$5,438	2

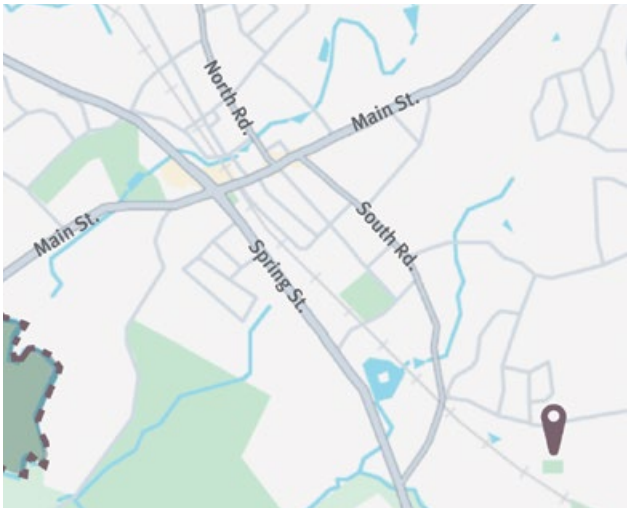
CAPITAL RECOMMENDATIONS - CONT.

Distribution	Replace RTU w/ AC	$522,000	2
	Replace RTU w/ HW coil	$348,000	2
	Replace MUA unit	$145,000	2
Heat Generating Systems	Replace Boiler / Pumps	$1,015,000	2
Electrical Service & Distribution	Add receptacles at ultra short throw projectors	$43,500	2
Lighting & Branch Wiring	Upgrade interior lighting that has not been upgraded to LED. Provide new lighting controls that include occupancy sensors and daylight sensors in compliance with current energy codes.	$507,500	2
Parking Lots	Spot repair and crack sealant at bus loop, general crack repair in other areas	$14,770	2
	Remove & reclaim asphalt paving, repave all parking lots, drive lanes and bus loop	$147,700	2
Landscaping	LS Engineering to determine proper surface grading req'd to improve playground site and prevent further degradation	$14,770	2
	Rebuild playground area to eliminate hazards from drainage structures and root exposure.	$147,700	2
Priority 2 Total		**$3,739,288**	
Roof Construction	Clean and paint portico steel and ceiling	$14,770	3
Communications & Security	Upgrade access control and CCTV systems	$290,000	3
Landscaping	Add asphalt walks where natural foot traffic occurs to eliminate mudholes.	$14,770	3
Priority 3 Total		**$319,540**	
Electrical Service & Distribution	Upgrade kitchen overcurrent protection to meet current GFCI protection code.	$116,000	5
Priority 5 Total		**$116,000**	
Total		**$11,282,313**	

ELECTRIFICATION RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	COST ESTIMATE	PRIORITY
D30-HVAC	Based on the age of the boiler plant, existing unit ventilators and rooftop units, and that the schools building management system is in need of an upgraded system, a VRF Air source heat pump option could be considered to replace the existing natural gas fired boiler plant.	$8,280,421	
D50-Electrical	Upgrade electrical service to 1200 amp. This will require a new 1200 amp trip plug in the existing main circuit breaker as well as an additional set of 500KCMIl	$116,000	
D50-Electrical	Upgrade emergency generator to 250KW 277/480V 3phase, 4 wire. Replace existing ATS and provide new Emergency distribution panel to connect heating system components required for freeze protection	$507,500	
Total		**$8,903,921**	
Cost above non-electric option		**$4,954,121**	

Ralph Wheelock School



Facilities Information

Address:	17 Elm Street
Building Use:	Elementary School (2 - 3)
Year(s) Built:	1968
Major Renovations	Early 2000's (roof & HVAC in kind), 2023
Building Area:	65,190 SF
Assessed Value:	$8,809,800
On Site Combustion:	yes
Capacity for Solar:	yes

Electrification Information	EXISTING	PROPOSED	% CHANGE
Electric (KWH/yr)	192,056	574,880	199%
Natural Gas (kBTU/yr)	2,458,300	0	-100%
TOTAL Energy Use (kBTU/yr)	3,113,596	1,961,490	-37%
Electric Utility Cost ($/yr)	$24,679	$73,872	199%
Natural Gas Utility Cost ($/yr)	$26,889	$0	-100%
TOTAL Utility Cost ($/yr)	$51,568	$73,872	43%
TOTAL Utility Cost w/ PV ($/yr)	$51,568	$59,512	15%
TOTAL Emissions (MTCO2e/yr)	180	102	-43%
TOTAL Emissions w/ PV (MTCO2e/yr)	180	38	-79%

CONDITIONS SUMMARY

PARKING	Bituminous asphalt cracked and worn in several areas. Large cracks and trip hazards are present near entries. Accessible slopes and curb cuts exceed MAAB regulations. Pavement markings and striping faded or non-existent.
LANDSCAPE	Not all routes to play areas are accessible.
SIDEWALKS	In several areas, asphalt paving leads to entrances, with no level landing in place.
FOUNDATIONS	Very little of the building foundation is visible from the exterior. Concrete steps at loading dock worn and damaged in need of repair.
STRUCTURE	Combination structural masonry block with face brick and structural steel framing. Metal trusses support gypsum plank decking. Several block walls at both interior and exterior have visible, structural cracks.
ROOF	Built-up roofing with gravel surfacing, well over 20 years of age. Flashing at edges and transitions are failing and separating from sheet metal. Roof is past its service life and should be replaced.
GUTTERS & RAINWATER MANAGEMENT	Flashing is poorly installed and damaged in some areas. Gutters have been damaged.
WALLS & FAÇADE	Settlement cracks present at exterior walls. Abandoned penetrations left unsealed. Moisture damage and mildew are present at ground level and along north-facing walls.
WINDOWS	Single-pane, aluminum windows with operable hoppers throughout. Windows are in adequate condition with little signs of corrosion or water damage. Signs of repairs or lintel replacement along second floor windows. Skylight domes are cracked, deteriorated, and visibly dirty from the interior.
DOORS & ENTRIES	Steel-framed storefront doors and windows. Corrosion present at base of entry frames, but not yet failing. Entry canopies are cast-in-place concrete slabs without proper flashing or waterproofing. At least one canopy shows signs of leaks.
SEALANTS & JOINTS	Face brick mortar in poor condition, sealants are aged and worn.
FLOORING	VCT flooring throughout building. Some areas show wear and possible water damage at first floor. Floors are uneven and worn at second floor. Carpet in admin area is a more recent replacement. Bathroom floors are ceramic tile with a painted, epoxy coating - coating is worn and dirty. Wall base at gymnasium is missing in several areas.
WALLS	Interior walls are exposed, painted masonry block. Cracking present in several areas.
CEILINGS	Plasterboard ceilings on steel grid in good condition. There is evidence of patching and possible water damage at the east corridor along the courtyard. Acoustic panels in cafeteria and cafeteria are badly worn - potential ACM. Acoustic panels along top of wall in classrooms is worn and damaged in some locations.
STAIRS	Steel-pan stairs with terrazzo treads. In adequate condition. Handrails and guardrails need to be stripped and repainted.
ELEVATORS & LIFTS	A small, retrofit lift was installed to meet accessibility requirements.

CONDITIONS SUMMARY - CONT.

PLUMBING FIXTURES	Fixtures are vitreous china and stainless steel. All fixtures appear to be functioning properly. In general fixtures are antiquated and should be replaced with new high efficiency fixtures.
WATER DISTRIBUTION	There is a 4-inch domestic water service with a 2-inch water meter. There is no reduced pressure backflow preventer on the service. Distribution piping is copper tubing with either soldered or press type joints and fittings. Hot Water is produced by four hybrid electric tank type water heaters. The water heaters were manufactured in April 2023 and are in good condition. The hot water regulated by a thermostatic mixing valve. The hot water system is recirculated.
SANITARY WASTE	Cast iron is used for sanitary and storm drainage. Where visible, the cast iron pipe appears to be in good condition. Smaller pipe sizes appear to be copper.
OTHER	An elevated pressure gas service is provided to the building. Gas meter is located on the exterior. Natural gas is provided to heating boilers and kitchen cooking equipment. Gas piping is black steel with threaded or welded joints depending on pipe size. Gas piping appears to be in good condition.
ELECTRICAL SERVICE & DISTRIBUTION	The service is sized at 1200amperes 120/208V, 3Phase 4 wire. The service is fed from a utility owned pad mounted transformer, primary and secondary feeds are installed below grade. The main section also contains a C.T. section where the utility meter is connected. The Main Switch board is rated for 1200Amperes. The capacity of the service equates to 8W/SF. Down stream of the main switch board are \ 120/208V, 3 phase branch circuit panelboards some of which have been upgraded. In general the existing distribution system is undersized for any renovation project and is in poor condition.
LIGHTING & POWER	Older lighting is in poor condition, and the newer, LED linear strips added have glare issues, making them unsuitable for teaching spaces. Overall, lighting is in poor shape. Controls use line voltage and key switches. There are no dedicated receptacles for wall-mounted short-throw projectors, leading to the use of extension cords and patch cables. Receptacles are generally lacking, evidenced by widespread use of plug strips and extension cords. GFCI protection does not meet current code. Site pole lighting uses inefficient HPS fixtures and overhead wiring, and neither site nor building-mounted LED lighting is dark-sky compliant.
COMMS & SECURITY	The building contains Category 5e cabling throughout. The building has a copper wiring throughout for phone lines. UPS power is rack mounted. The school contains an intrusion system and access control system and a CCTV system. The CCTV cameras are manufactured by Avigilon and are located both exterior and interior. There are Alphone intercoms at key entry points. The systems seem to be in fair condition and can remain as is if they are operating properly and meeting the schools needs. The building has a Valcom intercom system with call buttons in the classrooms. The valcom system is dated.

CONDITIONS SUMMARY - CONT.

EMERGENCY POWER	A 60KW ± Blue Star generator is installed adjacent to the utility co. pad mount transformer. It is natural gas fired and utilized for emergency lighting. Emergency lighting is not code compliant and a lights out test should be performed to confirm potential shortcomings.
OTHER	The fire alarm system consists of a simplex 4005 panel and an simplex 4007. The system is not a voice evacuation system therefore not code compliant from a notification standpoint. The system is in poor condition. Transmission of alarms is accomplished via AES intellinet wireless transmitter. There was no CO detection noted in the classrooms or in the kitchen.
HVAC SUPPLY & GENERATION	The building is heated by a gas-fired hot water boiler plant. The boiler plant consists of (2) Lochinvar energy efficient boilers installed in 2016. The large gym is served by (2) ceiling suspended air handling units.
DISTRIBUTION	Hot water piping is delivered to the building's hot water heating equipment by (2) base-mounted Weg pumps equipped with VFDs, which were installed in 2016 along with the boiler plant. Visible hot water piping appears to be in good condition. Ventilation air is delivered to the cafetorium, classrooms and small gym via unit ventilators. The large gym is ventilated via ceiling-suspended air handling units ducted to exterior louvers.
UNIT SOURCES	Entryways and vestibules are heated by wall or ceiling-mounted hot water unit heaters. The library and classrooms are heated primarily by unit ventilators. Cooling in these spaces is provided by window air conditioning units. Administration, hallways, and toilet spaces are heated by hot water radiant fin tube. The cafetorium is heated by a row of unit ventilators along the exterior wall. Classrooms and office spaces throughout are cooled by window air conditioning units. Library office spaces are cooled via a ductless split cooling system.
CONTROLS	The building HVAC control system is a pneumatic compressed air system that ties back to a basic Johnson Controls energy management control system. The Johnson Controls system acts as a timeclock to determine occupied and unoccupied mode, and aids in outdoor air modulation for the new boiler plant.
OTHER	The building classroom, administration office, library, cafetorium, and toilet room areas are exhausted by exhaust air fan systems ducted to roof-mounted exhaust fans. The kitchen is exhausted by a dedicated kitchen hood with ansul system. The adjacent cafetorium space appears to be the only source of make-up air for the system.
FIRE PROTECTION	The building does not contain an automatic sprinkler system. MA General Law requires that any existing commercial building over 7,500 square feet which undergoes major alterations, or a building addition, must be sprinklered throughout.

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	COST ESTIMATE	PRIORITY
Roof Coverings	Hire roof engineer to evaluate existing roof.	$221,550	1
	Replace failed base flashing, properly flash boiler flue penetrations, secure loose access ladder.	$36,925	1
	Remove all roofs and underlying insulation and replace with white PVC membrane and 4.5” avg. insulation, remove and replace all roof drains, snake drain lines, remove and rebuild disrupted brick masonry and repoint mortar joints	$2,215,500	1
Exterior Walls	Hire a structural engineer and exterior envelope specialist to evaluate areas of concern, review entire building envelope, and create repair documents.	$103,390	1
	Repair all damaged walls identified by the engineer	$738,500	1
Exterior Windows	Replace single-pane windows with triple glazed aluminum windows. Replace interior sills.	$2,244,600	1
	Recaulk new windows	$295,400	1
	Remove all skylight domes and infill openings	$23,200	1
Exterior Doors	Replace all entry store front system with commercial-grade, thermally-broken system	$208,800	1
Floor Finishes	Remove all VCT tile throughout the building. Repair any damage to slabs and subbase, install linoleum sheet product or similar.	$708,941	1
Distribution Systems	Replace Classroom Unit Ventilators	$377,000	1
	Provide code required ventilation in hallways	$65,250	1
	Replace Terminal Heating Units (convectors, unit heaters, etc)	$145,000	1
	Replace Small gym unit ventilators	$20,300	1
	Install dedicated Kitchen MUA unit	$36,250	1
Controls & Instrumentation	Install new DDC control system & integrate into BMS	$652,500	1
Sprinklers	Install automatic sprinkler system ($8/s.f.)	$756,204	1
Electrical Service & Distribution	add CO detection with gas shut off in kitchen	$21,750	1
	Add CO detection in the classrooms if the building does not go all electric	$58,000	1
Communication & Security	Replace fire alarm system	$290,000	1
Priority 1 Total		**$9,219,060**	

CAPITAL RECOMMENDATIONS - CONT.

Exterior Walls	Remove and replace broken bricks, rake out and repoint joints at water table (or replace with soft sealant). Repair and repoint brick facades that were previously improperly repaired.	$147,700	2
	Test all existing caulking for ACMs. Rake out and re-seal all existing control joints and provide backer rod where none is present. Rake out and re-seal joints where precast meets adjoining surfaces, provide new backer rod.	$295,400	2
	Add adhered membrane flashed into the vertical wall behind the concrete caps at covered entries. Install metal coping at edges.	$36,925	2
	Provide sealant around all louvers and electrical service penetrations	$2,954	2
Exterior Windows	Scrape and repaint existing louvers, replace dented and rusted louvers. Refasten existing louvers and unit ventilators tight to wall.	$14,770	2
Exterior Doors	Replace non-compliant latching hardware with new compliant level latches. Check closers for proper operation (effort and closing speed).	$73,850	2
Wall Finishes	Remove damaged drywall and ceiling at the kitchen laundry area and rebuild with moisture resistant GWB and damp area ACT.	$2,175	2
	Repaint walls	$283,577	2
Floor Finishes	Replace all bathroom floors with tile	$443,100	2
Ceiling Finishes	Remove and replace acoustic panels on walls in corridors	$36,250	2
	Replacement of acoustic tiles	$73,850	2
	Remove and replace acoustic panels ceiling in small gym and cafeteria, verify the presence of ACM	$149,270	2
	Paint ceilings in corridors	$42,195	2
Distribution Systems	Replace Exhaust Fans	$203,000	2
	Replace Large gym RTU's	$174,000	2
Electrical Service & Distribution	Upgrade distribution system to a 120/208V 3phase 4 wire 1600 ampere main with new branch circuit panel boards throughout	$725,000	2
	Add receptacles at ultra short throw projectors	$43,500	2
Lighting and Branch Wiring	Upgrade interior lighting . Provide new lighting controls that include occupancy sensors and daylight sensors in compliance with current energy codes.	$507,500	2
Communication & Security	upgrade paging system add clock system and upgrade to VOIP phone system	$275,500	2

CAPITAL RECOMMENDATIONS - CONT.

Pedestrian Paving	Replace sloped paving at entries with minimum 5' x 5' concrete landing with a maximum slope of 20%	$29,540	2
Priority 2 Total		**$3,560,056**	
Standard Foundations	(Loading dock) Scrape and paint existing metal components and guardrail	$4,431	3
	(Loading dock) Repair concrete steps and provide new, galvanized pipe rail where missing	$11,816	3
	Add handrails to steps leading from side door on the east side, eliminate steps toward yard and install guardrail	$8,862	3
Exterior Walls	Remove rusted, abandoned fasteners with sealant or mortar. Clean all brick faces with restoration detergent and apply (2) coats of brick sealer	$147,700	3
Exterior Doors	Sand, repair and paint all exterior doors and frames	$73,850	3
	Replace delaminated garage doors	$14,500	3
	Scrape and repaint all exposed metal components	$73,850	3
Stair Finishes	Scrape and repaint all stair handrails and guardrails	$21,750	3
Wall Finishes	Upgrade classroom interiors including casework and paint	$1,477,000	3
Plumbing Fixtures	Replace plumbing fixtures with new high efficiency fixtures	$406,000	3
Plumbing Distribution	Replace domestic water distribution piping and shutoff valves throughout the building.	$362,500	3
Communication & Security	upgrade access control and CCTV systems	$290,000	3
	Upgrade data wiring to Category 6 with new patch panels and rack mount UPS units	$261,000	3
Other Electrical Systems	Generator upgrade to 100KW with new transfer switches and distribution to connect to emergency loads	$362,500	3
Parking Lots	Remove, reclaim, and replace bituminous asphalt pavement. Regrade sub-grade and install new binder and topcoat.	$295,400	3
Pedestrian Paving	Replace sidewalks and bituminous berm along driveway areas	$118,160	3
	Eliminate lip in paving to provide flush condition at after-school program ramp	$4,431	3
Landscaping	Provide compliant, accessible routes to all school facilities and public gardens	$14,770	3

CAPITAL RECOMMENDATIONS - CONT.

	Repair damaged lawn areas and provide new berm in areas where vehicular traffic has damaged grass	$29,540	3
	Provide accessible picnic tables and fixed seating	$7,385	3
	Replace jersey barrier with concrete-filled bollards	$7,385	3
Priority 3 Total		**$3,992,830**	
Landscaping	Provide a concrete pad with screened enclosure and bollards for all dumpsters	$7,385	4
Priority 4 Total		**$7,385**	
Heat Generating Systems	Replace boiler plant	$1,015,000	5
Electrical Service & Distribution	Upgrade kitchen overcurrent protection to meet current GFCI protection code.	$116,000	5
Priority 5 Total		**$1,131,000**	
Total		**$17,910,331**	

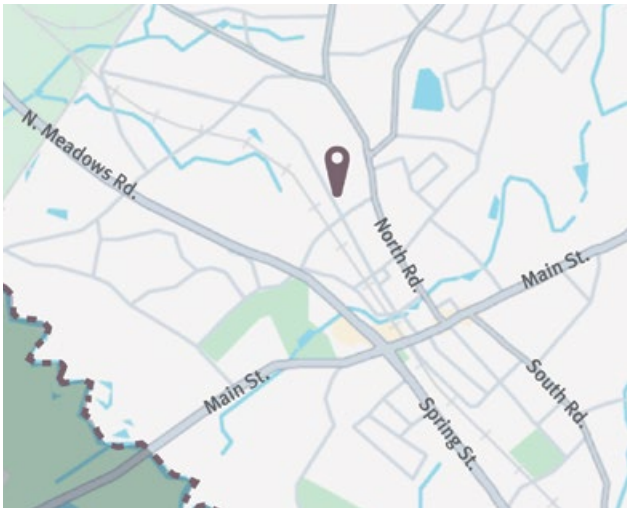
ELECTRIFICATION RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	COST ESTIMATE	PRIORITY
D30-HVAC	An air-source heat pump VRF system could replace existing hot water unit ventilators and terminal units throughout the building, along with the RTUs being replaced by packaged air-source heat pump RTUs. Although the boiler plant is in good condition and may not need replacement for 10–15 years, a full system replacement with an air-source heat pump VRF system or a geothermal ground-source heat pump system could be considered. Ceiling-suspended unit ventilators in the small gym, at the end of their serviceable life, can be replaced with ceiling-suspended VRF air-source heat pump units. Vestibule and restroom unit heaters can be replaced with electric resistance heating, and indoor gym air handling units with split air-source heat pump units.	$9,925,178	1
D50- Electrical	Upgrade distribution system to a 277/480V 3phase 4 wire 1200 ampere main with new dry type transformers to back feed existing 120/208 loads branch circuit panel boards throughout	$942,500	1
	Upgrade emergency generator to 250KW 277/480V 3phase, 4 wire. Replace existing ATS and provide new Emergency distribution panel to connect heating system components required for freeze protection	$507,500	1
Total		**$11,375,178**	
Cost above non-electric option		**$6,284,924**	

Dale Street School

Facilities Information

Address:	45 Adams Street
Building Use:	Elementary School (4 - 5)
Year(s) Built:	1942
Major Renovations	1962, 1996
Building Area:	47,341 SF
Assessed Value:	$16,500,500
On Site Combustion:	yes
Capacity for Solar:	no



Electrification Information	EXISTING	PROPOSED	% CHANGE
Electric (KWH/yr)	147,763	830,564	462%
Natural Gas (kBTU/yr)	4,271,500	0	-100%
TOTAL Energy Use (kBTU/yr)	4,775,668	2,833,884	-41%
Electric Utility Cost ($/yr)	$18,988	$106,727	462%
Natural Gas Utility Cost ($/yr)	$46,722	$0	-100%
TOTAL Utility Cost ($/yr)	$65,710	$106,727	62%
TOTAL Emissions (MTCO2e/yr)	265	148	-44%

CONDITIONS SUMMARY

PARKING	The parking lot to the east of the school was newly paved within the last 12 years, however the stripping could be repainted. The drop off loops at the west and south of the building are worn and require spot repair and crack filling.
SIDEWALKS	Sidewalks around the building are in adequate condition however unlevel and presenting potential trip hazards. Ramps at the main entry may not adequately meet MAAB requirements. Additionally, the path to the after-school program (Pfaff Building) are in poor condition and do not provide an accessible entrance to the building.
FOUNDATIONS	Foundations are cracked and worn in several locations. Sections of concrete have spalled off, revealing rusted rebar. Foundations are otherwise in adequate condition.
ROOF	Roof is a combination of a slate, hipped roof with signs of repairs over time with unknown material. There is a built-up, flat roof over the locker room area. All roofs are well past their life and would require substantial repair or full replacement. Roof leaks and upkeep are consistent.
GUTTERS & RAINWATER MANAGEMENT	The gutters and downspouts are damaged and partially removed allowing water to run down the face of exterior masonry. Snowguards are present, but are ineffective.
WALLS & FAÇADE	Triple wythe brick masonry with several areas of wear and cracking. 1969 addition consists of brick veneer over structural masonry. Painted wood trim is rotting in several locations. Water damage and mold present in several locations.
WINDOWS	Original windows in the 1941 building were replaced during a 1996 renovation. The windows are in adequate condition though difficult to operate and have reached their end of life. Windows in the 1969 portion of the building are original single-pane, steel windows aged well past their lifespan and require replacement.
DOORS & ENTRIES	The steel-framed entrance storefronts are worn but in adequate condition.
SEALANTS & JOINTS	Mortar at face brick is failing and missing in some locations.
OTHER	The attic spaces above classrooms are not insulated.
FLOORING	Flooring throughout the building is mostly VAT (Vinyl Asbestos Tile) which are well past their effective life and should be replaced.
WALLS	Interior partitions are painted masonry with little modification from their original construction.
CEILINGS	Most of the ceilings are either painted plaster or a patchwork of acoustic tiles. Much of the acoustic tile ceiling is worn and shows signs of water damage. (5) rooms at the second floor classroom wing have had recent ceiling and lighting replacement.
STAIRS	All stairs within the building appear to be in good condition, however the finishes are in poor condition.
ELEVATORS & LIFTS	There are no elevators but there are wheelchair lifts connection the 1st floor of the 1941 building to the 2nd floor of the 1969 addition. There is also a wheelchair lift behind the gymnasium and tiered seating area.

CONDITIONS SUMMARY - CONT.

PLUMBING FIXTURES	Fixtures are vitreous china and stainless steel. All fixtures appear to be functioning properly. In general fixtures are antiquated and should be replaced with new high efficiency fixtures.
WATER DISTRIBUTION	There is a 4-inch domestic water service with a 2-inch water meter. There is no reduced pressure backflow preventer on the service. Distribution piping is copper tubing with either soldered or press type joints and fittings. Hot water is produced by a gas fired tank type water heater. The water heaters was installed in July 2015 and appears to be in good condition. The hot water regulated by a thermostatic mixing valve. The hot water system is recirculated.
SANITARY WASTE	Cast iron is used for sanitary and storm drainage. Where visible, the cast iron pipe appears to be in good condition. Smaller pipe sizes appear to be copper.
OTHER	An elevated pressure gas service is provided to the building. Gas meter is located on the exterior. Natural gas is provided to heating boilers, domestic water heater, kitchen cooking equipment and exterior emergency generator. Gas piping is black steel with threaded or welded joints depending on pipe size. Gas piping appears to be in good condition.
ELECTRICAL SERVICE & DISTRIBUTION	The three-phase primary service runs overhead on the street and underground between a utility pole and a pad-mounted transformer at the building's front. The secondary service, rated at 800 amps, 120/208 volts, 3-phase, 4-wire, runs underground from the transformer to the service cubicle in the Boiler Room. The cubicle houses a main breaker and C/T compartment, feeding a main lug-only distribution panel (MDP) that supplies sub-panels throughout the building, with a service capacity of 4W/SF. The service cubicle and MDP were replaced in 2003, back-feeding existing panelboards. The electric meter is located in the Boiler Room. Original panelboards (1941, 1969) vary from fair to poor condition. The original service equipment in the Boiler Room has been disconnected. The lighting and power panels are circuit breaker type, 120/208V, 3-phase, 4-wire. Two modular classrooms are also fed from the main service. The 2003 Cutler-Hammer switchgear is in good condition, and the MDP has room for future breakers, but most other electrical components should be replaced due to poor condition.
LIGHTING & POWER	The lighting is standard fluorescent fixtures and T8 lamps. The existing wiring and switches were reused. The corridor lighting consists of 1x4 surface wraparound fixtures with two T8 lamps. The corridor lights are controlled with local switches. Some of the new fixtures were mounted directly over the existing flush fixtures. Classrooms typically have two or three receptacles. Receptacles are not of the tamper resistant type, currently required by code for elementary schools. A receptacle mounted high on wall is used for a thru-wall plug-in A/C unit. The general wiring method is pipe and wire, and A/C / MC Cable. A lot of the circuitry and feeders including low tension wiring runs in the crawl space within the 1941 building.

CONDITIONS SUMMARY - CONT.

COMMS & SECURITY	Incoming communications services enter overhead. The intercom/paging system, a Bogen MCP-35-A Series console, is located in the Main Office, with call-in switches and wall speakers in classrooms (switch heights exceed ADA guidelines). A DSC security system with motion detectors and exterior door contacts is installed, though not all doors have contacts. A security keypad is located in the main lobby. The closed-circuit TV system includes one exterior camera at the Main Entrance. An Aiphone video intercom with door release is at the Main Entrance, and there are two proximity card readers, at the Main Entrance and rear access door.
EMERGENCY POWER	The facility has a 60 kW, 120/208V, 3-phase, 4-wire natural gas generator in a weatherproof enclosure, feeding an automatic transfer switch (ATS) and panel in the Boiler Room hallway. A remote annunciator is in the Main Office. Both the generator and ATS are Kohler, in fair condition. Exit signs are typically internally lit, with conditions ranging from fair to poor; gym exit signs have protective wire guards. Emergency egress lighting includes normally-off lights with bypass relays and some normal/emergency lights in corridors, though exterior egress doors lack emergency lighting. The kitchen has a central battery unit feeding remote heads in the 1969 addition, including the Cafeteria and Library. The emergency system no longer meets current code requirements for life safety egress lighting and exit signs, which now require battery-operated lights and signs with backup.
FIRE ALARM	The fire alarm system is a conventional Gamewell Zans 12-zone control panel (locked) in the Main Office, with a battery cabinet nearby and an AES Intellinet radio box adjacent. Installed in 1969, the system lacks adequate coverage, with no smoke or heat detectors in most corridors and classrooms, and the horn/strobe units are not ADA compliant. Utility Rooms have smoke detectors, but the Nurse's suite lacks a smoke detector, carbon monoxide detector, or strobe. The system is in poor condition, and current codes require speakers instead of horns for voice evacuation.
HVAC SUPPLY & GENERATION	The majority of the school is heated by an oil fire low pressure steam plant. The steam heating plant consists of two (2) cast iron, gas fired low pressure Weil McLean (Model 688) steam boilers. The gym, cafeteria and library spaces are served by heating and ventilation units ducted to ceiling and sidewall diffusers.
DISTRIBUTION	Steam and condensate piping are routed from the boiler room to and from the building heating equipment. The majority of steam and condensate piping appears to be steel construction. There are some sections of piping at the boiler and condensate receiver that was installed in 1994 to connect the replacement boiler and condensate receiver to the existing piping. Ventilation air is delivered to the cafeteria, library and gym spaces via heating and ventilation units ducted to ceiling and wall diffusers throughout. Ventilation air is delivered to the majority of classrooms in the 1969 wing and some classrooms in the 1941 wing via unit ventilators. Gas-fired rooftop units provide heating, cooling and ventilation to the modular classrooms via ducted ceiling diffusers.

CONDITIONS SUMMARY - CONT.

UNIT SOURCES	Entryways, hallways, and toilet rooms are heated by original steam convectors. Classrooms are heated by a mix of steam cast iron radiators and unit ventilators. Most classrooms in the 1941 wing rely on radiators and natural ventilation via operable windows and exhaust fans, though some have unit ventilators. Classrooms in the 1969 wing are primarily served by unit ventilators, with some having supplemental radiators. Some classrooms also have window air conditioners. The Administration offices are heated by perimeter steam fintube radiation and lack mechanical ventilation, relying on transfer air through door grilles and ceiling exhaust. Two ductless mini-split AC units serve the Administration offices. The cafeteria is heated and ventilated by a steam unit in the attic above the kitchen. Modular classrooms have rooftop gas-fired AC units, and residential-type air purifiers are used throughout the building.
CONTROLS	The building HVAC system, with the exception of the modular classrooms, are primarily controlled by a pneumatic control system consisting of control panels, pneumatic air tubing, and an air compressor and air dryer system. The control system appears to be original 1941 and 1969 vintage with several components having been repaired and replaced since the original installation. There are also two older control system compressors and associated components that have been abandoned in place in the boiler room. In general, the control system is antiquated and in need of replacement.
OTHER	The boiler room contains several pieces of abandoned heating equipment, including two HB Smith Model 44 Mills cast iron sectional water tube boilers, a boiler feed water tank, condensate receiver pump, two air compressors, and old control system components and wiring. Exhaust for the classrooms, administration office, library, cafeteria, gym, and toilet rooms is provided by exhaust fans, with ductwork running through attic or basement spaces and vented through wall or roof louvers. Installed around 1969, the exhaust fans and ductwork are in fair to poor condition and need replacement. The kitchen is ventilated by a dedicated hood and exhaust fan system, but there is inadequate make-up air, with the adjacent cafeteria's heating and ventilation unit seemingly the only source of outdoor air for the kitchen.
FIRE PROTECTION	The building does not contain an automatic sprinkler system. MA General Law requires that any existing commercial building over 7,500 square feet which undergoes major alterations, or a building addition, must be sprinklered throughout.

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	COST ESTIMATE	PRIORITY
Roof Construction	Engineer review of the structural components and columns of the Dale Street Portico and repair is needed	$44,310	1
	Insulate attics above classrooms	$51,695	1
Exterior Walls	Replace all caulking and sealants	$147,700	1
	Masonry repointing on lower vertical band courses, along with areas of excessive mortar failure.	$1,477,000	1
Exterior Windows	Replace all windows with triple glazed aluminum windows. Replace interior sills.	$3,549,528	1
Exterior Doors	Replace exterior doors with insulated doors and weatherproofing upgrades	$88,620	1
Roof Coverings	Remove and replace roof at the 1962 section	$3,544,800	1
	Repair slate roof of original building	$36,925	1
	Replace damaged sections of aluminum gutter of the 1941 building and add required snow fencing.	$26,586	1
Floor Finishes	Replacement of all VCT flooring and gymnasium floor	$980,333	1
Heat Generating Systems	Replace steam boiler plant with high efficiency boiler plant	$1,015,000	1
Distribution Systems	Replace Classroom Unit Ventilators	$464,000	1
	Replace Terminal Heating Units (convectors, unit heaters, etc)	$181,250	1
	Replace H&V units	$203,000	1
	Install dedicated Kitchen MUA unit	$36,250	1
	Install RTU for code required ventilation in hallways	$65,250	1
Controls & Instrumentation	Install new DDC control system	$1,160,000	1
Sprinklers	Install automatic sprinkler system	$549,156	1
Communication & Security	Replace fire alarm system with new addressable type with Speaker/Strobe	$290,000	1
Priority 1 Total		**$13,911,403**	
Standard Foundations	Evaluate foundation for cracks movement, repair as necessary.	$14,500	2
Roof Construction	Repair structural columns, bases, and stair/handrails of the Dale Street portico.	$590,800	2
Interior Doors	Refinish all doors, wood trim, and jambs.	$64,525	2
Wall Finishes	Repair damage and cracking plaster.	$147,700	2
Floor Finishes	Carpet replacement	$14,770	2

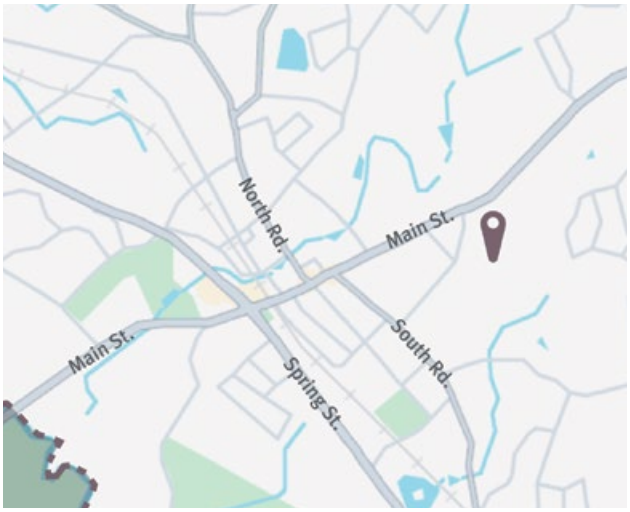
CAPITAL RECOMMENDATIONS - CONT.

Distribution Systems	Replace Exhaust Fans	$203,000	2
	Replace Modular Classroom RTU's	$116,000	2
Lighting & Branch Wiring	Replace exterior lighting and upgrade interior lighting to LED. Provide new lighting controls that include occupancy sensors and daylight sensors in compliance with current energy codes.	$507,500	2
Communication & Security	Provide an integrated electronic security system consisting of CCTV, card access, and security intrusion.	$290,000	2
Other Electrical Systems	Install Lighting Protection System	$36,250	2
Roadways	The bus drop off circle of the parking lot will need spot repair and crack sealing.	$147,700	2
Landscaping	Landscape Engineering to determine what is the best surface and grading required to make the playground a better site and to stabilize the area to prevent further use degradation.	$14,770	2
	Rebuild landscape area to eliminate hazards site as site drainage and tree root exposure/trip hazard.	$14,770	2
Priority 2 Total		**$2,162,285**	
Plumbing Fixtures	Replace plumbing fixtures with new high efficiency fixtures	$362,500	3
Domestic Water Distribution	Replace domestic water distribution piping and shutoff valves throughout the building.	$261,000	3
Other HVAC Systems	Replace kitchen hood	$58,000	3
Communication & Security	Provide central UPS within a new MDF/IDF Rooms with UPS connected to emergency generator backup	$43,500	3
	Upgrade all existing infrastructure cabling with Category 6 cabling.	$261,000	3
	Provide an IP public address and wireless master clock system.	$36,250	3
Priority 3 Total		**$1,022,250**	
Total		**$17,095,938**	

ELECTRIFICATION RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	COST ESTIMATE	PRIORITY
D30-HVAC	Based on the condition of the existing boilers, unit ventilators and terminal units throughout the building, a VRF Air source heat pump system could be considered to replace the entire steam heating system and boiler plant. A geothermal ground-source heat pump system could be considered in the case of a full system replacement. The ceiling suspended unit ventilators in the small gym are at the end of their serviceable life and can be replaced with ceiling suspended VRF air source heat pump system. Vestibule & restroom unit heaters can be replaced with electric resistance heating. Modular classroom RTUs can be replaced with packaged air-source heat pump units. H&V units can be replaced with split air-source heat pump units.	$10,238,660	1
D50-Electrical	Emergency power system will require upgrade to an exterior rated 300KW 480/277V, 3Phase generator with sound attenuated enclosure.	$507,500	1
	Replace distribution and wiring system		
	Replace branch wiring		
	Replace all wiring devices		
	Electrical service and distribution should be upgraded to a 2000 amp 480/277V 3phase service.	$1,015,000	1
Total		**$11,761,160**	
Cost above non-electric option		**$7,768,255**	

Thomas Blake Middle School



Facilities Information

Address:	24 Pound Street
Building Use:	Middle School (6 - 8)
Year(s) Built:	1960
Major Renovations	1995
Building Area:	121,564 SF
Assessed Value:	$30,782,000
On Site Combustion:	yes
Capacity for Solar:	yes

Electrification Information	EXISTING	PROPOSED	% CHANGE
Electric (KWH/yr)	592,278	1,263,551	113%
Natural Gas (kBTU/yr)	4,740,900	0	-100%
TOTAL Energy Use (kBTU/yr)	6,761,751	4,311,234	-36%
Electric Utility Cost ($/yr)	$76,108	$162,366	113%
Natural Gas Utility Cost ($/yr)	$51,856	$0	-100%
TOTAL Utility Cost ($/yr)	$127,964	$162,366	27%
TOTAL Utility Cost w/ PV ($/yr)	$122,016	$151,658	24%
TOTAL Emissions (MTCO2e/yr)	403	225	-44%
TOTAL Emissions w/ PV (MTCO2e/yr)	365	177	-52%

CONDITIONS SUMMARY

PARKING	Asphalt drive and bus loop in adequate condition. Would benefit from regular maintenance, spot repair and crack sealing.
LANDSCAPE	Minimal landscaping - Mostly lawn with trees accenting the parking and drive lanes. Trees (2) courtyard spaces.
SIDEWALKS	Asphalt sidewalks connect bus and parent drop-off lanes to main entry, sporting fields to the east and to the high school. Concrete walkway leads to main entrance.
FOUNDATIONS	Poured concrete foundation walls and slab-on-grade. No visible signs of wear, cracking, or movement.
STRUCTURE	The one-story building structure is steel columns, beams, and roof trusses. The brick facade is supported by both the steel structure and CMU wall. The cafeteria and gymnasium structure are load-bearing masonry.
ROOF	The roofs over the original building and the addition are both flat roofs with either EPDM or PVC and 2-4 inches of insulation and parapets. Some sections of PVC roofing have been replaced by EPDM, possibly during renovations in the mid-1990's. Both types of roof are in poor condition and should be replaced. The roof over the gymnasium is pitched with an EPDM system. All roofs have reached their end of life. Patching is constant and on-going.
GUTTERS & RAINWATER MANAGEMENT	Rainwater is managed by storm drains at the flat portions of roof. The gymnasium has gutters on either side of the gabled roof that appear to tie in to the stormwater system.
WALLS & FAÇADE	The original building facades are backed up by steel and load bearing masonry with brick cladding, no insulation. There is significant evidence of water/moisture infiltration as the steel lintels above windows are corroded and causing masonry joints to fail.
WINDOWS	Windows are double-glazed aluminum with operable awnings and were replaced with the 1995 renovation. Operation is worn on several windows and weather sealant is deteriorating. Sealant around all windows is poor or failing. Curtain wall system at cafeteria is original and poorly sealed. Repairs have been made to remedy air infiltration. There is significant water damage at the interior of some windows. GWB window returns are cracked and peeling and the wood window seats are damaged to the point of visible rot.
DOORS & ENTRIES	Main entry is a commercial -grade aluminum storefront system. Condition is fair, but weatherstripping is poor and should be replaced. Other egress doors are insulated hollow metal. Frames at the base of these doors are corroded and failing.
SEALANTS & JOINTS	Moisture infiltration in exterior walls has caused mortar joints at windows and penetrations to fail. Efflorescence is present throughout the facade. Horizontal cracking indicates movement from moisture infiltration. Missing mortar allows for further degradation and infiltration. Expansion joint sealant throughout the exterior facades has failed. There are also several penetrations across the facade that do not have any sealant.

CONDITIONS SUMMARY - CONT.

FLOORING	Flooring is VCT with carpet in select spaces (office, library etc.). VCT is cracked and chipping throughout the building, tile replacement is constant as tiles “pop up” in certain areas, suggesting moisture infiltration through the slab. Carpet throughout the building has reached its end of life. Carpet tiles are missing in several locations and show signs of wear and fraying in others. Wall base is also missing from areas in the library. There is tile in the bathrooms in
WALLS	Walls are mostly painted CMU and glazed block throughout the original building. Some areas have painted GWB. Normal wear and damage for the age of the building (20 years since most recent renovation). Some walls show damage - typically require regular maintenance and repainting as needed. There is at least one missing wall safety pad in the gym.
CEILINGS	Ceilings are typically suspended ACT throughout. The tiles are in poor shape, with signs of water damage throughout. Some tiles are missing in certain areas throughout the building, possibly due to constant damage and replacement from roof leaks. The tectum ceiling in the cafeteria is badly water damaged and there is visible corrosion at the ceiling grid.
STAIRS	Finish on stairs in in poor condition - duct tape is patching holes in the finish.
PLUMBING FIXTURES	Fixtures are vitreous china and stainless steel. All fixtures appear to be functioning properly. Building was renovated in 1995. In general fixtures are antiquated and should be replaced with new high efficiency fixtures.
WATER DISTRIBUTION	The building has a 4-inch domestic water service with a 3-inch water meter, but no reduced pressure backflow preventer. A 2-inch reduced pressure backflow preventer is provided for non-potable water to the science classrooms. Distribution piping is copper with soldered or press-type joints. Domestic hot water is supplied by four hybrid electric tank heaters (installed April 2022) in good condition, regulated by a thermostatic mixing valve, and recirculated. Non-potable hot water is provided by a natural gas-fired 199,990 BTUH, 80-gallon tank, nearing the end of its useful life, also regulated by a thermostatic mixing valve and recirculated.
SANITARY WASTE	Cast iron is used for sanitary and storm drainage. Where visible, the cast iron pipe appears to be in good condition. Smaller pipe sizes appear to be copper.
OTHER	An elevated pressure gas service is provided to the building. Gas meter is located on the exterior. Natural gas is provided to heating boilers, non-potable water heater, kitchen cooking equipment, and emergency generator. Gas piping is black steel with threaded or welded joints depending on pipe size. Gas piping appears to be in good condition.

CONDITIONS SUMMARY - CONT.

ELECTRICAL SERVICE & DISTRIBUTION	The service is sized at 1600amperes 120/208V, 3Phase 4 wire. The service is fed from a utility owned pad mounted transformer, primary and secondary feeds are installed below grade. The main section also contains a C.T. section where the utility meter is connected. The Main Switch board is rated for 1600Amperes. The capacity of the service equates to 5W/SF. Down stream of the main switch board are \ 120/208V, 3 phase branch circuit panelboards some of which have been upgraded. In general the existing distribution system is undersized for any renovation project and is in fair condition
LIGHTING & POWER	Lighting is in good condition. The majority of the lighting has been updated to energy efficient LED, at appears there is still some back of house type areas that could upgraded to more efficient LED fixtures. Some classrooms currently have pendant mounted parabolic fluorescent fixtures. Lighting controls are via ceiling mounted occupancy sensor devices. There is building mounted lighting that appears to be LED. There was some site pole fixtures located at the front of the building.
COMMS & SECURITY	There is a main MDF Room. This room also feeds over to the High School. The building contains Category 5e cabling throughout. The building has a copper wiring throughout for phone lines. The provider appears to be Verizon. UPS power is floor mounted. The school contains an intrusion system and limited access control system and a CCTV system. Most exterior doors do not have card access to enter. The CCTV cameras are located both exterior and interior. There are intercoms at key entry points. The systems seem to be in fair condition and can remain as is if they are operating properly and meeting the schools needs.
EMERGENCY POWER	A 55KW Katolight generator is installed inside adjacent to the boiler room. It is natural gas fired and utilized for emergency lighting.
FIRE ALARM	Fire alarm control panel is a Notifier Panel. The panel reported system normal during the site visit. Transmission of alarms is accomplished via AES intellinet wireless transmitter. Notification coverage is adequate and appears an system upgrade was performed at an earlier date .
HVAC SUPPLY & GENERATION	The school's heating system uses a natural gas boiler plant with two primary and backup Weil McLain boilers (2,500 CFH input, 2,419 MBH output). An abandoned HB Smith cast iron boiler is also present, replaced by high-efficiency condensing boilers. Each boiler has a Grunfos circulator pump, and hot water is circulated by two Taco base-mounted pumps (Model FI5011E2H), each sized for 650 GPM at 95 feet of head pressure, 25 HP, and 1750 RPM. Manufactured in 2002, the heating pumps are nearing the end of their service life and should be replaced.
DISTRIBUTION	Heating hot water supply and return piping run throughout the building to terminal heating devices. Air handling units (AHUs) and Exhaust Fans (EFs) are throughout the building. AHUs serve larger areas such as the Gym and Auditorium. All equipment appeared to be from the 2002 renovation

CONDITIONS SUMMARY - CONT.

UNIT SOURCES	Unit Ventilators serve classroom and small meeting rooms. Unit heaters are provided throughout the building at entry points, vestibules and lobbies.
CONTROLS	The building is served by pneumatic controls. The compressor and air dryer appear recently replaced and in good condition. Densely occupied areas appeared to have CO2 space sensors to increase OA.
OTHER	Window AC units observed throughout, exhaust hoods observed in residential cooking classrooms and in some Science classrooms (although Science classroom hoods didn't appear to be still utilized for that purpose). A Sterilizer and vented cabinet were observed in a closet between classrooms. the Sterilizer was vented to atmosphere and the vented cabinet was wooden, has an inline fan venting through the ceiling. it was unclear what controls this fan.
ACCESSIBILITY	Door to girl's locker room cannot open fully - hits the adjacent bleachers. (HVAC) No Accessibility concerns observed for servicing HVAC equipment. Equipment such as AHUs mounted high in the space have limited Access
CODE CONSIDERATIONS	Kitchen exhaust fan did not have a vented curb section and was missing a grease trap. Some equipment utilized older refrigerant systems such as R22 which has been phased out in the industry and would improve energy efficiency by upgrading equipment
APPEARANCE	Equipment appearance varies throughout the building, mostly age dependent. Some UVs were being serviced and had covers removed.
HISTORIC DISTRICT	The School does not have any Historic District provisions that would need to be required.
FIRE PROTECTION	Building is fully protected with an automatic sprinkler system. The fire service is 6-inch. Service includes a 4-inch double check valve assembly. There is one 4-inch wet alarm valve. Fire Department connection is a 4-inch Storz type with 30-degree elbow. Piping is black steel with coupling or threaded joints depending on pipe size. Sprinkler heads are semi-recessed pendent type in ceiling areas and upright type in non-ceiling areas. In general the system appears to be in good condition.

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	COST ESTIMATE	PRIORITY
Exterior Walls	Weatherization, sealing, and caulking of the entire structure required to prevent air infiltration as an energy savings measure, and stop rusting conditions.	$443,100	1
Exterior Windows	Replacement of all caulking joints at windows.	$295,400	1
Exterior Windows	Address the cafeteria curtain wall head joint.	$29,540	1
Exterior Windows	Replace all windows with triple glazed aluminum windows	$7,723,643	1
Roof Coverings	Remove and replace all white roofing and underlying insulation and install 4” tapered insulation, remove and replace all roof drains and snake lines, remove and replace low through wall flashings, clad deteriorated masonry walls, replace/relocate auditorium smoke release vents, repoint defective mortar joints, remove and replace skylight domes, defective glazing panels, and reconfigure sills.	$5,021,800	1
Roof Construction	Insulate thermal breaks (10 exhaust fan openings) in the roof reconstruction	$2,954	1
Priority 1 Total		**$13,516,437**	
Exterior Walls	Evaluation of the cast concrete sill assembly by an exterior envelop engineer is required to determine the integrity of the cast sill/brick façade, and solution as to best practices to address flashing and assembly. Evaluate all exterior façade concerns with regards to water penetration (consultant and repairs).	$472,640	2
Exterior Walls	Spot repointing of localized mortar joint failures.	$14,770	2
Exterior Walls	Evaluation of the Auditorium Fire Vent assembly by an exterior envelop engineer is required to determine the integrity assembly and flashing and develop a solution as to best practices to address flashing and assembly.	$147,700	2
Exterior Doors	Remove rust on frames and repaint all doors	$73,850	2
Exterior Doors	Replace weatherstripping at all door locations	$29,540	2
Floor Finishes	Repair/replace cafeteria flooring. Removal and treat subbase.	$29,540	2
Floor Finishes	Replace carpet in Auditorium	$124,970	2
Ceiling Finishes	Paint Gym ceiling after roof replacement		2
Domestic Water Distribution	Replace non-potable water heater and mixing valve	$21,750	2
Heat Generating Systems	Replace heating hot water pumps 650 GPM, 95’ hd, 25 HP	$50,750	2

CAPITAL RECOMMENDATIONS - CONT.

Distribution Systems	Unit Ventilator replacement	$843,281	2
Distribution Systems	Exhaust Fan Replacement	$372,989	2
Lighting & Branch Wiring	Upgrade interior lighting . Provide new lighting controls that include occupancy sensors and daylight sensors in compliance with current energy codes.	$362,500	2
Communications & Security	Upgrade access control and CCTV systems	$362,500	2
Other Electrical Systems	Install Lightning Protection System	$435,000	2
Roadways	The bus drop off circle of the parking lot will need spot repair and crack sealing.	$14,770	2
Pedestrian Paving	Repair concrete sidewalks that have suffered damage due to age or excessive salt usage.	$14,770	2
Landscaping	Landscape designer to determine what is the best design of low maintenance materials to install In the courtyard to promote use. Evaluate the existing court yard tree to determine the best approach to pruning to prevent future damage of the building by the tree.	$14,770	2
Priority 2 Total		**$3,386,090**	
Exterior Walls	Remove rust and paint lintels to extend its life.	$59,080	3
Wall Finishes	Repaint all interiors	$147,700	3
Floor Finishes	Locker Room painted floors and tile work need substantial scrubbing, grouting and paint.	$147,700	3
Ceiling Finishes	After roof replacement, replace the acoustical tile ceilings that have been damaged or need upgrade due to age.	$73,850	3
Ceiling Finishes	Repair and paint Locker Room ceilings.	$14,770	3
Controls & Instrumentation	BMS System replacing Pneumatic Controls	$1,411,186	3
Communications & Security	Upgrade data wiring to Category 6 or Category 6e with new patch panels and rack mount UPS units	$362,500	3
Communications & Security	Upgrade paging system add clock system and upgrade to VOIP phone system	$352,536	3
Fixed Furnishings	Repair/replace damaged lockers. Sandblasting and new electrostatic painting of lockers.	$59,080	3
Landscaping	Landscape implementation	$73,850	3

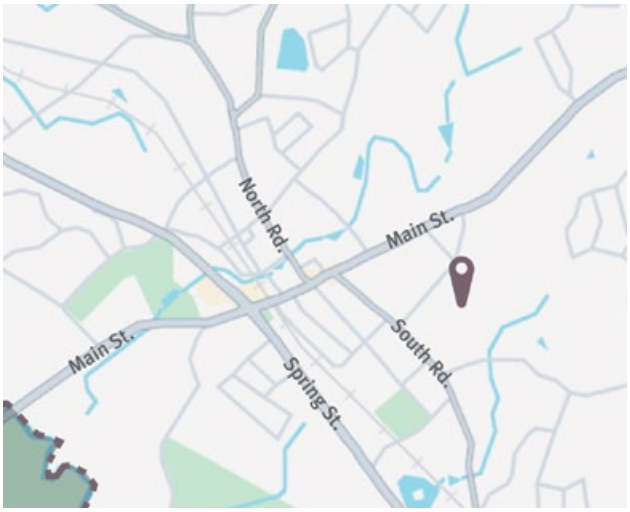
CAPITAL RECOMMENDATIONS - CONT.

Priority 3 Total		**$2,702,252**	
Distribution Systems	AC systems	$130,500	4
Priority 4 Total		**$130,500**	
Electrical Service & Distribution	Upgrade kitchen overcurrent protection to meet current GFCI protection code.	$116,000	5
Priority 5 Total		**$116,000**	
Total		**$19,851,279**	

ELECTRIFICATION RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	COST ESTIMATE	PRIORITY
D30-HVAC	Based on the condition of the base mounted heating hot water pumps, existing unit ventilators and that the school doesn't have a building management system, a VRF Air source heat pump option could be considered to replace the existing natural gas fired boiler plant.	$14,111,864	2
D50-Electrical	Upgrade distribution system to a 277/480V 3phase 4 wire 3000 ampere main with new downstream distribution.	$1,812,500	2
	Replace distribution and wiring system		
	Replace branch wiring		
	Replace all wiring devices		
	Upgrade emergency generator to 500KW 277/480V 3phase, 4 wire. Replace existing ATS and provide new Emergency distribution panel to connect heating system components required for freeze protection.	$725,000	2
Total		**$16,649,364**	
Cost above non-electric option		**$13,818,907**	

Medfield High School



Facilities Information

Address:	88 South Street
Building Use:	High School
Year(s) Built:	1966
Major Renovations	1996 (windows, roof, HVAC), 2005 (addition)
Building Area:	186,487 SF
Assessed Value:	$67,988,200
On Site Combustion:	yes
Capacity for Solar:	yes

Electrification Information	EXISTING	PROPOSED	% CHANGE
Electric (KWH/yr)	1,197,831	1,962,500	64%
Natural Gas (kBTU/yr)	7,161,000	0	-100%
TOTAL Energy Use (kBTU/yr)	11,247,999	6,696,049	-40%
Electric Utility Cost ($/yr)	$153,921	$252,181	64%
Natural Gas Utility Cost ($/yr)	$78,327	$0	-100%
TOTAL Utility Cost ($/yr)	$232,248	$252,181	9%
TOTAL Utility Cost w/ PV ($/yr)	$201,848	$208,621	3%
TOTAL Emissions (MTCO2e/yr)	687	349	-49%
TOTAL Emissions w/ PV (MTCO2e/yr)	492	155	-68%

CONDITIONS SUMMARY

PARKING	Asphalt paving appears to be new and in good condition.
SIDEWALKS	Some sidewalks are showing wear from age and/or excessive salt usage and should be repaired or replaced.
FOUNDATIONS	The foundations are poured-in-place concrete with slab-on-grade. Foundations are mostly in adequate condition, no major signs of cracking or movement. However, some exposed corners of the foundation are chipped and spalling. The mortar joint between the face brick and the foundation is damaged and is allowing for water infiltration.
STRUCTURE	The building structure is steel columns, beams, and roof trusses. The brick facade is supported by steel structure and CMU.
ROOF	Original building roof has been replaced with a rolled asphalt membrane and 4-inches of tapered insulation. The roof over the original building is in poor condition and should be replaced. The roof over the addition is in relatively good condition.
WALLS & FAÇADE	Existing buildings walls are uninsulated brick with block backup. The main building appears to be in adequate shape. There is efflorescence and water staining visible on several areas around the building. There is a significant crack at the exterior of the gymnasium.
WINDOWS	Windows are double-glazed aluminum with operable awnings replaced in the 1996 renovation. The windows appear to be in good condition however, the sealant at the exterior is at the end of its life cycle and is failing. Cast concrete sills have failed mortar butt joints, allowing for water infiltration. Interior window seats show signs of water/moisture damage either from infiltration or condensation.
DOORS & ENTRIES	Main entry is a commercial-grade aluminum storefront system. The frames appear to be in good condition however the seals have reached end of life. Other hollow metal doors have significant corrosion at the floor level. In some cases the corrosion in such that daylight can be seen through the frames.
FLOORING	VCT and carpet throughout. The VCT is worn and cracked in several locations including at thresholds and flooring transitions. Carpet in the main office and guidance suite appear to be recently replaced. Other carpet throughout the building has reached its end of life and is showing signs of significant wear and fraying.
WALLS	Walls are a combination of painted CMU, glazed block, and Painted GWB. Condition of walls is fair - regular maintenance and repair is recommended.
CEILINGS	Ceilings are suspended ACT throughout with a few exceptions. Most of the ACT throughout the building has signs of significant water damage from multiple roof leaks. In some areas, tiles have been removed, presumably due to active leaks.
STAIRS	Stairs are metal pan, concrete stairs with rubberized treads. The rubberized treads are worn and coming loose in multiple spots.
PLUMBING FIXTURES	Fixtures are vitreous china and stainless steel. All fixtures appear to be functioning properly. Building was constructed in 1996.

CONDITIONS SUMMARY - CONT.

WATER DISTRIBUTION	There is a 4-inch domestic water service with a 4-inch water meter and 4-inch reduced pressure backflow preventer. A 1-inch reduced pressure backflow preventer is provided for heating boiler make-up water. Distribution piping is copper tubing with soldered joints and fittings. Domestic Hot Water is produced by two gas fired tank type water heaters. The water heaters were installed in 2017 and appear to be in good condition. The hot water regulated by a thermostatic mixing valve. The hot water system is recirculated.
SANITARY WASTE	Cast iron is used for sanitary and storm drainage. Where visible, the cast iron pipe appears to be in good condition. Smaller pipe sizes appear to be copper.
OTHER	An elevated pressure gas service is provided to the building. Gas meter is located on the exterior. Natural gas is provided to heating boilers, domestic water heater, kitchen cooking equipment, and HVAC rooftop equipment. Gas piping is black steel with threaded or welded joints depending on pipe size. Gas piping appears to be in good condition.
ELECTRICAL SERVICE & DISTRIBUTION	The main electrical service is 3000 amp, 277/480 volt, 3 phase, 4 wire service that originates from a utility company pad mounted transformer located adjacent to the building. The utility company transformer primary feed is fed from pole 321 on Pound Street where the 3 phase service runs down the pole to an underground conduit which runs below the parking lot and a grassy area between the Middle School and High School to the transformer. There is also a spare 4" conduit stubbed up on the base of the pole. From the transformer, the secondary service runs into the building to the 3000 amp main switchboard (Msb), which then feeds a normal distribution panels at 277/480 volt and transformers throughout the building. The transformers in the building transform the power from 277/480 volt to 120/208 volt which feeds all the receptacle and low voltage equipment panels. All power equipment was installed in the 2003 renovation is in very good condition.
LIGHTING & POWER	Lighting is existing with recessed and surface mounted fluorescent fixtures retrofit with an LED lamp source. Some of these retrofit lamps were flickering. Control of the fixtures is via wall mounted, line voltage single pole switches. There are occupancy sensors in most areas but no daylight harvesting in any areas. Typical classrooms have pendant fixtures with retrofit LED 4' tubes. Lighting is in fair condition.
EMERGENCY POWER	The facility is equipped with a Olympian D125P1 125kW, 277/480 volt, 3 phase, 4 wire emergency generator which feeds the life safety for the building during power outages. The generator is in good condition and related emergency equipment (automatic transfer switches and emergency power panels) are in very good condition.
OTHER	The facility is equipped with a Autocall 4100ES fire alarm control panel with voice evacuation. The alarm signal is transmitted via master box #322 at the front entrance of the building. The fire alarm system and related equipment is in excellent condition.

CONDITIONS SUMMARY - CONT.

HVAC SUPPLY & GENERATION	The building is heated by (3) HB Smith cast iron boilers which are gas fired. Breeching for each boiler consists of double wall flues which combine into a common header and terminate into a masonry chimney. The breeching system is equipped with an automatic exhaust relief system manufactured by Exhausto. The system is not operating properly and should be serviced. The plant is associated with (2) Taco base mounted end suction pumps, (3) vertical expansion tanks, inline air separator, chemical feeder and glycol feeder.
DISTRIBUTION	Distribution for hot water through the building is a combination of schedule 40 black steel and copper piping. All of which is insulated with fiberglass insulation. The building is equipped with RTU's and its air distribution system consists of galvanized sheet metal for supply and return, all of which is insulated with fiberglass insulation.
UNIT SOURCES	The building is equipped with unit ventilators for all classrooms, which provides ventilation and heating for the spaces. The large group spaces are tempered by rooftop air handling units which provides ventilation and heating, and in some spaces cooling. The common spaces such as corridors, vestibules, storage rooms and toilet rooms are heated through a combination of fintube radiation and unit heaters.
CONTROLS	The building is equipped with a Honeywell Jace which collects information from the main DDC system which is manufactured by Trane Tracer. The Tracer system is utilized for the boiler plant, exhaust fans and the unit ventilators. Overall the Tracer system is mainly used for monitoring and does not offer much capabilities as far as adjustment to the equipment and its parameters. The DDC system in the building should be upgraded and should extend to all building equipment.
OTHER	The dishwasher exhaust fan in the kitchen is not properly interlocked with the actual dishwasher, this should be corrected.
FIRE PROTECTION	Building is fully protected with an automatic sprinkler system. The fire service is 6-inch. Service includes a 6-inch double check valve assembly. There are three 4-inch wet alarm valves. Fire Department connection is a 4-inch Storz type with 30-degree elbow. Fire hose cabinets are provided on each side of the existing stage. Piping is black steel with coupling or threaded joints depending on pipe size. Sprinkler heads are either fully concealed or semi-recessed pendent type in ceiling areas and upright type in non-ceiling areas. In general the system appears to be in good condition.

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	COST ESTIMATE	PRIORITY
Exterior Walls	West side brick wall at the roof line/gym wall has cracking in the brick face. Further investigation of the cracking and repair required.	$73,850	1
	Perform an exterior envelope design to address air infiltration as a major energy savings measure.	$59,080	1
Exterior Windows	Removal and Replacement of the all caulking joints at the windows is required due to life cycle failure.	$443,100	1
Exterior Doors	Remove rust on frames and repaint all exterior doors	$44,310	1
Roof Coverings	Replace roof of original building wing with new white PVC membrane and 4" insulation	$3,544,800	1
Wall Finishes	Replace Auditorium wood doors	$29,000	1
Floor Finishes	Replace carpet in music, band, drama, and practice rooms	$87,000	1
	Replace auditorium carpet runners	$11,816	1
Ceiling Finishes	Replace acoustic ceiling tiles in music rooms and corridor outside Auditorium	$21,750	1
	Replace water damaged ACT ceilings	$407,784	1
Heat Generating Systems	Exhaust system associated with the boiler breeching needs to be replcaced	$29,000	1
Distribution Systems	The dishwasher exhaust fan interlock is not currently working with the actual dishwasher system.	$4,350	1
Roof Coverings	Resealing flashing separation, fixing pitch pockets and general repairs of failing areas should be addressed immediately.		1
Accessibility	Accessibility upgrades per 2021 Self Evaluation and Transition Plan	$50,895	1
Priority 1 Total		**$4,806,735**	
Roof Construction	The 1996 entrance canopy requires further engineering inspection and repair drawings.	$14,770	2
	Repair/replace brick columns and plumbing on the 1996 canopy	$73,850	2
Exterior Walls	Implement the installation of sealant and weatherization measures in the 2014 Northern Energy Services report exterior envelope design along the wall roof intersection and at the glass curtain wall.	$590,800	2
Exterior Windows	Replace windows with triple glazed aluminum frames. Replace interior wood sills.	$12,233,527	2
Exterior Doors	Replace and re-install weather stripping at all door locations	$44,310	2

CAPITAL RECOMMENDATIONS - CONT.

Roof Coverings	Replace roof of addition wing with new white PVC membrane and 4.5" insulation	$2,363,200	2
Floor Finishe	Replace library carpet	$73,850	2
Distribution Systems	RTU's are showing signs of corrosion, these should be replaced.	$7,975,000	2
	Replace classroom unit ventilators.	$826,500	2
Pedestrian Paving	Repair concrete sidewalks that have suffered damage due to age and excessive salt usage.	$29,540	2
Lighting & Branch Wiring	Replace lighting and controls	$2,163,400	2
Priority 2 Total		**$26,388,747**	
Roof Construction	Insulate the (3) roof hatches at the auditorium	$5,908	3
Exterior Doors	Replace all doors.	$1,631,137	3
Wall Finishes	Repaint interiors	$73,850	3
Domestic Water Distribution	Replace existing domestic water heater and mixing valve (original construction)	$36,250	3
Heat Generating Systems	Boiler plant is not high efficiency and should be considered for a replant with high efficiency boilers.	$1,015,000	3
Priority 3 Total		**$2,762,145**	
Total		**$33,957,627**	

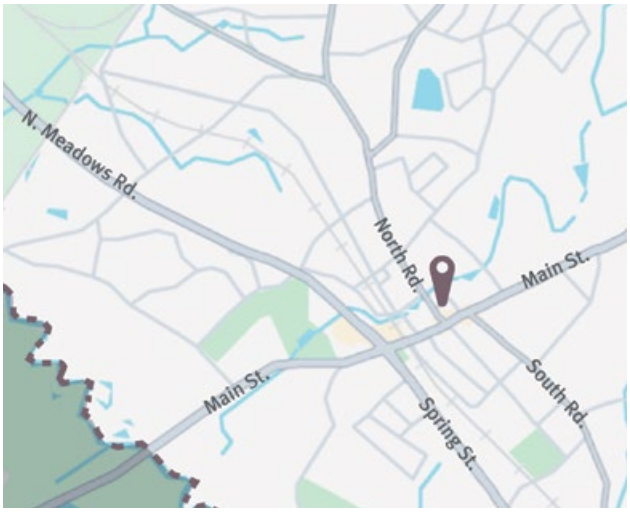
ELECTRIFICATION RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	COST ESTIMATE	PRIORITY
D30-HVAC	Remove existing hot water boiler, pumps, terminal heating equipment and associated hot water piping and controls. Provide new air source heat pump heat recovery chiller unit to provide simultaneous hot water heating and chilled water cooling to new terminal equipment throughout the building. Provide new hot water/chilled water piping with insulation, pumps, and accessories. Terminal equipment would consist of radiant heating/cooling panels in conjunction with a displacement ventilation system. The ventilation system would consist of rooftop air handlers which would distribute tempered ventilation air to spaces via a galvanized sheet metal duct distribution system. VAV's for each space will be provided for CO2 and temperature control. General spaces such as corridors, vestibules, toilet rooms and storage rooms will be provided with unit heaters and radiant panels. A general exhaust system would also be provided for dedicated spaces and would exit the building via roof mounted exhaust fans. Provide new ATC/BMS controls for all new HVAC equipment and systems. The existing second floor VRF system can remain and be reused to continue to provide heating and cooling to the second floor areas.	$21,632,492	2
D50-ELECTRICAL	Additional Distribution equipment feeders to feed new Air Source recovery chiller and RTU's	$543,750	2
	Upgrade emergency generator to 500KW 277/480V 3phase, 4 wire. Replace existing ATS and provide new Emergency distribution panel to connect heating system components required for freeze protection	$725,000	2
Total		**$22,901,242**	
Cost above non-electric option		**$13,019,492**	

Medfield Town House

Facilities Information

Address:	459 Main Street
Building Use:	Town Hall, Offices
Year(s) Built:	1900
Major Renovations	1997
Building Area:	17,356 SF
Assessed Value:	$2,856,200
On Site Combustion:	yes
Capacity for Solar:	no



Electrification Information	EXISTING	PROPOSED	% CHANGE
Electric (KWH/yr)	99,149	133,200	34%
Natural Gas (kBTU/yr)	341,000	0	-100%
TOTAL Energy Use (kBTU/yr)	679,297	454,480	-33%
Electric Utility Cost ($/yr)	$12,741	$17,116	34%
Natural Gas Utility Cost ($/yr)	$3,730	$0	-100%
TOTAL Utility Cost ($/yr)	$16,471	$17,116	4%
TOTAL Emissions (MTCO2e/yr)	43	24	-44%

CONDITIONS SUMMARY

PARKING	The parking lot off Janes Ave is in poor condition, requiring spot repairs and crack sealing. Raised dividers are covered with cobblestone pavers. While there are accessible spaces, the curb cuts at the basement entry are inadequate. The lot could be reconfigured to provide accessible parking near the rear entry walkway. Adequate signage is needed. Accessible street parking is available at the front entrance, but the designated space lacks a proper curb cut.
LANDSCAPE	Landscaping in the front is adequately maintained. The small area of landscaping in the rear is overgrown with ivy. Virginia Creeper was observed in one of the potter planters which shouldn't be allowed to spread.
SIDEWALKS	The sidewalks around the building are in poor condition. Brick pavers leading to the front and rear entrances are uneven due to settling, creating trip hazards. The granite steps at the front entrance are also in disrepair.
FOUNDATIONS	Foundations are stone and mortar with capstones around 3 sides of the building. The foundation is in adequate condition with some cracks and deterioration in the granite present. Repointing in certain areas as well as structural crack filler should be considered.
STRUCTURE	Structure is a full wythe, solid mass brick wall. The 1998 renovation added a brick veneer tower to allow for an elevator and additional stair. The roof was added as part of the 1998 renovation and is a wood truss construction.
ROOF	The roof is covered in heavyweight asphalt shingles which typically have a longer lifespan than typical asphalt shingles however, several shingle tabs are missing (possibly poor installation). The roof is approaching 20 years of age and all damaged tiles should be replaced. If not covered under warranty, a full replacement may be necessary.
GUTTERS & RAINWATER MANAGEMENT	Gutters and downspouts are located over the front and rear entrances and appear to be in adequate condition. In addition, there are snow guards located over egress openings below.
WALLS & FAÇADE	The building's original brick facades have not been repointed or repaired since the 1998 renovation. Repointing is needed on much of the façade, and broken or loose bricks should be replaced. The limestone accents are spalling and cracking and need repair or replacement. The granite cap at the wall base does not shed water properly and requires repair and repointing. Abandoned penetrations should be sealed.
WINDOWS	The vinyl-clad windows have stone sills sloped to shed water, but standing water and infiltration are present. Sills should be fitted with flashing caps to prevent water buildup. The window caulking is worn and needs replacement, and the window trim should be refinished and repainted.
DOORS & ENTRIES	Metal doors should be sanded and repainted as routine maintenance. Wood egress doors are water-damaged at the base, and wood frames and trim are rotting, needing replacement with insulated, hollow metal frames. Significant water damage and infiltration were observed inside the egress doors.

CONDITIONS SUMMARY - CONT.

SEALANTS & JOINTS	Repointing of all masonry is required. Raking and resealing of all doors and windows recommended.
FLOORING	Flooring is mainly carpet throughout. There are some areas of VCT in breakrooms. Bathrooms are finished with ceramic tile. The carpet has mostly reached its end of life and should be replaced throughout.
WALLS	Walls are mostly painted GWB and in adequate condition. Regular maintenance in high-traffic areas recommended.
CEILINGS	Suspended ACT over plaster ceilings throughout. Some signs of water damage on tiles
STAIRS	Steel pan stairs with rubberized treads and risers are in good condition.
ELEVATORS & LIFTS	Elevator appears to be in good, working condition.
PLUMBING FIXTURES	Fixtures are vitreous china and stainless steel. All fixtures appear to be functioning properly. Building was last renovated in 1998.
WATER DISTRIBUTION	The building has a 4-inch domestic water service with a 1-inch meter but no reduced pressure backflow preventer; a 1-inch preventer is in place for lawn irrigation. Distribution piping is copper with soldered joints. Domestic hot water is supplied by a tank-type electric water heater, installed in January 2024 and in good condition, with a recirculated system but no thermostatic mixing valve.
SANITARY WASTE	Cast iron is used for sanitary and storm drainage. Where visible, the cast iron pipe appears to be in good condition. Smaller pipe sizes appear to be copper.
OTHER	An elevated pressure gas service is provided to the building. Gas meter is located on the exterior. Natural gas is provided to heating boilers and HVAC equipment. Gas piping is black steel with threaded joints. Gas piping appears to be in good condition.
ELECTRICAL SERVICE & DISTRIBUTION	The 800A, 120/208V, 3-phase, 4-wire service is fed by a utility-owned pad-mounted transformer with underground primary and secondary feeds. The Siemens main circuit breaker has an 800A frame and plug, with ground fault protection. A C.T. section for the utility meter is included, and the main switchboard is rated at 800A, providing 15W/SF. Downstream are 120/208V 3-phase panelboards with circuit breakers; emergency circuits have designated panelboards, though other loads are not segregated by type. Overall, the distribution system is in good condition.
LIGHTING & POWER	The lighting is in good condition, with most areas updated to energy-efficient LED fixtures, though some back-of-house areas could still be upgraded. Lighting controls use local switching, but none were observed during the site visit. There is no building-mounted lighting at egress doors, but site pole fixtures are located at the front of the building.
COMMS & SECURITY	The building uses Category 5 cabling, but the patching in the rack is disorganized and should be cleaned up. It also has copper telephone lines with a Verizon system. UPS units were not observed during the site visit, and there appear to be no CCTV cameras. The building has key card access at exterior egress doors.

CONDITIONS SUMMARY - CONT.

EMERGENCY POWER	There is an emergency generator on site with a diesel base tank. The size of the generator was unknown, as the doors were locked and not accessible. Emergency distribution is provided through an ATS and panels downstream. The emergency electric room on the lower level is a code violation for working clearances in front of a panel and the ATS.
OTHER	Fire alarm control panel is a Firelite MS-9200UDLS. The panel reported system normal during the site visit. Transmission of alarms is accomplished via AES intellinet wireless transmitter. Notification coverage is inadequate.
HVAC SUPPLY & GENERATION	Building heat is supplied by a 2006 Burnham cast iron sectional boiler with a Powerflame burner, rated at 808 CFH input and 646 MBH output, controlled by a two-stage Tekmar controller for efficiency. Atmospheric combustion air is partially obstructed by stored supplies and covered openings. Cooling is provided by a 40-ton Trane chiller from 1997, requiring constant flow and using R-22 refrigerant. The chiller was not functioning properly at the time of inspection and needs replacement.
DISTRIBUTION	The building has a two-pipe change-over system for heating or cooling. Fan coil terminal devices are installed but malfunctioning, with some isolated from use. A unit heater in a stair lobby has been isolated due to the lack of a drain pan and improper use of chilled water.
UNIT SOURCES	Fan Coil units are utilized throughout the building. ceiling space is very congested. Many fan coils are floor mounted. Equipment is approaching the end of its serviceable life and should be considered to be replaced.
CONTROLS	HVAC equipment has a Building management system (BMS) which is manufactured by Automated Logic. The system has occupied and unoccupied temperatures, and a 4 degree deadband. We did learn that during the summer the chiller may run all weekend because if it doesn't interior spaces such as the third floor will be too warm and uncomfortable of a work environment.
OTHER	The 40-ton chiller should be replaced due to poor operation and age. The boiler plant could be upgraded to a high-efficiency condensing boiler for better turndown than the current two-stage Tekmar controller. Fan coils, exhaust fans, and air handling units also need replacement.
FIRE PROTECTION	The building is fully protected by an automatic sprinkler system with a 6-inch fire service, including a 4-inch double check valve assembly, one 4-inch wet alarm valve, and one 4-inch dry alarm valve. The Fire Department connection is a 4-inch Storz type with a 30-degree elbow. Wet system piping is black steel with couplings or threaded joints, while dry system piping is galvanized steel. Sprinkler heads are concealed in ceiling areas and upright in non-ceiling areas. The system appears to be in good condition.

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	COST ESTIMATE	PRIORITY
Exterior Walls	Repair existing limestone (replacement cost options should be compared and evaluated). If replacement is determined as the appropriate remedy, consider new steel anchoring and repair of damaged substrate.	$59,080	1
	Remove the loose limestone material down to a solid surface. The original stone grains are salvaged and mixed with a mortar product and reapplied matching existing appearance as close as possible.	$29,540	1
Cooling Generating Systems	New 40 Ton Chiller	$150,800	1
Priority 1 Total		**$239,420**	
Standard Foundations	Repoint cracks and mortar-filled joints of granite foundation cap stone. Consider epoxy-injected structural crack filler at these stones.	$2,954	2
Exterior Walls	Replace broken or loose bricks including the rowlock brick sills at windows. At brick sills, provide a flashing cap or replace with a sloping brick.	$29,540	2
	Engineering review of porous brick, replace brick that has reached end of life. Rake and repoint Joints in water table bricks , or in some cases, add sealant as a soft joint.	$14,770	2
	Rake out and re-seal existing control joints and add backer rod where missing. (Existing caulking should be tested for ACM).	$29,540	2
	Repaint wood frieze board and cornice work	$29,540	2
Exterior Windows	Repaint windows and accents, rake out and replace existing window caulking, and replace missing window screens.	$125,831	2
Exterior Doors	Repaint metal doors and exposed steel lintels.	$1,450	2
	Sand and refinish wood doors and sidelights with 2 coats marine grade polyurethane annually.	$2,954	2
Roof Coverings	Evaluation of roof by engineer	$59,080	2
	Full roof replacement	$590,800	2
Wall Finishes	Scrape all loose paint, prime and repaint all areas.	$44,310	2
Floor Finishes	Replace all carpeting	$427,825	2
Ceiling Finishes	Replace water stained tiles throughout after roof replacement	$18,875	2
Domestic Water Distribution	Install thermostatic mixing valve at existing water heater	$3,625	2

CAPITAL RECOMMENDATIONS - CONT.

Distribution Systems	New Exhaust Fans	$54,439	2
	New Fan Coils throughout the building	$128,743	2
Controls & Instrumentation	Upgrades to the BMS based on New Equipment	$180,223	2
Lighting & Branch Wiring	Upgrade interior lighting that has not been upgraded to LED. Provide new lighting controls that include occupancy sensors and daylight sensors in compliance with current energy codes.	$108,750	2
	Upgrade building egress lighting at exterior entrances	$14,500	2
Other Electrical Systems	Install Lightning Protection System	$65,250	2
Parking Lots	Provide blue handicap signage at front of building's main entrance stating " accessible entrance is at rear of building"	$1,450	2
	Resurface asphalt paving and repair/repave low areas adjacent to the island to have the correct pitch.	$29,540	2
	Restripe pavement markings every 5 years or when they become illegible.	$1,477	2
Pedestrian Paving	Re-set brick walkways where the settlement has resulted in possible tripping hazards. Re-set top riser of front granite steps, provide a concrete sub-base to prevent further settlement. Consideration should be given to replacing the brick pavers within 20 years.	$14,770	2
	Rebuild granite steps (reset granite, provide new mortar joints, and replacing missing bricks).	$7,385	2
Site Development	Fill depressions around all guardrail posts, flush with surrounding surface, using non-shrink grout to prevent water accumulation and subsequent frost damage.	$2,954	2
	Bolt generator to its concrete pad in the holes provided. (Required to resist seismic forces).	$2,954	2
	Repair damaged chain link fence. Consider to adding gates to complete the enclosure at generator.	$7,250	2
Priority 2 Total		**$2,000,779**	
Exterior Windows	Replace all windows with triple glazed wood windows	$1,258,310	3
Heat Generating Systems	New High Efficiency Condensing boiler	$94,250	3
Communication & Security	Upgrade data wiring to CAT6 with new patch panels racks and UPS	$87,000	3

CAPITAL RECOMMENDATIONS - CONT.

	Upgrade access control and CCTV systems	$50,750	3
Site Development	Keep a circle of the crushed stone around area drains clean and free of mulch, possibly adding metal edging to separate the two. Verify outlet pipe in eastside area well is free flowing.	$2,954	3
	Provide a dumpster enclosure	$14,500	3
Accessibility	Accessibility upgrades per 2021 Self Evaluation and Transition Plan	$113,434	3
Communication & Security	Replace fire alarm system with new addressable system with compliant notification and detection devices.	$116,000	
Priority 3 Total		**$1,737,198**	
Total		**$3,977,396**	

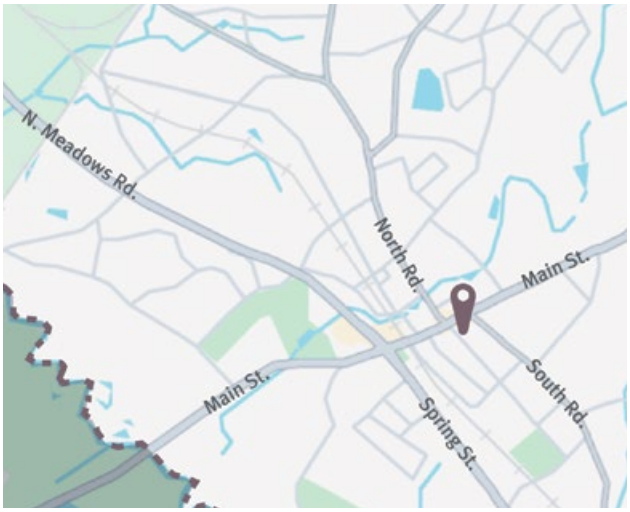
ELECTRIFICATION RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	COST ESTIMATE	PRIORITY
D30-HVAC	Due to the overall condition of the HVAC equipment serving the building, electrification may be a viable option for this site. The chiller needs to be replaced, the fan coils are beyond serviceable life and the boiler operates at best at approximately 78-82% efficiency. An air source heat pump system would with new terminal devices throughout could replace the seasonal changeover system and provide simultaneous heating and cooling based on space demand. Based on the existing equipment capacity, we estimate the building would need a total capacity of approximately 720 MBH, or approximately (3) three 240 MBH/20 ton systems. These air cooled outdoor units will be connected by refrigerant pipe to indoor units which would be a combination of ducted ceiling units, ceiling mounted cassette units, and wall mounted units. Each box would be capable of heating or cooling based on space demand. This system would provide a more overall comfortable system throughout the building.	$2,703,351	1-2
D50-Electrical	Upgrade electrical service and distribution to a 1000 amp 120/208V 3-phase service.	$145,000	2
	Replace distribution and wiring system		
	Replace branch wiring		
	Replace all wiring devices		
Total		**$2,848,351**	
Cost above non-electric option		**$2,294,335**	

Medfield Public Library

Facilities Information

Address:	468 Main Street
Building Use:	Library
Year(s) Built:	1917
Major Renovations	1998 (addition), 2020's (attic insulation)
Building Area:	22,192 SF
Assessed Value:	$4,856,700
On Site Combustion:	yes
Capacity for Solar:	no



Electrification Information	EXISTING	PROPOSED	% CHANGE
Electric (KWH/yr)	75,542	147,735	96%
Natural Gas (kBTU/yr)	455,800	0	-100%
TOTAL Energy Use (kBTU/yr)	713,550	504,071	29%
Electric Utility Cost ($/yr)	$9,707	$18,984	96%
Natural Gas Utility Cost ($/yr)	$4,986	$0	-100%
TOTAL Utility Cost ($/yr)	$14,693	$19,984	29%
TOTAL Emissions (MTCO2e/yr)	44	26	-41%

CONDITIONS SUMMARY

PARKING	Parking lot and drive are in adequate condition.
LANDSCAPE	Some plantings are overgrown and should be trimmed/pruned. Areas are over-mulched, covering masonry weeps.
SIDEWALKS	Portions of the concrete walks to the main entrance are uneven - potential trip hazards present. Original entry is now only used as an emergency exit, stairs and landing at original entry are deteriorating.
FOUNDATIONS	Original building has a brick foundation with stucco parging. The 1998 addition has a poured concrete foundation. The condition of the original is adequate but there are signs of water infiltration, in the basement interior. Parging at original foundation requires patching and some crack repair. Window wells are in poor condition.
STRUCTURE	Original building is a full wythe, solid brick wall with wood framing. The 1998 addition is a steel-framed structure with a brick veneer exterior.
ROOF	Wood-framed, gabled roofs are finished with EPDM and slate tile. The roofs appear to be in good condition and have been repaired within the last 10 years. Roofs are flashed into brick parapets at each end at both the original building and the addition. Flat areas are membrane roofs flashed into brick walls.
GUTTERS & RAINWATER MANAGEMENT	Copper gutters and downspouts are located at the eaves and are routed to the underground collection system. Metal snow guards are located at strategic areas. Some gutters and downspouts are damaged. Others appear to be decorative only as they do not attach to a downspout.
WALLS & FAÇADE	Original brick facades are in adequate condition, though there are signs of weathering and porosity. Some bricks appear damaged and effloresce is present in some areas, indicating water infiltration. Façade at the 1998 addition in relatively good condition though regular maintenance and inspection of masonry recommended.
WINDOWS	Windows are vinyl-clad throughout - most likely original windows were replaced in the addition renovation. Exterior caulking should be thoroughly inspected and repaired as part of routine maintenance.
DOORS & ENTRIES	Doors are a combination of solid wood entry doors (original main entrance non-operation and emergency egress only). Other egress doors are flush metal. ADA operator non-functional at main entrance. Wood trim at entrance canopy is in need of sanding and repainting.
SEALANTS & JOINTS	Original building façade in need of repointing - some repointing work appears to have been done incorrectly causing potential failure in mortar and face brick. Shrinking mortar present at several locations. Masonry joints at 1998 addition should be fully inspected and repointed if necessary as building is approaching 20 years of age. Several penetrations require sealant.

CONDITIONS SUMMARY - CONT.

FLOORING	Most of the building is carpeted with the exception of the main entry lobby and circulation desk which is finished with VCT. There is ceramic tile in the bathrooms. Carpet at the main level appears to be original from 1998. Carpet at the main level of the original building appears to have reached it's end of life and should be replaced. Sections of carpet in the basement have been replaced within recent years. The carpet at the children's area at the second floor has reached it's end of life and replacement is recommended.
WALLS	Walls are either painted GWB or painted plaster and lath. Walls are mostly in good condition except in areas of the original building where water infiltration is causing the paint to peel. Repair and replacement is recommended once source of water infiltration is addressed.
CEILINGS	Ceilings are either suspended ACT or painted plaster. Ceilings are mostly in adequate condition with minimal staining on the ACT ceilings. Some areas of plaster ceilings show signs of water damage and paint is peeling.
STAIRS	Steel pan and concrete stairs are finished with a rubberized surface. The condition is adequate.
ELEVATORS & LIFTS	Elevator appears to be in good, working condition.
PLUMBING FIXTURES	Fixtures are vitreous china and stainless steel. All fixtures appear to be functioning properly. Building was last renovated in 1998.
WATER DISTRIBUTION	There is a 2-inch domestic water service with a 1-inch water meter. There is no reduced pressure backflow preventer on the service. Distribution piping is copper tubing with soldered joints and fittings. Domestic Hot Water is produced by an electric tank type water heater. The water heater appears to be in good condition. There is no thermostatic mixing valve on the system. The hot water system is recirculated.
SANITARY WASTE	Cast iron is used for sanitary and storm drainage. Where visible, the cast iron pipe appears to be in good condition. Smaller pipe sizes appear to be copper.
OTHER	An elevated pressure gas service is provided to the building. Gas meter is located on the exterior. Natural gas is provided to the heating boiler. Gas piping is black steel with threaded joints. Gas piping appears to be in good condition.
ELECTRICAL SERVICE & DISTRIBUTION	120/208V 3phase 4 wire 800Ampere service. Manufactured by Siemens.800Ampere main breaker feeds 800Ampere MDP. The Service is fed from a utility co. owned pad mounted transformer below grade. Distribution system is in fair condition. The service is adequately sized for the current use, however it is Marginal for any substantial renovation with an electric heating system.
LIGHTING & POWER	Some lighting and lamps have been upgraded to LED. Exit signs are edge-lit, but backup battery status is unclear. Occupancy sensors are in some areas, though some wall-mounted sensor lenses are damaged. Most spaces use line voltage switches for control. Site lighting consists of decorative pole-mounted lanterns with screw-in LED bulbs. There are no required service receptacles for the RTUs.

CONDITIONS SUMMARY - CONT.

COMMS & SECURITY	The building uses Category 5 cabling, but the rack patching is disorganized and needs reorganization. It has copper telephone lines, a Toa mixer/amp for general paging, and an outdated Vodavi PBX system. UPS units are not rack-mounted and sit on equipment or furniture. The CCTV system has several cameras with image issues, covering only interior areas and lacking IP functionality. The building also has an intrusion system with keypads, door contacts, and motion sensors, but no access control system.
EMERGENCY POWER	There is no generator. Emergency lighting is accomplished using battery units with remote heads and bodine ballasts. The system looks to be having issues. Bodine ballasts seem to be problematic. Emergency lighting generally does not look to be adequate. A lights out test should be done to determine code compliance.
FIRE ALARM	Fire alarm control panel is a Simplex 4020. The panel reported system normal during the site visit. Transmission of alarms is accomplished via AES intellinet wireless transmitter. Notification coverage is inadequate. The control panel is beyond its serviceable life.
OTHER	The building contains a lightning protection system.
HVAC SUPPLY & GENERATION	The building has 8 packaged RTUs with DX cooling and natural gas heat; two units were recently replaced, and six more are planned for replacement with heat pumps to reduce fuel use. Perimeter and supplemental heat are provided by hydronic fin-tube radiation and cabinet unit heaters. Hydronic heat comes from a Lochinvar Knight high-efficiency condensing boiler with a 399 CFH input and 380 MBH output.
DISTRIBUTION	Supply and return ductwork distribution is run throughout the building and distributed through registers, grilles and diffusers. Hydronic heat is distributed throughout the building through hot water piping.
UNIT SOURCES	Registers, grilles and diffusers distribute supply and return air. Exhaust grilles are provided for exhaust terminations in spaces
CONTROLS	The building uses standalone, dated controls for RTUs and supplemental heat sources. Though occupied and unoccupied modes may exist, they likely aren't maintained. New thermostats will be needed for the heat pump RTUs, and a building management system is recommended.
FIRE PROTECTION	The building has full automatic sprinkler protection with a 6-inch fire service, a 4-inch double check valve, one wet and one dry 4-inch alarm valve, and a 4-inch Storz Fire Department connection. Piping is black steel with couplings or threaded joints as needed. Sprinkler heads are semi-recessed pendant type in ceiling areas and upright in non-ceiling areas. The system appears to be in good condition.

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	COST ESTIMATE	PRIORITY
Exterior Walls	Repoint original portion of the building with similar mortar mix and aggregate.	$145,000	1
	Remove and replace broken face bricks.	$36,250	1
	Repoint joints in water table bricks or add sealant as a soft joint.	$14,500	1
	Repoint poorly repaired areas to match the existing mortar's consistency and material.	$88,620	1
	Re-seal all existing control joints and add backer rod where missing (test existing caulking for ACM).	$29,540	1
	Engage an exterior envelope specialist to evaluate the source of water infiltration in the areaway. Investigate potential sources, including open joints in brickwork, area drain failure, failed seams in parapet coping, or roof leaks; destructive testing may be necessary.	$14,770	1
	Core out and restore weeps at the 1998 addition. Review construction documents to confirm if through-wall base flashing was installed in the brickwork; destructive testing may be necessary.	$14,770	1
	If base flashing is present, install additional weep holes as needed. Avoid placing mulch in a way that could block these weep holes.	$7,385	1
	Apply sealant to the open joint where horizontal flashing was cut in at the shed roof on the rear wall.	$4,431	1
	Entire area of brick - clean and then apply (2) coats of brick sealer. A restoration detergent is recommended.	$59,080	1
Exterior Windows	Remove storms and replace windows in original building with triple-glazed wood windows to match original.	$804,460	1
	Verify window sills on east side pitch away from window. Make adjustments as necessary.	$4,431	1
	Upon completion of area well repairs, check window sills there for damage or infiltration and make similar repairs.	$7,250	1
Roof Coverings	Replace all EPDM roof areas	$73,850	1
Wall Finishes	After exterior and roof repairs are complete, repair all wood trim in original building.	$14,770	1
Floor Finishes	Replace carpet in first floor back of house	$23,200	1
Ceiling Finishes	After roof repairs, repaint ceiling in original building and replace damaged ceiling tiles	$108,750	1

CAPITAL RECOMMENDATIONS - CONT.

Electrical Service & Distribution	Provide code required service receptacles at RTU's	$7,250	1
Lighting & Branch Wiring	Upgrade emergency lighting system to a combination of emergency battery units and inverters.	$58,000	1
Communications & Security	Replace fire alarm system with new addressable system with compliant notification and detection devices.	$145,000	1
Priority 1 Total		**$1,661,307**	
Standard Foundations	Remove areas of loose stucco and apply new.	$1,477	2
	Create control joint in area of current crack and fill joint with sealant and where stucco meets any other dissimilar materials.	$7,385	2
Exterior Walls	Replace stucco finish in the exterior stairwell. Remove handrail for the work and reinstall. Install control joints at vertical cracks, and apply sealant where stucco meets adjoining materials.	$43,500	2
	Rebuild the original brick steps and entrance platform of the 1917 wing.	$29,540	2
	Scrape and paint existing wood louvers at rear shaft, add bird screen where missing, or blank-off if not functional.	$4,431	2
	Provide sealant around electrical service penetrations on west side.	$725	2
Exterior Windows	Replace the existing window caulking in the addition. Clean any mildew from window surfaces.	$118,160	2
Roof Coverings	Replace damaged gutter hangers. Provide additional hangers at shaded areas to help prevent further ice damage.	$14,500	2
	Provide adapters where missing at downspouts. Replace damaged section of downspout at rear with cast-iron receptor and fasten to brick to prevent further damage.	$2,954	2
	Provide termination bars at areas noted above	$4,431	2
Wall Finishes	Scrape all loose paint, prime and repaint.	$14,770	2
	Test for and monitor moisture levels in the space to prevent further peeling.	$21,750	2
Controls & Instrumentation	Upgrade to new BMS	$383,393	2
Lighting & Branch Wiring	Upgrade interior lighting to LED. Provide new lighting controls, occupancy and daylight sensors in compliance with current energy codes.	$130,500	2
	Upgrade site pole light with LED lantern.	$5,800	2

CAPITAL RECOMMENDATIONS - CONT.

Landscaping	Clean debris from subsurface drainage, excavate down and add a layer of crushed stone at basement windows.	$1,477	2
Priority 2 Total		**$784,793**	
Standard Foundations	Scrape and paint existing metal grates, handrails and guardrail.	$1,477	3
	Add top rail to existing guardrail to achieve minimum 36” height	$1,477	3
Exterior Walls	Scrape, paint, and reinstall the existing handrails and guardrails at the 1917 entrance.	$2,954	3
	Scrape and paint all existing metal brackets on original building.	$4,431	3
	Remove random rusted fasteners and fill holes with sealant.	$2,954	3
	Add handrails to steps leading from side door on east and clean vegetation off steps.	$1,477	3
	Scrape and repaint wood columns, trim, etc. (repeat every 5 yrs)	$11,816	3
Exterior Windows	Replace windows in Addition with triple glazed fiberglass windows	$643,568	3
Exterior Doors	Replace rusted hinges at rear HM door.	$1,477	3
Floor Finishes	Replace all carpet, except back of house to replaced earlier	$434,408	3
Domestic Water Distribution	Install thermostatic mixing valve on exiting water heater	$3,625	3
Communications & Security	Upgrade data wiring to CAT6 with new patch panels racks and UPS	$116,000	3
	Upgrade access control and CCTV systems	$72,500	3
Parking Lots	Provide new compliant sign posts, remount handicap parking signs. Eliminate lip in paving and granite accent strip to provide flush conditions. Replace damaged brick edging. Verify entrance slope (if it exceeds 1:20, add handrail on side of ramp segment per MAAB regulations). Relocate dumpsters to maintain sidewalk width. Relocate book depository for proper clearance at Knox box.	$29,540	3
Accessibility	Accessibility upgrades per 2021 Self Evaluation and Transition Plan	$59,378	3
Priority 3 Total		**$1,387,082**	
Total		**$3,833,182**	

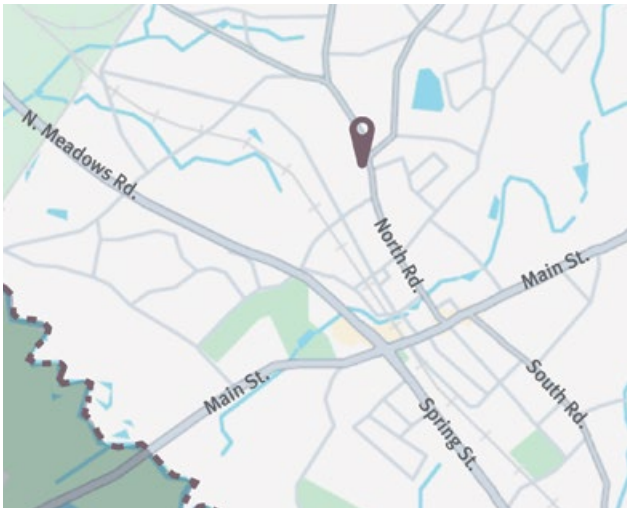
ELECTRIFICATION RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	COST ESTIMATE	PRIORITY
D30-HVAC	The Library is served by 8 RTUs, 2 have already been replaced recently and the remaining 6 are scheduled to be replaced with air source heat pumps to reduce the gas consumption for the building. The high efficiency gas boiler appears to be operating in good to fair condition and shouldn't require replacement for 6-10 years.	$1,287,136	2
D50 Electrical	Replace existing 800 amp 120/208V 3 phase service with a 1200 ampere 120/208V 3 phase service and back feed existing panelboards.	$174,000	2
Total		**$1,461,136**	

Pfaff Building

Facilities Information

Address:	124 North Street
Building Use:	Office, Assembly
Year(s) Built:	1927
Major Renovations	-
Building Area:	8,556 SF
Assessed Value:	$421,500
On Site Combustion:	yes
Capacity for Solar:	no



Electrification Information	EXISTING	PROPOSED	% CHANGE
Electric (KWH/yr)	12,362	148,277	1099%
Natural Gas (kBTU/yr)	715,400	0	-100%
TOTAL Energy Use (kBTU/yr)	757,578	505,923	-33%
Electric Utility Cost ($/yr)	$1,588	$19,054	1100%
Natural Gas Utility Cost ($/yr)	$7,825	$0	-100%
TOTAL Utility Cost ($/yr)	$9,413	$19,054	102%
TOTAL Emissions (MTCO2e/yr)	41	26	-37%

CONDITIONS SUMMARY

PARKING	Asphalt parking is cracked and deteriorating. Pavement markings worn and need to be repainted. No accessible parking spaces or signage.
LANDSCAPE	Landscaped areas are minimal. There is ivy climbing the building's east façade. Basement window wells are filled with debris.
SIDEWALKS	There are no sidewalks at the entrance used by the parks department. Asphalt paving slopes to the north entrance but does not meet MAAB requirements. The south entrance which is used by the Dale St. School's after-school program is not accessible. The sidewalk leading to this entrance is uneven and several trip hazards are present.
FOUNDATIONS	The foundation is a poured in place concrete structure. There are several cracks present in the foundation walls as well as unsealed penetrations. Water infiltration is present and the basement is susceptible to moisture. The storage areas in the basement smell damp and musty. Regular flooding is a persistent issue.
STRUCTURE	The structure is a three-wythe brick construction with heavy timber framing. The floor joist for the main floor are undersized.
ROOF	The roof is a white PVC membrane which was replaced in the early 2000s. Spot repair is required in some locations though given the age of the replacement, a full-replacement may be necessary. The roof structure has deflected from heavy snow loads.
GUTTERS & RAINWATER MANAGEMENT	The flat roof utilizes storm drains which may not be efficient due to the deflection of the roof. During the walkthrough, an employee noted that heavy rains might be overtaxing the storm drains and potentially causing flooding in the basement.
WALLS & FAÇADE	The original brick façade is in extremely poor condition. There are several cracks across all faces of the building. Complete separation of mortar joints suggest water and moisture infiltration is consistent. Brick is spalling, cracked and crumbling in several areas. Wood trim at the entries is rotting and in some cases, missing completely.
WINDOWS	Windows at main floor have been replaced at some point and are in fair condition. Steel lintels at all windows are in various states of rust and corrosion. Masonry at lintel level is cracked and broken, no flashing or waterproofing observed.
DOORS & ENTRIES	Original wood doors are operational but in poor condition. Door hardware is old and in need of replacement. Weather seal is inefficient. Wood trim around doors is rotting and in need of replacement. Signs of water infiltration at interior side of entries was observed. Metal door frames are rusted and disintegrating.
SEALANTS & JOINTS	Brick façade is cracked and crumbling - the walls could benefit from complete repointing, but the condition of the face brick is so poor that extensive repairs would be required simultaneously. Sealant around doors and windows is dried and cracked and will required complete replacement. Several penetrations around the building exterior require sealant.

CONDITIONS SUMMARY - CONT.

FLOORING	The majority of the main floor of the building is the original oak floor. The north entry has some ceramic tile, most likely added in recent years when the kitchenette was refurbished. The office utilized by the Parks Department is carpeted - the carpet has reached its end of life. The hardwood flooring throughout the remainder of the building is uneven and sagging due to undersized joist framing.
WALLS	Walls are either plaster on lath or painted GWB. The condition of the walls is fair with only some water infiltration present in some areas where paint has bubbled and peeled away from the walls.
CEILINGS	Ceilings are plaster on lath throughout. Paint has flaked off in some areas, potentially from moisture but otherwise in fair condition.
STAIRS	There is one wood-framed and unfinished stair leading to the basement. The stair is in adequate condition for its use.
PLUMBING FIXTURES	All fixtures are in Poor/Fair condition, are not efficient and have exceeded their life expectancy. Most Plumbing Fixtures do not adhere to ADA/MAAB requirements. Pedestal Urinals are not code compliant.
WATER DISTRIBUTION	There is an old 1-1/2" Domestic Water Service that enters the buildings basement, it gets reduced to 3/4" (New copper with Pro Press fittings) after a 1-1/2" Ball Valve it then goes through a 3/4" Meter and go up to the ceiling of Basement to 2" Galvanized main and distributes to the building from there. There is no Reduced Pressure Backflow Preventer and the piping (besides the 3/4" Copper to the meter) appears to be beyond its useful life and should be replaced with a system using materials and installation procedure that adheres to Massachusetts Plumbing Code. The Domestic Hot Water is produced by (1) 6 Gallon Water Heater in each Restroom and appear to provide adequate Hot Water to the required fixtures.
SANITARY WASTE	The 4" Cast Iron Sanitary pipe exits the building about 1 ft. below the First Floor in the Basement. The majority of the visible pipes are covered with rust and have served their useful life, they should be replaced with materials and installation procedure that adheres to Massachusetts Plumbing Code.
ELECTRICAL SERVICE & DISTRIBUTION	120/208V 3phase 4 wire 200 Ampere service. Manufactured by Murray. 200Ampere main breaker. The capacity of the service equates to 6W/SF. The service is fed via an overhead utility line to the utility meter mounted on the exterior of the building and then directly into Panel LP-1. Distribution system is in fair condition. The service is adequately sized for the current use, however it is Marginal for any substantial renovation with an electric heating system.
LIGHTING & POWER	Lighting is basic surface mounted strip fixtures with LED light sources. Exit signs are non illuminated placard signs in classrooms with illuminated signs at egress doors. There are no lighting controls in the building. The exterior lighting has been upgraded to LED type wall pack fixtures. Receptacles are adequate as the building functions currently.

CONDITIONS SUMMARY - CONT.

COMMS & SECURITY	There does not appear to be any security required for entrance i.e. card reader access. There is no CCTV present in the building.
EMERGENCY POWER	There is no emergency generator on site. Emergency lighting is via emergency battery heads.
FIRE ALARM	There are fire alarm devices that are not ADA compliant with a master box on the exterior of the building. Unknown if that masterbox is still functional. There is no FACP in the building.
HVAC SUPPLY & GENERATION	The building is heated by (1) Burnham cast iron steam boiler which is gas fired. Breeching for the boiler consists of single wall galvanized sheet metal flue which terminates into a masonry chimney. There did not appear to be any combustion air for the space. The boiler was in good condition. The plant did not appear to have a chemical feeder for yearly piping treatment.
DISTRIBUTION	Distribution for steam through the building is a combination of schedule 40 black steel and copper piping. All of which is not insulated.
UNIT SOURCES	The building utilizes cast iron steam radiators for the main heat source in the building. The radiators are antiquated and do not provide adequate thermal coverage. There are several wall mounted propeller style fans which assist in circulating air throughout the building.
CONTROLS	The building is not equipped with a central control system. There is one main digital thermostat manufactured by PRO which is centrally located and used to enable and disable the boiler. As far as individual temperature control, each radiator is provided with a thermostatic control valve. This valve allows the occupant to increase or decrease the amount of steam into the radiator which in turn changes the amount of heat dissipated.
OTHER	The overall system is antiquated and not energy efficient and consideration should be given to replacing the system in its entirety.
ACCESSIBILITY	There exist several ADA deficiencies throughout including access from parking, parking spaces, entry steps and handrail, uneven floors and transitions, and plumbing fixtures.
FIRE PROTECTION	The building does not contain an automatic sprinkler system. MA General Law requires that any existing commercial building over 7,500 square feet which undergoes major alterations, or a building addition, must be sprinklered throughout.

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	COST ESTIMATE	PRIORITY
Standard Foundations	Basement - Remove all small wood framed rooms, and materials that wick water and promote mold conditions.	$14,770	1
	Re-evaluate all stored records and material storage no longer required to be kept. Reorganize files on a rack storage system to promote air flow. Open access from the interior basement into the crawl spaces to promote air flow and dry conditions.	$14,770	1
Basement Foundations	Epoxy or mechanically fix the cracking in the retaining wall.	$7,250	1
Floor Construction	Upgrades to undersized flooring structure to address flooring movement (flexing/bounce).	$200,000	1
Roof Construction	Investigate roof loading and reinforce as needed.	$240,660	1
Exterior Walls	Perform an immediate, full, and comprehensive structural analysis. Renovation to this structure will require upgrades to seismic, snow loading, and floor loading to meet current code requirements.	$73,850	1
	Replace or repair parapet wall and thru wall flashing. Replace steel lintels.	$590,800	1
	Repair and repoint masonry, repair flashing, and repair structure as determined by the engineering review.	$72,500	1
	Repoint damaged mortar and brick.	$145,000	1
Exterior Doors	Replace basement level doors to prevent weather infiltration.	$7,385	1
Roof Coverings	Perform certified inspection of PVC roofing.	$2,954	1
	Repair areas of concern or leaking. Structural repair of the parapet will affect the roof membrane and thru wall flashing.	$50,000	1
Heat Generating Systems	Replace entire heating system. Provide a new air source VRF system for the entire building to provide heating and cooling. Provide a dedicated OA ERV unit for building ventilation air. The unit would be associated with a duct distribution system which would terminate in each space via ceiling mounted grilles for supply and return air.	$1,483,067	1
Distribution Systems	Provide mechanical ventilation system in lieu of the current natural ventilation via windows.	$290,000	1
Sprinklers	Install automatic sprinkler system.	$139,583	1
Electrical Service & Distribution	Electrical service and distribution should be upgraded to a 800 amp 120/208V 3phase service. Replace distribution and wiring system, branch wiring, and all wiring devices.	$145,000	1

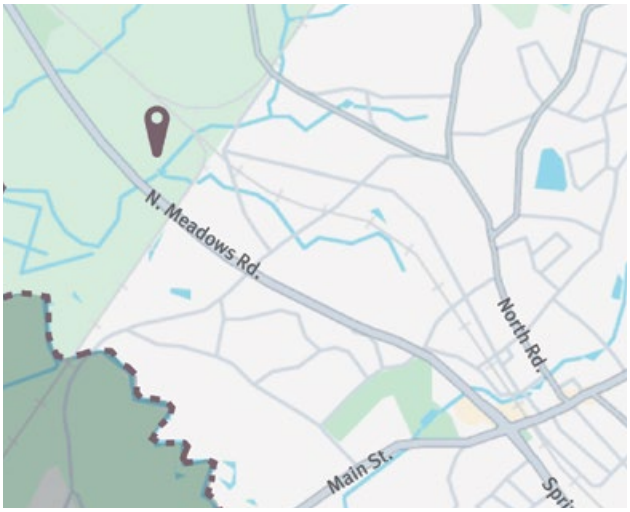
CAPITAL RECOMMENDATIONS - CONT.

Communications & Security	Replace fire alarm system with new addressable system with compliant notification and detection devices.	$145,000	1
Lighting & Branch Wiring	Upgrade site with pole lighting, and provide new LED exterior lighting at egress doors.	$11,600	1
	Upgrade/repair emergency lighting system to a combination of emergency battery units and inverters.	$36,250	1
Accessibility	Accessibility upgrades per 2021 Self Evaluation and Transition Plan	$99,398	1
Priority 1 Total		**$3,769,837**	
Exterior Windows	Replace all basement wood windows with metal insulated panel. Remove all excess debris in the window wells.	$22,155	2
Wall Finishes	Replace all worn and dated materials as part of an interior restoration and upgrade.	$443,100	2
Floor Finishes	Replace carpet in Parks Dept. Office	$87,239	2
	Replace warped hardwood after repairing or replacing floor joists.	$261,718	2
Ceiling Finishes	Scrape and repaint all painted, plaster ceilings	$261,718	2
Lighting & Branch Wiring	Upgrade interior lighting that has not been upgraded to LED. Provide new lighting controls that include occupancy sensors and daylight sensors in compliance with current energy codes.	$130,500	2
Other Electrical Systems	Install Lightning Protection System.	$43,500	2
Parking Lots	Replace the driveway and parking areas in their entirety.	$147,700	2
	Engineer and tie in all roof drains into a catch basin drainage system to control roof discharge and damage to the asphalt.	$29,540	2
Site Development	In lawn areas, run all downspouts to drywells and away from building.	$29,540	2
	Where asphalt pitches towards the building, regrade slope and asphalt away from the building.	$29,000	2
Priority 2 Total		**$1,485,710**	
Communications & Security	Provide an integrated electronic security system consisting of CCTV, card access, and security intrusion.	$87,000	3
	Upgrade data wiring to CAT6 with new patch panels racks and UPS.	$116,000	3
Priority 3 Total		**$203,000**	
Total		**$5,458,546**	

Transfer Station

Facilities Information

Address:	135 North Meadow Street
Building Use:	Municipal, Waste Facility
Year(s) Built:	1986
Major Renovations	-
Building Area:	5,436 SF
Assessed Value:	n/a
On Site Combustion:	no
Capacity for Solar:	no



Electrification Information	EXISTING	PROPOSED	% CHANGE
Electric (KWH/yr)	32,830	28,890	-12%
Natural Gas (kBTU/yr)	-	-	-
TOTAL Energy Use (kBTU/yr)	112,015	98,573	-12%
Electric Utility Cost ($/yr)	$4,219	$3,712	-12%
Natural Gas Utility Cost ($/yr)	$0	$0	-12%
TOTAL Utility Cost ($/yr)	$4,219	$3,712	-12%
TOTAL Emissions (MTCO2e/yr)	8	5	-38%

CONDITIONS SUMMARY

PARKING	There is substantial pavement across the site for public access and equipment traffic. Asphalt is cracked and patched in several locations but is still in adequate condition for its use. There is cracking and deterioration present in drive aisles and around drainage structures. There is no curbing on in the parking and drop-off areas and pavement markings are still clear.
LANDSCAPE	Landscape is minimal other than grass dividers within the parking and drive lanes and a
SIDEWALKS	There are no sidewalks, but there are concrete pads near the recycling drop off units which appears to be in fair condition.
FOUNDATIONS	Foundations are poured-in-place concrete and appear to be in good condition. No signs of cracking or settlement present. Some retaining walls along the backside have a lot of organic growth, but are still in good shape.
STRUCTURE	The building is a pre-engineered steel framed building with metal roof and siding. The heavy columns and beams support the roof structure and wall girts are in good condition.
ROOF	The roof is a metal panel roof structure and in mostly fair condition. The roof overhang at the public drop-off area is in fair condition, though the underside is corroded and loose, allowing for bird nests etc. The roof over the office appears to be an extension of the metal structure and is in fair condition.
GUTTERS & RAINWATER MANAGEMENT	There are gutters and downspouts serving all roof edges. They are worn but seem to be in fair shape.
WALLS & FAÇADE	The metal panel wall system is fastened directly to the steel super structure. The panels are mostly in adequate condition though there is corrosion present at openings in the panels at penetrations etc.
WINDOWS	The main building has two sections of a fiberglass sandwich panel system, much of which has been covered with plywood, likely to deter nesting birds. Office windows are old and worn, with operable sliders of unknown functionality and exterior metal mesh for protection. Several facade louvers are also worn, with unknown efficiency.
DOORS & ENTRIES	The door to the office is an insulated hollow metal door and frame and is functionally adequate. Large roll-up doors on the north and east faces are in adequate condition but beyond their end of life (doors were open an in-use during walkthrough, condition of the door panels could not be assessed). Rollup doors at public drop off area are also in adequate condition but rusty and past their usable life span.
FLOORING	The office is finished with VCT which is worn and past its useable lifespan
WALLS	Walls in the office appear to be painted plaster panels. Given the use of the space, they are well worn and abused.
CEILINGS	Ceilings in office are painted plaster panels. Mostly in fair condition.

CONDITIONS SUMMARY - CONT.

PLUMBING FIXTURES	Bathroom fixtures are vitreous china. A pedestal drinking fountain is located in office. All fixtures appear to be functioning properly.
WATER DISTRIBUTION	The 2-inch domestic water service has a 2-inch meter but no reduced pressure backflow preventer. Distribution piping is copper with soldered joints. Domestic hot water is provided by a point-of-use electric tank water heater, manufactured in May 2023, in good condition. There is no thermostatic mixing valve, and the hot water system is not recirculated.
SANITARY WASTE	Cast iron is used for sanitary and storm drainage. Where visible, the cast iron pipe appears to be in good condition. Smaller pipe sizes appear to be copper.
ELECTRICAL SERVICE & DISTRIBUTION	The existing service is a 277/480V, 3-phase, 4-wire, 150A service by Federal Pacific. A 150A main breaker feeds a 225A MDP, which then feeds a 75 KVA transformer supplying a 225A, 120/208V, 3-phase, 4-wire panel, also by Federal Pacific. The utility company's pad-mounted transformer is installed below grade. The remote shed is tapped from the compactor feed. The distribution system and equipment are in poor condition and should be upgraded, as Federal Pacific equipment is historically unsafe for overcurrent protection. A shelf in front of the MDP violates code.
LIGHTING & POWER	Lighting has been upgraded to LED type with exception to an office area. There does not seem to be any automatic lighting controls installed. GFI protection is not code compliant and there are non-in use weatherproof covers that are utilized outside and within the garage bay which is not code compliant. There is no parking lot area lighting
EMERGENCY POWER	There is no emergency generator nor is there any emergency battery lighting.
OTHER	Fire alarm control panel is a Fire-Lite MS-5UD 4 zone conventional panel . The panel reported system normal during the site visit. Transmission of alarms is accomplished via AES intellinet wireless transmitter. Notification coverage is inadequate
HVAC SUPPLY & GENERATION	Terminal Electric Heat in Office Spaces. Exhaust for toilet rooms. Transfer fans in open trash depository
DISTRIBUTION	Electric Baseboard with terminal heat controls.
UNIT SOURCES	Electric Baseboard in poor condition and should be considered for replacement
CONTROLS	Electric Baseboard with terminal heat controls. Toilet room fans interlocked with light switch. Wall mount fans for trash depository run continuous.
ACCESSIBILITY	EBB located under some desks, some items stored close to heat source
FIRE PROTECTION	The building does not contain an automatic sprinkler system. MA General Law requires that any existing commercial building over 7,500 square feet which undergoes major alterations, or a building addition, must be sprinklered throughout.

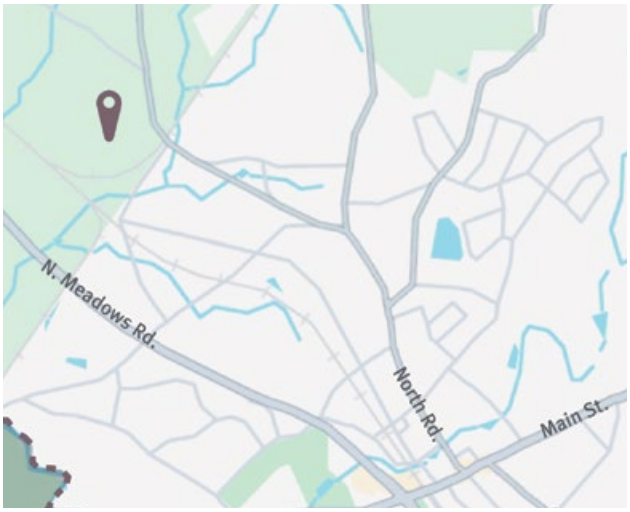
CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	COST ESTIMATE	PRIORITY
Electrical Service & Distribution	Upgrade weatherproof outlets to GFCI protected in-use type.	$2,900	1
Communications & Security	Provide code required fire alarm notification.	$9,425	1
Priority 1 Total		**$12,325**	
Exterior Walls	Hire structural engineer to inspect the exterior metal panel fasteners. Replace damaged units.	$14,500	2
Exterior Windows	Replace damaged metal panels at the fiberglass panel window.	$44,310	2
Exterior Doors	Replace large door motor	$2,900	2
Roof Coverings	Hire engineer to inspect the exterior metal panel fasteners and flashing details at the cheek walls. Determine if the roof needs an emulsion coating.	$7,385	2
	Full inspection and replacement of metal screw panel fasteners at the roof deck, roof penetration flashings, and caulking.	$14,500	2
Other HVAC Systems	Replace wall mounted transfer fans in trash depository, provide timeclock	$17,400	2
Distribution Systems	Replace Electric resistance heat with heat pumps	$65,250	2
	Replace Exhaust fans in toilet room	$4,350	2
Lighting & Branch Wiring	Upgrade the remainder of the fluorescent lighting	$2,900	2
	Add lighting controls	$11,600	2
Electrical Service & Distribution	Replace and upgrade existing Federal Pacific electrical distribution to 400Amp 277/480V 3 phase 4 wire and replace existing transformer and subpanels	$72,500	2
Priority 2 Total		**$257,595**	
Exterior Walls	Power wash entire building and spot paint rusted panels.	$7,385	3
Parking Lots	Systematic replacement plan of asphalt paving and site drainage.	$11,816	3
Accessibility	Accessibility upgrades per 2021 Self Evaluation and Transition Plan	$4,350	3
Priority 3 Total		**$23,551**	
Total		**$293,471**	

Council on Aging

Facilities Information

Address:	One Ice House Road
Building Use:	Community Center
Year(s) Built:	2007
Major Renovations	-
Building Area:	7,810 SF
Assessed Value:	$1,510,300
On Site Combustion:	yes
Capacity for Solar:	yes



Electrification Information	EXISTING	PROPOSED	% CHANGE
Electric (KWH/yr)	35,450	121,805	244%
Natural Gas (kBTU/yr)	334,100	0	-100%
TOTAL Energy Use (kBTU/yr)	455,057	415,599	-9%
Electric Utility Cost ($/yr)	$4,555	$15,652	244%
Natural Gas Utility Cost ($/yr)	$3,654	$0	-100%
TOTAL Utility Cost ($/yr)	$8,209	$15,652	91%
TOTAL Utility Cost w/ PV ($/yr)	$8,210	$15,108	84%
TOTAL Emissions (MTCO2e/yr)	27	22	-19%
TOTAL Emissions w/ PV (MTCO2e/yr)	27	19	-30%

CONDITIONS SUMMARY

PARKING	Asphalt paving in drive aisles cracked and worn along the entire center of the drive aisle, causing potential for water damage and further asphalt deterioration. Pavement markings are worn and could be repainted.
LANDSCAPE	Landscaping around the building is in good shape and appears to be regularly maintained.
SIDEWALKS	Sidewalks at main entrance are in good condition but should be inspected for uneven spots and potential trip hazards. The pavers at the center of the covered walk are unlevel and may present a trip hazard for those with mobility issues. The curb cut at the drop off zone should be checked for slope in adherence to MAAB regulations. Sidewalks at the rear of the building are mostly in good shape but should be checked for uneven conditions. The rear patio does not appear to slope effectively away from the building to allow for water to shed away.
FOUNDATIONS	Poured-in-place foundation with a spread footing and slab on grade. No visible cracks present, foundations appear to be in good shape.
STRUCTURE	Structure is a stick-built, wood frame construction with structural wood beams and roof trusses. Condition is in good shape.
ROOF	Asphalt shingles appear to the original and are nearing end of life. There are signs of water infiltration and repair attempts at the false dormers.
GUTTERS & RAINWATER MANAGEMENT	Gutters are present at certain locations - where gutters are present, they seem to be inadequate, working condition. Where gutters are not present, there is water damage and mildew present at the base of the exterior wall. Rainwater runs off adjacent, outdoor shade structures and splashes back on the building.
WALLS & FAÇADE	Fiber cement siding, wood stud with batt insulation. Fiber-cement siding shows signs of age in several locations. Lower portions have been replaced more recently to fix extensive damage but the remainder of the walls are showing signs of wear and water infiltration. Shingles are warped where water has infiltrated.
WINDOWS	Wood, double hung, double pane windows are typical throughout. No signs of damage or water infiltration, however sealant should be inspected for wear and defects. Azeck trim board around the windows show signs of wear and shrinkage and should be inspected for potential water infiltration.
DOORS & ENTRIES	Exterior doors at entry vestibule, back patio are poorly sealed due to failing weather stripping and possible shrinkage of wood doors. Covered entries are open above doors, full of spider webs, hornet nests and bird nests. Wood trim at covered entries showing water damage and wear.
SEALANTS & JOINTS	Sealant at all windows and doors are showing signs of age and should be inspected for signs of wear or damage. Trim boards around the entire building have shrunk in several locations and should be reviewed for potential water infiltration.

CONDITIONS SUMMARY - CONT.

FLOORING	VCT in kitchen is showing signs of wear and damage near floor drains. Damaged tiles should be replaced. Carpet in the main lobby and corridor is reaching its end of life and should be replaced. Ceramic tile in bathrooms is in adequate condition but is in need of a deep clean of both tile and grout. Wood floors in the multi-purpose rooms appears to be in good condition.
WALLS	Walls and soffits are painted GWB and are in good condition. Wood trim is also in good condition.
CEILINGS	Suspended ACT throughout is mostly in good condition. Some signs of water damage and marring are present but do not seem to come from any significant leaks and may be more related to HVAC condensation.
PLUMBING FIXTURES	Fixtures are vitreous china and stainless steel. All fixtures appear to be functioning properly.
WATER DISTRIBUTION	There is a 4-inch domestic water service with a 2-inch water meter and 2-inch reduced pressure backflow preventer. Distribution piping is copper tubing with soldered joints and fittings. Domestic Hot Water is produced by a natural gas fired tank type water heater. The water heater appears to have been installed in 2007 and is near the end of its useful life. There is a thermostatic mixing valve on the system. The hot water system is recirculated.
SANITARY WASTE	Cast iron is used for sanitary and storm drainage. Where visible, the cast iron pipe appears to be in good condition. Smaller pipe sizes appear to be copper.
OTHER	An elevated pressure gas service is provided to the building. Gas meter is located on the exterior. Natural gas is provided to heating gas furnaces, domestic hot water heater, HVAC rooftop equipment, and interior gas fireplace. Gas piping is black steel with threaded joints. Gas piping appears to be in good condition. Exterior gas piping on roof should be painted.
ELECTRICAL SERVICE & DISTRIBUTION	120/208V 3phase 4 wire 800Ampere service. Manufactured by Square D. 800Ampere main breaker feeds 800Ampere MDP. Service is fed from a utility co. owned pad mounted transformer below grade. Distribution system is 2005 vintage and in good condition. The service is sized at approximately 35W/SF more than adequate for electrification of the HVAC system.
LIGHTING & POWER	2X2 and 2X4 fluorescent lay in fixtures where upgraded to LED approximately 3 years ago. There are decorative lights in a number of spaces which include pendant fixtures, utility work lights and wall sconces that remain as fluorescent. Lighting controls consist of local occupancy sensors with line voltage switches in all offices, classrooms, craft rooms, multipurpose room and activity room. The remainder of the spaces are controlled via line voltage switches. Exit signs are LED with self contained battery. Receptacles seem to be adequate and in good condition. Kitchen contains GFCI receptacles however equipment is not protected by GFCI breakers.

CONDITIONS SUMMARY - CONT.

EMERGENCY POWER	There is not an emergency generator, emergency lighting is accomplished with emergency battery units. They are in good condition and seem to be code compliant.
FIRE ALARM	The fire alarm control panel is an EST quick start addressable panel and is in good condition. The panel indicated system normal during the site visit. Transmission of alarms is accomplished via AES intellinet wireless transmitter. The building is covered with smoke detectors and heat detectors located in most spaces, which is beyond what is required by code. Audio visual notification appliances are horn/strobes. The fire alarm system is code compliant and in good condition. There is no CO detection in the Kitchen to shut down gas fired range.
HVAC SUPPLY & GENERATION	The building is heated and Air Conditioned by a combination of Gas heaters and Packaged Roof top Equipment. Gas furnaces are located in the mechanical attic space and ducted throughout the building. The two roof top units serve either side of the community room, allowing the divider to split the space. Direct Expansion (DX cooling) equipment appears to utilize R-22 refrigerant which is no longer produced or utilized in the industry. R22 is very expensive to replace for service calls. condensing units are grade mounted and roof mounted
DISTRIBUTION	Ducted supply and return from AHUs and RTUs, ducted exhaust from fans
UNIT SOURCES	Registers, Grilles and Diffusers are utilized as supply return and exhaust throughout the building. Terminal electric resistance heat is provided in entry ways, the attic space, and other spaces requiring supplemental heat. There is also a gas fireplace in the library.
CONTROLS	All Controls are stand-alone. Many are programmable, with the exception of Thermostats for Electric heat. There is no building management system
FIRE PROTECTION	Building is fully protected with an automatic sprinkler system. The fire service is 6-inch. Service includes a 4-inch double check valve assembly. There is one 4-inch wet alarm valve and one 4-inch dry alarm valve. Fire Department connection is a 4-inch Storz type. Piping is black steel with coupling or threaded joints depending on pipe size. Sprinkler heads are semi-recessed pendent type in ceiling areas and upright type in non-ceiling areas. In general the system appears to be in good condition.

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	COST ESTIMATE	PRIORITY
Exterior Walls	Evaluate all trim and siding that has signs of rot and moisture penetration and replace damaged wood. Spot repair all wood siding where nail connections have failed. Address flashing on clapboard siding has excessive gaps to assure water is not penetrating wood siding.	$11,816	1
Exterior Doors	Installation of new door weatherstripping at all exterior doors including new astragals at double doors.	$2,900	1
	Clean areas above covered entries	$2,900	1
Communications & Security	Install CO detection in kitchen that will shut down gas valve	$6,525	1
Pedestrian Paving	Redesign the rear asphalt egress area to prevent water damage to the wood façade and eliminate water heaving at the door. Improve drainage beneath the accessible pad to prevent movement and manage excessive moisture.	$5,908	1
	At the front entry, redesign the immediate concrete walk to prevent frost heaving and anchoring concrete pad to prevent movement. A similar repair is required at the rear patio.	$20,678	1
Priority 1 Total		**$50,727**	
Exterior Walls	Repaint all white trim to stabilize paint failure	$17,724	2
Exterior Windows	Remove and replace exterior sealant at all windows	$18,857	2
Interior Construction	Investigate attic and soffits to assure proper ventilation is occurring.	$1,477	2
	Install drywall in the mechanical attic space with required access doors to the uninsulated space.	$22,155	2
Floor Finishes	Hardwood floor screen and reseal flooring yearly.	$1,477	2
	Replace VCT in kitchen	$9,788	2
Other Plumbing Systems	Paint exterior gas piping at rooftop equipment.	$2,175	2

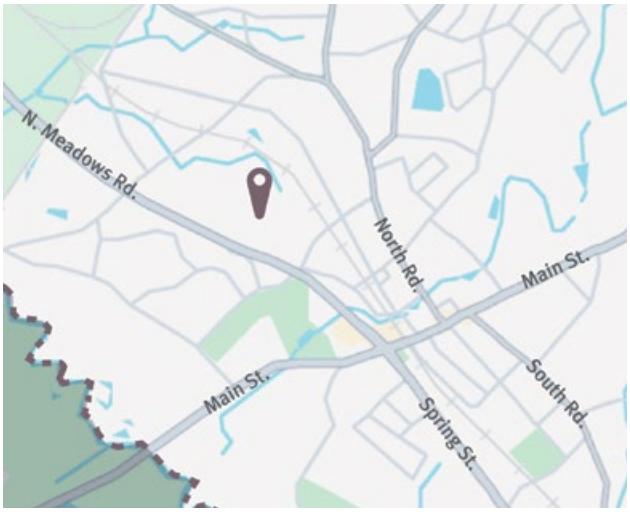
CAPITAL RECOMMENDATIONS - CONT.

HVAC Supply & Generation	Similar to the Electrification upgrade currently occurring at the Library, we recommend existing equipment be replaced in kind with similar equipment, but instead of just gas fired and DX cooling, the replacement equipment could be high efficiency gas fired with a DX heat pump. this would reduce dependency on natural gas fired equipment and allowing for ductwork distribution from the equipment to remain in place. There are 8 total gas furnaces, 4 at 88 CFH input and are between approximately 1200-2200 CFM each and 83 MBH output and 4 at 44 CFH and 41 MBH and are between approximately between 750-1020 CFM. RTU-1 is 4,000 CFM and 250 CFH, 202.5 MBH output. RTU-2 is 6000 CFM, 350 CFH input and 284 MBH output. There is a Gas fired make up air unit that does not have cooling, which provides 1800 CFM at a gas input 187.5 CFH and a 172.5 MBH output. the make up air unit should be reviewed to determine if heat pump capacity wants to be added.	$849,338	2
Distribution Systems	Replace RTUs and Kitchen Make up Air unit	$319,000	2
	Replace AHUs, Condensing units and refrigerant pipes	$81,200	2
Electrical Service & Distribution	New electrical distribution and feeders to serve new heat pump equipment	$43,500	2
Lighting & Branch Wiring	Replace the remainder of the Fluorescent lighting with LED	$36,250	2
Parking Lots	Replace asphalt paving of parking area	$29,000	2
Site Development	Maintenance at the bio-retention area should receive an annual cut back and cleaning of the plant material to assure it proper operation.	$2,900	2
Priority 2 Total		**$1,434,840**	
Exterior Walls	Full replacement of siding	$436,523	3
Wall Finishes	Repaint the interior walls and trim	$17,724	3
Floor Finishes	Replace carpet	$65,105	3
Ceiling Finishes	Replace damaged tiles	$5,662	3
Domestic Water Distribution	Replace existing domestic water heater and mixing valve.	$21,750	3
Controls & Instrumentation	Replace stand-alone controls with Building Management System	$134,927	3
Distribution Systems	Replace Exhaust Fans	$23,945	3

CAPITAL RECOMMENDATIONS - CONT.

Lighting & Branch Wiring	Provide lighting controls in the remainder of the building that is controlled via line voltage switching.	$14,500	3
Fixed Furnishings	Replace damaged kitchen cabinets	$7,250	3
Parking Lots	Redesign the rear asphalt delivery area to prevent water flow from drive running into foundation and doorway.	$5,908	3
Site Development	Conduct a thorough assessment of all existing landscaping to align with the desired concept. If limiting the fir trees' height is a goal, establish a pruning program to prevent them from reaching full maturity at 40 feet. Evaluate and control surrounding tree line growth to ensure it does not impact the building or exterior site functions.	$7,250	3
Priority 3 Total		**$740,544**	
Exterior Windows	Replace all windows with triple glazed vinyl windows	$263,103	4
Roof Covering	Engineering for roof replacement	$44,310	4
	Full replacement and re-flashing of penetrations	$531,720	4
Priority 4 Total		**$839,133**	
Floor Finishes	Replace ceramic tile	$30,341	5
Accessibility	Accessibility upgrades per the 2021 Self Evaluation and Transition Plan	$31,030	5
Priority 5 Total		**$61,371**	
Total		**$2,726,415**	

Department of Public Works



Facilities Information

Address:	55 North Meadows Road
Building Use:	Office, Commercial Garage
Year(s) Built:	2014
Major Renovations	2017 (PV panel array)
Building Area:	38,837
Assessed Value:	$9,434,100
On Site Combustion:	yes
Capacity for Solar:	n/a

Electrification Information	EXISTING	PROPOSED	% CHANGE
Electric (KWH/yr)	145,895	534,109	266%
Natural Gas (kBTU/yr)	2,060,800	0	-100%
TOTAL Energy Use (kBTU/yr)	2,558,593	1,822,379	-29%
Electric Utility Cost ($/yr)	$18,747	$68,633	266%
Natural Gas Utility Cost ($/yr)	$22,541	$0	-100%
TOTAL Utility Cost ($/yr)	$41,288	$68,633	66%
TOTAL Utility Cost w/ PV ($/yr)	$32,244	$59,589	85%
TOTAL Emissions (MTCO2e/yr)	147	95	-35%
TOTAL Emissions w/ PV (MTCO2e/yr)	89	55	-38%

CONDITIONS SUMMARY

PARKING	Asphalt lot around the entirety of the building. Some wear is present but is in good condition considering the size and frequency of equipment traffic through the site. ADA pavement markings are showing wear and may need to be repainted. Proper signage may be required at accessible parking spaces.
LANDSCAPE	Landscape is mostly grouped around the center, office building and appears to be well maintained.
SIDEWALKS	The sidewalk connecting the parking area to the main entrance is in good condition and doesn't show any significant wear. The curb cut serving the main entrance appears to be in good condition.
OTHER	There is a wood-framed salt shed on the property. The structure appears to be in good condition but the exterior wood panels require repainting. The concrete slab appears to be in adequate condition despite the harsh salts stored within.
FOUNDATIONS	Foundations are poured-in-place concrete foundations with spread footings. Foundations are in good shape with no signs of damage. The slab-on-grade, exposed concrete floors in the service bays is in good condition however, there are some settlement cracks present. The cracks do not appear to be significant, but should be sealed to prevent water infiltration and corrosion of the reinforcing steel.
STRUCTURE	The building is a CMU block construction with supplemental steel structure for the roof framing. The one-story office building is flanked on either side by double-height service garages, also CMU block construction supporting steel roof trusses. No signs of settlement or cracking present at structural walls.
ROOF	The main office section of the building is covered with a hipped roof with dormers at the front and rear entries. The roof is covered with asphalt shingles which appear to be in good condition but should be inspected for wear within 3-5 years. The two garages are covered with a white, EPDM system and appear to be in good condition with no signs of leaks.
GUTTERS & RAINWATER MANAGEMENT	No gutters are present at the main office. Flat roofs at the two garages incorporate storm drains.
WALLS & FAÇADE	The building walls are constructed with a 4" ground-face CMU veneer with a 12" CMU backup. The walls all appear to be in good condition with no signs of cracking or degradation of mortar.
WINDOWS	Windows are double-pane, steel-clad with operable awnings throughout. Windows appear to be in good condition with no signs of condensation or water infiltration.
DOORS & ENTRIES	Entry doors are steel-clad storefront doors. Doors are in good condition but weather stripping and astragals are worn and may need replacement. Other access and egress doors are insulated hollow metal doors and frames and appear to be in good condition.

CONDITIONS SUMMARY - CONT.

SEALANTS & JOINTS	Sealant around building joints seems to be in adequate condition. Mortar joints throughout are in good condition, though there are some signs of efflorescence on some faces of the building. It is difficult to tell whether this is recent efflorescence or from the original construction.
FLOORING	Flooring of the main office is VCT throughout. Bathrooms and locker rooms are finished with ceramic tile. All in good shape thought the tile in the men's locker room would benefit from a deep clean of tile and grout. The service garage has an epoxy coating over the concrete slab. The finish is worn and peeling away in the service bays where fluids drip from service vehicles. The finish also looks to have been applied without consideration of the control joints and has cracked over the control joints, allowing for moisture penetration.
WALLS	Walls in the office area are painted GWB and are in good condition. Walls in the break/meeting room are damaged from furniture being moved and run into walls. Painted block in the interior of the garage spaces is in good condition but there is wear from regular use of the space.
CEILINGS	Ceilings in the office are ACT throughout. There is no signs of damage or water infiltration, but tiles near HVAC diffusers are dirty and it's unclear if the accumulation is dust or mildew.
STAIRS	There are steel stairs with steel grate treads leading up to the mezzanines in the service garages. All in good conditions.
OTHER	There is a gas fired range in the kitchen.
PLUMBING FIXTURES	Fixtures are vitreous china and stainless steel. All fixtures are properly functioning and meet ADA/MAAB where required.
WATER DISTRIBUTION	There is a 2" Domestic Water Service that flows through a meter and 1-1/2" Reduced Pressure Backflow Preventer with bypass. Distribution piping is in like new condition and is properly insulated. Hot Water is produced by an Indirect Water Tank style heater, the distribution temperature is regulated by a Symmons Mixing Valve set to 117°F at time of visit. The Emergency fixtures are equipment with the required Emergency Water Tempering Valve set to 72°F which is within the range required by code.
SANITARY WASTE	The Sanitary Waste System Piping and Drains appear to be functioning as expected.
OTHER	Natural Gas: The 2" service penetrates the ground and runs through a Meter and Regulator then increases to 5" and enters the building. There is no Gas Cock immediately inside of the building which is good engineering practice. The Natural Gas piping is well labeled. Compressed Air: Compressor and distribution piping are in good shape and appear to be operating as expected. Storm Drain: The piping for appears to be functioning as expected and pipes are insulated where required. Roof Drains and scuppers are unobstructed at this time.

CONDITIONS SUMMARY - CONT.

ELECTRICAL SERVICE & DISTRIBUTION	The service is sized at 600amperes 277/480V, 3Phase 4 wire. The service is fed from a utility owned pad mounted transformer, primary and secondary feeds are installed below grade. Secondary service goes to Panel HP1 with a Main Circuit Breaker MCB. The utility meter is located on Unistrut adjacent to the pad mounted transformer. Panel HP1 is rated for 600A. The capacity of the service equates to 12W/SF. Down stream of the main switch board are 120/208V, 3 phase branch circuit panelboards. The building was constructed in 2015 and the electrical distribution system is in good working condition.
LIGHTING & POWER	Lighting is in good condition. All lighting installed is energy efficient LED. Lighting controls are via wall mounted occupancy sensors. Common corridor is controlled via local switching. The apparatus bays are provided with ceiling mounted occupancy devices with industrial strip fixtures with wire guards. Building lighting is via LED wall packs. There are not site lighting poles present.
COMMS & SECURITY	There main MDF/IDF equipment is located in a file storage room. The room contains a floor mounted data cabinet and wall mounted data rack. The building contains Category 5e cabling throughout. The building has a copper wiring throughout for phone lines. The provider appears to be Verizon. There is no UPS present as the building appears to be fully backed up by the emergency generator. The building contains access control system and a CCTV system. Exterior doors have card access to enter. The CCTV cameras are located on the exterior of the building. The systems are in good condition and can remain as is if they are operating properly and meeting the public safety needs.
EMERGENCY POWER	A 350KW Diesel Emergency Generator is located at the exterior. The generator is inside an sound attenuated enclosure with a diesel fuel base tank. There is a Generac ATS located in the electric room. It appears the building is completely backed up by this emergency generator. There is no separate Emergency Electric Room.
OTHER	Fire alarm control panel is a Notifier Panel NFW2-100. The panel reported system normal during the site visit. Transmission of alarms is accomplished via AES intellinet wireless transmitter Located in the electric room. Notification coverage is adequate as this system was installed during the construction in 2015.
HVAC SUPPLY & GENERATION	The building is heated by (1) HTP high efficiency boiler which is gas fired. Breeching for the boiler is direct vent and is constructed of stainless steel double wall which terminates up through the roof. The plant is associated with (2) Taco inline pumps, one used as a boiler circulator and one for building distribution. The boiler plant is equipped with a vertical expansion tank, inline air separator, and chemical feeder. Overall we would recommend installing a second boiler for backup/redundancy.

CONDITIONS SUMMARY - CONT.

DISTRIBUTION	Distribution for hot water through the building is a combination of schedule 40 black steel and copper piping. All of which is insulated with fiberglass insulation. The building is equipped with an indoor air handling unit and roof mounted energy recovery units and its air distribution system consists of galvanized sheet metal for supply and return, all of which is insulated with fiberglass insulation, except for the energy recovery duct distribution systems.
UNIT SOURCES	The building is equipped with an indoor air handling unit which provides ventilation, heating and air conditioning for the entire building. Variable Air Volume (VAV), terminal units with hot water reheat coils are provided for each space which provides air flow control for each space. The two garage bays are tempered with roof mounted energy recovery units. The common spaces such as corridors, vestibules, storage rooms and toilet rooms are heated through a combination of fintube radiation and unit heaters.
CONTROLS	The buildings DDC system is manufactured by Johnson Controls and utilizes a BACnet protocol. The DDC system extends to all equipment throughout the building with thermostats in each space and for each air handling unit. The system is provided with a full graphics program providing real time visual confirmation of equipment operation and provides real time adjustment and modifications.
OTHER	One of the Energy recovery units is not currently operational and should be serviced or replaced.
FIRE PROTECTION	The building is protected by a combination of wet and dry sprinkler system that originate in the Mechanical Room via 6” service that flows through a Double Check Valve as required. There are (3) Dry Alarm Valves and (1) Main Alarm Valve located at the service. The building appears to have adequate coverage with the exception of the following: 1) There is not adequate Sprinkler coverage in the Storage (Motor Oil) Room located in the Mechanic bay. The area below the Mezzanine that the Air Compressor is on requires a Sprinkler head due to its width, per NPFA 13 sprinklers must be installed under fixed obstructions that are wider than 48”. B)The Storage (Misc. Parts/Boxes) Room in the Mechanics Bay with the Mezzanine that covers the entire floor area of the room does not have adequate Sprinkler coverage, per NFPA 13 open grate flooring over 4 ft. in width shall require sprinkler protection below the grating.

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	COST ESTIMATE	PRIORITY
Distribution Systems	Replace (1) rooftop energy recovery unit within the garage bay.	$253,750	1
Heat Generating Systems	Provide second HW boiler for backup/redundancy including a second boiler and building pump.	$145,000	1
Sprinklers	Provide proper FP Sprinkler protection below Air Compressor mezzanine in Storage (Oil) Room off of Mechanics Bay	$2,175	1
	Provide proper FP Sprinkler protection below mezzanine in Storage (Parts/Misc. Boxes) Room off of Mechanics Bay	$6,525	1
Priority 1 Total		**$407,450**	
Wall Finishes	Paint walls throughout	$169,098	2
Floor Finishes	Remove and replace damaged epoxy coating in the auto bays. Inspect floors for solvent damage, clean, and patch as needed. Seal the epoxy coating at floor control joints to prevent moisture infiltration.	$362,500	2
Appliances	Replace gas range with electric cooktop	$11,600	2
Priority 2 Total		**$543,198**	
Accessibility	Accessibility upgrades per 2021 Self Evaluation and Transition Plan	$13,050	3
Priority 3 Total		**$13,050**	
Roof Covering	Replace asphalt roof at office in kind	$424,125	4
	Replace membrane roof at auto bays in kind	$1,644,300	4
Priority 4 Total		**$2,068,425**	
Total		**$3,032,123**	

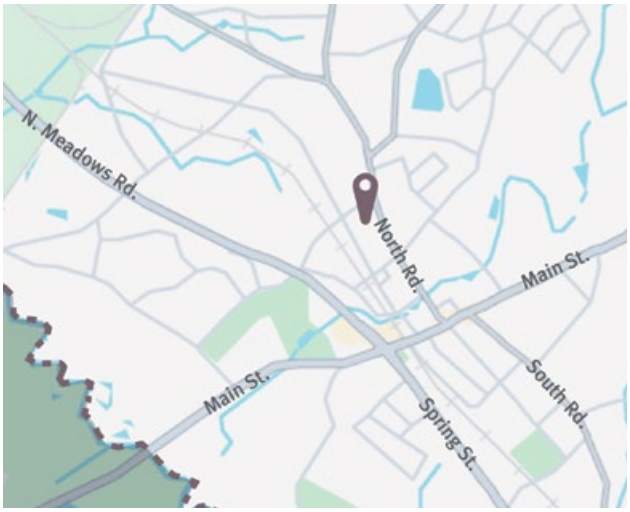
ELECTRIFICATION RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	COST ESTIMATE	PRIORITY
D30-HVAC	Provide a new air source VRF system for the entire building to provide heating and cooling. Provide a dedicated OA ERV unit for building ventilation air. The unit would be associated with a duct distribution system which would terminate in each space via ceiling mounted grilles for supply and return air. The existing VAV system ductwork could be utilized for the new ventilation system.	$4,791,097	4
D50-ELECTRICAL	New distribution and feeders to serve the VRF equipment	$145,000	4
Total		**$4,936,097**	
Cost above non-electric option		**$4,791,097**	

Public Safety Building

Facilities Information

Address:	112 North Street
Building Use:	Police Station, Fire Station
Year(s) Built:	2015
Major Renovations	-
Building Area:	40,690 SF (28,800 2-story office & dormitory)
Assessed Value:	$16,008,900
On Site Combustion:	yes
Capacity for Solar:	n/a



Electrification Information	EXISTING	PROPOSED	% CHANGE
Electric (KWH/yr)	399,477	663,552	66%
Natural Gas (kBTU/yr)	1,449,100	0	-100%
TOTAL Energy Use (kBTU/yr)	2,812,116	2,264,040	-19%
Electric Utility Cost ($/yr)	$51,333	$85,266	27%
Natural Gas Utility Cost ($/yr)	$15,850	$0	-100%
TOTAL Utility Cost ($/yr)	$67,183	$85,266	27%
TOTAL Utility Cost w/ PV ($/yr)	$58,122	$76,205	31%
TOTAL Emissions (MTCO2e/yr)	179	118	-34%
TOTAL Emissions w/ PV (MTCO2e/yr)	161	106	-34%

CONDITIONS SUMMARY

PARKING	Drive lanes and parking in good condition. There is one, small public lot to the east of the building off North St. and a larger lot for employee parking to the west off Dale St. There is also a lot for police cruisers.
LANDSCAPE	There is minimal landscape near the public entrances which appears to be well maintained.
SIDEWALKS	Sidewalks leading to the public entrance off North St appear to be in good condition. No signs of cracking or settling. Multiple accessible curb cuts connect crosswalks at North St. and Dale St.
FOUNDATIONS	Foundations are poured-in-place concrete with a slab on grade. Foundations are in good condition with no signs of cracking or movement.
STRUCTURE	The building structure is steel columns and beams with steel trusses at the double height garage bays.
ROOF	The roof is a combination of hipped roof with asphalt shingles over 2-story portion of the building and white EPDM over the garage. 5” of rigid insulation above deck. The garage also supports a 64.1 kW solar PV array which was added in 2017.
GUTTERS & RAINWATER MANAGEMENT	Flat roof over garage utilizes tapered insulation sloping to roof storm drains and over-flow at the east and west parapets. Single-story entries utilize storm drains and overflows as well. The hipped roof over the two-story portion of the building utilizes an external gutter and downspout system.
WALLS & FAÇADE	Walls are a brick veneer with 4” rigid insulation over either a CMU or light gauge framing backup. Walls are in good condition.
WINDOWS	Windows are a double-hung, aluminum-clad wood units throughout. Areas within the police station utilize a layer of ballistic glass on the interior. Windows are in good working condition. One window showed signs of sealant failure at the pane, but this may be covered under the manufacturer’s warranty.
DOORS & ENTRIES	Entries are a commercial-grade, aluminum storefront system which appears to be in good condition. Other egress doors are insulated, hollow metal doors and frames and also are in good, working condition. The garage has large, metal rollup doors, all in working condition.
SEALANTS & JOINTS	Given the building is only 9 years old, the masonry mortar joints and soft joints seem to be in good condition. Sealant around windows, openings, and penetrations also appear to be in good condition.
OTHER	The ballasts for the rooftop PV array are in poor condition and are crumbling.
FLOORING	Flooring throughout the building is mostly sheet vinyl in corridors and other public areas with carpet in offices and private areas. Bathrooms and locker rooms are ceramic tile. Flooring throughout the building is in good condition with little to no wear present.
WALLS	Walls are mostly painted GWB with painted, exposed concrete block in garages and stairwells. No signs of wear or damage are present.

CONDITIONS SUMMARY - CONT.

CEILINGS	Ceilings throughout the building are suspended ACT with the exception of bathrooms and locker rooms. All ceilings are in good condition and don't show any signs of damage.
PLUMBING FIXTURES	Fixtures are vitreous china and stainless steel. All fixtures are properly functioning and meet ADA/MAAB where required.
WATER DISTRIBUTION	There is a 4" Domestic Water Service that flows through a meter and Reduced Pressure Backflow Preventer. Distribution piping is in like new condition and is properly insulated. The Domestic Cold Water is not used for human consumption due to poor water quality, the supply valves to the Drinking Fountains and Refrigerator Water Supply have been turned off. Hot Water is produced by a Natural Gas fired Water Heater with an Indirect Storage Tank, the distribution temperature is regulated by a Leonard Mixing Valve set to 124°F at time of visit. It was mentioned by staff during on-site visit that the fixtures in the Detention Rooms take a long time for Hot Water to be delivered.
SANITARY WASTE	The Sanitary Waste System Piping and Drains appear to be functioning as expected. There was no obvious method of testing/draining the Pre-Action cabinet in JAN 236. Add new Floor Drain if required.
OTHER	Natural Gas: The 4" service enters the building at the southern end of the Fire Apparatus Bay. There is no Gas Cock immediately inside of the building which is good engineering practice. The Natural Gas piping is well labeled. Compressed Air: Compressor and distribution piping are in good shape and appear to be operating as expected. Storm Drain: The piping for the majority of the system appears to be functioning as expected and pipes are insulated where required. There are ceiling tile in Corridor 247 near the doors to Archive Doc Storage 211 & 211 that show potential for a leak in the Storm Drain piping that serves the Roof Drain above that area. The Roof Drains and Overflow Nozzles are unobstructed at this time.
ELECTRICAL SERVICE & DISTRIBUTION	The main electrical service is 1200 amp, 120/208 volt, 3 phase, 4 wire service that originates from a utility company pad mounted transformer located adjacent to the building near the emergency generator. The utility company transformer primary feed is fed from pole #31 where the 3 phase service runs down the pole to an underground conduit which runs below Dale Street to the transformer. There is also a spare 4" conduit stubbed up on the base of the pole. From the transformer, the secondary service runs into the building to the 1200 amp main distribution panel (MDP), which then feeds a normal/emergency distribution panel (NEDP). Panel NEDP receive power via the ATS-OS (emergency power) and the MDP (normal utility power). All power equipment is in excellent condition.

CONDITIONS SUMMARY - CONT.

LIGHTING & POWER	Lighting panels and the Encellium lighting system controls are located in the same electric closets. There is a Encellium touch control panel located in the dispatch room which controls the lighting in the Watch Room and the Apparatus Bays. It had been mentioned that the Encellium system cannot be accessed due to changes in access codes. Lighting in the sleeping quarters come on to full brightness upon alarm, the lighting should be reprogramed via the lighting control system to come on to half brightness upon alarm. The lighting is LED and for the most part is in excellent condition. Lighting controls (occupancy sensors) in some areas are not providing the on function and lights need to be put on by the switches when entering the area. Power main distribution panel, general power and lighting panels, automatic transfer switches (ATS) are all in excellent condition. All areas have sufficient receptacles for equipment to plug into, no plug strips were observed
EMERGENCY POWER	The facility is equipped with a 350kW, 437.5kVA 120/208 volt, 3 phase, 4 wire emergency generator which feeds the entire building during power outages. The generator and related equipment is in excellent condition.
FIRE ALARM	The facility is equipped with a Notifier NFS2-640 fire alarm control panel with voice evacuation. The alarm signal is transmitted to a central station via a AES IntelliNet radio master box. The fire alarm system and related equipment is in excellent condition.
HVAC SUPPLY & GENERATION	The building is heated by (2) High efficiency boilers which are gas fired and manufactured by Crest Boiler company. Breeching for each boiler is direct vent and constructed of stainless steel double wall breeching which terminates through the roof. The plant is associated with (2) Inline Bell & Gossett pumps for building circulation, (2) Inline Bell & Gossett pumps one for each boiler, (1) vertical expansion tank, inline air separator, chemical feeder and glycol feeder. The building is also equipped with an air cooled chiller which is located outside on grade. The chiller is manufactured by Trane and provides chilled water to the building. The chilled water system is equipped with two loops, one dedicated for the indoor air handling unit providing 45 degree water while a secondary compensated loop provides 53 degree water for the induction terminal units throughout the building. The main chilled water loop is provided with (2) Inline Bell & Gossett pumps, the compensated loop is provided with (2) Inline Bell & Gossett pumps and each of these systems are associated with (1) vertical expansion tank, inline air separator, chemical feeder and the main chilled water loop is equipped with a buffer tank and glycol feeder.
DISTRIBUTION	Distribution for hot water and chilled water through the building is a combination of schedule 40 black steel and copper piping. All of which is insulated with fiberglass insulation. The building is equipped with an indoor air handling unit and its air distribution system consists of galvanized sheet metal for supply and return, all of which is insulated with fiberglass insulation.

CONDITIONS SUMMARY - CONT.

UNIT SOURCES	The building is equipped with an indoor air handling unit which provides ventilation, heating and air conditioning for the entire building. Induction terminal units with hot water and chilled water coils are provided for each space which provides temperature control for each space. The apparatus bays are tempered by a radiant HW floor system and vertical propeller style unit heaters. The common spaces such as corridors, vestibules, storage rooms and toilet rooms are heated through a combination of fintube radiation and unit heaters. The apparatus bays are also equipped with Airvac units which are associated with vehicle exhaust system.
CONTROLS	The buildings DDC system is manufactured by Johnson Controls Metasys system and utilizes a bacnet protocol. The DDC system extends to all equipment throughout the building with thermostats in each space and for the air handling unit. The system is provided with a full graphics program providing real time visual confirmation of equipment operation and provides real time adjustment and modifications.
OTHER	The building appears to have some issues with temperature control in the Police and Fire portions of the building. Also some of the induction units condense on the face of the diffuser causing water droplets to fall to the ground.

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	COST ESTIMATE	PRIORITY
Roof Covering	Replace all concrete block ballasts for rooftop PV	$4,350	1
Domestic Water Distribution	Conduct Water Quality Test to determine method of filtration to reduce/eliminate poor water quality condition	$1,450	1
Sanitary Waste	Provide floor drain in JAN 236 if adequate drainage of Pre-Action Cabinet does not exist.	$7,250	1
Domestic Water Distribution	Extend Domestic Hot Water loop down chase to Detention Fixtures on (2) locations	$3,625	1
Controls & Instrumentation	Temperature Control issues in the Police and Fire portions of the building, diagnostic work and service should be completed.	$14,500	1
Lighting & Branch Wiring	Provide dimmed lighting in the sleeping quarters upon alarm via lighting control system.	$26,100	1
Priority 1 Total		**$57,275**	
Appliances	Replace gas fired range in kitchen with induction range	$11,600	2
Distribution Systems	Condensation forming on induction unit diffuser face. Induction unit box should be confirmed that it is insulated and if not this should be provided.	$29,000	2
Priority 2 Total		**$40,600**	
Exterior Walls	Replace caulking and sealants	$51,308	3
Priority 3 Total		**$51,308**	
Wall Finishes	Paint all walls	$177,002	4
Priority 4 Total		**$177,002**	
Exterior Windows	Replace windows with triple glazed fiberglass	$495,349	5
Roof Covering	Replace asphalt and membrane roofs in kind	$1,487,990	5
Accessibility	Accessibility upgrades per 2021 Self Evaluation and Transition Plan	$50,351	5
Priority 5 Total		**$2,033,690**	
TOTAL		**$2,359,875**	

ELECTRIFICATION RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	COST ESTIMATE	PRIORITY
D50 Electrical	New distributin and feeders to serve the VRF equipment	$145,000	5
D30 HVAC	Provide a new air source VRF system for the entire building to provide heating and cooling. Provide a dedicated OA ERV unit for building ventilation air. The unit would be associated with a duct distribution system which would terminate in each space via ceiling mounted grilles for supply and return air. The existing VAV system ductwork could be utilized for the new ventilation system.	$2,957,180	5
Total		**$3,202,180**	

III. ENERGY & EMISSIONS ASSESSMENT

Energy & Emission Reductions

INTRODUCTION

In 2021, residents voted to affirm the State Net Zero 2050 goal for Medfield and charge the Town to create a roadmap for responsibly reducing greenhouse gas emissions. Per the Select Board's Strategic Town Goals, climate considerations are part of all relevant decision making. This portion of the study investigates and identifies opportunities to increase energy efficiency in town buildings, and which of these energy-focused projects should be prioritized. This aspect of the report will assist the Medfield Energy Committee in its role to advise on and support the implementation of the Town of Medfield Climate Action Plan.

In support of meeting the Town's carbon emission reduction targets, the Town is currently pursuing an on-site PV installation at the High School and Wheelock School. These arrays will add to those already existing at DPW, Public Safety Building, and Blake Middle School.

Medfield adopted the Massachusetts Stretch Energy Code in 2017, the current 2023 version of this code applies to existing building alterations.

PROPOSED ELECTRIFICATION

For each building that currently contains fossil fuel systems, except emergency generators, the existing HVAC, domestic hot water, and cooking systems were evaluated for switching to high efficiency all-electric heat pump systems. While specific electric systems are recommended for each building, there are other potential systems that could be viable and should be considered as part of capital project design implementation for each building. The exterior envelope systems were also visually assessed for air leakage and thermal performance and upgrade recommendations provided. Envelope performance is an essential component for an all-electric building to function at the highest efficiency. HVAC, water heating, and envelope upgrades are intended to comply with the 2023 Stretch Energy Code 225 CMR 23.00. No energy modeling or system option comparisons were performed as part of this study and should be done for any capital projects undertaken.

ENERGY REDUCTION

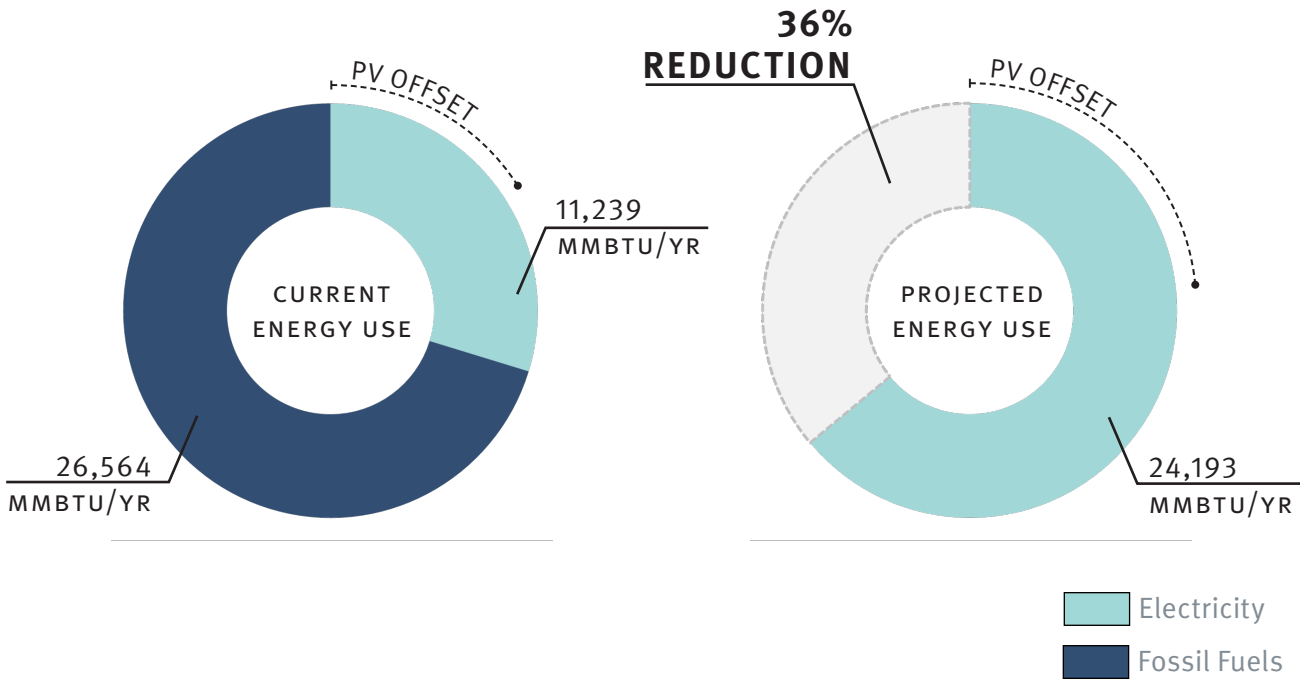
The existing average EUI across all buildings, based on existing utility data, is 59 kBTU/sf/yr. The combined energy use of all buildings included in this study currently amounts to 37,803 MMBTU/yr, with electricity use accounting for 11,239 MMBTU/yr and the remaining portion attributed to fossil fuels. The Town currently has 5,593 MMBTU (1,639 MWh) of existing renewable solar PV generation. This renewable generation covers 15% of the total energy use, 50% of electricity use.

With the recommended electrification and system upgrades, the average EUI of all buildings within the scope of the report is proposed to be 38 kBTU/sf/yr. The total energy use of all buildings after the proposed electrification is 24,193 MMBTU/yr. This represents a 36% reduction in total energy use. The electrified heat pump systems are much more efficient than the natural gas fired existing systems. Therefore, the energy use is reduced even while adding cooling and ventilation to buildings, such as Wheelock, Memorial, and Dale St schools, that do not currently have it.

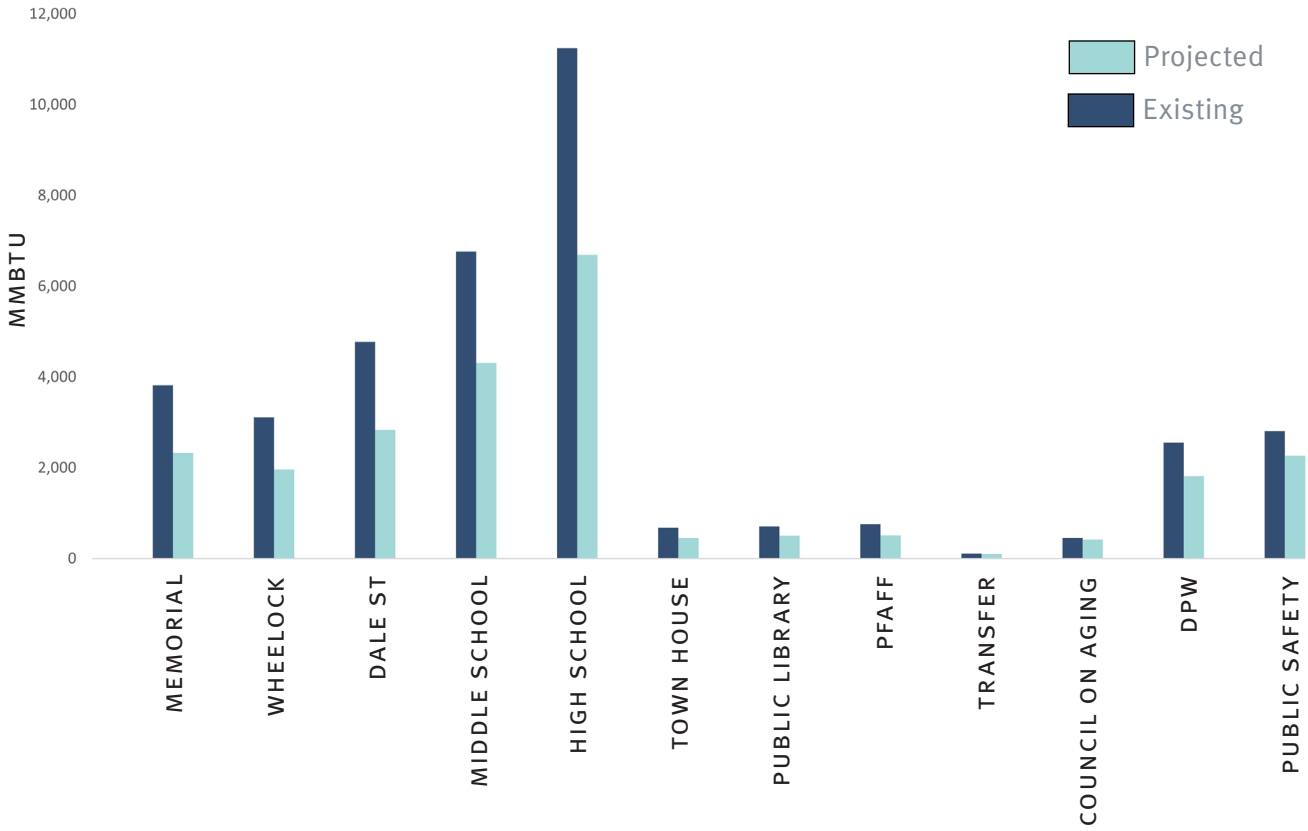
When considering both existing and proposed PV generation, 36% of the total proposed electrification energy use would be covered by renewable generation.

The following charts illustrate the total portfolio-wide energy use, as well as individual building use, for the existing and proposed cases. The "Energy Use Charts" at the end of this section include detailed numerical values.

EXISTING & PROJECTED TOTAL ENERGY USE



ENERGY USE BY BUILDING



ENERGY USE ESTIMATIONS & BENCHMARKING

Utilizing 2023 utility data from the 2024 energy audits, the existing total annual building energy usage and energy use intensity (EUI) values for each building was calculated. The existing building energy data was compared against typical EUIs for each building typology as per the Commercial Building Energy Consumption Survey (CBECS) database and Lawrence Berkeley Lab (LBL) Building Performance database for benchmarking validation.

Future potential EUI and energy savings for each building were estimated based on the alteration and electrification recommendations found in Section II.

To estimate the future energy usage, each building's total predicted energy use is broken down by end use based on typical building typology data via CBECs. The potential energy use reduction for each applicable end use was estimated based on the system electrification and other energy saving measures recommended for each building. This estimation relies on the percentage breakdown from the CBECS database and provides an approximate prediction of the savings to be expected based on recommendations. The table below presents the energy end use breakdowns for each typology, as provided by CBECS.

USE TYPE	HEATING	COOLING	VENTILATION	WATER HEATING	LIGHTING	PLUG LOADS
Office	31%	8%	20%	2%	12%	33%
Public Assembly	51%	19%	5%	1%	6%	27%
Public Order and Safety	35%	11%	7%	12%	13%	25%
Warehouse and Storage	49%	12%	5%	2%	16%	35%

ENERGY USE BY BUILDING

ANNUAL ENERGY USE				
		Existing	Proposed	Change
Memorial School	Electric (KWH/yr)	363,346	681,360	88%
	Natural Gas (kBTU/yr)	2,576,550	-	-100%
	TOTAL (kBTU/yr)	3,816,288	2,324,801	-39%
	EUI (kBTU/SF)	70	43	-39%
Wheelock School	Electric (KWH/yr)	192,056	574,880	199%
	Natural Gas (kBTU/yr)	2,458,300	-	-100%
	TOTAL (kBTU/yr)	3,113,596	1,961,490	-37%
	EUI (kBTU/SF)	48	30	-37%
Dale St. School	Electric (KWH/yr)	147,763	830,564	462%
	Natural Gas (kBTU/yr)	4,271,500	-	-100%
	TOTAL (kBTU/yr)	4,775,668	2,833,884	-41%
	EUI (kBTU/SF)	71	42	-41%
Blake Middle School	Electric (KWH/yr)	592,278	1,263,551	113%
	Natural Gas (kBTU/yr)	4,740,900	-	-100%
	TOTAL (kBTU/yr)	6,761,751	4,311,234	-36%
	EUI (kBTU/SF)	56	35	-36%

High School	Electric (KWH/yr)	1,197,831	1,962,500	64%
	Natural Gas (kBTU/yr)	7,161,000	-	-100%
	TOTAL (kBTU/yr)	11,247,999	6,696,049	-40%
	EUI (kBTU/SF)	60	36	-40%
Town House	Electric (KWH/yr)	99,149	133,200	34%
	Natural Gas (kBTU/yr)	341,000	-	-100%
	TOTAL (kBTU/yr)	679,297	454,480	-33%
	EUI (kBTU/SF)	39	26	-33%
Public Library	Electric (KWH/yr)	75,542	147,735	96%
	Natural Gas (kBTU/yr)	455,800	-	0%
	TOTAL (kBTU/yr)	713,550	504,071	-29%
	EUI (kBTU/SF)	32	23	-29%
Pfaff Building	Electric (KWH/yr)	12,362	148,277	1099%
	Natural Gas (kBTU/yr)	715,400	-	0%
	TOTAL (kBTU/yr)	757,578	505,923	-33%
	EUI (kBTU/SF)	63	42	-33%
Transfer Station	Electric (KWH/yr)	32,830	28,890	-12%
	Natural Gas (kBTU/yr)	-	-	-
	TOTAL (kBTU/yr)	112,015	98,573	-12%
	EUI (kBTU/SF)	28	25	-12%
Council on Aging	Electric (KWH/yr)	35,450	121,805	244%
	Natural Gas (kBTU/yr)	334,100	-	-100%
	TOTAL (kBTU/yr)	455,057	415,599	-9%
	EUI (kBTU/SF)	58	53	-9%
Dept. Public Works	Electric (KWH/yr)	145,895	534,109	266%
	Natural Gas (kBTU/yr)	2,060,800	-	-100%
	TOTAL (kBTU/yr)	2,558,593	1,822,379	-29%
	EUI (kBTU/SF)	66	47	-29%
Public Safety	Electric (KWH/yr)	399,477	663,552	66%
	Natural Gas (kBTU/yr)	1,449,100	-	-100%
	TOTAL (kBTU/yr)	2,812,116	2,264,040	-19%
	EUI (kBTU/SF)	69	56	-19%
TOTAL ALL BUILDINGS	ELECTRIC (KWH/YR)	3,293,979	7,090,423	115%
	NATURAL GAS (KBTU/YR)	26,564,450	-	-100%
	TOTAL (KBTU/YR)	37,803,508	24,192,523	-36%
	EUI (KBTU/SF)	59	38	-36%
TOTAL ALL BUILDINGS W/ PV	ELECTRIC (KWH/YR)	1,654,661	4,513,805	173%
	NATURAL GAS (KBTU/YR)	26,564,450	-	-100%
	TOTAL (KBTU/YR)	32,210,154	15,401,103	-52%
	EUI (KBTU/SF)	51	24	-52%

CARBON EMISSIONS

For the purpose of this study emissions factors were used to develop the green house gas emissions (CO_2e) for each building for both the existing and electrification conditions. The factors for existing emissions for electricity and natural gas are based on predicitvie carbon emissions intensity factors (pCEIs) provided for the local ISONE grid and by the EPA EnergyStar Portfolio Manager respectively. For the future upgrade scenario, we utilized 2035 projected electricity emission factors based on data provided for the local ISONE grid.

The Town of Medfield sources renewable electricity for some municipal buildings through a power purchase agreement (PPA), which entails net metering renewable energy from solar PV arrays located on some town buildings/sites. The Town purchases this renewable electricity from the PPA provider at a discounted rate than purchasing from the utility. Purchasing renewable energy reduces the carbon emissions of the Town, however, fossil fuel use can not be offset. The proposed electrification improvements would allow all of the town energy use to be offset by renewable energy.

The existing carbon emission intensity across all buildings is 3.5 kg CO_2e/sf/yr for a total 2,254 $MTCO_2e$/yr. With the recommended electrification and system upgrades, the portfolio-wide CEI is predicted to drop to 2.0 kg CO_2e/sf/yr for a total 1,262 $MTCO_2e$/yr. This represents a 44% reduction in carbon emissions across all buildings. When considering the renewable energy generation, the existing CEI is 2.9 and the proposed is 1.3, which is a 56% reduction. Refer to the table on the next page for emissions breakdown by building.

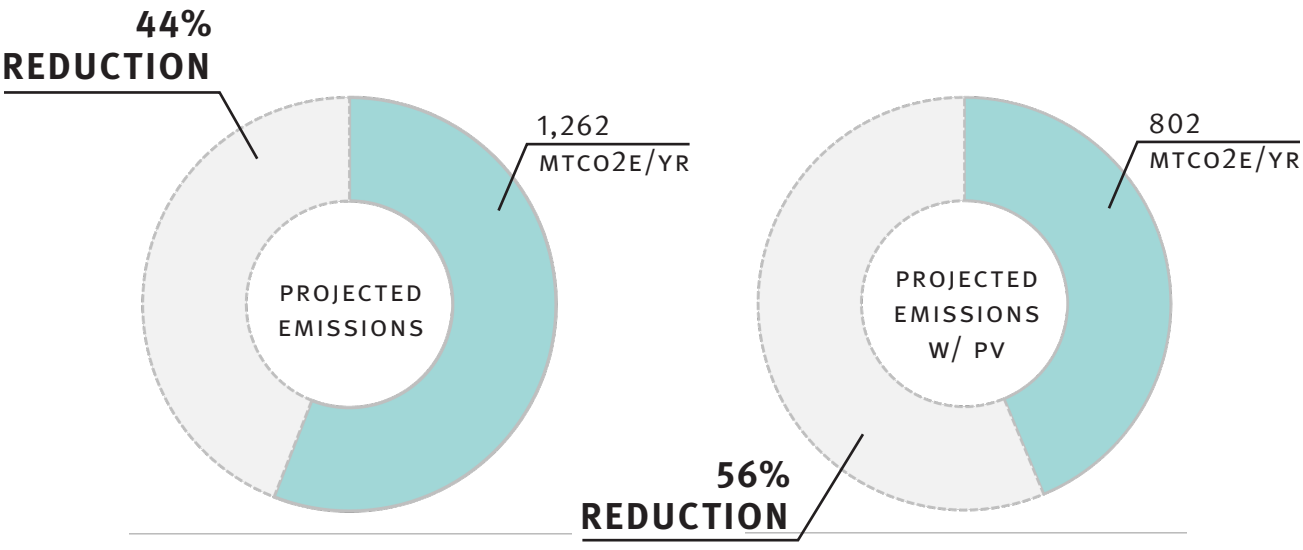
The existing renewable generation would offset 23% of the future town wide emissions. With the proposed additional solar generation included, this increases to 36%.

UTILITY CO_2e EMISSIONS FACTORS

Current Electricity Emissions (kg CO_2e/MBtu)[1]	75
Current Natural Gas Emissions (kg CO_2e/MBtu) [2]	53
2035 Electricity Emissions (kg CO_2e/MBtu)[3]	52

1 Source: 2023 Boston BERDO/IsoNE
2 EPA EnergyStar Portfolio Manager
3 Source: 2035 Boston BERDO/IsoNE

PROJECTED TOTAL EMISSIONS



TOTAL EMISSIONS (MTCO2E/YR)

BUILDING NAME	EXISTING	PROPOSED	REDUCTION
Memorial School	230	121	-47%
Wheelock School	180	102	-43%
Dale St. School	265	148	-44%
Blake Middle School	403	225	-44%
High School	687	349	-49%
Town House	43	24	-44%
Public Library	44	26	-41%
Pfaff Building	41	26	-37%
Transfer Station	8	5	-38%
Council on Aging	27	22	-19%
Dept. of Public Works	147	95	-35%
Public Safety	179	118	-34%
TOTAL ALL BUILDINGS	2254	1261	-44%

TOTAL EMISSIONS W/ PV (MTCO2E/YR)

BUILDING NAME	EXISTING	PROPOSED	REDUCTION
Memorial School	119	23	-81%
Wheelock School	180	38	-79%
Dale St. School	265	148	-44%
Blake Middle School	365	177	-52%
High School	492	155	-68%
Town House	43	24	-44%
Public Library	44	26	-41%
Pfaff Building	41	26	-37%
Transfer Station	8	5	-38%
Council on Aging	27	19	-30%
Dept. of Public Works	89	55	-38%
Public Safety	161	106	-34%
TOTAL ALL BUILDINGS	1834	802	-56%

UTILITY COSTS

The utility costs of the buildings was calculated based on natural gas rate of $1.0938/therm and electricity rate of $0.1285/kWh as provided by the Town. Renewable energy was calculated at a rate of $0.0885/kWh. The charts below include costs with and without savings from the Power Purchase Agreements.

While the energy use and emissions are reduced for each building through the recommended upgrades, the utility costs actually increase for many buildings due to the current higher cost of electricity than natural gas. However, as the buildings are electrified, most of the utility cost can be offset with renewable generation, either through additional PPAs, virtual PPAs or ownership, which is a lower cost than utility electricity.

ANNUAL UTILITY COSTS

		Existing	Proposed	$ Change	% Change
Memorial School	Electric	$46,690	$87,555	$40,865	88%
	Fossil Fuel	$28,182	$-	-$28,182	-100%
	TOTAL	$74,872	$87,555	$12,683	17%
Wheelock School	Electric	$24,679	$73,872	$49,193	199%
	Fossil Fuel	$26,889	$-	-$26,889	-100%
	TOTAL	$51,568	$73,872	$22,304	43%
Dale School	Electric	$18,988	$106,727	$87,739	462%
	Fossil Fuel	$46,722		-$46,722	-100%
	TOTAL	$65,710	$106,727	$41,017	62%
Blake Middle School	Electric	$76,108	$162,366	$86,258	113%
	Fossil Fuel	$51,856	$-	-$51,856	-100%
	TOTAL	$127,964	$162,366	$34,402	27%
High School	Electric	$153,921	$252,181	$98,260	64%
	Fossil Fuel	$78,327	$-	-$78,327	-100%
	TOTAL	$232,248	$252,181	$19,933	9%
Town House	Electric	$12,741	$17,116	$4,375	34%
	Fossil Fuel	$3,730	$-	-$3,730	-100%
	TOTAL	$16,471	$17,116	$645	4%
Public Library	Electric	$9,707	$18,984	$9,277	96%
	Fossil Fuel	$4,986	$-	-$4,986	-100%
	TOTAL	$14,693	$18,984	$4,291	29%
Pfaff Building	Electric	$1,588	$19,054	$17,466	1100%
	Fossil Fuel	$7,825	$-	-$7,825	0%
	TOTAL	$9,413	$19,054	$9,641	102%
Transfer Station	Electric	$4,219	$3,712	-$507	-12%
	Fossil Fuel	$-	$-	$0	-
	TOTAL	$4,219	$3,712	-$507	-12%
Council on Aging	Electric	$4,555	$15,652	$11,097	244%
	Fossil Fuel	$3,654	$-	-$3,654	-100%
	TOTAL	$8,209	$15,652	$7,443	91%

Dept. of Public Works	Electric	$18,747	$68,633	$49,886	266%
	Fossil Fuel	$22,541	$-	-$22,541	-100%
	TOTAL	$41,288	$68,633	$27,345	66%
Public Safety	Electric	$51,333	$85,266	$33,933	66%
	Fossil Fuel	$15,850	$-	-$15,850	-100%
	TOTAL	$67,183	$85,266	$18,083	27%
TOTAL ALL BUILDINGS	TOTAL ($/YR)	$713,838	$911,118	$197,280	28%
TOTAL ALL BUILDINGS W/ PV	TOTAL ($/YR)	$642,025	$801,814	$159,789	25%

EXISTING PV GENERATION

The existing renewable solar PV generation comes from arrays at the DPW, Public Safety, Middle School, and planned arrays at the High School and Memorial School site canopy. Annual generation data for the existing arrays and Memorial School was provided by the Town. We assume that the existing PV arrays will continue to exist into the future at the same level of generation. In addition, the team understands that the Town is in the planning process to add solar at the High School. This generation was not provided but based on the size the study assumed that this will be about 760,000 kWh/year.

NEW PV GENERATION

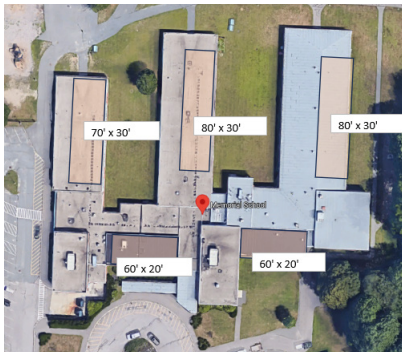
Buildings were categorized based on their anticipated structural capacity to support PV on their rooftops, with 5 of the buildings being potentially suitable for future rooftop PV installation. A capacity study was conducted on these 5 buildings to determine the potential additional solar generation that could help offset the additional electrical burden induced by removing dependence on fossil fuels.

The additional solar energy generation potential is 937,300 kWh/yr. When combined with the existing and already planned generation, this comes to a total potential generation of 2,576,618 kWh/yr. This would offset approximately 36% of the total proposed town wide energy and 44% of the total emissions. By 2035, due to the grid getting cleaner, the proposed generation would offset 56% of the emissions.

PV GENERATION BY BUILDING

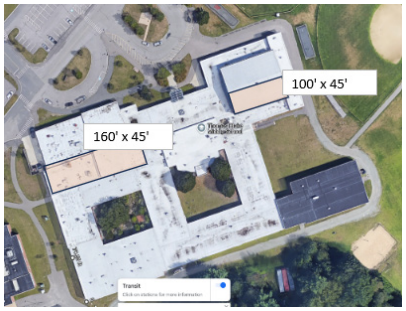
BUILDING NAME	CURRENT PV (KWH)	POTENTIAL PV (KWH)
Memorial School	434,000	116,700
Wheelock School	-	359,000
Dale St. School	-	-
Blake Middle School	148,700	119,000
High School	760,000	329,000
Town House	-	-
Public Library	-	-
Pfaff Building	-	-
Transfer Station	-	-
Council on Aging	-	13,600
Dept. of Public Works	226,103	-
Public Safety	70,515	-
Sub Total	1,639,318	937,300
GRAND TOTAL		2,576,618

Memorial School
PV Panel Area: 984 SF

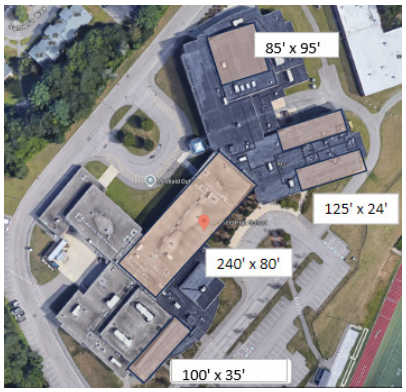


Wheelock School
PV Panel Area: 984 SF

Blake Middle School
PV Panel Area: 984 SF



High School
PV Panel Area: 984 SF



Council on Aging
PV Panel Area: 984 SF

For visualization purposes, the roof plans are not in scale.

Rebates & Incentives

INTRODUCTION

There are several state and federal incentives that provide rebates for the incorporation of efficient electric HVAC systems, efficient lighting and lighting controls, air leakage and thermal performance upgrades of exterior envelope, induction cooking appliances, and solar renewable energy.

MASS SAVE INCENTIVES

The utility companies which sponsor the Mass Save program have two incentive programs that are applicable to the types of renovations that are recommended in this report. Eversource is the utility Mass Save sponsor for the Town of Medfield buildings.

Prescriptive Equipment Rebates

There are incentives available for qualifying individual equipment including switching from natural gas, electric resistance or oil to high efficiency heat pumps and heat pump water heaters, lighting and controls, weatherization and air sealing, and induction stoves. Some incentive amounts are shown in the tables below.

Comprehensive Incentives

If a project includes multiple efficiency upgrades, Eversource offers special incentive rates for multi-measure energy efficiency projects in existing commercial and industrial projects that may generate larger incentives than individual equipment rebates. These incentives are for renovation projects that include at least 2 energy conservation measures. See table on the next page for incentive amounts. Amounts are subject to change.

Deep Energy Retrofit

In addition to the above incentive programs the Deep Energy Retrofit (DER) program provides an additional $1.00 per SF for projects achieving 40% reduction in GHG emissions. Projects must be completed within a three year time frame. This path may be possible for the elementary, middle and high schools and the Town House and Public Library.

New Construction & Major Renovations

The Path 3 program is available to major renovations that include at least three of the following systems, HVAC, DHW, lighting, envelope and process equipment. In addition, the building must include a gut renovation such that occupancy is not possible during construction. Of the buildings in this study, the Dale St School may qualify for this path. The Dale St School and Pfaff Building may also qualify for the Path 1 or 2 if new construction.

PRESCRIPTIVE EQUIPMENT REBATES

Heat Pumps [1]		
Equipment Type[2]		Rebate ($/ton)[3]
Air-Source Heat Pumps (ASHP)	Refer to MassSave.com/cihpapl for list of equipment and minimum requirements	$2,500
Air-Source Variable Refrigerant Flow Heat Pump (VRF)		$3,500
Ground Loop Heat Pump (GLHP) or Ground Water Heat Pump (GWHP)		$4,500

1 For units not listed by AHRI or the QPL, please contact us by email at ne-heatpumps@energy-solution.com for guidance.
2 ASHP and VRF refer to air-to-air equipment. Please contact your Sponsor for information on air-to-water heat pump rebates.
3 Total rebate amount shall not exceed installed consts (Inclusive of both equipment and installation).

Heat Pump Water Heaters					
Equipment	Sector	Existing Heating System Fuel Type	Size	Required Efficiency	Customer Incentive ($/Unit)
Electric Heat Pump Water Heater (HPWH)	Residential	Electric, Propane, Oil, or Natural Gas	≤ 80 Gallon	UEF ≥ 3.2	$750
	Commercial	Electric, Propane, Oil, or Natural Gas	≤ 80 Gallon	UEF ≥ 3.2	$1,000
			81-120 Gallon	COP ≥ 3.6	$2,200

COMPREHENSIVE INCENTIVES

Incentive tier	Energy Conservation Measures	End Use	Buildings	$ per KWH	$ per therm	Not to exceed % cost	Not to exceed payback
Total Comprehensive*	3+	2+	1	$0.65	$5.50	75%	1 year
Total-Measure*	2	2	1	$0.45	$4.50	65%	1.5 years
Custom Retrofit Base	1	1	1	$0.30	$3.00	50%	2 years

*Multi-Measure requires 2 measures, impacting 2 end uses, in 1 building. Total Comprehensive requires 3+ measures, impacting 2+ end uses, in 1 building.

NEW CONSTRUCTION & MAJOR RENOVATIONS

Path 3: High Preformance Buildings	
Custom: Envelope, lighting controls, unitary HVAC (RTU, AC), high efficiency chillers, energy recovery, demand control ventilation, variable flow kitchen hoods, DHW heaters, low flow water fixtures and other custom measures	$0.35/KWh $2.00/therm
Prescriptive: variable frequency drives	Current program rate
Space Heating Heat Pump* - Air Source Head Pumps - Variable Refrigerant FLow (VRF) - Ground Source Heat Pumps	 $800/ton $1,200/ton $4,500/ton

Path 2: EUI Reduction Buildings 50,000sf+				
Tier	Construction Incentive	All sectors other than office	Office	Heat Pump Adders
Tier 1	$1.25/sf	25%+	20%+	Air Source $800/ton VRF $1,200/ton Ground Source $4,500/ton
Tier 2	$0.75/sf	20-25%	15-20%	
Tier 3	$0.50/sf	15-20%	10-15%	
Tier 4	$0.35/sf	10-15%	5-10%	

Path 1: Net Zero & Low EUI Buildings 10,000sf+				
EUI	Construction Incentive	Post Occupancy Incentive	Heat Pump Adders	Adder for Performing Under EUI Target
School 25 High School 25-29 Library 30-35 Office 30-35 Police Station 35-40	$1.50-$2.00/sf depends on EUI target	$1.50	Air Source $800/ton VRF $1,200/ton Ground Source $4,500/ton	$0.05/sf per EUI point reduction

AEC REVENUE

Advanced Energy Credits (AECs) are a state financial incentive for buildings adopting “clean heat” technology such as electrification. The MA Alternative Energy Performance Standard (APS) provides for minting AEC certificates quarterly as incentive payments for buildings heating with efficient electric technology (air or ground source heat pumps). AECs are calculated in accordance with the Massachusetts Guideline on Metering and Calculating the Useful Thermal Output of Eligible Renewable Thermal Generation Units. AECs are available for all buildings although it is typically only worth pursuing for the largest buildings such as the High School and Blake Middle School.

DEMAND RESPONSE

ConnectedSolutions is a demand response to reduce a building’s energy use during periods of high or costly demand and provide incentives when participating in demand response events.

Eversource offers two different participation options, which allow the customer to select the number of events and incentive amounts that work best. Daily participants will generally participate in more called events, which means more opportunity for incentives. Targeted participants will likely participate in fewer events and will see less in incentives.

Demand response programs may require specific control technologies to be installed as part of the HVAC system.

FEDERAL TAX INCENTIVES

As part of the 2022 Inflation Reduction Act, several tax incentives were signed into law that cover certain energy efficiency and renewable energy projects. Tax exempt entities, such as towns, may now be eligible for Direct Payments of the tax credits. The programs require prevailing wage requirements and apprenticeship requirements if the capacity is larger than 1MW/tons. The direct payment occurs after the system is constructed and placed in survice. Section 48 and Section are the two applicable programs for the types of buildings include in this study.

Section 48 Clean Electricity Tax Credit

This Investment Tax Credit covers between 30% - 50% of the cost of clean energy property investments including solar, geothermal heat pumps, and combined heat and power and energy storage, microgrid controllers and dynamic glass. In 2025 the credit will become tech neutral.

Medfield is not located in any of the eligible nergy community or low income bonus areas so the maximum rate would be 30% minus any adjustments for tax exempt bonds. The solar arrays in this study would be eligible for Section 48. Air source heat pumps were priced in this study and they would not be eligbile for Section 48. If ground source heat pumps were utilized instead, those would qualify.

Section 45 Production Tax Credit

The Production Tax Credit Provides a per kWh rate for the electricity produced and sold by the solar installation, starting on the date the facility is originally placed in service and lasting for ten years. The current PTC (adjusted for inflation) is 2.6 cents per kWh.

IV. APPENDIX

RSE ASSOCIATES Inc.
63 Pleasant Street, Suite 300, Watertown, MA 02472 | Tel (617) 926-9300

Send to	Arrowstreet		
Attention	Katherine Bubriski, AIA	Memo Date	October 31, 2024
Cc:		RSE Project No.	24143
From	Jennifer McClain, PE		
Project	Medfield Public Buildings		
Subject	Repairs at Pfaffe		

Per your request, a representative from RSE visited the existing Pfaffe building in Medfield on October 22, 2024 to make some additional observations of the condition of the exterior wall, and take some measurements of the existing structure. Based on her observations, we recommend that the exterior masonry repair be noted as requiring immediate repair. The rust jacking at the window lintels has led to significant cracking. We cannot tell if these cracks extend through the entire wall thickness, but based on what we can see, there are loose masonry elements that are at risk of falling, and other elements that will be soon if the wall is exposed to continued freeze thaw cycles. The cracks we can see indicate a lack of continuity in the exterior wythe of brick which means that the wall cannot support out of plane wind loads properly.

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