FACILITY CONDITION ASSESSMENT & NETZERO ENERGY AUDIT

prepared for

School Administrative Unit 70
41 Lebanon Street, Suite 2
Hanover, New Hampshire
Jamie Teague

Frances C. Richmond Middle School
63 Lyme Road
Hanover, New Hampshire 03755

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BV PROJECT #:
158531.22R000-003.379

DATE OF REPORT:
To Be Filled In By CD

ON SITE DATE:
December 20, 2022

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1. Executive Summary

Property Overview and Assessment Details

General Information	
Property Type	School
Main Address	63 Lyme Road, Hanover, New Hampshire 03755
Site Developed	2005
Site Area	22.00 acres (estimated)
Parking Spaces	93 total spaces all in open lots; seven of which are accessible
Building Area	105,000 SF
Number of Stories	Three above grade
Outside Occupants / Leased Spaces	None
Date(s) of Visit	December 20, 2022
Management Point of Contact	School Administrative Unit 70, Anthony Daigle, Director of Facilities 603.643.3810 phone anthonydaigle@hanovernorwichschools.org email
On-site Point of Contact (POC)	same as above
Assessment and Report Prepared By	Carl Alejandro
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AssetCalc Link	Full dataset for this assessment can be found at: https://www.assetcalc.net/

Significant/Systemic Findings and Deficiencies

Historical Summary

The Frances C. Richmond Middle School was originally constructed in 2005, and no major renovations have occurred since then.

Architectural

The roof and exterior wall finishes are original. Roof leaks have occurred in the past and were repaired as needed. According to the point of contact, there have not been any roof leaks in 2022. The exterior wall finishes are in overall fair condition. Repointing on the CMU walls is recommended during the reserve term. Moisture issues were observed on the exterior of Classrooms 800 and 810.

The interior finishes are replaced on an as needed basis. The interior finishes are mostly original throughout the building, except in the library where the carpet was replaced in 2021. Typical lifecycle replacements for exterior and interior finishes are budgeted and anticipated.

Mechanical, Electrical, Plumbing and Fire (MEPF)

The building has a central heating system consisting of a main wood pellet boiler that is backed up by two boilers. The wood pellet plant is cleaned once a year and inspected regularly for proper functioning. Cooling is provided in some parts of the building by rooftop packaged units and split systems. The unit ventilators in the gymnasium have a history of failing and are difficult to maintain. According to the point of contact, there have been complaints about not enough ventilation in the woodworking classroom. A cost allowance has been included in the online capital planning database to add additional ventilation.

The electrical wiring and equipment are original to the building's date of construction. The property has an emergency generator on-site. The interior and exterior lighting system was upgraded with LED fixtures in 2015-2016. A solar tracker was installed in 2019.

Hot water is supplied by an indirect water heater that works in conjunction with the wood pellet boiler. Typical commercial plumbing fixtures are utilized in the restrooms. The stainless steel sinks in the classrooms were observed to not have aerators. Low flow aerators are recommended for installation to increase energy efficiency.

Fire suppression consists of a sprinkler system that serves the entire building. The fire alarm panel is located in the lobby.

Site

The site consists of the asphalt parking lots, outdoor basketball court, and surrounding landscaping. Seal and striping was last done on the parking lots in 2021. Site lighting appears to be adequate for the facility's needs.

Recommended Additional Studies

No additional studies recommended at this time.

Facility Condition Index (FCI)

One of the major goals of the FCA is to calculate each building's Facility Condition Index (FCI), which provides a theoretical objective indication of a building's overall condition. By definition, the FCI is defined as the ratio of the cost of current needs divided by current replacement value (CRV) of the facility. The chart below presents the industry standard ranges and cut-off points.

FCI Ranges and Description	
0 – 5%	In new or well-maintained condition, with little or no visual evidence of wear or deficiencies.
5 – 10%	Subjected to wear but is still in a serviceable and functioning condition.
10 – 30%	Subjected to hard or long-term wear. Nearing the end of its useful or serviceable life.
30% and above	Has reached the end of its useful or serviceable life. Renewal is now necessary.

The deficiencies and lifecycle needs identified in this assessment provide the basis for a portfolio-wide capital improvement funding strategy. In addition to the current FCI, extended FCI's have been developed to provide owners the intelligence needed to plan and budget for the "keep-up costs" for their facilities. As such the 3-year, 5-year, and 10-year FCI's are calculated by dividing the anticipated needs of those respective time periods by current replacement value. As a final point, the FCI's ultimately provide more value when used to relatively compare facilities across a portfolio instead of being over-analyzed and scrutinized as stand-alone values. The table below summarizes the individual findings for this FCA:

FCI Analysis | Frances C. Richmond Middle School(2005)

Replacement Value	*Total SF*	*Cost/SF*
$ 45,150,000	*105,000*	*$ 430*

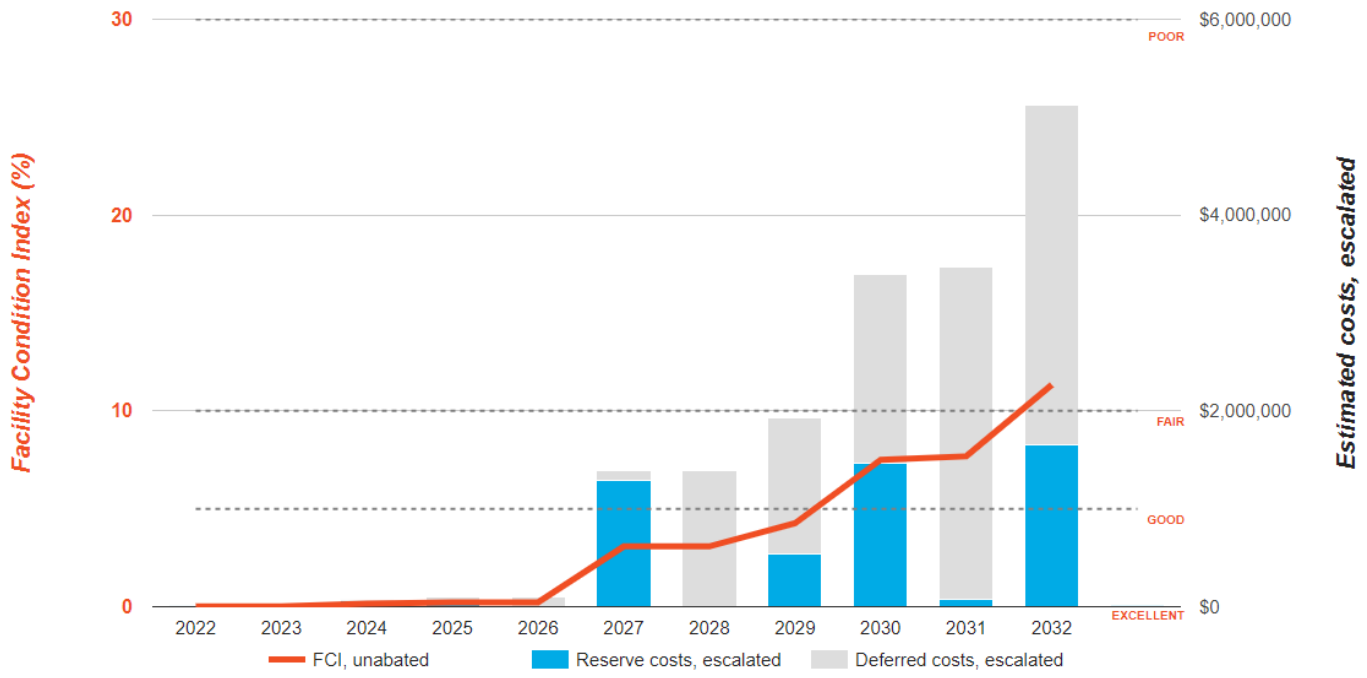
	Est Reserve Cost	FCI
Current	$ 5,000	**0.0 %**
3-Year	$ 100,400	0.2 %
5-Year	$ 1,389,700	3.1 %
10-Year	$ 5,119,500	11.3 %

The vertical bars below represent the year-by-year needs identified for the site. The orange line in the graph below forecasts what would happen to the FCI (left Y axis) over time, assuming zero capital expenditures over the next ten years. The dollar amounts allocated for each year (blue bars) are associated with the values along the right Y axis.

Needs by Year with Unaddressed FCI Over Time

FCI Analysis: Frances C. Richmond Middle School

Replacement Value: $45,150,000 Inflation Rate: 3.0% Average Needs per Year: $465,500



Immediate Needs

Facility/Building	Total Items	Total Cost
Frances C. Richmond Middle School	2	$5,000
Total	**2**	**$5,000**

Frances C. Richmond Middle School

ID	Location	Location Description	UF Code	Description	Condition	Plan Type	Cost
4714541	Frances C. Richmond Middle School	Building exterior	A2010	Basement Wall, any type, Waterproofing of Exterior Face, Replace	Poor	Performance/Integrity	$1,000
4714639	Frances C. Richmond Middle School	Building Exterior	B2010	Exterior Walls, Concrete Block (CMU), Repair/Repoint	Poor	Performance/Integrity	$4,000
Total (2 items)							**$5,000**

Key Findings

Exterior Walls in Poor condition.

Concrete Block (CMU)
Frances C. Richmond Middle School Building Exterior

Uniformat Code: B2010
Recommendation: **Repair/Repoint in 2022**

Priority Score: **88.9**

Plan Type: Performance/Integrity

Cost Estimate: $4,000

**$$**$$

Exterior wall is recommended for repointing - AssetCALC ID: 4714639

Basement Wall in Poor condition.

any type, Waterproofing of Exterior Face
Frances C. Richmond Middle School Building exterior

Uniformat Code: A2010
Recommendation: **Replace in 2022**

Priority Score: **86.9**

Plan Type: Performance/Integrity

Cost Estimate: $1,000

**$$**$$

Moisture on exterior walls of classrooms 810 and 800. - AssetCALC ID: 4714541

Unit Ventilator in Poor condition.

approx/nominal 3 Ton
Frances C. Richmond Middle School Gymnasium

Uniformat Code: D3030
Recommendation: **Replace in 2024**

Priority Score: **81.8**

Plan Type: Performance/Integrity

Cost Estimate: $54,000

$$$$

Hard to maintain. Units have a history of failing. - AssetCALC ID: 4714517

Exhaust Fan

Industrial Dust Collection, 3 HP Motor, 2000 CFM
Frances C. Richmond Middle School Wood Working Classroom

Uniformat Code: D3060
Recommendation: **Replace in 2024**

Priority Score: **58.8**

Plan Type: Retrofit/Adaptation

Cost Estimate: $5,000

**$$**$$

Complaints about not enough ventilation in wood working classroom. This is a cost allowance to either upgrade current system or install an additional system. - AssetCALC ID: 4833777

Plan Types

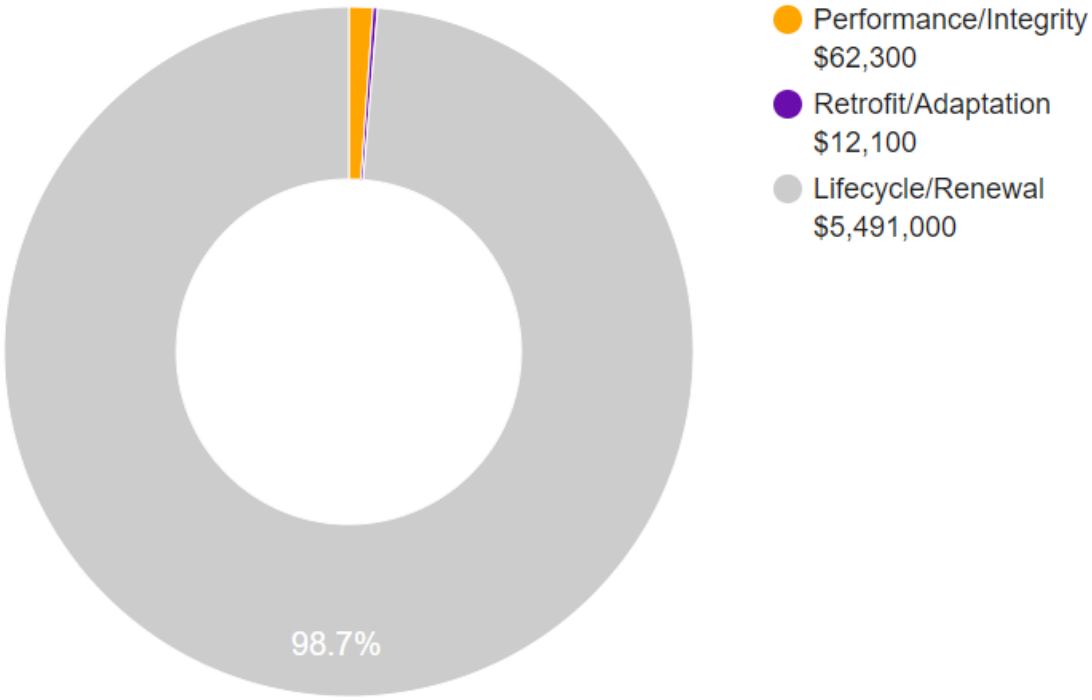
Each line item in the cost database is assigned a Plan Type, which is the primary reason or rationale for the recommended replacement, repair, or other corrective action. This is the "why" part of the equation. A cost or line item may commonly have more than one applicable Plan Type; however, only one Plan Type will be assigned based on the "best" fit, typically the one with the greatest significance.

Plan Type Descriptions		
Safety	■	An observed or reported unsafe condition that if left unaddressed could result in injury; a system or component that presents potential liability risk.
Performance/Integrity	■	Component or system has failed, is almost failing, performs unreliably, does not perform as intended, and/or poses risk to overall system stability.
Accessibility	■	Does not meet ADA, UFAS, and/or other handicap accessibility requirements.
Environmental	■	Improvements to air or water quality, including removal of hazardous materials from the building or site.
Retrofit/Adaptation	■	Components, systems, or spaces recommended for upgrades in in order to meet current standards, facility usage, or client/occupant needs.

Plan Type Descriptions

Lifecycle/Renewal ■ Any component or system that is not currently deficient or problematic but for which future replacement or repair is anticipated and budgeted.

Plan Type Distribution (by Cost)



10-YEAR TOTAL: $5,565,400

2. Building and Site Information

Systems Summary

System	Description	Condition
Structure	Steel frame and masonry walls with concrete-topped metal decks over concrete foundation slab	Good
Façade	Primary Wall Finish: Metal siding Secondary Wall Finish: CMU Windows: Aluminum	Good
Roof	Primary: Flat construction with single-ply EPDM membrane	Fair
Interiors	Walls: Painted gypsum board and CMU Floors: Carpet, VCT, wood, coated concrete Ceilings: ACT	Fair
Elevators	Passenger: One hydraulic car serving all three floors	Fair
Plumbing	Distribution: Copper supply and cast iron waste & venting Hot Water: Indirect water heater Fixtures: Toilets, urinals, and sinks in restrooms	Fair
HVAC	Central System: Boilers feeding unit ventilators Non-Central System: Packaged units, split-systems, unit heaters, thru-wall air conditioners	Fair
Fire Suppression	Wet-pipe sprinkler system, fire extinguishers, and kitchen hood system	Fair
Electrical	Source & Distribution: Main switchboard with copper wiring Interior Lighting: LED Emergency Power: Diesel Generator with automatic transfer switch	Fair

Systems Summary

Fire Alarm	Alarm panel with smoke detectors, heat detectors, alarms, strobes, pull stations, back-up emergency lights, and exit signs	Fair
Equipment/Special	Commercial kitchen equipment	Fair
Site Pavement	Asphalt lots with limited areas of concrete aprons and pavement and adjacent concrete sidewalks and curbs	Fair
Site Development	Building-mounted signage; wood and metal fencing Basketball courts Limited park benches and picnic tables	Fair
Landscaping and Topography	Significant landscaping features including lawns and trees Irrigation not present Low to moderate site slopes throughout	Fair
Utilities	Municipal water Local utility-provided electric, propane gas, fuel oil tanks, and wood pellets	Fair
Site Lighting	Pole-mounted: LED Building-mounted: LED	Fair
Ancillary Structures	None	--
Accessibility	Presently it does not appear an accessibility study is needed for this property.	
Key Issues and Findings	CMU wall needs repointing, exterior wall moisture on 800 and 810, inadequate ventilation in woodworking classroom, issues with gymnasium unit ventilators	

Systems Expenditure Forecast

System	Immediate	Short Term (1-2 yr)	Near Term (3-5 yr)	Med Term (6-10 yr)	Long Term (11-20 yr)	TOTAL
Structure	$990	-	-	-	-	$990
Facade	$4,000	-	-	$2,687	$683,580	$690,267
Roofing	-	-	$791,657	-	-	$791,657
Interiors	-	-	$443,163	$566,353	$894,689	$1,904,205
Conveying	-	-	-	$11,400	$99,803	$111,203
Plumbing	-	-	-	$90,928	$225,359	$316,287
HVAC	-	$62,592	$39,413	$645,253	$605,427	$1,352,685
Fire Protection	-	-	$6,955	$146,777	$18,757	$172,489
Electrical	-	-	-	$828,612	$125,057	$953,669
Fire Alarm & Electronic Systems	-	-	-	$841,366	$898,229	$1,739,595
Equipment & Furnishings	-	-	$40,917	$596,413	$54,992	$692,322
Site Utilities	-	-	-	$202,667	-	$202,667
Site Development	-	-	-	$77,408	-	$77,408
Site Pavement	-	-	-	$165,725	-	$165,725
TOTALS (3% inflation)	**$5,000**	**$62,600**	**$1,322,200**	**$4,175,600**	**$3,605,900**	**$9,171,300**

3. Property Space Use and Observed Areas

Areas Observed

The interior spaces were observed in order to gain a clear understanding of the property's overall condition. Other areas accessed included the site within the property boundaries and the exterior of the property.

Key Spaces Not Observed

Areas of note that were either inaccessible or not observed for other reasons are listed here:

- Roof; safety concerns due to icy conditions on roof

4. ADA Accessibility

Generally, Title II of the Americans with Disabilities Act (ADA) prohibits discrimination by entities to access and use of "areas of public accommodations" and "public facilities" on the basis of disability. Regardless of their age, these areas and facilities must be maintained and operated to comply with the Americans with Disabilities Act Accessibility Guidelines (ADAAG).

A public entity (i.e. city governments) shall operate each service, program, or activity so that the service, program, or activity, when viewed in its entirety, is readily accessible to and usable by individuals with disabilities.

However, this does not:

1. Necessarily require a public entity to make each of its existing facilities accessible to and usable by individuals with disabilities;
2. Require a public entity to take any action that would threaten or destroy the historic significance of an historic property; or
3. Require a public entity to take any action that it can demonstrate would result in a fundamental alteration in the nature of a service, program, or activity or in undue financial and administrative burdens. In those circumstances where personnel of the public entity believe that the proposed action would fundamentally alter the service, program, or activity or would result in undue financial and administrative burdens, a public entity has the burden of proving that compliance with 35.150(a) of this part would result in such alteration or burdens. The decision that compliance would result in such alteration or burdens must be made by the head of a public entity or his or her designee after considering all resources available for use in the funding and operation of the service, program, or activity, and must be accompanied by a written statement of the reasons for reaching that conclusion. If an action would result in such an alteration or such burdens, a public entity shall take any other action that would not result in such an alteration or such burdens but would nevertheless ensure that individuals with disabilities receive the benefits or services provided by the public entity.

Removal of barriers to accessibility should be addressed from a liability standpoint in order to comply with federal law, but the barriers may or may not be building code violations. The Americans with Disabilities Act Accessibility Guidelines are part of the ADA federal civil rights law pertaining to the disabled and are not a construction code. State and local jurisdictions have adopted the ADA Guidelines or have adopted other standards for accessibility as part of their construction codes.

During the FCA, Bureau Veritas performed a limited high-level accessibility review of the facility non-specific to any local regulations or codes. The scope of the visual observation was limited to the same areas observed while performing the FCA and the categories set forth in the tables that are included in the appendix. It is understood by the Client that the limited observations described herein do not comprise a full ADA Compliance Survey, and that such a survey is beyond the scope of this particular assessment. A full measured ADA survey would be required to identify any and all specific potential accessibility issues. Additional clarifications of this limited survey:

- This survey was visual in nature and actual measurements were not taken to verify compliance
- Only a representative sample of areas was observed
- Two overview photos were taken for each subsection regardless of perceived compliance or non-compliance
- Itemized costs for individual non-compliant items are not included in the dataset
- For any "none" boxes checked or reference to "no issues" identified, that alone does not guarantee full compliance

The facility was originally constructed in 2005. The facility has not since been substantially renovated.

During the interview process with the client representatives, no complaints or pending litigation associated with potential accessibility issues was reported.

A prior accessibility survey was performed after construction. From BV's perspective and limited analysis of the documents provided in conjunction with our own site visit, it appears that the recommendations from that study have been fully addressed. A line item by line item comparison between the prior study and BV's recent observations are beyond the scope of this assessment. Reference the appendix for specific data, photos, and tables or checklists associated with this limited accessibility survey.

5. Purpose and Scope

Purpose

Bureau Veritas was retained by the client to render an opinion as to the Property's current general physical condition on the day of the site visit.

Based on the observations, interviews and document review outlined below, this report identifies significant deferred maintenance issues, existing deficiencies, and material code violations of record, which affect the Property's use. Opinions are rendered as to its structural integrity, building system condition and the Property's overall condition. The report also notes building systems or components that have realized or exceeded their typical expected useful lives.

The physical condition of building systems and related components are typically defined as being in one of five condition ratings. For the purposes of this report, the following definitions are used:

Condition Ratings	
Excellent	New or very close to new; component or system typically has been installed within the past year, sound and performing its function. Eventual repair or replacement will be required when the component or system either reaches the end of its useful life or fails in service.
Good	Satisfactory as-is. Component or system is sound and performing its function, typically within the first third of its lifecycle. However, it may show minor signs of normal wear and tear. Repair or replacement will be required when the component or system either reaches the end of its useful life or fails in service.
Fair	Showing signs of wear and use but still satisfactory as-is, typically near the median of its estimated useful life. Component or system is performing adequately at this time but may exhibit some signs of wear, deferred maintenance, or evidence of previous repairs. Repair or replacement will be required due to the component or system's condition and/or its estimated remaining useful life.
Poor	Component or system is significantly aged, flawed, functioning intermittently or unreliably; displays obvious signs of deferred maintenance; shows evidence of previous repair or workmanship not in compliance with commonly accepted standards; has become obsolete; or exhibits an inherent deficiency. The present condition could contribute to or cause the deterioration of contiguous elements or systems. Either full component replacement is needed or repairs are required to restore to good condition, prevent premature failure, and/or prolong useful life.
Failed	Component or system has ceased functioning or performing as intended. Replacement, repair, or other significant corrective action is recommended or required.
Not Applicable	Assigning a condition does not apply or make logical sense, most commonly due to the item in question not being present.

Scope

The standard scope of the Facility Condition Assessment includes the following:

- Visit the Property to evaluate the general condition of the building and site improvements, review available construction documents in order to familiarize ourselves with, and be able to comment on, the in-place construction systems, life safety, mechanical, electrical, and plumbing systems, and the general built environment.
- Identify those components that are exhibiting deferred maintenance issues and provide cost estimates for Immediate Costs and Replacement Reserves based on observed conditions, maintenance history and industry standard useful life estimates. This will include the review of documented capital improvements completed within the last five-year period and work currently contracted for, if applicable.
- Provide a full description of the Property with descriptions of in-place systems and commentary on observed conditions.
- Provide a high-level categorical general statement regarding the subject Property's compliance to Title III of the Americans with Disabilities Act. This will not constitute a full ADA survey, but will help identify exposure to issues and the need for further review.
- Obtain background and historical information about the facility from a building engineer, property manager, maintenance staff, or other knowledgeable source. The preferred methodology is to have the client representative or building occupant complete a Pre-Survey Questionnaire (PSQ) in advance of the site visit. Common alternatives include a verbal interview just prior to or during the walk-through portion of the assessment.
- Review maintenance records and procedures with the in-place maintenance personnel.
- Observe a representative sample of the interior spaces/units, including vacant spaces/units, to gain a clear understanding of the property's overall condition. Other areas to be observed include the exterior of the property, the roofs, interior common areas, and the significant mechanical, electrical and elevator equipment rooms.
- Provide recommendations for additional studies, if required, with related budgetary information.
- Provide an Executive Summary at the beginning of this report, which highlights key findings and includes a Facility Condition Index as a basis for comparing the relative conditions of the buildings within the portfolio.

6. Opinions of Probable Costs

Cost estimates are attached throughout this report, with the Replacement Reserves in the appendix.

These estimates are based on Invoice or Bid Document/s provided either by the Owner/facility and construction costs developed by construction resources such as *R.S. Means, CBRE Whitestone,* and *Marshall & Swift,* Bureau Veritas's experience with past costs for similar properties, city cost indexes, and assumptions regarding future economic conditions.

Opinions of probable costs should only be construed as preliminary, order of magnitude budgets. Actual costs most probably will vary from the consultant's opinions of probable costs depending on such matters as type and design of suggested remedy, quality of materials and installation, manufacturer and type of equipment or system selected, field conditions, whether a physical deficiency is repaired or replaced in whole, phasing or bundling of the work (if applicable), quality of contractor, quality of project management exercised, market conditions, use of subcontractors, and whether competitive pricing is solicited, etc. Certain opinions of probable costs cannot be developed within the scope of this guide without further study. Opinions of probable cost for further study should be included in the FCA.

Definitions

Immediate Needs

Immediate Needs are line items that require immediate action as a result of: (1) material existing or potential unsafe conditions, (2) failed or imminent failure of mission critical building systems or components, or (3) conditions that, if not addressed, have the potential to result in, or contribute to, critical element or system failure within one year or will most probably result in a significant escalation of its remedial cost.

For database and reporting purposes the line items with RUL=0, and commonly associated with *Safety* or *Performance/Integrity* Plan Types, are considered Immediate Needs.

Replacement Reserves

Cost line items traditionally called Replacement Reserves (equivalently referred to as Lifecycle/Renewals) are for recurring probable renewals or expenditures, which are not classified as operation or maintenance expenses. The replacement reserves should be budgeted for in advance on an annual basis. Replacement Reserves are reasonably predictable both in terms of frequency and cost. However, Replacement Reserves may also include components or systems that have an indeterminable life but, nonetheless, have a potential for failure within an estimated time period.

Replacement Reserves generally exclude systems or components that are estimated to expire after the reserve term and are not considered material to the structural and mechanical integrity of the subject property. Furthermore, systems and components that are not deemed to have a material effect on the use of the Property are also excluded. Costs that are caused by acts of God, accidents, or other occurrences that are typically covered by insurance, rather than reserved for, are also excluded.

Replacement costs are solicited from ownership/property management, Bureau Veritas's discussions with service companies, manufacturers' representatives, and previous experience in preparing such schedules for other similar facilities. Costs for work performed by the ownership's or property management's maintenance staff are also considered.

Bureau Veritas's reserve methodology involves identification and quantification of those systems or components requiring capital reserve funds within the assessment period. The assessment period is defined as the effective age plus the reserve term. Additional information concerning system's or component's respective replacement costs (in today's dollars), typical expected useful lives, and remaining useful lives were estimated so that a funding schedule could be prepared. The Replacement Reserves Schedule presupposes that all required remedial work has been performed or that monies for remediation have been budgeted for items defined as Immediate Needs.

For the purposes of 'bucketizing' the System Expenditure Forecasts in this report, the Replacement Reserves have been subdivided and grouped as follows: Short Term (years 1-3), Near Term (years 4-5), Medium Term (years 6-10), and Long Term (years 11-20).

Key Findings

In an effort to highlight the most significant cost items and not be overwhelmed by the Replacement Reserves report in its totality, a subsection of Key Findings is included within the Executive Summary section of this report. Key Findings typically include repairs or replacements of deficient items within the first five-year window, as well as the most significant high-dollar line items that fall anywhere within the ten-year term. Note that while there is some subjectivity associated with identifying the Key Findings, the Immediate Needs are always included as a subset.

Exceedingly Aged

A fairly common scenario encountered during the assessment process, and a frequent source of debate, occurs when classifying and describing "very old" systems or components that are still functioning adequately and do not appear nor were reported to be in any way deficient. To help provide some additional intelligence on these items, such components will be tagged in the database as Exceedingly Aged. This designation will be reserved for mechanical or electrical systems or components that have aged well beyond their industry standard lifecycles, typically at least 15 years beyond and/or twice their Estimated Useful Life (EUL). In tandem with this designation, these items will be assigned a Remaining Useful Life (RUL) not less than two years but not greater than 1/3 of their standard EUL. As such the recommended replacement time for these components will reside outside the typical Short Term window but will not be pushed 'irresponsibly' (too far) into the future.

Methodology

Based upon site observations, research, and judgment, along with referencing Expected Useful Life (EUL) tables from various industry sources, Bureau Veritas opines as to when a system or component will most probably necessitate replacement. Accurate historical replacement records, if provided, are typically the best source of information. Exposure to the elements, initial quality and installation, extent of use, the quality and amount of preventive maintenance exercised, etc., are all factors that impact the effective age of a system or component. As a result, a system or component may have an effective age that is greater or less than its actual chronological age. The Remaining Useful Life (RUL) of a component or system equals the EUL less its *effective age*, whether explicitly or implicitly stated. Projections of Remaining Useful Life (RUL) are based primarily on age and condition with the presumption of continued use and maintenance of the Property similar to the observed and reported past use and maintenance practices, in conjunction with the professional judgment of Bureau Veritas's assessors. Significant changes in occupants and/or usage may affect the service life of some systems or components.

Where quantities could not be or were not derived from an actual construction document take-off or facility walk-through, and/or where systemic costs are more applicable or provide more intrinsic value, budgetary square foot and gross square foot costs are used. Estimated costs are based on professional judgment and the probable or actual extent of the observed defect, inclusive of the cost to design, procure, construct and manage the corrections.

7. Net Zero Energy Audit

The purpose of this Net Zero Energy Audit is to provide Frances C. Richmond Middle School with a baseline of energy usage, the relative energy efficiency of the facility, and specific recommendations for both renewable and non-renewable Energy Conservation Measures to reduce the carbon emissions from building operations to net zero. This is achieved through the following steps:

1. Benchmark the building using EPA -portfolio manager tool to understand the existing carbon foot print.
2. Identify ways to reduce and optimize energy use in building through retrofits and energy efficient replacments.
3. Electrification – replace all fossil fuel consuming HVAC and DWH systems with high efficiency electric equivanelts
4. Onsite generation- perform feasibility study on installing solar PV systems on building roof and carports to offset electric use at the site
5. Procure the balance of electricity from renewable source such as “Solar Farms” or “Wind Farms”.

This audit will focus on the first four steps of the process, terminating with performing a “Gap- Analysis” to project the carbon footprint of the building post implementation of all non-renewable and renewable energy + water saving measures at the building.

Historical Energy and Water Performance Metrics + EPA Benchmarking

- Establishing the energy baseline begins with an analysis of the utility cost and consumption of the facility. Utilizing the historical energy data and local weather information, we evaluate the existing utility consumption and assign it to the various end-uses throughout the buildings.
- On developing a baseline, Bureau Veritas uses the Portfolio Manager tool developed by the Federal Environmental Protection Agency to track relative energy uses of buildings by property type.

Energy and Water Use Optimization Audit

The energy audit consisted of an onsite visual assessment to determine current conditions, itemize the energy consuming equipment (i.e. Boilers, Make-Up Air Units, DWH equipment); review lighting systems both exterior and interior; and review efficiency of all such equipment. The study also included interviews and consultation with operational and maintenance personnel. The energy audit process includes the following:

- Interviewing staff and review plans and past upgrades
- Performing an energy audit for each use type
- Performing a preliminary evaluation of the utility system
- Analyzing findings, utilizing ECM cost-benefit worksheets
- Making preliminary recommendations for system energy improvements and measures
- Estimating initial cost and changes in operating and maintenance costs based on implementation of energy efficiency measures.
- Ranking recommended cost measures, based on the criticality of the project and the largest payback.

Electrification

This includes identifying all fossil fuel burning HVAC and DWH systems and identifying optimal energy efficient electric alternatives to offset any Scope -II emissions from building operations.

Onsite Generation

This includes conducting feasibility study for onsite energy generation through renewable energy sources such as roof top solar PV to offset the electric use at the building.

8. Historical Energy and Water Performance Metrics

Utility Data Tabulation Methodology

The baseline utility consumption data for the proper has been developed by aggregating the consumption from one electric meter and one water meter.

Data Limitation:
No assumptions were made in tabulation of the utility data for the purposes of the audit.

Utilities Metering at Glance	
Number of electric meters observed	One
Number of gas meters observed	Zero
Number of domestic water meter observed	One

Average Utility Rates				
Electricity	Wood Pellet	Propane	No.2 Oil	Water & Sewer
Average Rate	Average Rate	Average Rate	Average Rate	Blended Rate
$0.15/kWh	$55.00/Ton	$1.59/Gal	$2.38/Gal	$ 10.00/kgal

Electricity

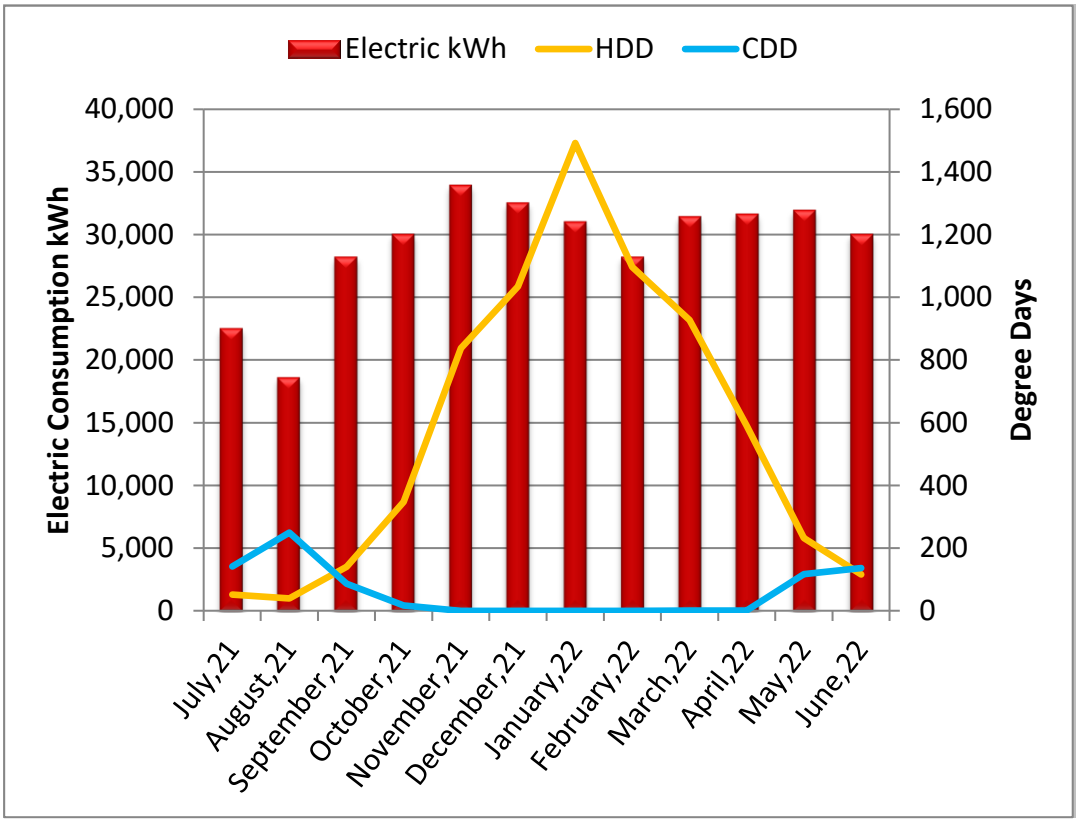
Liberty Utilities provides the electrical service to the facility.

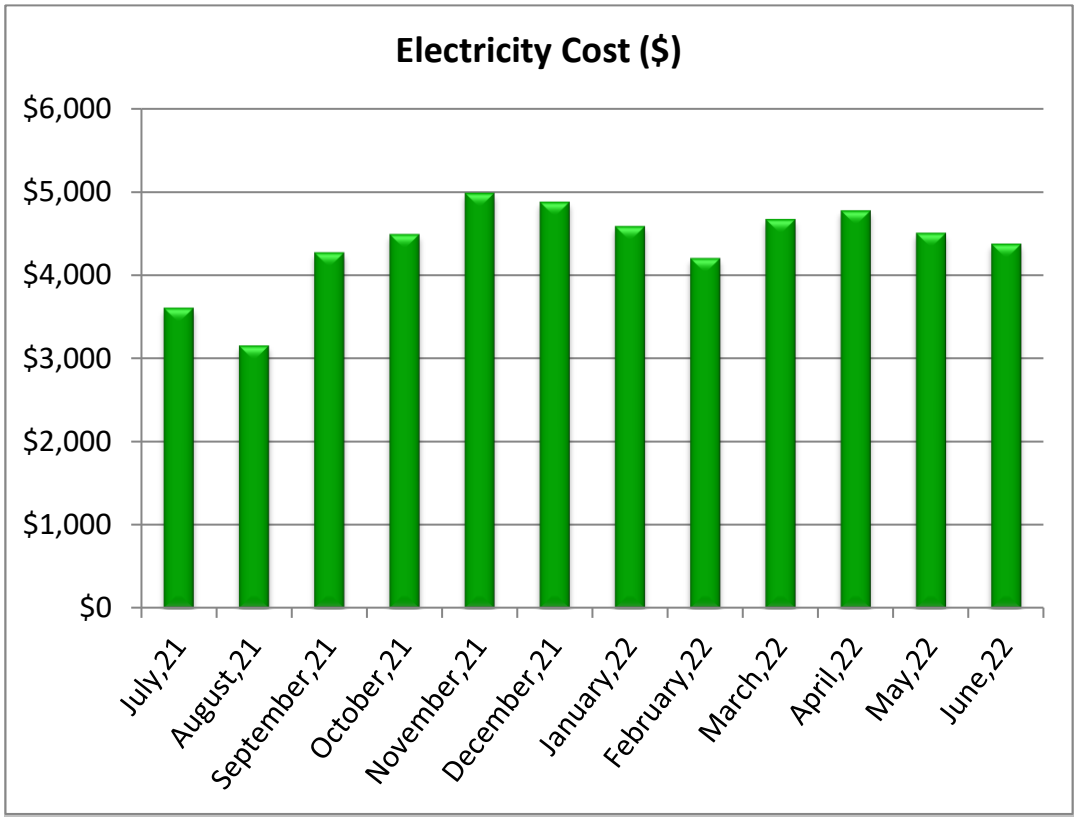
The consumption pattern for the period under consideration varies seasonally. The seasonal variation in the consumption is primarily attributed to the cooling loads, while the static base load primarily consists of lighting and appliances.

"Heating degree days", or "HDD", are a measure of how much (in degrees), and for how long (in days), outside air temperature was lower than a specific "base temperature" (in this case 65F). They are widely used in the energy industry for calculations relating to the effect of outside air temperature on building energy consumption.

"Cooling degree days", or "CDD", are a measure of how much (in degrees), and for how long (in days), outside air temperature was higher than a specific base temperature. They are used for calculations relating to the energy consumption required to cool buildings.

Electricity Consumption & Cost Data			
Billing Month	Consumption (kWh)	Unit Cost (per kWh)	Total Cost
July, 2021	22,500	$0.16	$3,607
August, 2021	18,600	$0.17	$3,154
September, 2021	28,200	$0.15	$4,274
October, 2021	30,000	$0.15	$4,493
November, 2021	33,900	$0.15	$4,987
December, 2021	32,500	$0.15	$4,881
January, 2022	31,000	$0.15	$4,588
February, 2022	28,200	$0.15	$4,203
March, 2022	31,400	$0.15	$4,671
April, 2022	31,600	$0.15	$4,776
May, 2022	31,900	$0.14	$4,506
June, 2022	30,000	$0.15	$4,375
TOTAL/AVERAGE	**349,800**	**$0.15**	**$52,514**


Electric kWh
HDD
CDD
Electric Consumption kWh
Degree Days
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
1,600
1,400
1,200
1,000
800
600
400
200
0
July,21
August,21
September,21
October,21
November,21
December,21
January,22
February,22
March,22
April,22
May,22
June,22


Electricity Cost ($)
$6,000
$5,000
$4,000
$3,000
$2,000
$1,000
$0
July,21
August,21
September,21
October,21
November,21
December,21
January,22
February,22
March,22
April,22
May,22
June,22

Natural Gas

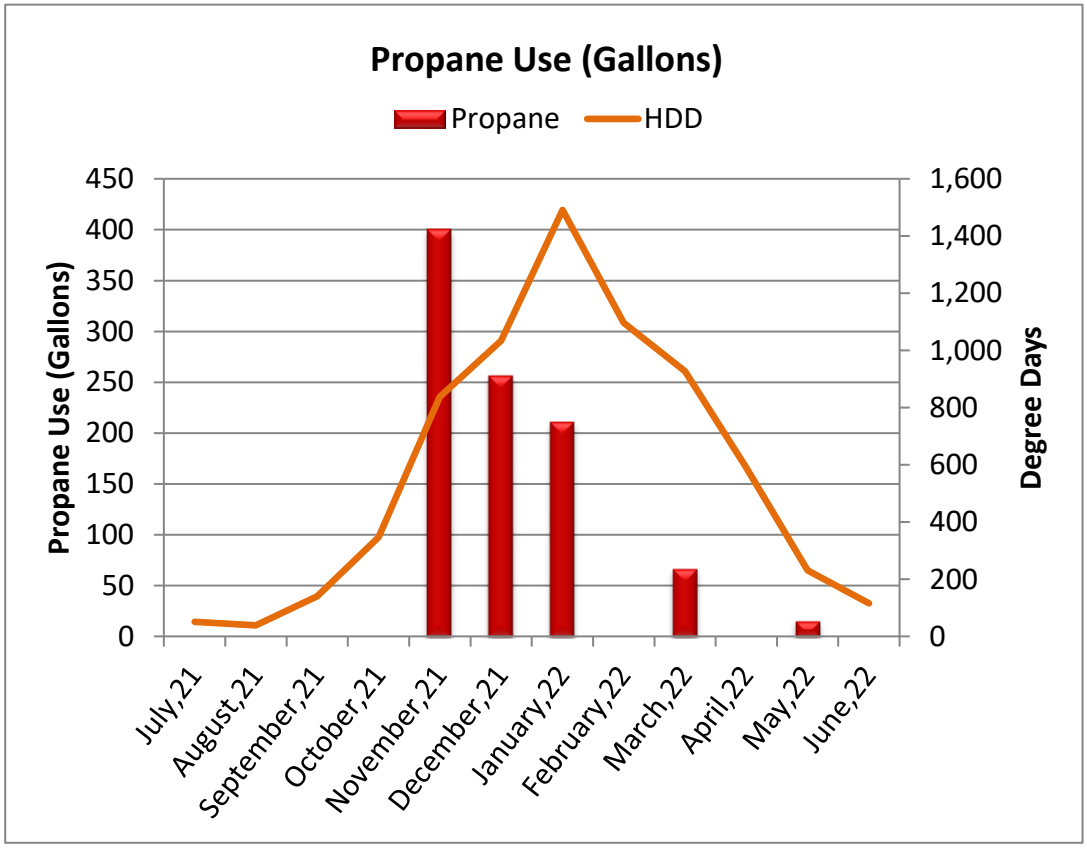
Not applicable. There is no natural gas service provided to the facility.

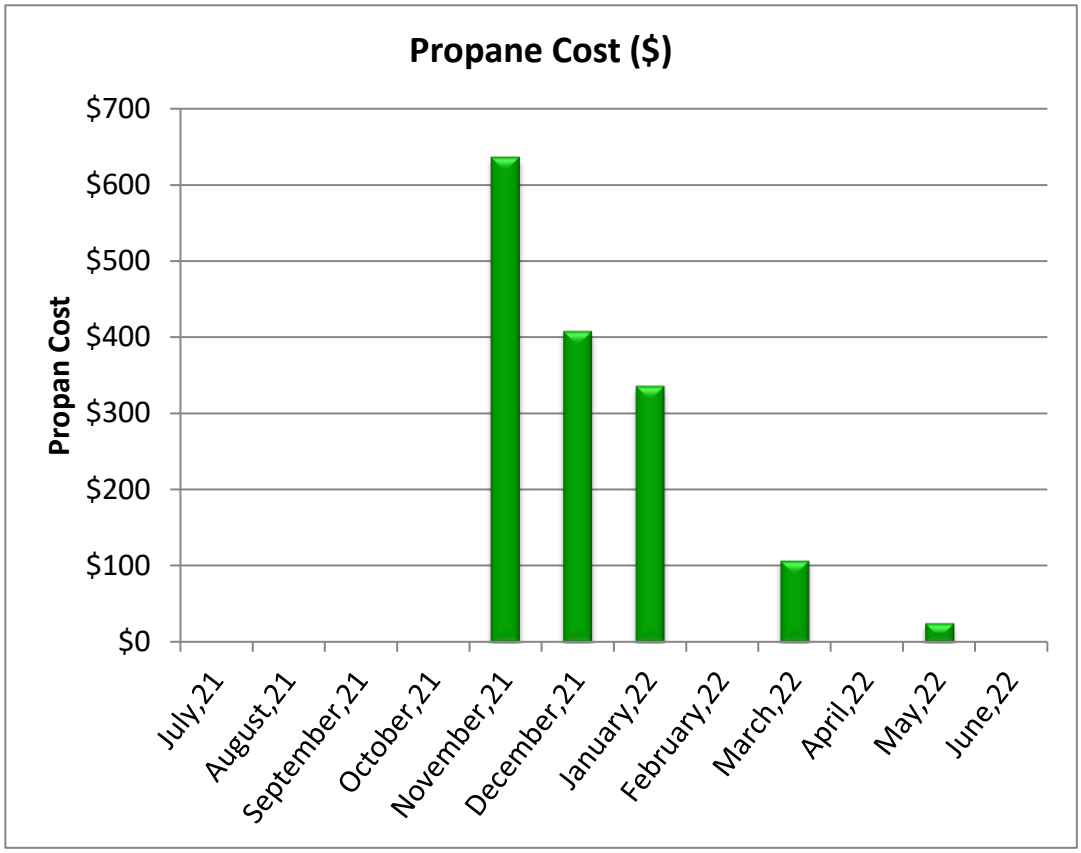
Propane / Fuel Oil / Wood Pellet

Dead River provides the propane and fuel oil to the facility. Cousineau Forest Products provided the wood pellets to the facility. The deliveries are made on an as-needed basis. The underground storage tanks are located on-site and have a total rated capacity of 10,000 gallons for propane and 1,000 gallons for fuel oil.

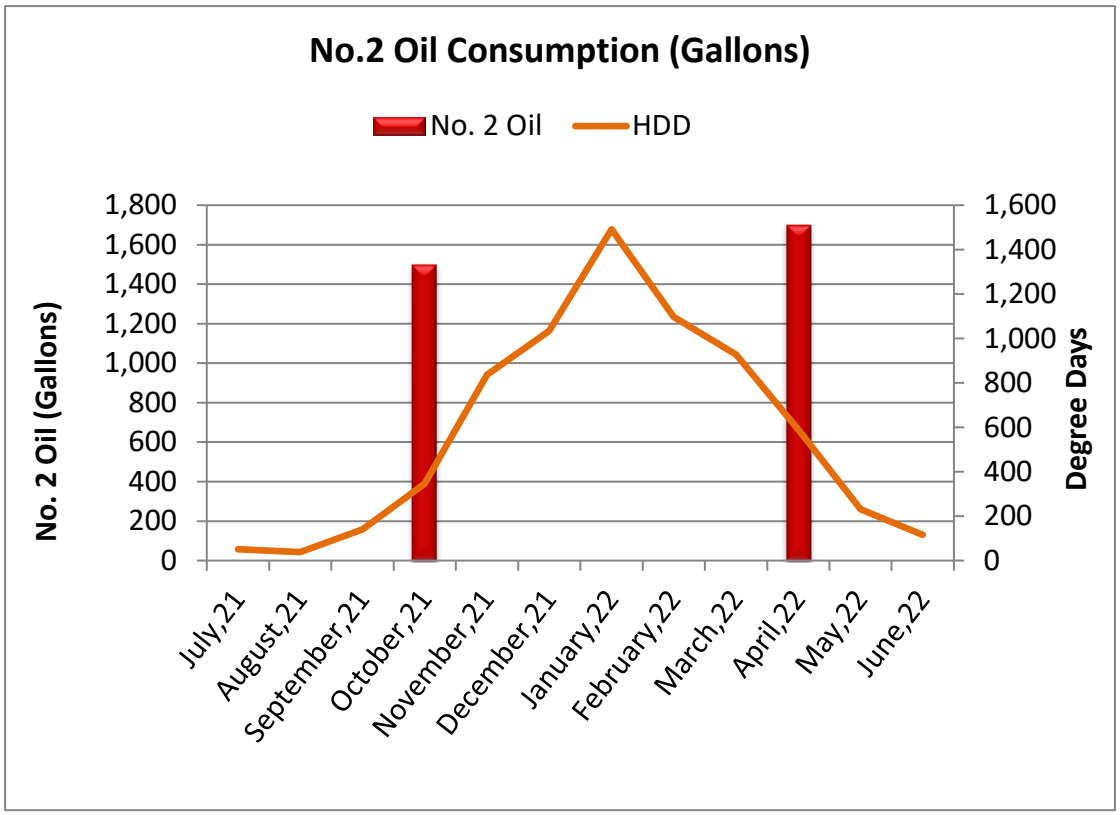
The primary use of the propane, fuel oil, and wood pellets is for space heating, domestic water heating, and cooking. The consumption pattern for the period under consideration varies seasonally. The seasonal variation in the consumption is primarily attributed to the heating loads, while the static base load primarily consists of domestic water heating and cooking.
"Heating degree days", or "HDD", are a measure of how much (in degrees), and for how long (in days), outside air temperature was lower than a specific "base temperature" (in this case 65F). They are widely used in the energy industry for calculations relating to the effect of outside air temperature on building energy consumption.

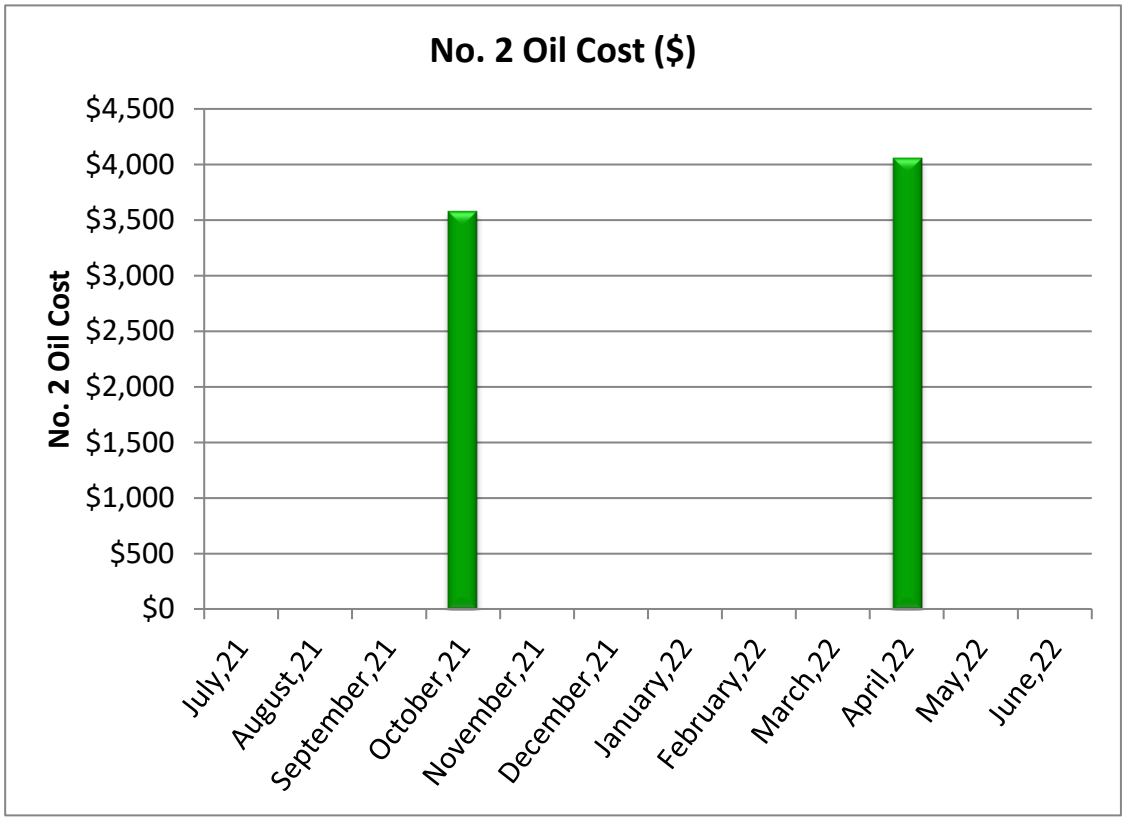
Propane Consumption & Cost Data			
Delivery Month	Delivery (gallons)	Unit Cost (per gallon)	Total Cost
July, 2021	0	0	$0
August, 2021	0	0	$0
September, 2021	0	0	$0
October, 2021	0	0	$0
November, 2021	400	1.59	$636
December, 2021	256	1.59	$408
January, 2022	211	1.59	$336
February, 2022	0	0	$0
March, 2022	67	1.59	$107
April, 2022	0	0	$0
May, 2022	16	1.59	$25
June, 2022	0	0	$0
Total	**951**	**1.59**	**$1,511**


Propane Use (Gallons)
Propane
HDD
Propane Use (Gallons)
Degree Days
450
400
350
300
250
200
150
100
50
0
1,600
1,400
1,200
1,000
800
600
400
200
0
July,21
August,21
September,21
October,21
November,21
December,21
January,22
February,22
March,22
April,22
May,22
June,22

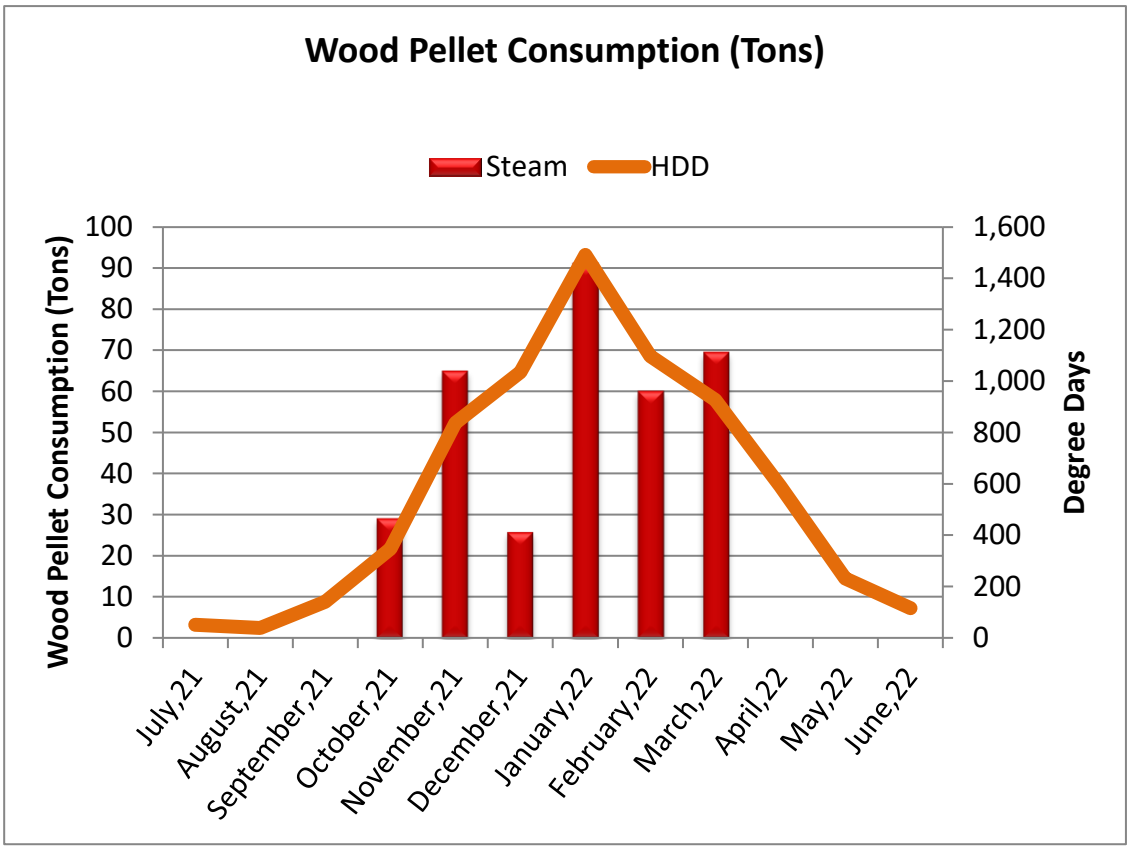

Propane Cost ($)
Propan Cost
$700
$600
$500
$400
$300
$200
$100
$0
July,21
August,21
September,21
October,21
November,21
December,21
January,22
February,22
March,22
April,22
May,22
June,22

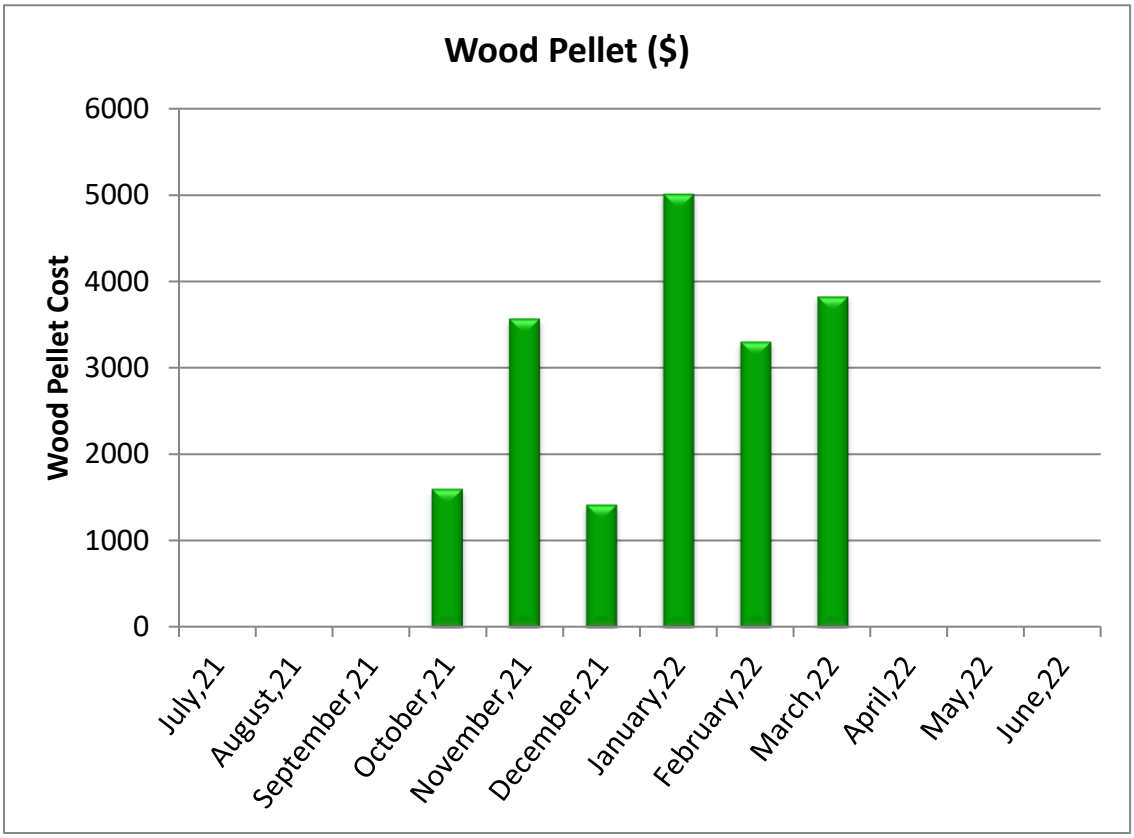
Fuel Oil Consumption & Cost Data			
Delivery Month	Delivery (gallons)	Unit Cost (per gallon)	Total Cost
July, 2021	0	0	$0
August, 2021	0	0	$0
September, 2021	0	0	$0
October, 2021	1,500	$2.38	$3,575
November, 2021	0	0	$0
December, 2021	0	0	$0
January, 2022	0	0	$0
February, 2022	0	0	$0
March, 2022	0	0	$0
April, 2022	1,700	$2.38	$4,052
May, 2022	0	0	$0
June, 2022	0	0	$0
Total	**3,200**	**$2.38**	**$7,628**


No.2 Oil Consumption (Gallons)
No. 2 Oil
HDD
No. 2 Oil (Gallons)
Degree Days
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
1,600
1,400
1,200
1,000
800
600
400
200
0
July,21
August,21
September,21
October,21
November,21
December,21
January,22
February,22
March,22
April,22
May,22
June,22


No. 2 Oil Cost ($)
No. 2 Oil Cost
$4,500
$4,000
$3,500
$3,000
$2,500
$2,000
$1,500
$1,000
$500
$0
July,21
August,21
September,21
October,21
November,21
December,21
January,22
February,22
March,22
April,22
May,22
June,22

Wood Pellet Consumption & Cost Data			
Delivery Month	Delivery (Tons)	Unit Cost (per Ton)	Total Cost
July, 2021	0	0	0
August, 2021	0	0	$0
September, 2021	0	0	$0
October, 2021	29	$55.00	$1,602
November, 2021	65	$55.00	$3,573
December, 2021	26	$55.00	$1,421
January, 2022	91	$55.00	$5,014
February, 2022	60	$55.00	$3,304
March, 2022	70	$55.00	$3,826
April, 2022	0	0	$0
May, 2022	0	0	$0
June, 2022	0	0	$0
Total	**341**	**$55.00**	**$18,741**


Wood Pellet Consumption (Tons)
Steam
HDD
Wood Pellet Consumption (Tons)
Degree Days
100
90
80
70
60
50
40
30
20
10
0
1,600
1,400
1,200
1,000
800
600
400
200
0
July,21
August,21
September,21
October,21
November,21
December,21
January,22
February,22
March,22
April,22
May,22
June,22

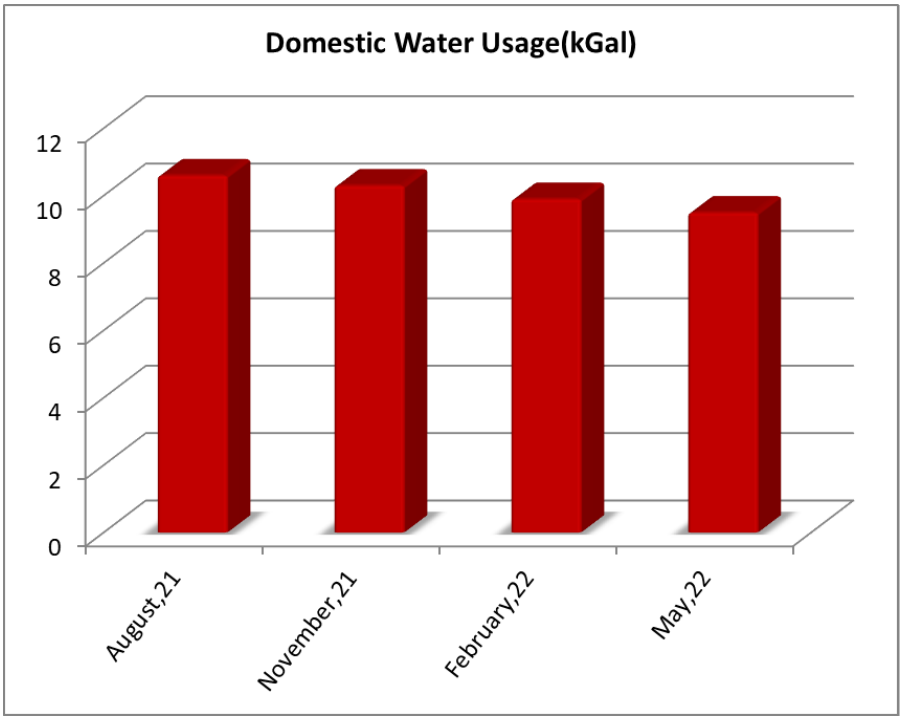

Wood Pellet ($)
Wood Pellet Cost
6000
5000
4000
3000
2000
1000
0
July,21
August,21
September,21
October,21
November,21
December,21
January,22
February,22
March,22
April,22
May,22
June,22

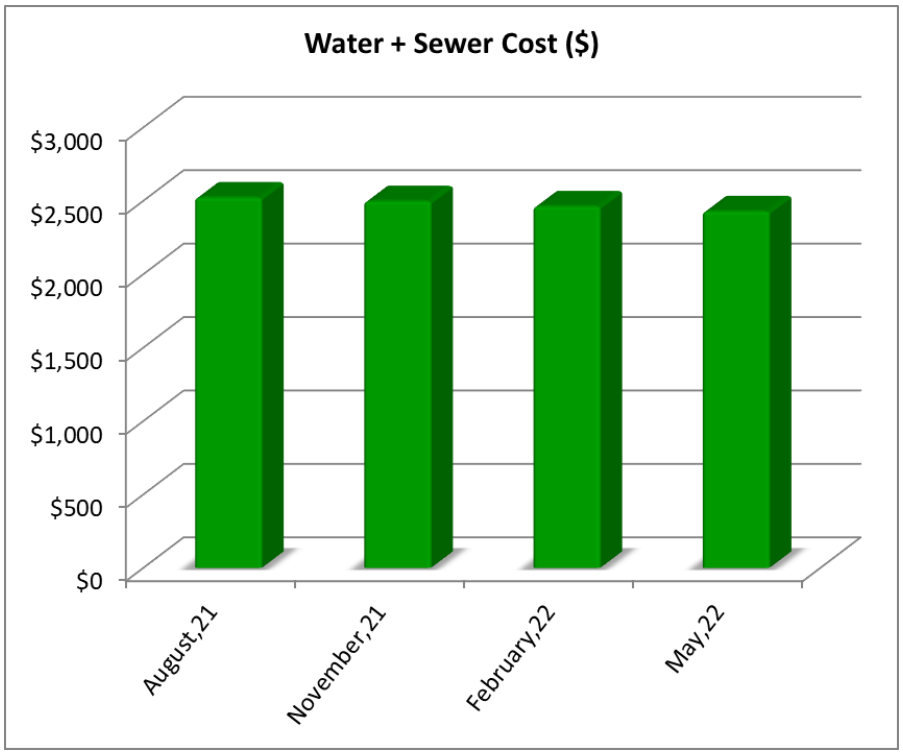
Water and Sewer

The Town of Hanover satisfies the water and sewer requirements of the facility. The billing for the water and sewer is yearly.

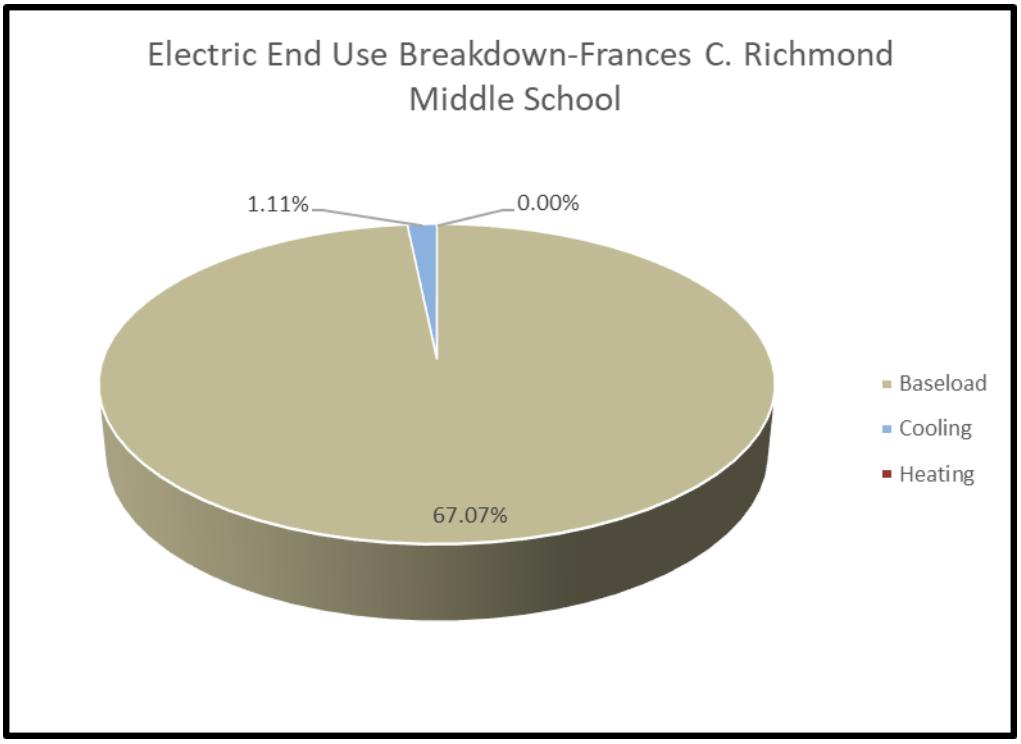
Based on the 2021-2022 water and sewer usage and costs provided, the average blended price paid during the year was $32.87 per kilogallon. The total annual consumption for the 12-month period analyzed is 301 kilogallons for a total cost of $9,909.

Water & Sewer Consumption & Cost Data			
Billing Month	Consumption (kGal)	Unit Cost (per kGal)	Total Cost
August,21	79	$31.81	$2,522
November,21	77	$32.41	$2,497
February,22	74	$33.25	$2,462
May,22	71	$34.17	$2,428
TOTAL/AVERAGE	**301**	**$32.87**	**$9,909**


Domestic Water Usage(kGal)
12
10
8
6
4
2
0
August,21
November,21
February,22
May,22


Water + Sewer Cost ($)
$3,000
$2,500
$2,000
$1,500
$1,000
$500
$0
August,21
November,21
February,22
May,22

End Use Energy Distribution



Energy Star Portfolio Manager Facility Summary

Bureau Veritas uses the Portfolio Manager tool developed by the Federal Environmental Protection Agency to track relative energy uses of buildings by property type. This tool allows the input of a facility's historic utility data to be compared with normalized data of a large database of its peer facilities.

Based on this analysis, Frances C. Richmond Middle School is performing at the national average level.

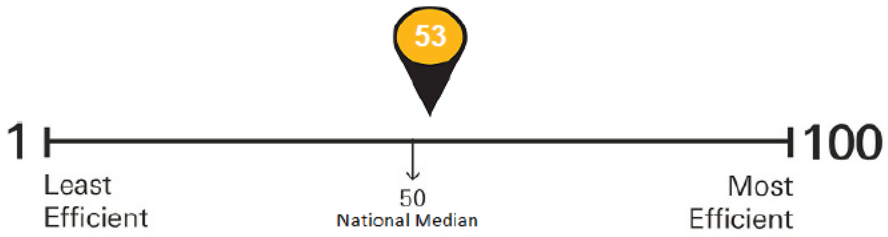
ENERGY STAR® Energy Performance Scorecard

53

out of 100

Frances C. Richmond Middle School

For Year Ending	June 30, 2022
Property Address	63 Lyme Road Hanover, New Hampshire 03755
Primary Function	K-12 School
Gross Floor Area (ft²)	105,000
Year built	2005
Energy Use per sq. ft.*	70.9 kBtu



What is the ENERGY STAR Score?
The ENERGY STAR score rates commercial building's energy performance relative to similar buildings nationwide. Expressed as a number on a simple 1-100 scale, the score rates performance on a percentile basis: a building with a score of 50 performs better than 50% of its peers. Higher scores mean better energy efficiency, resulting in less energy use and fewer greenhouse gas emissions. If a 1-100 score for a specific building type has not been developed, Site Energy Use Intensity (EUI) will be displayed on this scorecard.

Learn more at:
energystar.gov/scorecard

*Site energy use

EPA United States Environmental Protection Agency

Date Generated: January 09, 2023

9. Energy Conservation Measures

Bureau Veritas has conducted an Energy Audit on Frances C. Richmond Middle School. The study included a review of the building's construction features, historical energy and water consumption and costs, review of the building envelope, HVAC equipment, heat distribution systems, lighting, and the building's operational and maintenance practices.

Bureau Veritas has evaluated two Energy Conservation Measures (ECMs) for this property. The savings for each measure are calculated using standard engineering methods followed in the industry, and detailed calculations for ECM are provided in Appendix H for reference. A 10% discount in energy savings was applied to account for the interactive effects amongst the ECMs. In addition to the consideration of the interactive effects, Bureau Veritas has applied a 15% contingency to the implementation costs to account for potential cost overruns during the implementation of the ECMs.

The following table summarizes the recommended ECMs in terms of description, investment cost, energy consumption reduction, and cost savings.

Recommended Non-Renewable Energy Conservation Measures: Financial Impact	
Total Projected Initial ECM Investment	$5,015 *(In Current Dollars)*
Estimated Annual Cost Savings Related to ECMs	$3,548 *(In Current Dollars)*
Net Effective ECM Payback	1.41 years
Estimated Annual Energy Savings	5%
Estimated Annual Utility Cost Savings *(excluding water)*	0%
Estimated Annual Water Cost Savings	35%

Solar Rooftop Photovoltaic Analysis	
Estimated number of panels	1,757
Estimated kW Rating	553.60 kW
Potential Annual kWh Produced	664,347.0 kW
% of Current Electricity Load	189.9%
Investment Cost	$2,663,109
Estimated Energy Cost Savings	$99,736
Payback without Incentives	26.70 Years
Payback with All Incentives	19.76 Years

Key Metrics to Benchmark the Subject Property's Energy Usage Profile

- Building Site Energy Use Intensity - The sum of the total site energy use in thousands of Btu per unit of gross building area. Site energy accounts for all energy consumed at the building location only not the energy consumed during generation and transmission of the energy to the site.
- Building Source Energy Use Intensity – The sum of the total source energy use in thousands of Btu per unit of gross building area. Source energy is the energy consumed during generation and transmission in supplying the energy to your site.
- Building Cost Intensity - This metric is the sum of all energy use costs in dollars per unit of gross building area.

- Greenhouse Gas Emissions - Although there are numerous gases that are classified as contributors to the total for Greenhouse Emissions, the scope of this energy audit focuses on carbon dioxide (CO_2). Carbon dioxide enters the atmosphere through the burning of fossil fuels (oil, natural gas, and coal), solid waste, trees and wood products, and also as a result of other chemical reactions (e.g., manufacture of cement).

Energy Usage Profile	
Site Energy Use Intensity	
Current Site Energy Use Intensity (EUI)	20.29 kBTU/SF
Post ECM Site Energy Use Intensity (EUI)	19.21 kBTU/SF
Source Energy Use Intensity (EUI)	
Current Source Energy Use Intensity (EUI)	48.68 kBTU/SF
Post ECM Source Energy Use Intensity (EUI)	47.55 kBTU/SF
Building Cost Intensity (BCI)	
Current Building Cost Intensity	$0.77/SF
Post ECM Building Cost Intensity	$0.77/SF
Greenhouse Gas Emissions Reduction *(from recommended ECM's)*	
Current Annual CO2e Emissions from Building Operation	152.79 $MtCO_2/Yr$
Total Annual CO2 Emissions Reduced	6.04 $MtCO_2/Yr$
Estimated Annual Thermal Energy Reduction	113.71 MMBTU
Total Cars off the Road (Equivalent)*	1.3
Total Acres of Pine Trees Planted (Equivalent)*	1.4

Energy Conservation Measures Screening:

Bureau Veritas screens ECMs using two financial methodologies. ECMs which are considered financially viable must meet both criteria.

1. Simple Payback Period –The number of years required for the cumulative value of energy or water cost savings less future non-fuel or non-water costs to equal the investment costs of the building energy or water system, without consideration of discount rates. ECMs with a payback period greater than the Expected Useful Life (EUL) of the project are not typically recommended, as the cost of the project will not be recovered during the lifespan of the equipment. These ECMs are recommended for implementation during future system replacement. At that time, replacement may be evaluated based on the premium cost of installing energy efficient equipment.

$$Simple\ Payback = \frac{Initial\ Cost}{Annual\ Savings}$$

2. Savings-to-Investment Ratio (SIR) – The savings-to-investment ratio is the ratio of the present value savings to the present value costs of an energy or water conservation measure. The numerator of the ratio is the present value over the estimated useful life (EUL) of net savings in energy or water and non-fuel or non-water operation and maintenance costs attributable to the proposed energy or water conservation measure. The denominator of the ratio is the present value of the net increase in investment and replacement costs less salvage value attributable to the proposed energy or water conservation measure. It is recommended that energy efficiency recommendations should be based on a calculated SIR, with larger SIRs receiving a higher priority. A project is typically only recommended if SIR is greater than or equal to 1.0, unless other factors outweigh the financial benefit.

$$SIR = \frac{Present\ Value\ (Annual\ Savings, i\%, EUL)}{Initial\ Cost}$$

Bureau Veritas has identified two Energy Conservation Measures (ECM) for this property.

List of Recommended Energy Conservation Measures For Frances C. Richmond Middle School

		Description of ECM	Location	Labor Cost	Material Cost	Projected Initial Investment	Utility Company Incentive	Net Projected Initial Investment	Estimated Annual Energy & Water Savings						Total Energy Savings	Total Green House Gas Savings	Estimated Utility Cost Savings	Estimated Annual O&M Savings	Total Estimated Annual Cost Savings	Simple Payback	S.I.R.	Life Cycle Savings	Expected Useful Life (EUL)
						(a)	(b)	C=(a-b)	Propane	No.2 Oil	Wood Pellet	Electricity	Demand Reduction	Water									
				($)	($)	($)	($)	($)	(Gallons)	(Gallons)	(Tons)	(kWh)	(KW)	(kGal)	(Mmbtu)	($MtCO_2$/Yr)	($)	($)	($)	(Yrs.)		($)	(Yrs.)
1	Title:	Install Low Flow Faucet Aerators	Location: Classrooms, offices	$202	$256	$458	$0	$458	0	0	0	0	0	131	126	6.70	$0	$0	$1,307	0.35	24.32	$10,690	10.00
	Attribute:	Replace 32x 3.2GPM rated kitchen aerators with 1.5GPM WaterSense certified aerators																					
2	Title:	Retrofit Flush Tank Toilets to Dual Flush	Location: Restrooms	$3,111	$792	$3,903	$0	$3,903	0	0	0	0	0	264	0	0.00	$0	$0	$2,636	1.48	10.05	$35,311	20.00
	Attribute:	Retrofit 33x 1.6GPF toilets to dual-flush																					
Totals for No/Low Cost Items				**$202**	**$256**	**$458**	**$0**	**$458**	**0**	**0**	**0**	**0**	**0**	**0**	**131**	**6.70**	**$0**	**$0**	**$1,307**	**0.35**			
Total For Capital Cost				**$3,111**	**$792**	**$3,903**	**$0**	**$3,903**	**0**	**0**	**0**	**0**	**0**	**0**	**264**	**0.00**	**$0**	**$0**	**$2,636**	**1.48**			
		Interactive Savings Discount @ 10%							0	0	0	0	0	0	-39	-0.67	$0	$0	-$394				
		Total Contingency Expenses @ 15%				$654		$654															
Total for Improvements						**$5,015**	**$0**	**$5,015**	**0**	**0**	**0**	**0**	**0**	**0**	**355**	**6.03**	**$0**	**$0**	**$3,548**	**1.41**			

10. Electrification

This analysis investigates replacing HVAC and other fossil fuel consuming systems within the building with efficient electric alternatives. These improvements can be considered as green replacements to traditional “like and in kind” replacements as done as part of the life cycle replacement These replacements are recommended under Capital improvements and not as energy improvements as the cost savings are not significant enough to offset the initial investment.
To take advantage of the saving by transferring the improvements to electrical usage an increase in electrical demand for your present system will be required. This will require ensuring that the electrical equipment is of adequate size to handle the increased load. There are several things to consider before making an upgrade to the electrical equipment.

1. First determine if the service you presently have will require an increase in size. This can be done by reviewing your current electrical usage to see if the additional load will be more than you present system can accommodate. By getting a copy of the last year’s usage from the utility company a comparison can be made to determine if your system can handle the additional load.
2. Updating you present equipment may be required, based on the age and condition of your present equipment. If your system is at the end of its useful life or parts are not available, then a change to the entire system may be required. Things to consider beside the cost of a new system include the cost of shutdown of your present system during the changeover and remodeling to replace present systems.
3. We recommend building another service alongside your present system to handle the increase from the changes being recommended. According to the National Electrical Code under the “Rule of Six” you are allowed to have 6 separate electrical services, or six different main disconnects on your building. This rule allows you to build an additional electrical system to handle the increased load only.

Any changes made to your electrical system should be evaluated by an Electrical Engineer to ensure that the new system will meet the new load requirements and for compliance with all electrical codes. The cost for that study has been included in this evaluation.

Note: The facility is heated primarily by one wood chip boiler and two No. 2 fuel oil boilers. Hot water is also provided by these boilers. All components were installed with the original building construction in 2005. Bureau Veritas proposes the electrification replacements be scheduled so that the equipment with the longer remaining useful life is changed out last.

Fossil Fuel Burning Systems

	Asset Description	Input Capacity (MBH)	Quantity	EUL	RUL	Fuel
1	Water Heater	NA	1	20	8	Indirect
2	Boiler, 924 MBH	924	1	20	13	No. 2 Oil
3	Boiler, 4835 MBH	4835	1	20	13	No. 2 Oil
4	Boiler, 4184 MBH	4184	1	30	13	Wood Pellet
5	Generator, 80 KW	NA	1	20	7	Diesel
6	Range, 143 MBH	143	1	20	2	Propane
7	Range, 224 MBH	224	1	20	2	Propane

Net-Zero Project Schedule																			
				0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
	Action	Attributes	Initial Investment	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	Totals
1	Implement All Non- Renewable Measures		$5,015		$5,015														$5,015
2	ECM Electric, Solar Photovoltaic (PV) System, Fixed Tilt, Install	554 Watt	$2,663,109				$665,777	$665,777	$665,777	$665,777									$2,663,109
3	Switchboard, 277/480 V, 1600 AMP		$111,185									$111,185							$111,185
4	Water Heater, Electric, Commercial	500 GAL, 180 KW	$70,000									$70,000							$70,000
5	Foodservice Equipment, Range/Oven	6-Burner, Electric, 19 kW	$10,000										$10,000						$10,000
6	Foodservice Equipment, Range/Oven	4-Burner, Electric, 13 kW	$5,000										$5,000						$5,000
7	Boiler, Wood Pellet	Remove/Decommission	$50,000														$50,000		$50,000
8	Variable Refrigerant Flow (VRF) Heat Pump System	Replace wood chip plant with VRF	$1,575,000														$1,575,000		$1,575,000
9	Boiler, Oil, HVAC 924 MBH	Remove - Decommission	$40,000														$40,000		$40,000
10	Boiler, Oil, HVAC,2184 MBH	Remove - Decommission	$10,000														$10,000		$10,000
11	Remove unit ventilators		$135,000														$135,000		$135,000
12	HVAC System, Hydronic Piping, 2-Pipe, Remove		$52,500														$52,500		$52,500
13	Uninterruptible Power Supply, UPS, 150 KVA	Linked to solar. Replaces generator.	$70,000														$70,000		$70,000
14	Storage Tank, Site Fuel, Underground, Remove/Decomission		$15,840															$15,840	$15,840
15	Storage Tank, Site Fuel, Underground, Remove/Decomission		$8,250															$8,250	$8,250
16	Decommission Fuel Piping	Abandon & Cap Piping	$679															$679	$679
	Totals		$4,821,578	$0	$5,015	$0	$665,777	$665,777	$665,777	$665,777	$0	$181,185	$15,000	$0	$0	$0	$1,932,500	$24,769	$4,821,578
	Escalated at 3% Inflation			$0	$5,120	$0	$694,050	$698,712	$702,544	$705,800	$0	$193,531	$16,073	$0	$0	$0	$2,091,719	$26,865	$5,134,414

Analysis:

1. Implement energy conservation measures.
2. Install solar photovoltaic systems, spread out over multiple years to reduce financial impact.
3. Install new electrical service to accommodate added electrical demand when boilers are replaced with electrical HVAC system.
4. Switch out indirect water heater with electric unit.
5-6. Replace propane kitchen ranges with electric ranges as they come to the end of their expected useful life.
7-12. Replace boilers and boiler-based HVAC system with VRF system, and remove components.
13. Install UPS to replace diesel generator.
14-16. Remove underground fuel tanks and piping to complete switch to electricity.

11. Onsite Renewable Energy Generation

A photovoltaic array is a linked collection of photovoltaic modules, which are in turn made of multiple interconnected solar cells. The cells convert solar energy into direct current electricity via the photovoltaic effect. The power that one module can produce is seldom enough to meet requirements of a home or a business, so the modules are linked together to form an array. Most PV arrays use an inverter to convert the DC power produced by the modules into alternating current that can plug into the existing infrastructure to power lights, motors, and other loads. The modules in a PV array are usually first connected in series to obtain the desired voltage; the individual strings are then connected in parallel to allow the system to produce more current. Solar arrays are typically measured by the peak electrical power they produce, in watts, kilowatts, or even megawatts.

When determining if a site is suitable for a solar application, two basic considerations must be evaluated:

- At minimum, the sun should shine upon the solar collectors from 9 AM to 3 PM. If less, the application may still be worthwhile, but the benefit will be less.
- The array should face south and be free of any shading from buildings, trees, rooftop equipment, etc. If the array is not facing directly south, there will be a penalty in transfer efficiency, reducing the overall efficiency of the system.

Solar Feasibility	
Does the property have a south, east, or west facing roof or available land of more than 250 square feet per required Solar Array Panel?	Yes
Is the area free from any shading such as trees, buildings, equipment etc throughout the whole day	Yes
Can the panels be mounted at an incline of roughly 25-45 degrees? (equal to latitude of property)	Yes
Is the property in an area with acceptable average monthly sunlight levels?	Yes
Has the roofing been replaced within the past 3-5 years?	No
Is the roof structure sufficient to hold solar panels?	Yes
Is the property located in a state eligible for net metering?	Yes

A small photovoltaic array is present at the property. Sufficient roof area is available for installation of larger arrays.

12. Net Zero Gap Analysis

Net Zero Energy Analysis for Renewable and Non-Renewable Evaluated Measures

Net Zero Energy Analysis						
		Wood Pellets	Propane	No.2 Oil	Electric	MMBTU
--		(Tons)	(Gal)	(Gal)	(kWh)	(MMBtu)
(a)	Existing Net Annual Energy Consumption	341	951	3,200	349,800	2,131
(b)	Projected First Year, Annual Energy Savings from Non-Renewable Energy Measures	0	0	0	0	0
(c) = (a)-(b)	Projected Annual Consumption Post Non-Renewable Energy Measures	**341**	**951**	**3,200**	**349,800**	**2,131**
(d)	Projected Energy Consumption Post Electrification and Fossil Fuel Conversion	--	--	--	1,251,381	4,270
(e)	Projected First Year, Annual Energy Savings from Renewable Energy Measures		--	--	664,347	2266.75
(f) = (d)-(e)	Projected Energy Consumption Post Renewable + Non-Renewable Energy Implementation + Electrification		--	--	587,034	2,003

Net Zero Financial Analysis	
Total Projected Initial Investment for Recommended Non-Renewable Measures	$5,015 (in current dollars)
Total Projected Initial Investment for Electrification	$2,158,469
Total Projected Initial Investment for Recommended Renewable Measures	$2,663,109
Total project initial investment	$16,591,500

13. Recommended Operations & Maintenance Plan

The quality of the maintenance and the operation of the facility's energy systems have a direct effect on its overall energy efficiency. Energy-efficiency needs to be a consideration when implementing facility modifications, equipment replacements, and general corrective actions. The following is a list of activities that should be performed as part of the routine maintenance program for the property.

Building Envelope

- ✓ Ensure that the building envelope has proper caulking and weather stripping.
- ✓ Patch holes in the building envelope with foam insulation and fire rated caulk around combustion vents
- ✓ Inspect building vents semiannually for bird infestation
- ✓ Inspect windows monthly for damaged panes and failed thermal seals
- ✓ Repair and adjust automatic door closing mechanisms as needed.

Heating and Cooling

- ✓ Pilots lights on furnaces and boilers be turned off in summer
- ✓ All preventive maintenance should be performed on all furnaces and boilers, which would include cleaning of burners and heat exchanger tubes.
- ✓ Ensure that the combustion vents exhaust outside the conditioned space and the vent dampers are functional
- ✓ Ensure that the control valves are functioning properly before start of every season
- ✓ Ensure steam traps are functional before start of each heating season
- ✓ Ensure use of chemical treatment for boiler make up water
- ✓ Ensure boiler outside temperature re-set is set to 55F
- ✗ Ensure use of chemical treatment for Colling tower water to prevent corrosion
- ✓ Ensure the duct work in unconditioned space is un-compromised and well insulated
- ✓ Duct cleaning is recommended every 10 years. This should include sealing of ducts using products similar to 'aero-seal'
- ✓ Ensure use of economizer mode is functional and used
- ✓ Ensure that the outside air dampers actuators are operating correctly
- ✓ Ensure air coils in the AHU and FCA's are pressure washed annually
- ✓ Return vents should remain un-obstructed and be located centrally
- ✓ Temperature settings reduced in unoccupied areas and set points seasonally adjusted.
- ✓ Evaporator coils and condenser coils should be regularly cleaned to improve heat transfer
- ✓ Refrigerant pipes should be insulated with a minimum of ¾" thick Elastomeric Rubber Pipe Insulation
- ✓ Ensure refrigerant pressure is maintained in the condensers
- ✓ Change air filters on return vents seasonally. Use only filters with 'Minimum Efficiency Rating Value'(MERV) of 8

Central Domestic Hot Water Heater

- ✓ Never place gas fired water heaters adjacent to return vents so as to prevent flame roll outs
- ✓ Ensure the circulation system is on timer to reduce the losses through re-circulation
- ✓ Ensure all hot water pipes are insulated with fiberglass insulation at all times
- ✓ Replacement water heater should have Energy Factor (EF)>0.9
- ✓ Tank-type water heaters flushed monthly

Lighting Improvements

- ✓ Utilize bi-level lighting controls in stairwells and hallways.
- ✓ Use LED replacement lamps
- ✓ Clean lighting fixture reflective surfaces and translucent covers.
- ✓ Ensure that timers and/or photocells are operating correctly on exterior lighting
- ✓ Use occupancy sensors for offices and other rooms with infrequent occupancy

Existing Equipment and Replacements

- ✓ Ensure that refrigerator and freezer doors close and seal correctly
- ✓ Ensure kitchen and bathroom exhaust outside the building and the internal damper operates properly
- ✓ Ensure that bathroom vents exhaust out
- ✓ Office/ computer equipment either in the “sleep” or “off” mode when not used

Key

x	Maintenance Measure is Not Applicable For the Given Facility
✓	Maintenance Measure is Applicable For the Given Facility

14. Certification

School Administrative Unit 70 (the Client) retained Bureau Veritas to perform this Facility Condition Assessment in connection with its continued operation of Frances C. Richmond Middle School, 63 Lyme Road, Hanover, New Hampshire 03755, the "Property". It is our understanding that the primary interest of the Client is to locate and evaluate materials and building system defects that might significantly affect the value of the property and to determine if the present Property has conditions that will have a significant impact on its continued operations.

The conclusions and recommendations presented in this report are based on the brief review of the plans and records made available to our Project Manager during the site visit, interviews of available property management personnel and maintenance contractors familiar with the Property, appropriate inquiry of municipal authorities, our Project Manager's walk-through observations during the site visit, and our experience with similar properties.

No testing, exploratory probing, dismantling or operating of equipment or in-depth studies were performed unless specifically required under the *Purpose and Scope* section of this report. This assessment did not include engineering calculations to determine the adequacy of the Property's original design or existing systems. Although walk-through observations were performed, not all areas may have been observed (see Section 1 for specific details). There may be defects in the Property, which were in areas not observed or readily accessible, may not have been visible, or were not disclosed by management personnel when questioned. The report describes property conditions at the time that the observations and research were conducted.

This report has been prepared on behalf of and exclusively for the use of the Client for the purpose stated within the *Purpose and Scope* section of this report. The report, or any excerpt thereof, shall not be used by any party other than the Client or for any other purpose than that specifically stated in our agreement or within the *Purpose and Scope* section of this report without the express written consent of Bureau Veritas.

Any reuse or distribution of this report without such consent shall be at the Client and the recipient's sole risk, without liability to Bureau Veritas.

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15. Appendices

Appendix A: Photographic Record
Appendix B: Site and Floor Plans
Appendix C: Pre-Survey Questionnaire
Appendix D: Accessibility Review & Photos
Appendix E: Component Condition Report
Appendix F: Replacement Reserves
Appendix G: Equipment Inventory List
Appendix H: Lighting System Schedule
Appendix I: Energy Conservation Measures Calculation
Appendix J: Solar Photovoltaic Feasibility Study
Appendix K: Energy Audit Glossary of Terms

Appendix A:
Photographic Record

Photographic Overview

1 - FRONT ELEVATION

2 - LEFT ELEVATION

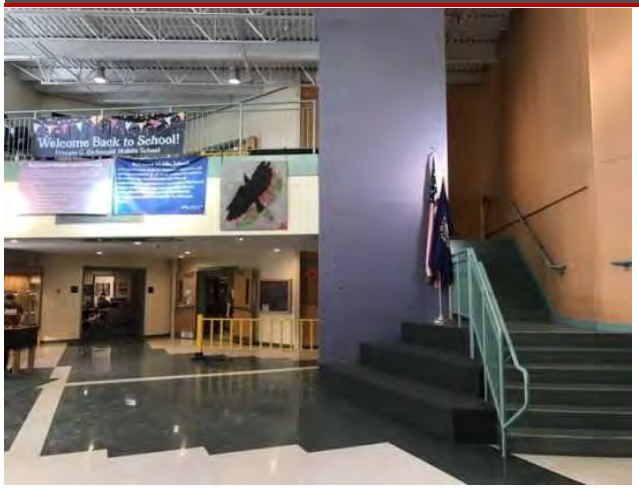
3 - REAR ELEVATION

4 - RIGHT ELEVATION

5 - LOADING DOCK ELEVATION

6 - CENTRAL HEATING PLANT

Photographic Overview



7 - LOBBY

8 - FRONT OFFICE

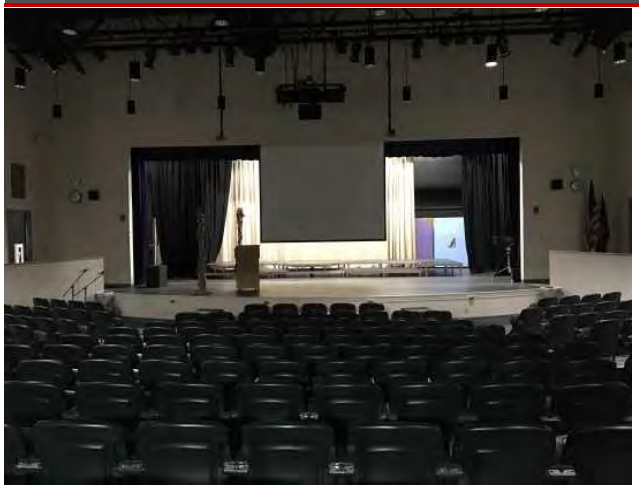
9 - CLASSROOM

10 - LIBRARY

11 - CAFETERIA

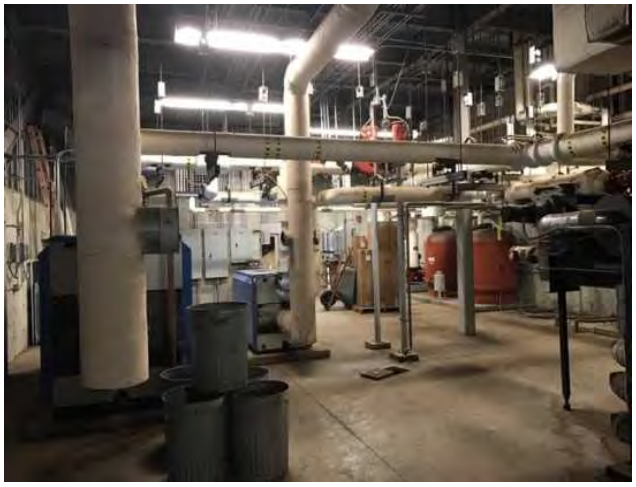
12 - GYMNASIUM

Photographic Overview



13 - AUDITORIUM

14 - KITCHEN



15 - MECHANICAL ROOM

16 - WOOD FIRE PLANT

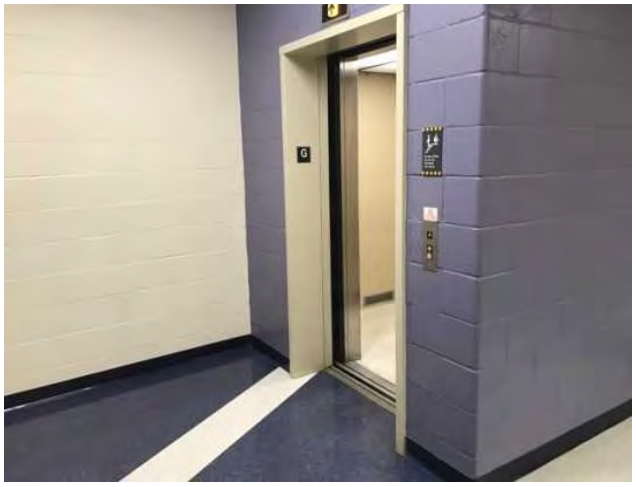
17 - BOILER

18 - DISTRIBUTION PUMP

Photographic Overview

19 - EXHAUST FAN

20 - UNIT HEATER



21 - ELEVATOR

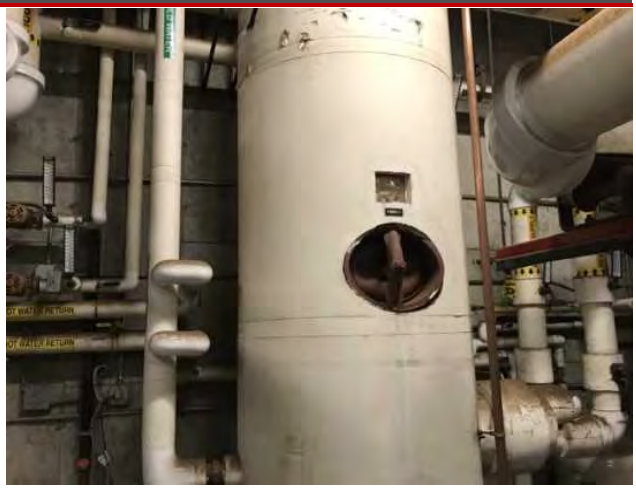
22 - ELEVATOR MACHINERY

23 - SWITCHBOARD

24 - GENERATOR

Photographic Overview

25 - SECONDARY TRANSFORMER



26 - WATER HEATER

27 - FIRE ALARM PANEL

28 - BASKETBALL COURT

29 - DUMPSTERS

30 - POLE LIGHT

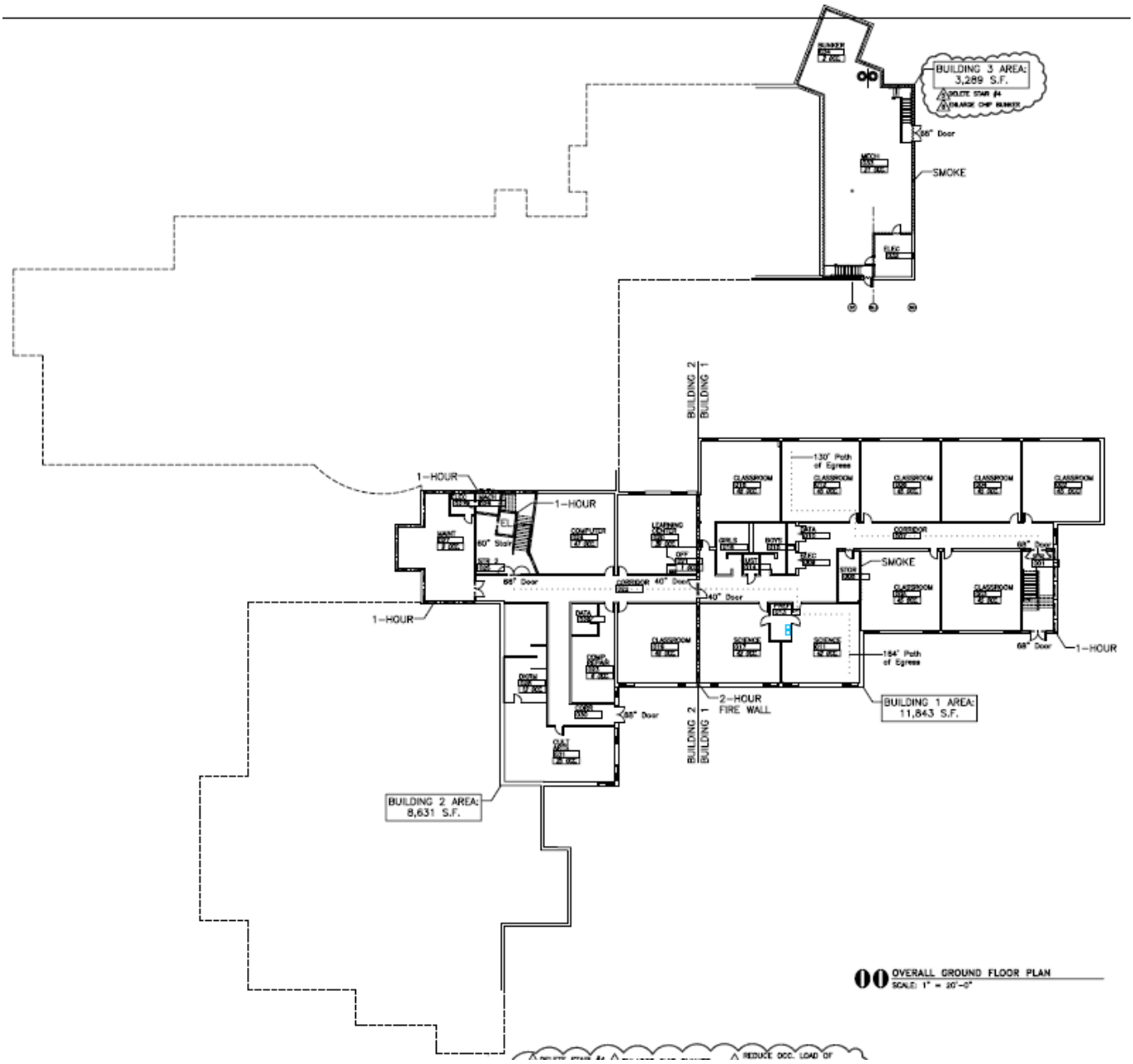
Appendix B:
Site and Floor Plans

Site Plan

Project Number	Project Name
158531.22R000-003.379	Frances C. Richmond Middle School
Source	**On-Site Date**
Google	December 20, 2022

N

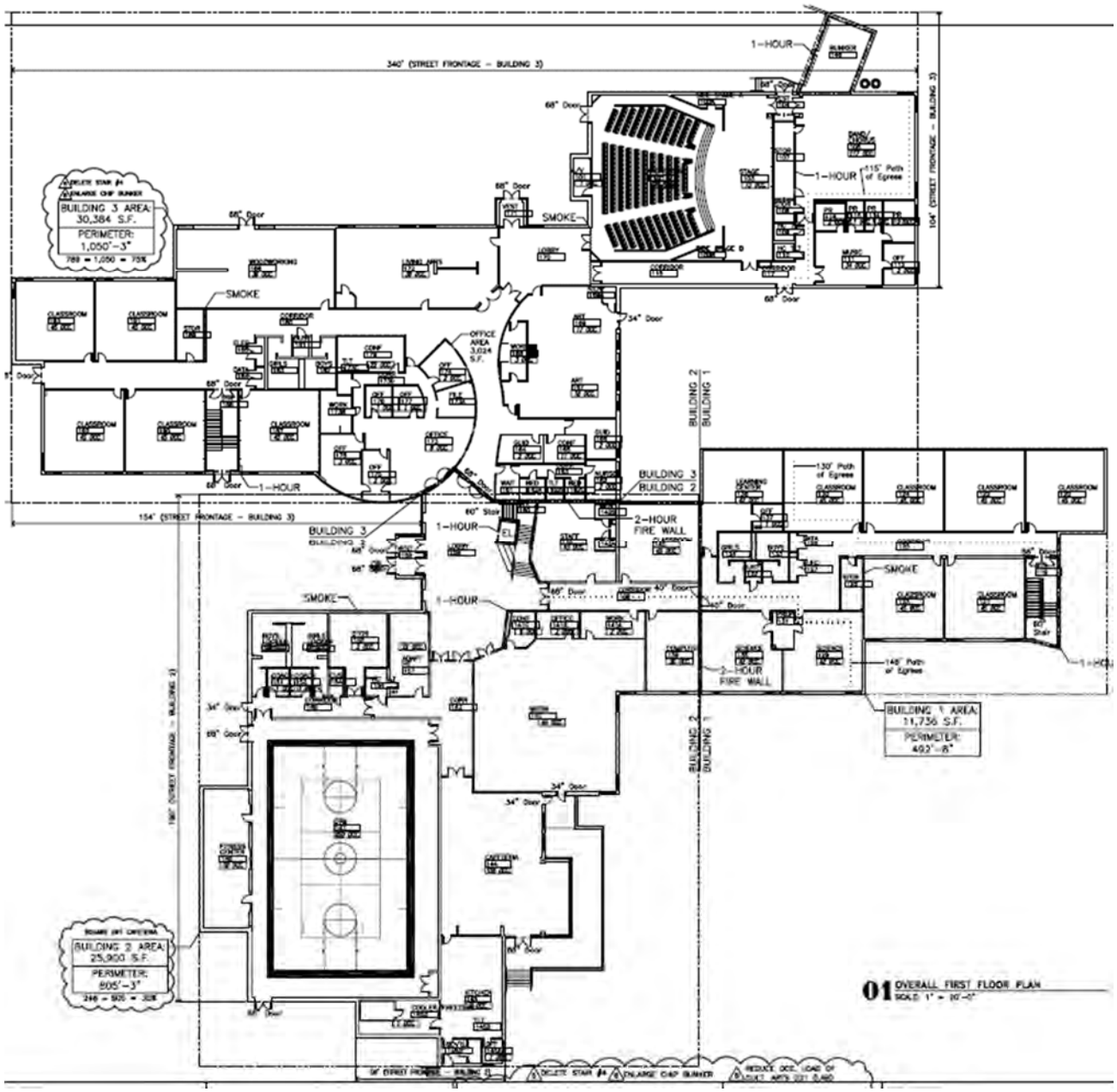
Floor Plan



Project Number	Project Name
158531.22R000-003.379	Frances C. Richmond Middle School
Source	**On-Site Date**
Google	December 20, 2022

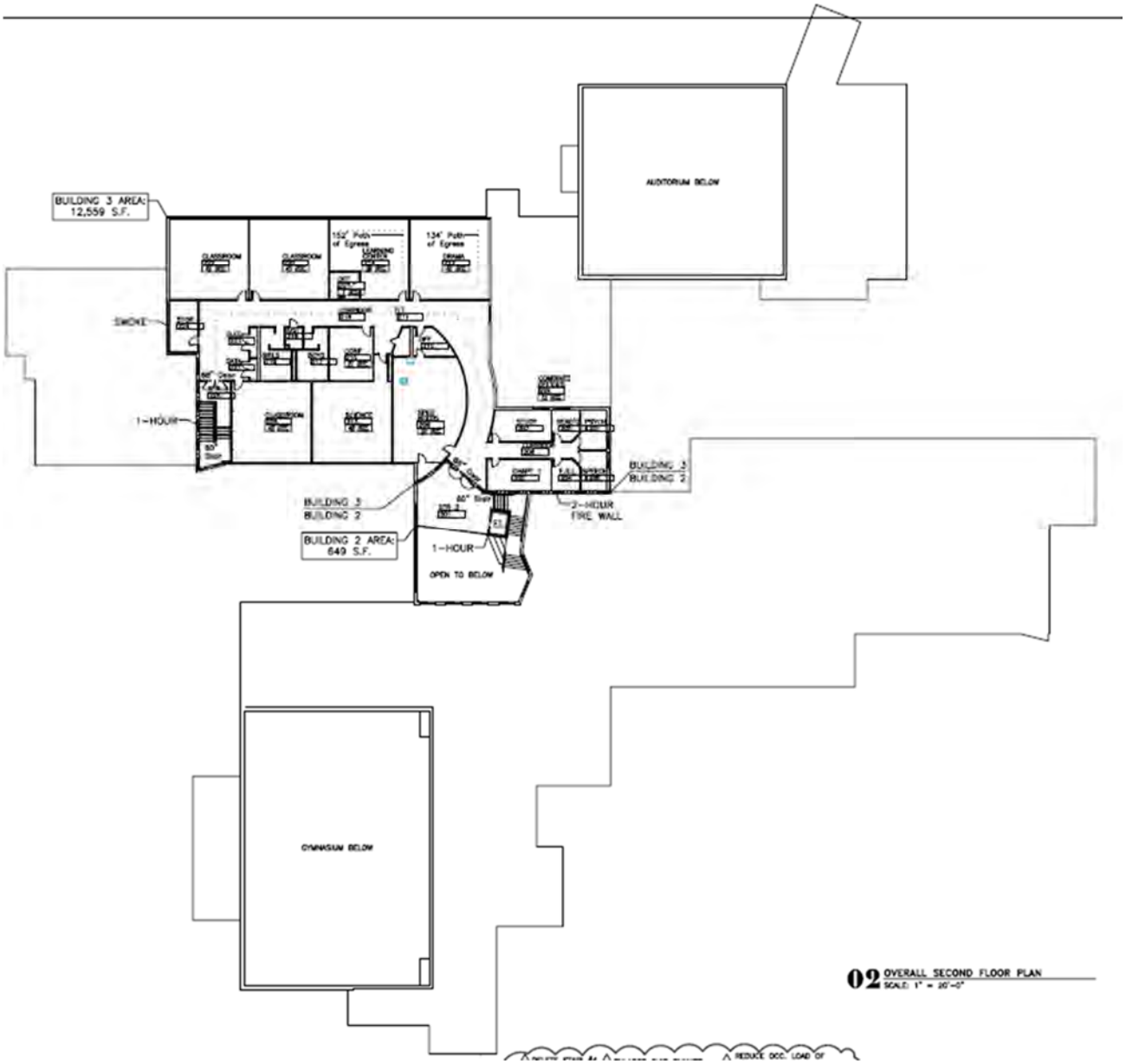
N

Floor Plan



Project Number	Project Name
158531.22R000-003.379	Frances C. Richmond Middle School
Source	**On-Site Date**
Google	December 20, 2022

Floor Plan



Project Number	Project Name
158531.22R000-003.379	Frances C. Richmond Middle School
Source	**On-Site Date**
Google	December 20, 2022

N

Appendix C:
Pre-Survey Questionnaire

Energy & FCA Audit
Pre-Survey Questionnaire

This questionnaire must be completed by the property owner, the owner's designated representative, or someone knowledgeable about the subject property. During the site visit, BV's Field Observer may ask for details associated with selected questions. This questionnaire will be utilized as an exhibit in BV's final report.

Name of Institution:	SAU 20 Dresden School District		
Name of Building:	Frances Richmond Middle School	Building #:	1
Name of person completing questionnaire:	Tony Daigle		
Length of Association with the Property:	Six Years	Phone Number:	603-643-3810

Site Information				
Year of Construction?	2005			
No. of Stories?	Floors 3			
Total Site Area?	+/- 22 acres			
Total Building Area?	Sqft 105,000			
Parking	Open Parking	Enclosed Parking	Partly Enclosed Parking	Is parking Heated?
Parking Area?	17,100 Sqft	0 Sqft	0 Sqft	Y / N
Area Heated (%)	100 %			
Area Cooled (%)	85 % | Cooling Equipment Redundancy? N / N+1 / N+2 / >2N			
Total Conditioned Area (%)	85 %			
Primary Heating System?	Wood Chip Boiler			
Secondary Heating System?	Oil Fired Boiler			
If Oil Used for Heating- Tank Capacity	4000 gal. 1 UST Total # of Tanks			
Primary Cooling System & Capacity?	RTU / split system			
Do Any HVAC Systems Use R-11, R-12 or R-22 Refrigerants?	No R410A			

	Elec.	Natural Gas	Propane	No.2 Oil	Wood Chip
Primary Heating Fuel?	☐	☐	☐	☐	☒
Secondary Heating Fuel?	☐	☐	☐	☒	☐
Domestic Water Heater Fuel?	☐	☐	☐	☒	☒

Building Occupancy/Schedule		
Facility Occupancy (avg. people ea. day)	440	
After Hours Facility Occupancy (avg. people /day)	6	
Standard Staff Work Timing	7:30 AM/PM - 4:00 AM/PM	
Maintenance Staff Hours	6:00 AM/PM - 11:00 AM/PM	
Number of Computers at Site	TBD - Tech Dept.	
Day	Hours open to Public	Hours open to Staff
Monday	7:30 AM/PM - 5:00 AM/PM	7:00 AM/PM - 8:00 AM/PM
Tuesday	: AM/PM - : AM/PM	: AM/PM - : AM/PM
Wednesday	: AM/PM - : AM/PM	: AM/PM - : AM/PM
Thursday	: AM/PM - : AM/PM	: AM/PM - : AM/PM
Friday	7:30 AM/PM - 5:00 AM/PM	: AM/PM - : AM/PM
Saturday	: AM/PM - : AM/PM	: AM/PM - : AM/PM
Sunday	: AM/PM - : AM/PM	7:00 AM/PM - 4:00 AM/PM
Number of Months the Facility Operates in a Year?	12 Months	

Energy & FCA Audit
Pre-Survey Questionnaire

Estimated Percentage of Male Staff and Guests	%

Inspections	Date of Last Inspection	List of Any Outstanding Repairs Required
1. Elevators	8/23/2022	
2. HVAC Mechanical, Electric, Plumbing?	10/2022	HVAC only
3. Life-Safety/Fire?	08/2022	
4. Roofs?	2018	

Key Questions	Response
Major Capital Improvements in Last 3 yrs.	No
Planned Capital Expenditure for Next Year?	Build a Pavilion / Outdoor Classroom
Age of the Roof?	12 Years
What bldg. Systems Are Responsibilities of Tenants? (HVAC/Roof/Interior/Exterior/Paving)	None

Unk = Unknown, NA = Not Applicable	Yes	No	NA	Unk	Comments
1. Are the plumbing fixtures Low Flow *(Below 2.0GPM, .6GPF)*	☒	☐	☐	☐	
2. Are there any vacant buildings or significant building areas?	☐	☒	☐	☐	
3. Do tenants pay for utilities at leased properties?	☐	☒	☐	☐	
4. Does the owner pay for exterior site lighting electricity?	☒	☐	☐	☐	
5. Any Issues with exterior Lighting?	☐	☒	☐	☐	

Preventive Maintenance of Mechanical System		
Systems	**Annual Professional Maintenance**	**Seldom or Never Maintained**
Tenant Space Heating Systems (*Furnace/Boilers/Heat pumps*)	☒	☐
Tenant Space Cooling Systems (*Condensers/Window AC*)	☒	☐
Domestic Water Heaters	☒	☐
Air Quality – Air Handling Unit - Air Filter Rating (MERV):	MERV- 11 and 13	
Air Quality – Annual Frequency of Filter Check	Choose an item. Every 4 months	

Utility Metering		
	Qty	Comments?
# of Elevators	1	Hydraulic/Traction
# of Electric Meters		
# of Nat. Gas Meters	N/A	
# of Water Meters	1	
# of Backup Generator	1	Generator Fuel? Off Road Diesel
Does facility have 3rd party power Procurement agreement?	Yes	
% of Green energy procured (Electric)		__%
% of Green energy procured (Natural Gas)		__%
Facility generates part of energy through onsite renewable?	1	Solar Tracker = avg. 7MWH

Energy & FCA Audit
Pre-Survey Questionnaire

10	Are there any problems with the landscape irrigation systems?				X	
BUILDING STRUCTURE						
11	Are there any problems with foundations or structures?		X			
12	Is there any water infiltration in basements or crawl spaces?		X			
13	Has a termite/wood boring insect inspection been performed within the last year?		X			
BUILDING ENVELOPE						
Mark the column corresponding to the appropriate response. Please provide additional details in the Comments column, or backup documentation for any *Yes* responses. (**NA** indicates "*Not Applicable*", **Unk** indicates "*Unknown*")						
	QUESTION	Y	N	Unk	NA	**COMMENTS**
14	Are there any wall, or window leaks?			X		No leaks, there are signs of exterior flashing having wet areas.
15	Are there any roof leaks?		X			Not this Year.
16	Is the roofing covered by a warranty or bond?		X			
17	Are there any poorly insulated areas?			X		
18	Is Fire Retardant Treated (FRT) plywood used?		X			
19	Is exterior insulation and finish system (EIFS) or a synthetic stucco finish used?		X			
BUILDING HVAC AND ELECTRICAL						
20	Are there any leaks or pressure problems with natural gas service?				X	
21	Does any part of the electrical system use aluminum wiring?		X			
22	Do Commercial units have less than 200-Amp service?	X				
23	Are there any problems with the utilities, such as inadequate capacities?		X			
ADA						
25	Has the management previously completed an ADA review?	X				New Building in 2005.

Energy & FCA Audit
Pre-Survey Questionnaire

Facility has onsite battery storage system?	NO	
Mechanical system sub-metered (boiler make-up water /humidifier)?	NO	
Makeup water for cooling tower metered Separately (if applicable)?	N/A	
Irrigation system metered separately (if applicable)?	N/A	

Building Appliances		
	Value	Additional Comments?
Percentage of Energy Star Certified Refrigerators	%	unknown -- employees bring in small ones
Percentage of Refrigerators older than 8 years	100 %	15 years
Cooking Range Type (Electric/Gas/Propane)	Propane	
Laundry System (Leased/Owned)	Owned	
No. of Washers	2	
No. of Dryers	2	

Mark the column corresponding to the appropriate response. Please provide additional details in the Comments column, or backup documentation for any *Yes* responses. (**NA** indicates "*Not Applicable*", **Unk** indicates "*Unknown*")

	QUESTION	Y	N	Unk	NA	COMMENTS
	ZONING, BUILDING DESIGN & LIFE SAFETY ISSUES					
1	Are there any unresolved building, fire, or zoning code issues?		X			
2	Is there any pending litigation concerning the property?		X			
3	Are there any other significant issues/hazards with the property?		X			
4	Are there any unresolved construction defects at the property?		X			
5	Has any part of the property ever contained visible suspect mold growth?		X			
6	Is there a mold Operations and Maintenance Plan?	X				Plan is to dry and clean wet areas within 48 hours.
7	Are there any recalled fire sprinkler heads (Star, GEM, Central, and Omega)?		X			
8	Have there been indoor air quality or mold related complaints from tenants?	X				One recent complaint. Evidence Counselor office. We found issue related to a beanbag chair.
	GENERAL SITE					
9	Are there any problems with erosion, storm water drainage or areas of paving that do not drain?		X			

Energy & FCA Audit
Pre-Survey Questionnaire

26	Have any ADA improvements been made to the property?		X			
27	Does a Barrier Removal Plan exist for the property?		X			
28	Has the Barrier Removal Plan been approved by an arms-length third party?		X			

Mark the column corresponding to the appropriate response. Please provide additional details in the Comments column, or backup documentation for any *Yes* responses. (**NA** indicates "*Not Applicable*", *Unk* indicates *"Unknown"*)

	QUESTION	Y	N	Unk	NA	COMMENTS
29	Has building ownership or management received any ADA related complaints?		X			
30	Does elevator equipment require upgrades to meet ADA standards?		X			
	PLUMBING					
31	Is the property served by private water well?		X			
32	Is the property served by a private septic system or other waste treatment systems?		X			
33	Is polybutylene piping used?		X			
34	Are there any plumbing leaks or water pressure problems?		X			

Issues or Concerns That BV Should Know About?	
1.	
2.	
3.	

Items Provided to BV Auditors				
	Yes	No	N/A	Additional Comments?
Access to All Mechanical Spaces	☒	☐	☐	
Access to Roof/Attic Space	☒	☐	☐	
Access to Building As-Built Drawings	☒	☐	☐	
Site plan with bldg., roads, parking and other features	☒	☐	☐	
Access to last 12/24 Months Common Area Utility Data	☒	☐	☐	
Contact Details of Mech, Elevator, Roof, Fire Contractors:	☒	☐	☐	
Previous reports pertaining to the physical condition of property.	☒	☐	☐	
ADA survey and status of improvements implemented.	☐	☐	☒	

Energy & FCA Audit
Pre-Survey Questionnaire

Current / pending litigation related to property condition.	☐	☐	☒	
Any brochures or marketing information.	☐	☐	☒	
Appraisal, either current or previously prepared.	☒	☐	☐	
Summary of Projects executed in last 5 years	☒	☐	☐	

Signature of person Interviewed or completing form

Date 9/28/2022

Appendix D:
Accessibility Review and Photos

Visual Survey - 2010 ADA Standards for Accessible Design

Property Name: Frances C. Richmond Middle School

BV Project Number: 158531.22R000 - 003.379

Facility History & Interview

	Question	Yes	No	Unk	Comments
1	Has an accessibility study been previously performed? If so, when?	X			2005
2	Have any ADA improvements been made to the property since original construction? Describe.	X			
3	Has building management reported any accessibility-based complaints or litigation?		X		

Frances C. Richmond Middle School: Accessibility Issues

Category	Major Issues (ADA study recommended)	Moderate Issues (ADA study recommended)	Minor Issues	None*
Parking				X
Exterior Accessible Route				X
Building Entrances				X
Interior Accessible Route				X
Elevators				X
Public Restrooms				X
Kitchens/Kitchenettes				X
Playgrounds & Swimming Pools				X
Other				X

**be cognizant that if the "None" box is checked that does not guarantee full compliance; this study is limited in nature*

Frances C. Richmond Middle School: Photographic Overview

OVERVIEW OF ACCESSIBLE PARKING AREA

2ND AREA OF ACCESSIBLE PARKING

ACCESSIBLE PATH

CURB CUT

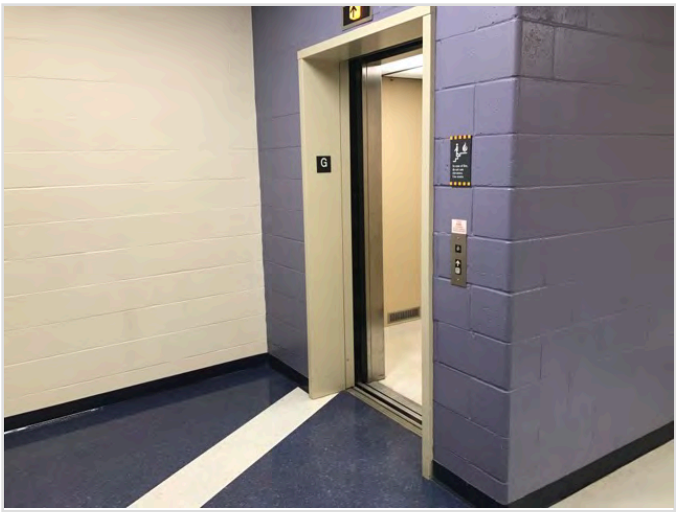
ACCESSIBLE ENTRANCE

AUTOMATIC DOOR OPENER

Frances C. Richmond Middle School: Photographic Overview

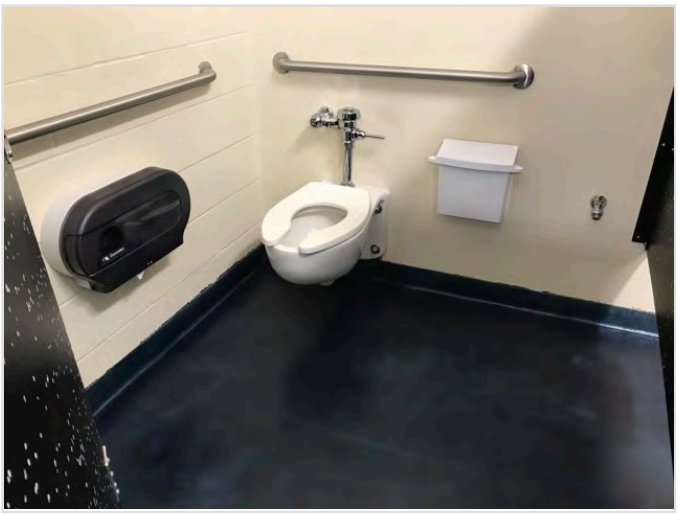
ACCESSIBLE INTERIOR RAMP

DOOR HARDWARE



LOBBY LOOKING AT CABS (WITH DOORS OPEN)

EMERGENCY CALL PANEL



TOILET STALL OVERVIEW

SINK, FAUCET HANDLES AND ACCESSORIES

Appendix E:
Component Condition Report

Component Condition Report | Frances C. Richmond Middle School

UF L3 Code	Location	Condition	Asset/Component/Repair	Quantity	RUL	ID
Structure						
A2010	Building exterior	Poor	Basement Wall, any type, Waterproofing of Exterior Face	110 SF	0	4714541
Facade						
B2010	Building Exterior	Good	Exterior Walls, Metal/Insulated Sandwich Panels	25,000 SF	27	4714611
B2010	Building Exterior	Poor	Exterior Walls, Concrete Block (CMU), Repair/Repoint	200 SF	0	4714639
B2020	Building Exterior	Fair	Window, Aluminum Double-Glazed, 16-25 SF	440	12	4714614
B2020	Kitchen	Fair	Screens & Shutters, Rolling Security Shutter, 55 to 100 SF	1	10	4714547
B2020	Building Exterior	Fair	Storefront, Glazing & Framing	250 SF	12	4714526
B2050	Building Exterior	Fair	Overhead/Dock Door, Aluminum, 20'x20' (400 SF)	1	12	4714578
B2050	Building Exterior	Fair	Exterior Door, Aluminum-Framed & Glazed, Standard Swing	29	12	4714564
B2050	Building Exterior	Fair	Exterior Door, Steel, Standard	10	22	4714569
Roofing						
B3010	Roof	Fair	Roofing, Single-Ply Membrane, EPDM	62,081 SF	5	4714513
Interiors						
C1030	Throughout building	Fair	Interior Door, Steel, Standard	14	22	4714589
C1030	Throughout building	Fair	Interior Door, Wood, Solid-Core Decorative High-End w/ Glazing	74	22	4714542
C1030	Throughout building	Fair	Interior Door, Wood, Solid-Core	52	22	4714536
C1070	Throughout building	Fair	Suspended Ceilings, Acoustical Tile (ACT)	50,000 SF	7	4714549
C1090	Locker Room	Fair	Lockers, Steel-Baked Enamel, 12" W x 15" D x 72" H	29	10	4714595
C2010	Throughout building	Fair	Wall Finishes, any surface, Prep & Paint	200,000 SF	5	4714642
C2030	Staff Rooms	Fair	Flooring, Carpet, Commercial Standard	4,000 SF	3	4714561
C2030	Restrooms	Fair	Flooring, any surface, w/ Epoxy Coating, Prep & Paint	2,000 SF	5	4714580
C2030	Gymnasium	Fair	Flooring, Maple Sports Floor	8,000 SF	12	4714602
C2030	Kitchen	Fair	Flooring, any surface, w/ Epoxy Coating, Prep & Paint	2,500 SF	5	4714619
C2030	Library	Good	Flooring, Carpet, Commercial Standard	8,000 SF	9	4714516
C2030	Throughout building	Fair	Flooring, Vinyl Tile (VCT)	40,000 SF	8	4714568
Conveying						
D1010	Elevator	Fair	Elevator Cab Finishes, Standard	1	8	4714601
D1010	Maintenance Sprinkler Room	Fair	Passenger Elevator, Hydraulic, 3 Floors, Renovate	1	12	4714640
Plumbing						
D2010	Restrooms	Fair	Toilet, Commercial Water Closet	33	12	4714518
D2010	Kitchen	Fair	Sink/Lavatory, Commercial Kitchen, 3-Bowl	1	12	4714609
D2010	Restrooms	Fair	Shower, Fiberglass	3	10	4714600
D2010	Boiler room	Fair	Water Heater, Wood Chip Plant, Indirect	1	8	4714557
D2010	Maintenance Sprinkler Room	Fair	Backflow Preventer, Domestic Water	1	12	4714520

UF L3 Code	Location	Condition	Asset/Component/Repair	Quantity	RUL	ID
D2010	Restrooms	Fair	Urinal, Standard	6	12	4714626
D2010	Kitchen	Fair	Sink/Lavatory, Commercial Kitchen, 2-Bowl	1	12	4714530
D2010	Throughout building	Fair	Plumbing System, Supply & Sanitary, High Density (excludes fixtures)	105,000 SF	22	4714527
D2010	Kitchen	Fair	Sink/Lavatory, Vanity Top, Stainless Steel	2	12	4714612
D2010	Throughout building	Fair	Drinking Fountain, Wall-Mounted, Bi-Level	12	8	4714571
D2010	Restrooms	Fair	Sink/Lavatory, Wall-Hung, Enameled Steel	30	12	4714585
D2010	Utility closet	Fair	Sink/Lavatory, Service Sink, Floor	6	17	4714627
D2010	Throughout building	Fair	Sink/Lavatory, Vanity Top, Stainless Steel	32	12	4714590
D2030	Site	Fair	Lift Station, Storm Water, 5 HP	1	8	4714510
D2060	Boiler room	Fair	Air Compressor, Tank-Style	1	8	4714511
HVAC						
D3010	Boiler room	Fair	Supplemental Components, Tank Monitoring System, Fuel Oil	1	10	4714566
D3020	Boiler room	Fair	Boiler, Oil, HVAC, 924 MBH	1	13	4714556
D3020	Boiler room	Fair	Boiler Supplemental Components, Expansion Tank	1	22	4714596
D3020	Entrances	Fair	Cabinet Heater, Electric, 3 to 4 LF	5	7	4714514
D3020	Boiler room	Fair	Boiler Supplemental Components, Expansion Tank	1	22	4714630
D3020	Boiler room	Fair	Boiler, Wood Pellet, HVAC,4184 MBH	1	13	4714545
D3020	Boiler room	Fair	Unit Heater, Hydronic	1	8	4714512
D3020	Boiler room	Fair	Boiler, Oil, HVAC, 4835 MBH	1	13	4714538
D3020	Boiler room	Fair	Unit Heater, Hydronic	1	10	4714531
D3020	Throughout building	Fair	Baseboard Heater, Electric, 2 LF	9	7	4714613
D3030	Throughout building	Fair	Unit Ventilator, approx/nominal 3 Ton	44	8	4714563
D3030	Building exterior	Fair	Split System, Condensing Unit/Heat Pump (AC)	1	5	4714622
D3030	Kitchen	Fair	Split System Ductless, Single Zone, 2.5 to 3 TON	1	5	4714623
D3030	Building exterior	Fair	Split System, Condensing Unit/Heat Pump (AC)	2	5	4714577
D3030	2nd floor	Good	Air Conditioner, Window/Thru-Wall	7	8	4714573
D3030	Gymnasium	Poor	Unit Ventilator, approx/nominal 3 Ton	6	2	4714517
D3030	Kitchen	Fair	Split System Ductless, Single Zone, 3 TON	1	5	4714634
D3050	Throughout building	Fair	HVAC System, Hydronic Piping, 2-Pipe	105,000 SF	22	4714631
D3050	Boiler room	Fair	Pump, Distribution, HVAC Heating Water	1	7	4714584
D3050	Roof	Fair	Packaged Unit (Cooling), RTU, Pad or Roof-Mounted	1	8	4714539
D3050	Boiler room	Fair	Pump, Distribution, HVAC Heating Water	1	7	4714535
D3050	Boiler room	Fair	Pump, Distribution, HVAC Heating Water	1	7	4714597
D3050	Roof	Fair	Packaged Unit, RTU, Pad or Roof-Mounted, 5 TON (Cooling)	1	8	4850173
D3050	Boiler room	Fair	Pump, Distribution, HVAC Heating Water	1	7	4714641
D3050	Boiler room	Fair	Pump, Distribution, HVAC Heating Water	1	7	4714588

UF L3 Code	Location	Condition	Asset/Component/Repair	Quantity	RUL	ID
D3050	Boiler room	Fair	Pump, Distribution, HVAC Heating Water	1	5	4714528
D3050	Boiler room	Fair	Pump, Distribution, HVAC Heating Water	1	5	4714558
D3060	Wood Working Room	Good	Exhaust Fan, Industrial Dust Collection, 3 HP Motor	1	24	4714562
D3060	Wood Working Classroom	NA	Exhaust Fan, Industrial Dust Collection, 3 HP Motor, 2000 CFM	1	2	4833777
D3060	Boiler room	Fair	Exhaust Fan, Roof or Wall-Mounted, 12" Damper	1	8	4714583
Fire Protection						
D4010	Throughout building	Fair	Fire Suppression System, Existing Sprinkler Heads, by SF	105,000 SF	7	4714628
D4010	Kitchen	Fair	Fire Suppression System, Commercial Kitchen, per LF of Hood	16 LF	10	4714572
D4010	Maintenance Sprinkler Room	Fair	Backflow Preventer, Fire Suppression	1	12	4714560
D4030	Throughout building	Fair	Fire Extinguisher, Wet Chemical/CO2	20	5	4714567
Electrical						
D5010	Building exterior	Good	Solar Power, Photovoltaic (PV) Panel, 24 SF	16	16	4714607
D5010	Building exterior	Fair	Generator, Diesel	1	7	4714521
D5010	Boiler room	Fair	Automatic Transfer Switch, ATS	1	7	4714582
D5010	Boiler room	Fair	Automatic Transfer Switch, ATS	1	7	4714543
D5020	Boiler room	Fair	Switchboard, 120/208 V	1	22	4714620
D5020	Maintenance Sprinkler Room	Fair	Distribution Panel, 277/480 V	1	12	4714574
D5020	Kitchen	Fair	Distribution Panel, 120/208 V	1	12	4714550
D5020	Boiler room	Fair	Switchboard, 277/480 V	1	22	4714594
D5020	Boiler room	Fair	Secondary Transformer, Dry, Stepdown	1	12	4714617
D5020	Maintenance Sprinkler Room	Fair	Switchboard, 120/208 V	1	22	4714621
D5020	PE Storage Room	Fair	Distribution Panel, 120/208 V	1	12	4714533
D5030	Throughout building	Fair	Electrical System, Wiring & Switches, High Density/Complexity	105,000 SF	22	4714643
D5030	Boiler room	Fair	Variable Frequency Drive, VFD, by HP of Motor, Replace/Install	1	8	4714581
D5030	Boiler room	Fair	Variable Frequency Drive, VFD, by HP of Motor, Replace/Install	1	8	4714522
D5030	Boiler room	Fair	Variable Frequency Drive, VFD, by HP of Motor, Replace/Install	1	8	4714618
D5040	Building exterior	Fair	Standard Fixture w/ Lamp, any type, w/ LED Replacement	7	10	4714593
D5040	Throughout building	Fair	Interior Lighting System, Full Upgrade, High Density & Standard Fixtures	105,000 SF	10	4714592
Fire Alarm & Electronic Systems						
D7030	Throughout building	Fair	Security/Surveillance System, Full System Upgrade, High Density	105,000 SF	8	4714604
D7050	Throughout building	Fair	Fire Alarm System, Full System Upgrade, Standard Addressable, Upgrade/Install	105,000 SF	10	4714632
D7050	Lobby	Fair	Fire Alarm Panel, Fully Addressable	1	8	4714534
D8010	Throughout	Good	BAS/HVAC Controls, Extensive/Robust BMS or Smart Building System, Install	105,000 SF	12	4833776
Equipment & Furnishings						
E1030	Kitchen	Fair	Foodservice Equipment, Convection Oven, Single	1	5	4714555
E1030	Kitchen	Fair	Foodservice Equipment, Exhaust Hood, 8 to 10 LF	1	8	4714579

UF L3 Code	Location	Condition	Asset/Component/Repair	Quantity	RUL	ID
E1030	Kitchen	Fair	Foodservice Equipment, Walk-In, Refrigerator	1	10	4714523
E1030	Kitchen	Fair	Foodservice Equipment, Heat Lamps, Food Warming Fixture	1	5	4714525
E1030	Kitchen	Fair	Foodservice Equipment, Prep Table Refrigerated, Salad/Sandwich	1	8	4714625
E1030	Kitchen	Fair	Foodservice Equipment, Freezer, 3-Door Reach-In	1	8	4714537
E1030	Kitchen	Fair	Foodservice Equipment, Steamer, Tabletop	1	5	4714548
E1030	Kitchen	Fair	Foodservice Equipment, Freezer, 3-Door Reach-In	1	8	4714587
E1030	Kitchen	Fair	Foodservice Equipment, Range/Oven, 4-Burner, 143 MBH	1	8	5154788
E1030	Kitchen	Fair	Foodservice Equipment, Exhaust Hood, 8 to 10 LF	2	8	4714519
E1030	Kitchen	Fair	Foodservice Equipment, Food Warmer, Proofing Cabinet on Wheels	1	8	4714644
E1030	Kitchen	Fair	Foodservice Equipment, Convection Oven, Single	1	5	4714616
E1030	Kitchen	Fair	Foodservice Equipment, Heat Lamps, Food Warming Fixture	1	5	4714554
E1030	Kitchen	Fair	Foodservice Equipment, Griddle	1	8	4714624
E1030	Kitchen	Fair	Foodservice Equipment, Mixer, Freestanding	1	7	4714605
E1030	Kitchen	Fair	Foodservice Equipment, Steam Kettle	1	8	4714544
E1030	Kitchen	Fair	Foodservice Equipment, Refrigerator, 4-Door Reach-In	1	8	4714565
E1030	Kitchen	Fair	Foodservice Equipment, Range/Oven, 6-Burner, 224 MBH	1	8	5154789
E1030	Kitchen	Fair	Foodservice Equipment, Steamer, Freestanding	1	5	4714610
E1040	Throughout building	Fair	Healthcare Equipment, Defibrillator (AED), Cabinet-Mounted	2	5	4714532
E1040	Art Room	Fair	Ceramics Equipment, Kiln	1	10	4714576
E2010	Throughout building	Fair	Casework, Cabinetry, Hardwood Standard	180 LF	10	4714559
E2010	Gymnasium	Fair	Bleachers, Telescoping Manual, 16 to 30 Tier (per Seat)	300	10	4714638
E2010	Auditorium	Fair	Fixed Seating, Auditorium/Theater, Metal Cushioned Standard	273	10	4714540
Pedestrian Plazas & Walkways						
G2020	Front Parking Lot	Fair	Parking Lots, Pavement, Asphalt, Mill & Overlay	27,000 SF	7	4714591
G2020	Kitchen Parking Lot	Fair	Parking Lots, Pavement, Asphalt, Mill & Overlay	11,500 SF	7	4714546
Athletic, Recreational & Playfield Areas						
G2050	Gymnasium	Fair	Sports Apparatus, Basketball, Backboard/Rim/Pole	2	7	4714633
G2050	Site	Fair	Trail, Asphalt	2,600 SF	10	4714636
G2050	Site	Fair	Sports Apparatus, Basketball, Backboard/Rim/Pole	2	7	4714637
G2050	Site	Fair	Athletic Surfaces & Courts, Basketball/General, Asphalt Pavement, Mill & Overlay	2,000 SF	7	4714552
Sitework						
G2060	Site	Fair	Dumpster Enclosure, Gates, Wood/Metal, Replace/Install	2	10	4714599
G2060	Site	Fair	Retaining Wall, Concrete Masonry Unit (CMU)	500 SF	22	4714524
G2060	Site	Fair	Fences & Gates, Fence, Metal Tube 4'	50 LF	22	4714515
G2060	Site	Fair	Bike Rack, Fixed 6-10 Bikes	2	10	4714529
G2060	Site	Fair	Picnic Table, Wood/Composite/Fiberglass	5	10	4714553

Component Condition Report | Frances C. Richmond Middle School

UF L3 Code	Location	Condition	Asset/Component/Repair	Quantity	RUL	ID
G2060	Site	Fair	Fences & Gates, Fence, Wood Board 4'	80 LF	10	4714629
G4050	Site	Fair	Pole Light Fixture w/ Lamps, any type 20' High, w/ LED Replacement, Replace/Install	21	10	4714598
Utilities						
G3060	Site	Fair	Storage Tank, Site Fuel, Underground, Replace/Install	1	7	4714586
G3060	Near Wood Chip Plant	Fair	Storage Tank, Site Fuel, Underground, Replace/Install	1	7	4714606

Appendix F:
Replacement Reserves

Replacement Reserves Report

Frances C. Richmond Middle School

2/8/2023

Location	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	Total Escalated Estimate
Frances C. Richmond Middle School	$4,990	$0	$62,593	$32,782	$0	$1,289,334	$0	$846,928	$1,462,853	$78,286	$1,787,557	$0	$2,181,200	$561,861	$0	$615,865	$46,216	$7,934	$26,217	$105,210	$61,408	**$9,171,234**
Grand Total	**$4,990**	**$0**	**$62,593**	**$32,782**	**$0**	**$1,289,334**	**$0**	**$846,928**	**$1,462,853**	**$78,286**	**$1,787,557**	**$0**	**$2,181,200**	**$561,861**	**$0**	**$615,865**	**$46,216**	**$7,934**	**$26,217**	**$105,210**	**$61,408**	**$9,171,234**

Uniformat Code	Location Description	ID	Cost Description	Lifespan (EUL)	EAge	RUL	Quantity	Unit	Unit Cost *	Subtotal	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	Deficiency Repair Estimate
A2010	Building exterior	4714541	Basement Wall, any type, Waterproofing of Exterior Face, Replace	0	0	0	110	SF	$9.00	$990	$990																					**$990**
B2010	Building Exterior	4714639	Exterior Walls, Concrete Block (CMU), Repair/Repoint	0	0	0	200	SF	$20.00	$4,000	$4,000																					**$4,000**
B2020	Building Exterior	4714614	Window, Aluminum Double-Glazed, 16-25 SF, Replace	30	18	12	440	EA	$950.00	$418,000													$418,000									**$418,000**
B2020	Building Exterior	4714526	Storefront, Glazing & Framing, Replace	30	18	12	250	SF	$55.00	$13,750													$13,750									**$13,750**
B2020	Kitchen	4714547	Screens & Shutters, Rolling Security Shutter, 55 to 100 SF, Replace	20	10	10	1	EA	$2,000.00	$2,000											$2,000											**$2,000**
B2050	Building Exterior	4714564	Exterior Door, Aluminum-Framed & Glazed, Standard Swing, Replace	30	18	12	29	EA	$1,300.00	$37,700													$37,700									**$37,700**
B2050	Building Exterior	4714578	Overhead/Dock Door, Aluminum, 20'x20' (400 SF), Replace	30	18	12	1	EA	$10,000.00	$10,000													$10,000									**$10,000**
B3010	Roof	4714513	Roofing, Single-Ply Membrane, EPDM, Replace	20	15	5	62081	SF	$11.00	$682,891						$682,891																**$682,891**
C1070	Throughout building	4714549	Suspended Ceilings, Acoustical Tile (ACT), Replace	25	18	7	50000	SF	$3.50	$175,000								$175,000														**$175,000**
C1090	Locker Room	4714595	Lockers, Steel-Baked Enamel, 12" W x 15" D x 72" H, Replace	20	10	10	29	EA	$500.00	$14,500											$14,500											**$14,500**
C2010	Throughout building	4714642	Wall Finishes, any surface, Prep & Paint	10	5	5	200000	SF	$1.50	$300,000						$300,000									$300,000							**$600,000**
C2030	Restrooms	4714580	Flooring, any surface, w/ Epoxy Coating, Prep & Paint	10	5	5	2000	SF	$12.00	$24,000						$24,000									$24,000							**$48,000**
C2030	Kitchen	4714619	Flooring, any surface, w/ Epoxy Coating, Prep & Paint	10	5	5	2500	SF	$12.00	$30,000						$30,000									$30,000							**$60,000**
C2030	Throughout building	4714568	Flooring, Vinyl Tile (VCT), Replace	15	7	8	40000	SF	$5.00	$200,000									$200,000													**$200,000**
C2030	Staff Rooms	4714561	Flooring, Carpet, Commercial Standard, Replace	10	7	3	4000	SF	$7.50	$30,000				$30,000										$30,000								**$60,000**
C2030	Library	4714516	Flooring, Carpet, Commercial Standard, Replace	10	1	9	8000	SF	$7.50	$60,000										$60,000										$60,000		**$120,000**
C2030	Gymnasium	4714602	Flooring, Maple Sports Floor, Replace	30	18	12	8000	SF	$17.00	$136,000													$136,000									**$136,000**
D1010	Elevator	4714601	Elevator Cab Finishes, Standard, Replace	15	7	8	1	EA	$9,000.00	$9,000									$9,000													**$9,000**
D1010	Maintenance Sprinkler Room	4714640	Passenger Elevator, Hydraulic, 3 Floors, Renovate	30	18	12	1	EA	$70,000.00	$70,000													$70,000									**$70,000**
D2010	Boiler room	4714557	Water Heater, Wood Chip Plant, Indirect, Replace	20	12	8	1	EA	$32,000.00	$32,000									$32,000													**$32,000**
D2010	Maintenance Sprinkler Room	4714520	Backflow Preventer, Domestic Water, Replace	30	18	12	1	EA	$6,600.00	$6,600													$6,600									**$6,600**
D2010	Throughout building	4714571	Drinking Fountain, Wall-Mounted, Bi-Level, Replace	15	7	8	12	EA	$1,500.00	$18,000									$18,000													**$18,000**
D2010	Restrooms	4714600	Shower, Fiberglass, Replace	20	10	10	3	EA	$1,600.00	$4,800											$4,800											**$4,800**
D2010	Restrooms	4714518	Toilet, Commercial Water Closet, Replace	30	18	12	33	EA	$1,300.00	$42,900													$42,900									**$42,900**
D2010	Kitchen	4714609	Sink/Lavatory, Commercial Kitchen, 3-Bowl, Replace	30	18	12	1	EA	$2,500.00	$2,500													$2,500									**$2,500**
D2010	Restrooms	4714626	Urinal, Standard, Replace	30	18	12	6	EA	$1,100.00	$6,600													$6,600									**$6,600**
D2010	Kitchen	4714530	Sink/Lavatory, Commercial Kitchen, 2-Bowl, Replace	30	18	12	1	EA	$2,100.00	$2,100													$2,100									**$2,100**
D2010	Kitchen	4714612	Sink/Lavatory, Vanity Top, Stainless Steel, Replace	30	18	12	2	EA	$1,200.00	$2,400													$2,400									**$2,400**
D2010	Restrooms	4714585	Sink/Lavatory, Wall-Hung, Enameled Steel, Replace	30	18	12	30	EA	$1,700.00	$51,000													$51,000									**$51,000**
D2010	Throughout building	4714590	Sink/Lavatory, Vanity Top, Stainless Steel, Replace	30	18	12	32	EA	$1,200.00	$38,400													$38,400									**$38,400**
D2010	Utility closet	4714627	Sink/Lavatory, Service Sink, Floor, Replace	35	18	17	6	EA	$800.00	$4,800																		$4,800				**$4,800**
D2030	Site	4714510	Lift Station, Storm Water, 5 HP, Replace	15	7	8	1	EA	$9,420.00	$9,420									$9,420													**$9,420**
D2060	Boiler room	4714511	Air Compressor, Tank-Style, Replace	20	12	8	1	EA	$7,270.00	$7,270									$7,270													**$7,270**
D3010	Boiler room	4714566	Supplemental Components, Tank Monitoring System, Fuel Oil, Replace	20	10	10	1	EA	$11,000.00	$11,000											$11,000											**$11,000**
D3020	Boiler room	4714556	Boiler, Oil, HVAC, 924 MBH, Replace	30	17	13	1	EA	$32,600.00	$32,600														$32,600								**$32,600**
D3020	Boiler room	4714545	Boiler, Wood Pellet, HVAC,4184 MBH, Replace	30	17	13	1	EA	$160,000.00	$160,000														$160,000								**$160,000**
D3020	Boiler room	4714538	Boiler, Oil, HVAC, 4835 MBH, Replace	30	17	13	1	EA	$160,000.00	$160,000														$160,000								**$160,000**
D3020	Entrances	4714514	Cabinet Heater, Electric, 3 to 4 LF, Replace	25	18	7	5	EA	$3,500.00	$17,500								$17,500														**$17,500**
D3020	Throughout building	4714613	Baseboard Heater, Electric, 2 LF, Replace	25	18	7	9	EA	$170.00	$1,530								$1,530														**$1,530**
D3020	Boiler room	4714512	Unit Heater, Hydronic, Replace	20	12	8	1	EA	$1,100.00	$1,100									$1,100													**$1,100**
D3020	Boiler room	4714531	Unit Heater, Hydronic, Replace	20	10	10	1	EA	$1,700.00	$1,700											$1,700											**$1,700**
D3030	Gymnasium	4714517	Unit Ventilator, approx/nominal 3 Ton, Replace	20	18	2	6	EA	$9,000.00	$54,000			$54,000																			**$54,000**
D3030	Building exterior	4714622	Split System, Condensing Unit/Heat Pump (AC), Replace	15	10	5	1	EA	$4,000.00	$4,000						$4,000															$4,000	**$8,000**
D3030	Kitchen	4714623	Split System Ductless, Single Zone, 2.5 to 3 TON, Replace	15	10	5	1	EA	$6,100.00	$6,100						$6,100															$6,100	**$12,200**
D3030	Building exterior	4714577	Split System, Condensing Unit/Heat Pump (AC), Replace	15	10	5	2	EA	$3,800.00	$7,600						$7,600															$7,600	**$15,200**
D3030	Kitchen	4714634	Split System Ductless, Single Zone, 3 TON, Replace	15	10	5	1	EA	$6,100.00	$6,100						$6,100															$6,100	**$12,200**
D3030	Throughout building	4714563	Unit Ventilator, approx/nominal 3 Ton, Replace	20	12	8	44	EA	$9,000.00	$396,000									$396,000													**$396,000**
D3030	2nd floor	4714573	Air Conditioner, Window/Thru-Wall, Replace	10	2	8	7	EA	$2,200.00	$15,400									$15,400										$15,400			**$30,800**

Replacement Reserves Report

Frances C. Richmond Middle School

2/8/2023

Uniformat Code	Location Description	ID	Cost Description	Lifespan (EUL)	EAge	RUL	Quantity	Unit	Unit Cost *	Subtotal	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	Deficiency Repair Estimate
D3050	Boiler room	4714528	Pump, Distribution, HVAC Heating Water, Replace	15	10	5	1	EA	$5,100.00	$5,100						$5,100															$5,100	**$10,200**
D3050	Boiler room	4714558	Pump, Distribution, HVAC Heating Water, Replace	15	10	5	1	EA	$5,100.00	$5,100						$5,100															$5,100	**$10,200**
D3050	Boiler room	4714584	Pump, Distribution, HVAC Heating Water, Replace	25	18	7	1	EA	$6,100.00	$6,100								$6,100														**$6,100**
D3050	Boiler room	4714535	Pump, Distribution, HVAC Heating Water, Replace	25	18	7	1	EA	$7,600.00	$7,600								$7,600														**$7,600**
D3050	Boiler room	4714597	Pump, Distribution, HVAC Heating Water, Replace	25	18	7	1	EA	$7,600.00	$7,600								$7,600														**$7,600**
D3050	Boiler room	4714641	Pump, Distribution, HVAC Heating Water, Replace	25	18	7	1	EA	$6,100.00	$6,100								$6,100														**$6,100**
D3050	Boiler room	4714588	Pump, Distribution, HVAC Heating Water, Replace	25	18	7	1	EA	$6,100.00	$6,100								$6,100														**$6,100**
D3050	Roof	4714539	Packaged Unit (Cooling), RTU, Pad or Roof-Mounted, Replace	20	12	8	1	EA	$20,000.00	$20,000									$20,000													**$20,000**
D3050	Roof	4850173	Packaged Unit, RTU, Pad or Roof-Mounted, 5 TON (Cooling), Replace	20	12	8	1	EA	$11,000.00	$11,000									$11,000													**$11,000**
D3060	Wood Working Classroom	4833777	Exhaust Fan, Industrial Dust Collection, 3 HP Motor, 2000 CFM, Replace	25	23	2	1	EA	$5,000.00	$5,000			$5,000																			**$5,000**
D3060	Boiler room	4714583	Exhaust Fan, Roof or Wall-Mounted, 12" Damper, Replace	20	12	8	1	EA	$1,400.00	$1,400									$1,400													**$1,400**
D4010	Throughout building	4714628	Fire Suppression System, Existing Sprinkler Heads, by SF, Replace	25	18	7	105000	SF	$1.07	$112,350								$112,350														**$112,350**
D4010	Maintenance Sprinkler Room	4714560	Backflow Preventer, Fire Suppression, Replace	30	18	12	1	EA	$6,600.00	$6,600													$6,600									**$6,600**
D4010	Kitchen	4714572	Fire Suppression System, Commercial Kitchen, per LF of Hood, Replace	20	10	10	16	LF	$400.00	$6,400											$6,400											**$6,400**
D4030	Throughout building	4714567	Fire Extinguisher, Wet Chemical/CO2, Replace	10	5	5	20	EA	$300.00	$6,000						$6,000										$6,000						**$12,000**
D5010	Building exterior	4714521	Generator, Diesel, Replace	25	18	7	1	EA	$58,000.00	$58,000								$58,000														**$58,000**
D5010	Building exterior	4714607	Solar Power, Photovoltaic (PV) Panel, 24 SF, Replace	20	4	16	16	EA	$1,800.00	$28,800																	$28,800					**$28,800**
D5010	Boiler room	4714582	Automatic Transfer Switch, ATS, Replace	25	18	7	1	EA	$12,000.00	$12,000								$12,000														**$12,000**
D5010	Boiler room	4714543	Automatic Transfer Switch, ATS, Replace	25	18	7	1	EA	$12,000.00	$12,000								$12,000														**$12,000**
D5020	Boiler room	4714617	Secondary Transformer, Dry, Stepdown, Replace	30	18	12	1	EA	$38,000.00	$38,000													$38,000									**$38,000**
D5020	Maintenance Sprinkler Room	4714574	Distribution Panel, 277/480 V, Replace	30	18	12	1	EA	$5,300.00	$5,300													$5,300									**$5,300**
D5020	Kitchen	4714550	Distribution Panel, 120/208 V, Replace	30	18	12	1	EA	$6,000.00	$6,000													$6,000									**$6,000**
D5020	PE Storage Room	4714533	Distribution Panel, 120/208 V, Replace	30	18	12	1	EA	$6,000.00	$6,000													$6,000									**$6,000**
D5030	Boiler room	4714581	Variable Frequency Drive, VFD, by HP of Motor, Replace/Install	20	12	8	1	EA	$5,300.00	$5,300									$5,300													**$5,300**
D5030	Boiler room	4714522	Variable Frequency Drive, VFD, by HP of Motor, Replace/Install	20	12	8	1	EA	$5,300.00	$5,300									$5,300													**$5,300**
D5030	Boiler room	4714618	Variable Frequency Drive, VFD, by HP of Motor, Replace/Install	20	12	8	1	EA	$5,300.00	$5,300									$5,300													**$5,300**
D5040	Building exterior	4714593	Standard Fixture w/ Lamp, any type, w/ LED Replacement, Replace	20	10	10	7	EA	$220.00	$1,540											$1,540											**$1,540**
D5040	Throughout building	4714592	Interior Lighting System, Full Upgrade, High Density & Standard Fixtures, Replace	20	10	10	105000	SF	$5.00	$525,000											$525,000											**$525,000**
D7030	Throughout building	4714604	Security/Surveillance System, Full System Upgrade, High Density, Replace	15	7	8	105000	SF	$3.00	$315,000									$315,000													**$315,000**
D7050	Lobby	4714534	Fire Alarm Panel, Fully Addressable, Replace	15	7	8	1	EA	$15,000.00	$15,000									$15,000													**$15,000**
D7050	Throughout building	4714632	Fire Alarm System, Full System Upgrade, Standard Addressable, Upgrade/Install	20	10	10	105000	SF	$3.00	$315,000											$315,000											**$315,000**
D8010	Throughout	4833776	BAS/HVAC Controls, Extensive/Robust BMS or Smart Building System, Install	15	3	12	105000	SF	$6.00	$630,000													$630,000									**$630,000**
E1030	Kitchen	4714555	Foodservice Equipment, Convection Oven, Single, Replace	10	5	5	1	EA	$5,600.00	$5,600						$5,600										$5,600						**$11,200**
E1030	Kitchen	4714525	Foodservice Equipment, Heat Lamps, Food Warming Fixture, Replace	10	5	5	1	EA	$1,800.00	$1,800						$1,800										$1,800						**$3,600**
E1030	Kitchen	4714548	Foodservice Equipment, Steamer, Tabletop, Replace	10	5	5	1	EA	$7,000.00	$7,000						$7,000										$7,000						**$14,000**
E1030	Kitchen	4714616	Foodservice Equipment, Convection Oven, Single, Replace	10	5	5	1	EA	$5,600.00	$5,600						$5,600										$5,600						**$11,200**
E1030	Kitchen	4714554	Foodservice Equipment, Heat Lamps, Food Warming Fixture, Replace	10	5	5	1	EA	$1,800.00	$1,800						$1,800										$1,800						**$3,600**
E1030	Kitchen	4714610	Foodservice Equipment, Steamer, Freestanding, Replace	10	5	5	1	EA	$10,500.00	$10,500						$10,500										$10,500						**$21,000**
E1030	Kitchen	4714605	Foodservice Equipment, Mixer, Freestanding, Replace	25	18	7	1	EA	$14,000.00	$14,000								$14,000														**$14,000**
E1030	Kitchen	4714579	Foodservice Equipment, Exhaust Hood, 8 to 10 LF, Replace	15	7	8	1	EA	$4,500.00	$4,500									$4,500													**$4,500**
E1030	Kitchen	4714625	Foodservice Equipment, Prep Table Refrigerated, Salad/Sandwich, Replace	15	7	8	1	EA	$4,700.00	$4,700									$4,700													**$4,700**
E1030	Kitchen	4714537	Foodservice Equipment, Freezer, 3-Door Reach-In, Replace	15	7	8	1	EA	$6,800.00	$6,800									$6,800													**$6,800**
E1030	Kitchen	4714587	Foodservice Equipment, Freezer, 3-Door Reach-In, Replace	15	7	8	1	EA	$6,800.00	$6,800									$6,800													**$6,800**
E1030	Kitchen	5154788	Foodservice Equipment, Range/Oven, 4-Burner, 143 MBH, Replace	15	7	8	1	EA	$4,500.00	$4,500									$4,500													**$4,500**
E1030	Kitchen	4714519	Foodservice Equipment, Exhaust Hood, 8 to 10 LF, Replace	15	7	8	2	EA	$4,500.00	$9,000									$9,000													**$9,000**
E1030	Kitchen	4714644	Foodservice Equipment, Food Warmer, Proofing Cabinet on Wheels, Replace	15	7	8	1	EA	$1,700.00	$1,700									$1,700													**$1,700**
E1030	Kitchen	4714624	Foodservice Equipment, Griddle, Replace	15	7	8	1	EA	$7,000.00	$7,000									$7,000													**$7,000**
E1030	Kitchen	4714544	Foodservice Equipment, Steam Kettle, Replace	20	12	8	1	EA	$30,000.00	$30,000									$30,000													**$30,000**
E1030	Kitchen	4714565	Foodservice Equipment, Refrigerator, 4-Door Reach-In, Replace	15	7	8	1	EA	$7,300.00	$7,300									$7,300													**$7,300**
E1030	Kitchen	5154789	Foodservice Equipment, Range/Oven, 6-Burner, 224 MBH, Replace	15	7	8	1	EA	$6,000.00	$6,000									$6,000													**$6,000**
E1030	Kitchen	4714523	Foodservice Equipment, Walk-In, Refrigerator, Replace	20	10	10	1	EA	$15,000.00	$15,000											$15,000											**$15,000**
E1040	Art Room	4714576	Ceramics Equipment, Kiln, Replace	20	10	10	1	EA	$3,200.00	$3,200											$3,200											**$3,200**

Replacement Reserves Report

Frances C. Richmond Middle School

2/8/2023

Uniformat Code	Location Description	ID	Cost Description	Lifespan (EUL)	EAge	RUL	Quantity	Unit	Unit Cost *	Subtotal	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	Deficiency Repair Estimate
E1040	Throughout building	4714532	Healthcare Equipment, Defibrillator (AED), Cabinet-Mounted, Replace	10	5	5	2	EA	$1,500.00	$3,000						$3,000										$3,000						**$6,000**
E2010	Throughout building	4714559	Casework, Cabinetry, Hardwood Standard, Replace	20	10	10	180	LF	$300.00	$54,000											$54,000											**$54,000**
E2010	Gymnasium	4714638	Bleachers, Telescoping Manual, 16 to 30 Tier (per Seat), Replace	20	10	10	300	EA	$600.00	$180,000											$180,000											**$180,000**
E2010	Auditorium	4714540	Fixed Seating, Auditorium/Theater, Metal Cushioned Standard, Replace	20	10	10	273	EA	$350.00	$95,550											$95,550											**$95,550**
G2020	Front Parking Lot	4714591	Parking Lots, Pavement, Asphalt, Mill & Overlay	25	18	7	27000	SF	$3.50	$94,500								$94,500														**$94,500**
G2020	Kitchen Parking Lot	4714546	Parking Lots, Pavement, Asphalt, Mill & Overlay	25	18	7	11500	SF	$3.50	$40,250								$40,250														**$40,250**
G2050	Gymnasium	4714633	Sports Apparatus, Basketball, Backboard/Rim/Pole, Replace	25	18	7	2	EA	$9,500.00	$19,000								$19,000														**$19,000**
G2050	Site	4714637	Sports Apparatus, Basketball, Backboard/Rim/Pole, Replace	25	18	7	2	EA	$9,500.00	$19,000								$19,000														**$19,000**
G2050	Site	4714552	Athletic Surfaces & Courts, Basketball/General, Asphalt Pavement, Mill & Overlay	25	18	7	2000	SF	$3.50	$7,000								$7,000														**$7,000**
G2050	Site	4714636	Trail, Asphalt, Replace	20	10	10	2600	SF	$2.50	$6,500											$6,500											**$6,500**
G2060	Site	4714529	Bike Rack, Fixed 6-10 Bikes, Replace	20	10	10	2	EA	$800.00	$1,600											$1,600											**$1,600**
G2060	Site	4714553	Picnic Table, Wood/Composite/Fiberglass, Replace	20	10	10	5	EA	$600.00	$3,000											$3,000											**$3,000**
G2060	Site	4714629	Fences & Gates, Fence, Wood Board 4', Replace	20	10	10	80	LF	$24.00	$1,920											$1,920											**$1,920**
G2060	Site	4714599	Dumpster Enclosure, Gates, Wood/Metal, Replace/Install	20	10	10	2	EA	$1,700.00	$3,400											$3,400											**$3,400**
G3060	Site	4714586	Storage Tank, Site Fuel, Underground, Replace/Install	25	18	7	1	EA	$25,000.00	$25,000								$25,000														**$25,000**
G3060	Near Wood Chip Plant	4714606	Storage Tank, Site Fuel, Underground, Replace/Install	25	18	7	1	EA	$48,000.00	$48,000								$48,000														**$48,000**
G4050	Site	4714598	Pole Light Fixture w/ Lamps, any type 20' High, w/ LED Replacement, Replace/Install	20	10	10	21	EA	$4,000.00	$84,000											$84,000											**$84,000**
Totals, Unescalated											**$4,990**	**$0**	**$59,000**	**$30,000**	**$0**	**$1,112,191**	**$0**	**$688,630**	**$1,154,790**	**$60,000**	**$1,330,110**	**$0**	**$1,529,850**	**$382,600**	**$0**	**$395,300**	**$28,800**	**$4,800**	**$15,400**	**$60,000**	**$34,000**	**$6,890,461**
Totals, Escalated (3.0% inflation, compounded annually)											**$4,990**	**$0**	**$62,593**	**$32,782**	**$0**	**$1,289,334**	**$0**	**$846,928**	**$1,462,853**	**$78,286**	**$1,787,557**	**$0**	**$2,181,200**	**$561,861**	**$0**	**$615,865**	**$46,216**	**$7,934**	**$26,217**	**$105,210**	**$61,408**	**$9,171,234**

Appendix G:
Equipment Inventory List

D10 Conveying

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
1	4714640	D1010	**Passenger Elevator**	Hydraulic, 3 Floors	2500 LB	Frances C. Richmond Middle School	Maintenance Sprinkler Room	ThyssenKrupp	EP09525	ET7837	2005		

D20 Plumbing

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
1	4714557	D2010	**Water Heater**	Wood Chip Plant, Indirect	No tag/plate found GAL	Frances C. Richmond Middle School	Boiler room	Adamson Global Technology	No tag/plate found	7076			
2	4714520	D2010	**Backflow Preventer**	Domestic Water	4 IN	Frances C. Richmond Middle School	Maintenance Sprinkler Room				2005		
3	4714510	D2030	**Lift Station**	Storm Water, 5 HP	Inaccessible	Frances C. Richmond Middle School	Site	Inaccessible	Inaccessible	Inaccessible			
4	4714511	D2060	**Air Compressor**	Tank-Style	1.5 HP	Frances C. Richmond Middle School	Boiler room	Champion	CASRSA R SERIES 1.5-30HP	D003217			

D30 HVAC

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
1	4714566	D3010	**Supplemental Components**	Tank Monitoring System, Fuel Oil		Frances C. Richmond Middle School	Boiler room	Veeder-Root	TLS-300C	No tag/plate found			
2	4714538	D3020	**Boiler**	Oil, HVAC, 4835 MBH	4835 MBH	Frances C. Richmond Middle School	Boiler room	Buderus	GE615/16	63130084-00- 4268-0059	2005		
3	4714556	D3020	**Boiler**	Oil, HVAC, 924 MBH	924 MBH	Frances C. Richmond Middle School	Boiler room	Buderus	GE315/9	05178848-00- 4266-0048	2005		
4	4714545	D3020	**Boiler**	Wood Pellet, HVAC,4184 MBH	4184 MBH	Frances C. Richmond Middle School	Boiler room	Hurst	S1-125	No tag/plate found	2005		
5	4714613	D3020	**Baseboard Heater**	Electric, 2 LF	2 KW	Frances C. Richmond Middle School	Throughout building	No tag/plate found	No tag/plate found	No tag/plate found	2005		9
6	4714514	D3020	**Cabinet Heater**	Electric, 3 to 4 LF		Frances C. Richmond Middle School	Entrances	No tag/plate found	No tag/plate found	No tag/plate found	2005		5
7	4714512	D3020	**Unit Heater**	Hydronic	Inacessible MBH	Frances C. Richmond Middle School	Boiler room	Inaccessible	Inaccessible	Inaccessible			
8	4714531	D3020	**Unit Heater**	Hydronic	Inaccessible	Frances C. Richmond Middle School	Boiler room	Inaccessible	Inaccessible	Inaccessible			
9	4714596	D3020	**Boiler Supplemental Components**	Expansion Tank	422 GAL	Frances C. Richmond Middle School	Boiler room	Bell & Gossett	B1600	135284	2005		
10	4714630	D3020	**Boiler Supplemental Components**	Expansion Tank	422 GAL	Frances C. Richmond Middle School	Boiler room	Bell & Gossett	B1600	135285	2005		
11	4714573	D3030	**Air Conditioner**	Window/Thru-Wall	No tag/plate found TON	Frances C. Richmond Middle School	2nd floor	Garrison	311438115	340C5160502120402H0021	2021		7
12	4714622	D3030	**Split System**	Condensing Unit/Heat Pump (AC)	3 TON	Frances C. Richmond Middle School	Building exterior	Lennox	HSXA19-036-230	No tag/plate found			
13	4714577	D3030	**Split System**	Condensing Unit/Heat Pump (AC)	2.5 TON	Frances C. Richmond Middle School	Building exterior	Lennox	HSXB15-030-230	No tag/plate found			2
14	4714623	D3030	**Split System Ductless**	Single Zone, 2.5 to 3 TON	3 TON	Frances C. Richmond Middle School	Kitchen	Mitsubishi Electric	MSZ-D36NA	3002157 T			
15	4714634	D3030	**Split System Ductless**	Single Zone, 3 TON	3 TON	Frances C. Richmond Middle School	Kitchen	Mitsubishi Electric	MSY-D36NA	4001129 T			
16	4714563	D3030	**Unit Ventilator**	approx/nominal 3 Ton	1005 CFM	Frances C. Richmond Middle School	Throughout building	AAF	AVS	No tag/plate found			44
17	4714517	D3030	**Unit Ventilator**	approx/nominal 3 Ton	1005 CFM	Frances C. Richmond Middle School	Gymnasium	AAF	AVS	No tag/plate found	2005		6
18	4714584	D3050	**Pump**	Distribution, HVAC Heating Water	No tag/plate found HP	Frances C. Richmond Middle School	Boiler room	Inaccessible	Inaccessible	Inaccessible	2005		
19	4714535	D3050	**Pump**	Distribution, HVAC Heating Water	15 HP	Frances C. Richmond Middle School	Boiler room	Inverter	IDNM2333T	20410148073	2005		
20	4714597	D3050	**Pump**	Distribution, HVAC Heating Water	15 HP	Frances C. Richmond Middle School	Boiler room	Inverter	IDNM2333T	Z0410140068	2005		
21	4714641	D3050	**Pump**	Distribution, HVAC Heating Water	No tag/plate found HP	Frances C. Richmond Middle School	Boiler room	Inaccessible	Inaccessible	Inaccessible	2005		
22	4714588	D3050	**Pump**	Distribution, HVAC Heating Water	No tag/plate found HP	Frances C. Richmond Middle School	Boiler room	Inaccessible	Inaccessible	Inaccessible	2005		

23	4714528	D3050	**Pump**	Distribution, HVAC Heating Water	1 HP	Frances C. Richmond Middle School	Boiler room	Baldor Reliance	VEM3546	F0505052292				
24	4714558	D3050	**Pump**	Distribution, HVAC Heating Water	1.5 HP	Frances C. Richmond Middle School	Boiler room	WEG	T001520T3E 182JMS	No tag/plate found				
25	4850173	D3050	**Packaged Unit**	RTU, Pad or Roof-Mounted, 5 TON (Cooling)	5 Ton	Frances C. Richmond Middle School	Roof	AAON	RM-005-3-0-AA01-EHN	No tag/plate found	2005			
26	4714539	D3050	**Packaged Unit (Cooling)**	RTU, Pad or Roof-Mounted	10 TON	Frances C. Richmond Middle School	Roof	AAON, Inc.	RM-010-3-0-AA02-EHN	No tag/plate found	2005			
27	4833777	D3060	**Exhaust Fan**	Industrial Dust Collection, 3 HP Motor, 2000 CFM		Frances C. Richmond Middle School	Wood Working Classroom							
28	4714562	D3060	**Exhaust Fan**	Industrial Dust Collection, 3 HP Motor	No tag/plate found CFM	Frances C. Richmond Middle School	Wood Working Room	Airomax	No tag/plate found	No tag/plate found	2021			
29	4714583	D3060	**Exhaust Fan**	Roof or Wall-Mounted, 12" Damper	No tag/plate found CFM	Frances C. Richmond Middle School	Boiler room	Greenheck	CH-161-C-X	08608934				

D40 Fire Protection

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
1	4714560	D4010	**Backflow Preventer**	Fire Suppression	No tag/plate found IN	Frances C. Richmond Middle School	Maintenance Sprinkler Room				2005		
2	4714572	D4010	**Fire Suppression System**	Commercial Kitchen, per LF of Hood		Frances C. Richmond Middle School	Kitchen	Ansul	No tag/plate found	No tag/plate found			16
3	4714567	D4030	**Fire Extinguisher**	Wet Chemical/CO2		Frances C. Richmond Middle School	Throughout building						20

D50 Electrical

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
1	4714521	D5010	**Generator**	Diesel	80 KW	Frances C. Richmond Middle School	Building exterior	Olympian	D80P4	0LY00000PD4P00633	2005		
2	4714582	D5010	**Automatic Transfer Switch**	ATS	250 AMP	Frances C. Richmond Middle School	Boiler room	ASCO	E00300C30260N1XC	292176-002 RE	2005		
3	4714543	D5010	**Automatic Transfer Switch**	ATS	No tag/plate found AMP	Frances C. Richmond Middle School	Boiler room	ASCO	No tag/plate found	No tag/plate found	2005		
4	4714617	D5020	**Secondary Transformer**	Dry, Stepdown	500 KVA	Frances C. Richmond Middle School	Boiler room	General Electric	9T40G0009	1475A1103VABG001	2005		
5	4714620	D5020	**Switchboard**	120/208 V	1200 AMP	Frances C. Richmond Middle School	Boiler room	General Electric	No tag/plate found	No tag/plate found	2005		
6	4714621	D5020	**Switchboard**	120/208 V	800 AMP	Frances C. Richmond Middle School	Maintenance Sprinkler Room	General Electric	No tag/plate found	MM503&	2005		
7	4714594	D5020	**Switchboard**	277/480 V	1200 AMP	Frances C. Richmond Middle School	Boiler room	General Electric	No tag/plate found	No tag/plate found	2005		
8	4714550	D5020	**Distribution Panel**	120/208 V	400 AMP	Frances C. Richmond Middle School	Kitchen	General Electric	AQF3424SB	No tag/plate found	2005		
9	4714533	D5020	**Distribution Panel**	120/208 V	400 AMP	Frances C. Richmond Middle School	PE Storage Room	General Electric	AQF3424SB	No tag/plate found	2005		
10	4714574	D5020	**Distribution Panel**	277/480 V	800 AMP	Frances C. Richmond Middle School	Maintenance Sprinkler Room	General Electric	AEF3424DBX	No tag/plate found	2005		
11	4714581	D5030	**Variable Frequency Drive**	VFD, by HP of Motor	No tag/plate found HP	Frances C. Richmond Middle School	Boiler room	Danfoss-Graham	176U0178	522200Y175			
12	4714522	D5030	**Variable Frequency Drive**	VFD, by HP of Motor	No tag/plate found HP	Frances C. Richmond Middle School	Boiler room	Danfoss-Graham	176U0178	522100Y175	2005		
13	4714618	D5030	**Variable Frequency Drive**	VFD, by HP of Motor	No tag/plate found HP	Frances C. Richmond Middle School	Boiler room	Danfoss-Graham	175Z7284	005022H215			
14	4714593	D5040	**Standard Fixture w/ Lamp**	any type, w/ LED Replacement	100 W	Frances C. Richmond Middle School	Building exterior						7

D70 Electronic Safety & Security

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
1	4714534	D7050	**Fire Alarm Panel**	Fully Addressable		Frances C. Richmond Middle School	Lobby						

E10 Equipment

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
1	4714555	E1030	**Foodservice Equipment**	Convection Oven, Single		Frances C. Richmond Middle School	Kitchen	Blodgett	No tag/plate found	No tag/plate found			

2	4714616	E1030	**Foodservice Equipment**	Convection Oven, Single		Frances C. Richmond Middle School	Kitchen	Blodgett	No tag/plate found	No tag/plate found				
3	4714579	E1030	**Foodservice Equipment**	Exhaust Hood, 8 to 10 LF		Frances C. Richmond Middle School	Kitchen	Greenheck	GHDW-8.50-S	05D07655				
4	4714519	E1030	**Foodservice Equipment**	Exhaust Hood, 8 to 10 LF		Frances C. Richmond Middle School	Kitchen	Greenheck	GHDW-14.50-S	05D07656				2
5	4714644	E1030	**Foodservice Equipment**	Food Warmer, Proofing Cabinet on Wheels		Frances C. Richmond Middle School	Kitchen	FWE	No tag/plate found	No tag/plate found				
6	4714537	E1030	**Foodservice Equipment**	Freezer, 3-Door Reach-In		Frances C. Richmond Middle School	Kitchen	True Manufacturing Co	T-72F	1-4158698				
7	4714587	E1030	**Foodservice Equipment**	Freezer, 3-Door Reach-In		Frances C. Richmond Middle School	Kitchen	True Manufacturing Co	T-72F	1-4196963				
8	4714624	E1030	**Foodservice Equipment**	Griddle		Frances C. Richmond Middle School	Kitchen	Wolf	No tag/plate found	No tag/plate found				
9	4714525	E1030	**Foodservice Equipment**	Heat Lamps, Food Warming Fixture		Frances C. Richmond Middle School	Kitchen	No tag/plate found	No tag/plate found	No tag/plate found				
10	4714554	E1030	**Foodservice Equipment**	Heat Lamps, Food Warming Fixture		Frances C. Richmond Middle School	Kitchen	Hatco	No tag/plate found	No tag/plate found				
11	4714605	E1030	**Foodservice Equipment**	Mixer, Freestanding		Frances C. Richmond Middle School	Kitchen	Univex	No tag/plate found	M013446	2005			
12	4714625	E1030	**Foodservice Equipment**	Prep Table Refrigerated, Salad/Sandwich		Frances C. Richmond Middle School	Kitchen	Vollrath	R3871660	F008-00737095-001				
13	5154788	E1030	**Foodservice Equipment**	Range/Oven, 4-Burner, 143 MBH		Frances C. Richmond Middle School	Kitchen	Vulcan	No tag/plate found	No tag/plate found				
14	5154789	E1030	**Foodservice Equipment**	Range/Oven, 6-Burner, 224 MBH		Frances C. Richmond Middle School	Kitchen	American Range	No tag/plate found	No tag/plate found				
15	4714565	E1030	**Foodservice Equipment**	Refrigerator, 4-Door Reach-In		Frances C. Richmond Middle School	Kitchen	Traulsen	AHT232NUT-HHS	T96272E05				
16	4714544	E1030	**Foodservice Equipment**	Steam Kettle		Frances C. Richmond Middle School	Kitchen	Groen	TDB-40	75989				
17	4714610	E1030	**Foodservice Equipment**	Steamer, Freestanding		Frances C. Richmond Middle School	Kitchen	Market Forge	SIRIUS II-6	011118MD075S				
18	4714548	E1030	**Foodservice Equipment**	Steamer, Tabletop		Frances C. Richmond Middle School	Kitchen	No tag/plate found	No tag/plate found	No tag/plate found				
19	4714523	E1030	**Foodservice Equipment**	Walk-In, Refrigerator		Frances C. Richmond Middle School	Kitchen	Brown	UDS-4	100443-1D				
20	4714576	E1040	**Ceramics Equipment**	Kiln		Frances C. Richmond Middle School	Art Room	Skutt Automatic Kiln	KM-1227	005912				
21	4714532	E1040	**Healthcare Equipment**	Defibrillator (AED), Cabinet-Mounted		Frances C. Richmond Middle School	Throughout building							2

G30 Liquid & Gas Site Utilities

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
1	4714586	G3060	**Storage Tank**	Site Fuel, Underground	1000 GAL	Frances C. Richmond Middle School	Site	Inaccessible	Inaccessible	Inaccessible	2005		
2	4714606	G3060	**Storage Tank**	Site Fuel, Underground	4000 GAL	Frances C. Richmond Middle School	Near Wood Chip Plant	No tag/plate found	No tag/plate found	No tag/plate found	2005		

Appendix H:
Lighting System Schedule

LIGHTING IN THIS SCHOOL HAS BEEN CONVERTED TO LED

Appendix I:
Energy Conservation Measures Calculation

UIC	Install Low Flow Faucet Aerators
EAP2-b	**Location**: Classrooms, offices
Attributes:	Replace 32x 2.2GPM rated kitchen aerators with 1GPM WaterSense certified aerators

Property Type:	Commercial	Estimated No. of Operational Weeks	52
		Number of Occupied Days/Week (Max 7)	5

KITCHEN FAUCETS			BATHROOM FAUCETS		
Number of Occupants Affected By Retrofit	50		Number of Occupants Affected by Retrofit	440	
Do You Want To Replace Kitchen Faucets Aerators	Yes	*(Select)*	Do You Want To Replace Bathroom Faucets Aerators	Yes	*(Select)*
Total Number of Faucet Aerators To Be Replaced	32		Total Number of Faucet Aerators To Be Replaced	0	
Total Number of Faucets To Be Replaced:	0		Total Number of Faucets To Be Replaced:	0	
GPM of Existing Faucet Aerators	2.2	GPM	GPM of Existing Faucet Aerators	1.5	GPM
GPM of Proposed Faucet Aerator	1	GPM	GPM of Proposed Faucet Aerator	0.5	GPM
Estimated Number of Uses Per Day	1		Estimated Number of Uses Per Day	3	

Annual Water Savings From Installing Low Flow Aerators: 34.44 kGal

WATER & ENERGY SAVING CALCULATION			COST SAVING CALCULATION		
Select Type of Water Heater Fuel:	Natural Gas	(Select)	Property Location in United States	Northern Localities	
Energy Factor of Domestic Hot Water Heater:	0.55	EF	Heating Fuel Tariff	0	$/Therm
Hot Water Discharge Temperature at Faucet	115.00	°F	Water Tariff ($/1000 Gal)	$32.87	$/kGal
Equivalent Heating Fuel Savings:	333	Therms	Annual Cost Savings In Form of Water	$1,132	$
Savings Discounted by 15% to Account For Cold Water Use					
Annual Water Savings	34.44	kGal	Annual Energy Savings From Water Heater	$0	$

COST BENEFIT ANALYSIS					
Estimated Material Cost	$256		Estiamted Labor Cost	$202	
Estimated Total Annual Cost Savings	$1,132	$$	Estimated Total Installation Cost	$458	$$
Simple Payback Period	0.40	Years	*Type of Recommendation*	No/Low Cost ECM Recommendation	

ECM EXPLANATION:

By reducing the flow of water coming from the restroom faucets, aerators can generate energy savings at low cost and with easy installation. The savings generated would be in the form of reduced water and sewer costs and at the same time aerators would save energy by reducing the demand for hot water. The average faucet has a flow rate of about 2 to 4 GPM. Adding a screw-in faucet aerator reduces the flow to 0.5 to 1.5 GPM in the bathroom and 2.2 GPM in the kitchen. In addition to saving energy and water, the "foamier" water that comes from faucet aerators wets objects better than water from a faucet with no aerator, which tends to bounce off the object rather than thoroughly wetting it.

BV recommends replacing the proposed faucet aerators with new low flow aerators as mentioned above. The proposed ECM shall also result in an annual energy saving in form of reduction in water heating bills.

Summary:

Initial Investment: $458 Estimated Annual Cost Savings: $1,132 Simple Payback Period (Yrs): 0.40

UIC	Install Low Flow Tankless Restroom Fixtures
EAP4	Location: Restrooms
Attribute:	Retrofit 33x; 1.6 GPF toilets with dual-flush flush vales

ECM FOR DETERMINING WATER SAVINGS IN COMMERCIAL PROPERTIES

Number of Males	220
Number of Females	220
Number of Occupied Days Per Week (Max 7)	5
Number of Occupied Weeks/Year (Max 52)	40
Number of Urinals To Be Retrofitted	0
Number of Water Closets To Be Retrofitted	33
No. of Water Closets With Separate Flush Tank (Typical Residential Type)	0
Estimated Restroom Usage/Individual/Day (Default is 4 Uses/Day For Residential/Office)	2 (Select)

Urinal Water Savings

Do you want to make any changes to the Urinals?	No	
Estimated Existing Use of Urinal/Day/Man	80%	
Existing Gallons Per Flush Ratings For Urinal Flushes	0.00	GPF
Proposed Urinal	-	
GPF of Proposed Urinal Flush Valve**	0.000	GPF

**(1992 EpACT Energy Act Mandates 1.0GPF Max on Urinals)

Water Closet Water Savings

Tankless Water Closets

Do you want to make any changes to the Water Closets?	Yes	
Existing Gallons Per Flush Ratings For Water Closet Flushes	1.60	GPF
Are The Existing Water Closet Being Replaced? (If No; Then Only The Flush Valve Would Be Replaced With Dual Flush Retrofit Kit)	No	
No. of Tankless Water Closets	33	
GPF of Proposed Dual Flush- Water Closet Valve* (Federal Low Requires All Flushes Not To Exceed 1.6 GPF) — Solid Waste (20%)	1.60	GPF
Liquid Waste (80%)	0.48	GPF
Estimated Annual Water Savings From Male Users	78.85	kGal
Estimated Annual Water Savings From Female Users	78.85	kGal

Water & Cost Saving Calculations

Water Savings Calculation

Water Savings By The Use of Low Flow Water Closet Flush Valves/Yr	157.70	kgal
Water Savings By The Use of Low Flow Urinal Flush Valves/ Yr	0.00	kgal
Total Annual Water Savings in kgal	157.70	kgal

Cost Savings Calculations

Enter Water Tariff Rate ($/1000Gal)	$32.87	
Estimated Cost Savings From Water	$5,184	

Estimated Cost of Retrofit

Material Cost for Low Flow Urinal(s)	$0
Labor Cost for Installing New Urinal(s)	$0
Material Cost For Replacing Existing Flush Valves With Low Flow - Dual Flush Valves	$2,640
Labor Cost For Water Closet (Up For Liquid Waste And Down For Solid Waste)	$3,111
Estimated Total Cost For Retrofit	$5,751
Simple Pay Back Period	1.11 Yrs
Type of Recommendation	Capital Cost ECM Recommendation

ECM EXPLANATION:

The highest water utilization at any home/office occurs in the restrooms. It is estimated that on an average a normal human being uses the restroom at least four times a day. Keeping with the global water conservation objectives, federal law prohibits use of any new water closet flushes over 1.6 GPF. At the same time the '1992 EpACT' mandates all new Urinals to have a maximum 1.0 GPF flush valves on urinals.

BV recommends replacing all urinals above 1.0 GPF with a new 0.5 GPF or lesser urinals. At the same time BV also recommends replacing all the water closets having a GPF rating of 1.6 and over with low flow water closet fixtures equipped with dual flush valves.

In case the property doesn't wish to replace the entire water closet fixtures, BV recommends retrofitting all the tankless water closet flush fixtures with new dual flush fixtures that would result in a 30% water savings per flush for liquid wastes, while retaining the same flush rate for solid wastes.

SUMMARY:

Initial Investment: $5,751
Annual Cost Savings: $5,184
Simple Payback Period: 1.11 Yrs

Appendix J:
Solar Photovoltaic Feasibility Study

UIC	Install Fixed Tilt Solar Photovoltaic System
EAR1	Location: Bernice A. Ray School
Attributes:	Install fixed tilt 553.6KW Solar Photovoltaic System consisting of 144.3kW Solar Carport PV System; 409.3kW Rooftop Fixed Array PV System;

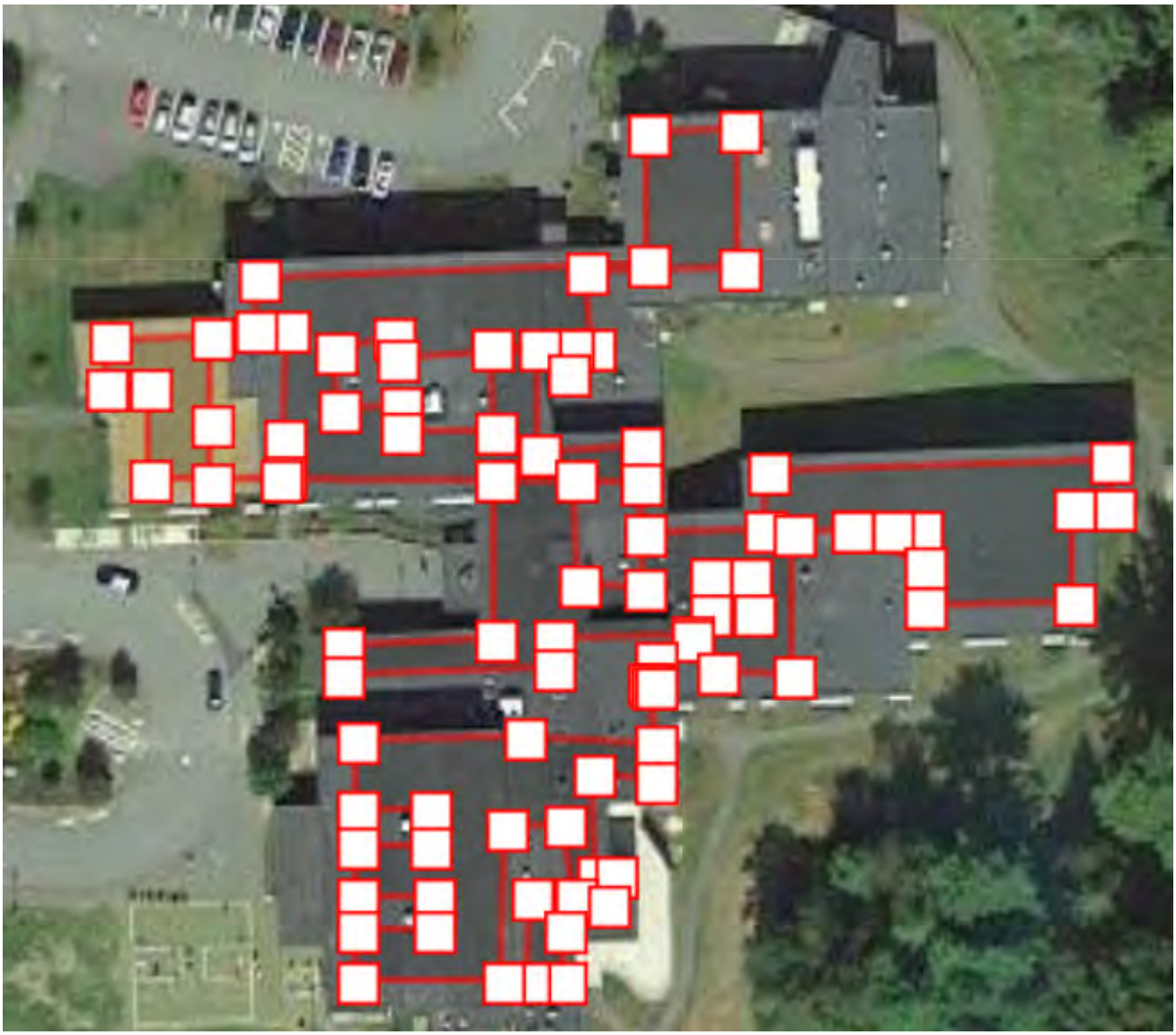
Select State: New Hampshire **Electric Rate:** $0.15 $/KWH Annual Electric Consumption: 349,800 KWh

Roof No.	Description	Location of the Array	DC System Size Per Roof	PV System Sizing For All Roofs	Estimated Number of 315 Watt PV Panels:	Total Estimated Annual Electricity Generated/ Roof	Total Estimated Electricity Generated (All Roofs)	Total Cost Savings	Installation Cost:	Simple Pay Back Period without Incentives	One Time Potential Utility or State Incentives	One Time Potential Federal Incentives	Annual Potential Incentives and Rebates		Simple Pay Back Period with All Incentives
			kW	kW		kWh	kWh			Yrs		Federal Tax Credit	Federal REPI Incentive	Solar Renewable Certificates (SRECS)- ($/MWH)	Years
												26%	$0.00	Varies by State	
1	Rooftop Fixed Array	Roof	409	409	1,299	491,165	491,165	$73,737	$1,911,876	25.9	$0	$497,088	$0	$0	19.2
2	Solar Carports	Carports	144	144	458	173,182	173,182	$25,999	$751,232	28.9	$0	$195,320	$0	$0	21.4
3				0	0		0	$0	$0		$0	$0	$0	$0	
4				0	0		0	$0	$0		$0	$0	$0	$0	
5				0	0		0	$0	$0		$0	$0	$0	$0	
6				0	0		0	$0	$0		$0	$0	$0	$0	
7				0	0		0	$0	$0		$0	$0	$0	$0	
8				0	0		0	$0	$0		$0	$0	$0	$0	
9				0	0		0	$0	$0		$0	$0	$0	$0	
10				0	0		0	$0	$0		$0	$0	$0	$0	
		2		554	1,757	664,347.0	664,347	$99,736	$2,663,109	26.70	$0	$692,408	$0	$0	19.76

Solar Rooftop Photovoltaic Analysis		
Total Number of Roofs	2	
Estimated Number of Panels	1,757	
Estimated KW Rating	554	kW
Potential Annual KWh Produced	664,347	kWh
% of Current Electricity Load	189.9%	

Financial Analysis		
Investment Cost	$2,663,109	
Estimated Energy Cost Savings	$99,736	
Potential Rebates	$692,408	
Potential Annual Incentives	$0	
Payback without Incentives	26.7	years
Incentive Payback but without SRECS	19.8	years
Payback with All Incentives	19.8	years

Solar PV Layout – Roof 1



Project Number	Project Name
158531.22R000-003.379	Frances C. Richmond Middle School
Source	**On-Site Date**
PVWatts	December 20, 2022

NREL

Caution: Photovoltaic system performance predictions calculated by PVWatts® include many inherent assumptions and uncertainties and do not reflect variations between PV technologies nor site-specific characteristics except as represented by PVWatts® inputs. For example, PV modules with better performance are not differentiated within PVWatts® from lower performing modules. Both NREL and private companies provide more sophisticated PV modeling tools (such as the System Advisor Model at https://sam.nrel.gov) that allow for more precise and complex modeling of PV systems.

The expected range is based on 30 years of actual weather data at the given location and is intended to provide an indication of the variation you might see. For more information, please refer to this NREL report: The Error Report.

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The energy output range is based on analysis of 30 years of historical weather data, and is intended to provide an indication of the possible interannual variability in generation for a fixed (open rack) PV system at this location.

RESULTS

491,165 kWh/Y

System output may range from 468,326 to 512,875 kWh per year near

Month	Solar Radiation (kWh / m^2 / day)	AC Energ (kWh)
January	2.79	30,207
February	3.80	36,888
March	4.83	50,180
April	4.98	46,600
May	5.77	53,918
June	5.90	52,745
July	5.67	51,952
August	5.61	51,674
September	4.67	42,484
October	3.05	29,741
November	2.45	24,421
December	1.89	20,355
Annual	4.28	491,165

Location and Station Identification

Requested Location	63 lyme rd, hanover nh
Weather Data Source	Lat, Lng: 43.73, -72.26 0.7 mi
Latitude	43.73° N
Longitude	72.26° W

PV System Specifications

DC System Size	409.3 kW
Module Type	Standard
Array Type	Fixed (open rack)
System Losses	14.08%
Array Tilt	20°
Array Azimuth	180°
DC to AC Size Ratio	1.2
Inverter Efficiency	96%
Ground Coverage Ratio	0.4%
Albedo	*From weather file*
Bifacial	No (0)

Monthly Irradiance Loss	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	N
	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0

Performance Metrics

DC Capacity Factor	13.7%

Solar PV Layout – Carports

Project Number	Project Name
158531.22R000-003.379	Frances C. Richmond Middle School
Source	**On-Site Date**
PVWatts	December 20, 2022

NREL

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The expected range is based on 30 years of actual weather data at the given location and is intended to provide an indication of the variation you might see. For more information, please refer to this NREL report: The Error Report.

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The energy output range is based on analysis of 30 years of historical weather data, and is intended to provide an indication of the possible interannual variability in generation for a fixed (open rack) PV system at this location.

RESULTS

173,182 kWh/Y

System output may range from 165,129 to 180,836 kWh per year near

Month	Solar Radiation (kWh / m^2 / day)	AC Energ (kWh)
January	2.79	10,652
February	3.81	13,009
March	4.83	17,696
April	4.98	16,430
May	5.77	19,010
June	5.90	18,597
July	5.67	18,317
August	5.61	18,219
September	4.67	14,978
October	3.05	10,486
November	2.45	8,610
December	1.89	7,178
Annual	4.29	173,182

Location and Station Identification

Requested Location	63 lyme street, hanover nh
Weather Data Source	Lat, Lng: 43.73, -72.26 0.7 mi
Latitude	43.73° N
Longitude	72.26° W

PV System Specifications

DC System Size	144.3 kW
Module Type	Standard
Array Type	Fixed (open rack)
System Losses	14.08%
Array Tilt	20°
Array Azimuth	180°
DC to AC Size Ratio	1.2
Inverter Efficiency	96%
Ground Coverage Ratio	0.4%
Albedo	*From weather file*
Bifacial	No (0)

Monthly Irradiance Loss	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	N
	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0

Performance Metrics

DC Capacity Factor	13.7%

Appendix K:
Energy Audit Glossary of Terms

Glossary of Terms and Acronyms

ECM – Energy Conservation Measures are projects recommended to reduce energy consumption. These can be No/Low cost items implemented as part of routine maintenance or Capital Cost items to be implemented as a capital improvement project.

Initial Investment – The estimated cost of implementing an ECM project. Estimates typically are based on R.S. Means Construction cost data and Industry Standards.

Annual Energy Savings – The reduction in energy consumption attributable to the implementation of a particular ECM. These savings values do not include the interactive effects of other ECMs.

Cost Savings – The expected reduction in utility or energy costs achieved through the corresponding reduction in energy consumption by implementation of an ECM.

Simple Payback Period –The number of years required for the cumulative value of energy or water cost savings less future non-fuel or non-water costs to equal the investment costs of the building energy or water system, without consideration of discount rates.

EUL – Expected Useful Life is the estimated lifespan of a typical piece of equipment based on industry accepted standards.

RUL – Remaining Useful Life is the EUL minus the effective age of the equipment and reflects the estimated number of operating years remaining for the item.

SIR - The savings-to-investment ratio is the ratio of the present value savings to the present value costs of an energy or water conservation measure. The numerator of the ratio is the present value of net savings in energy or water and non-fuel or non-water operation and maintenance costs attributable to the proposed energy or water conservation measure. The denominator of the ratio is the present value of the net increase in investment and replacement costs less salvage value attributable to the proposed energy or water conservation measure. It is recommended that energy-efficiency recommendations be based on a calculated SIR, with larger SIRs receiving a higher priority. A project typically is recommended only if the SIR is greater than or equal to 1.0, unless other factors outweigh the financial benefit.

Life Cycle Cost - The sum of the present values of (a) **I**nvestment costs, less salvage values at the end of the study period; (b) Non-fuel operation and maintenance costs: (c) Replacement costs less salvage costs of replaced building systems; and (d) Energy and/or water costs.

Life Cycle Savings – The sum of the estimated annual cost savings over the EUL of the recommended ECM, expressed in present value dollars.

Building Site Energy Use Intensity - The sum of the total site energy use in thousands of Btu per unit of gross building area. Site energy accounts for all energy consumed at the building location only not the energy consumed during generation and transmission of the energy to the site.

Building Source Energy Use Intensity – The sum of the total source energy use in thousands of Btu per unit of gross building area. Source energy is the energy consumed during generation and transmission in supplying the energy to your site.

Building Cost Intensity - This metric is the sum of all energy use costs in dollars per unit of gross building area.

Greenhouse Gas Emissions - Although there are numerous gases that are classified as contributors to the total for Greenhouse Emissions, the scope of this energy audit focuses on carbon dioxide (CO_2). Carbon dioxide enters the atmosphere through the burning of fossil fuels (oil, natural gas, and coal), solid waste, trees and wood products, and also as a result of other chemical reactions (e.g., manufacture of cement).