FACILITY CONDITION ASSESSMENT & NETZERO ENERGY AUDIT

prepared for

School Administrative Unit 70
41 Lebanon Street, Suite 2
Hanover, New Hampshire 03755-2147
Ms. Jamie Teague

Hanover High School
41 Lebanon Street
Hanover, New Hampshire 03755

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1. Executive Summary

Property Overview and Assessment Details

General Information	
Property Type	High School
Main Address	41 Lebanon Street, Hanover, New Hampshire 03755
Site Developed	Phase I: 1924; Phase II: 1935; Phase III:1963 Renovated: 1978-79; 2006-07
Site Area	28.25 acres (estimated)
Parking Spaces	237 total spaces all in open lots; 7 of which are accessible
Building Area	190,000 SF
Number of Stories	3 above grade with 1 below-grade semi-basement levels
Outside Occupants / Leased Spaces	None
Date(s) of Visit	December 21-23, 2022
Management Point of Contact	School Administrative Unit 70, Jamie Teague, Business Administrator 603.643.6050 phone jteague@sau70.org email
On-site Point of Contact (POC)	Tony Daigle
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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 original development date of the site occurred in 1924 with the construction of a new elementary school on Lebanon Street that opened the following year. In 1935, a new high school was built just to the southwest of the existing elementary school. In 1957, a wing was added to the high school followed by an addition in 1963. Further renovations occurred in 1978-79. A major renovation concluded in 2007 that connected the existing buildings and expanded the high school considerably to its current size and layout.

Architectural

As described above, the entire school underwent an extensive renovation concluding in 2007 which included nearly wholesale architectural updating. The storefront and operable aluminum windows all reportedly date from this time and along with the exterior and interior doors remain in the middle of their estimated useful life. Apart from the asphalt shingles above the school district offices and isolated areas of metal roofing, the extensive areas of flat roofs across all five sections of the building contain membranes of varying type, age, and condition. The oldest areas of the roof reportedly date from 1984 and 1991. The sections of roof not updated in 2007 will require replacement in the near-term. Brick exterior walls comprise the majority of the façade and show no deficiencies. The remaining exterior walls include EIFS installed in 2007 and a variety of painted wood surfaces that will require periodic repainting. The interior finishes of the school consist of durable institutional finishes that have been well maintained. In general, typical lifecycle-based interior and exterior finish replacements are budgeted and anticipated.

Mechanical, Electrical, Plumbing and Fire (MEPF)

Like many other large institutions throughout northern New England, Hanover High School is heated primarily through a large wood-fired steam boiler. The boiler along with the storage bin and feeder are housed in the Wood Chip Plant located directly behind the school between the football field and the track. The boiler dates from the last renovation and thanks to a rigorous maintenance schedule still functions well. A chiller at the front of the building provides space cooling to administrative areas of the school, although approximately 80 percent of the school remains uncooled. The terminal units include hydronic baseboard heaters, unit ventilators, and fan coil units, some of which are expected to need replacement in the next five years. There are three oil-fired boilers that serve both as a backup heating source and to heat the domestic water for the school. The insulated domestic storage tank located next to the boilers remains in fair condition. The plumbing fixtures throughout the school date from the renovation and are roughly halfway through their estimated useful life. The electrical system also underwent an extensive renovation and includes a switchboard and emergency generator. The lighting system is primarily linear fluorescent fixtures that should be updated to LED during the next lighting renovation. Both the fully addressable fire alarm system and the building's sprinkler system protecting the entire school are up to date with inspections and exhibit no issues at this time. A robust security/surveillance system safeguards the interior and exterior of the school and continues to function well according to technicians observing the system during this assessment. The card readers limiting access to some areas of the school reportedly function adequately as well. There are two elevators serving the three levels of the school: One of the elevators was updated during the last renovation while the other is expected to require a major upgrade during the next five years. The foodservice equipment in the kitchen and cafeteria area varies somewhat in age and condition but no deficiencies were observed. The potential for the installation of a solar panel array on the roof in concert with increased electrification of the school's HVAC system in the future exists.

Site

The school is situated just to the south and east of downtown Hanover and essentially abuts Dartmouth College located to the north. There are residential areas surrounding the school. There are asphalt parking areas at the northwest corner of the site and at various locations along the rear elevation of the school. The concrete walkways and patio located at the main entrances at the front and rear of the school show no deficiencies, but the asphalt walkways throughout show heavy wear and cracking. Ancillary buildings include the Wood Chip Plant, a press box, a greenhouse, and simple wood-framed storage sheds. An artificial turf football field with bleachers and stadium lights and a track with playing field in the center are located to the south of the school. Although covered in snow preventing close inspection, the POC reported the track surface has become worn and slated for replacement in 2023. There is also a soccer field with a natural grass surface to the west. Site lighting is reported to be adequate and is provided by a mix of pole lights and building-mounted fixtures, most of which have been upgraded to LED.

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 | Hanover High School

Replacement Value	*Total SF*	*Cost/SF*
$ 81,700,000	*190,000*	*$ 430*

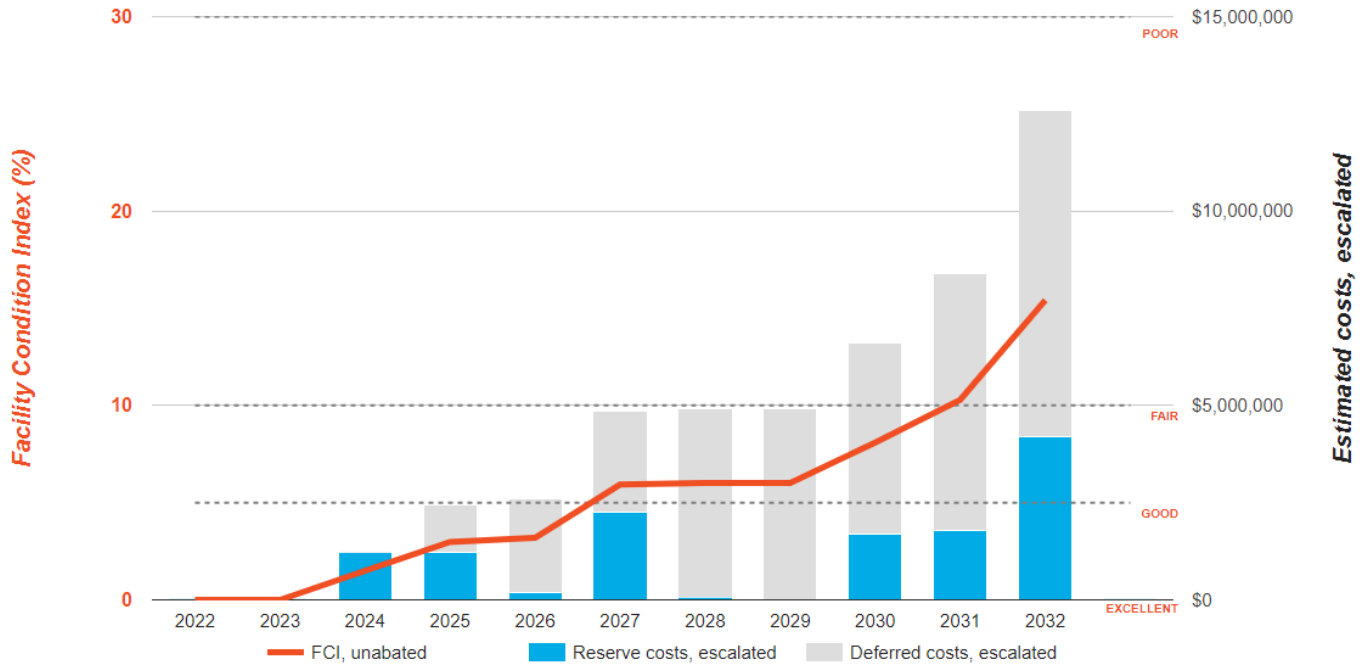
	Est Reserve Cost	FCI
Current	$ 0	**0.0 %**
3-Year	$ 2,433,200	3.0 %
5-Year	$ 4,845,700	5.9 %
10-Year	$ 12,588,900	15.4 %

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: Hanover High School

Replacement Value: $81,700,000 | Inflation Rate: 3.0% | Average Needs per Year: $1,144,500



Immediate Needs

Facility/Building	Total Items	Total Cost
Hanover High School	1	$8,000
Total	**1**	**$8,000**

Hanover High School

ID	Location	Location Description	UF Code	Description	Condition	Plan Type	Cost
4728443	Hanover High School	Site	G2050	Sports Apparatus, Scoreboard, Electronic Standard, Replace	Failed	Performance/Integrity	$8,000
Total (1 items)							**$8,000**

Key Findings

No Key Findings identified.

Plan Types

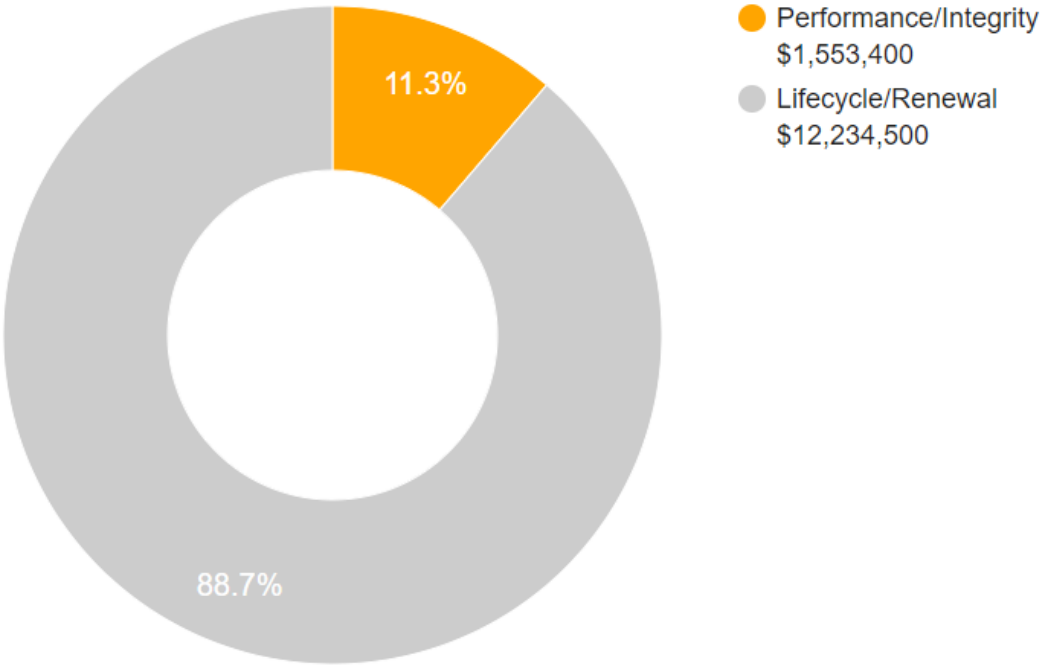
Each line item in the cost database is assigned a Plan Type, which is the primary reason or rationale for the recommended replacement, repair, or other corrective action. This is the “why” part of the equation. A cost or line item may commonly have more than one applicable Plan Type; however, only one 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: $13,787,900

2. Building and Site Information

Systems Summary

System	Description	Condition
Structure	Masonry bearing walls with a mix of wood and metal roof decks supported by a combination of wood joists and open-web steel joists and concrete wall footing foundation system	Good
Façade	Primary Wall Finish: Brick Secondary Wall Finish: EIFS Tertiary Wall Finish: Painted wood Windows: Aluminum	Fair
Roof	Building 1: Flat construction with white and tan single-ply TPO membranes and black single-ply EPDM membrane Building 2: Flat construction with black single-ply EPDM membrane and tan single-ply TPO membrane Building 3: Primary – Flat construction with white single-ply TPO membrane; Secondary – Gable construction with asphalt shingles Building 4: Flat construction with black single-ply EPDM membrane Building 5: Flat construction with white single-ply TPO membrane Throughout: Shed construction with metal finish	Fair
Interiors	Walls: Painted gypsum board and CMU, exposed brick Floors: VCT, Carpet, maple wood sports floor, epoxy coated concrete, rubber tile Ceilings: Suspended ACT, painted gypsum board and exposed elements	Fair
Elevators	Passenger: Two hydraulic cars serving all 3 floors	Fair

Systems Summary

Plumbing	Distribution: Copper supply and cast iron waste & venting Hot Water: Oil-fired HVAC boilers with domestic storage tank Fixtures: Toilets (1.6 gpm, most auto flush) and sinks (metered faucets) in all restrooms; Urinals (1.0 gpf) in boy's rooms	Fair
HVAC	Central System: Wood chip boiler feeding hydronic baseboard radiators, unit ventilators, and cabinet terminal units; Back-up: 3 oil-fired boilers Supplemental components: Rooftop package units, ductless split-systems	Fair
Fire Suppression	Wet-pipe sprinkler system with limited dry-piped portion and fire extinguishers, and kitchen hood system	Fair
Electrical	Source & Distribution: Main switchboard with copper wiring Interior Lighting: Linear fluorescent (T8 and T5), limited halogen Emergency Power: Diesel generator with automatic transfer switches	Fair
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 and adjacent concrete and asphalt sidewalks	Fair
Site Development	Building-mounted signage; Chain link and wood split 2-rail fencing Sports fields with bleachers, press box, fencing, and stadium lights Furnished with park benches, picnic tables, trash receptacles	Fair
Landscaping and Topography	Significant landscaping features including lawns, trees, bushes, and planters Irrigation present CMU retaining walls Low to moderate site slopes throughout, generally slopes gradually from north and east property boundaries to the south and west	Good
Utilities	Municipal water and sewer Local utility-provided electric and fuel oil tanks and wood chip container	Good
Site Lighting	Pole-mounted: LED Building-mounted: LED	Good
Ancillary Structures	• Wood chip plant • Field building • Storage sheds • Greenhouse	Fair
Accessibility	Presently it does not appear an accessibility study is needed for this property.	
Key Issues and Findings	Leaking and excessively aged sections of roof, severe sidewalk cracking, worn track surface, aged fencing, non-functional scoreboard, aged fuel storage tank, aging HVAC components	

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	-	-	-	$18,621	$77,892	$96,513
Facade	-	-	-	$81,362	$912,260	$993,622
Roofing	-	$1,224,596	$514,322	-	$53,905	$1,792,823
Interiors	-	-	$27,127	$2,430,443	$1,978,141	$4,435,711
Conveying	-	-	$76,490	$22,801	$105,881	$205,172
Plumbing	-	-	$73,376	$41,560	$506,907	$621,843
HVAC	-	-	$678,753	$1,737,922	$25,846,930	$28,263,605
Fire Protection	-	-	-	$294,720	$33,730	$328,450
Electrical	-	-	$1,541,834	$49,858	$87,203	$1,678,895
Fire Alarm & Electronic Systems	-	-	$569,125	$1,280,063	$875,959	$2,725,147
Equipment & Furnishings	-	-	$140,062	$1,785,781	$381,899,085	$383,824,928
Special Construction & Demo	-	-	-	-	$190,000	$190,000
Site Development	$8,000	$229,947	$37,142	$173,094	$2,770,557	$3,218,740
Site Pavement	-	$27,192	$47,609	$497,339	$138,155	$710,295
Site Utilities	-	$63,654	-	$115,038	$43,647	$222,339
TOTALS (3% inflation)	**$8,000**	**$1,545,400**	**$3,705,900**	**$8,528,700**	**$415,520,300**	**$429,308,300**

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, the exterior of the property, and the roofs.

Key Spaces Not Observed

All key areas of the property were accessible and observed. The site and roof observations were somewhat limited due to significant recent snowfall.

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 at various times starting in 1924. The facility was substantially renovated in 2006-07 and widespread accessibility improvements appear to have been implemented at that time.

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

No detailed follow-up accessibility study is currently recommended since no major or moderate issues were identified at the subject site. 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 Hanover High 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 5 electric meters, no natural gas meters and 4 water meters.

Data Limitation:
Costs for delivered fuels were distributed among the months between deliveries.

Utilities Metering at Glance	
Number of electric meters observed	5
Number of gas meters observed	0
Number of domestic water meter observed	4

Average Utility Rates				
Electricity	Natural Gas	Wood Chips	No.2 Oil	Water & Sewer
Average Rate	Average Rate	Average Rate	Average Rate	Blended Rate
$0.153 /kWh	N/A	$55/Ton	$2.38/Gal	$ 32.89/kgal

Electricity

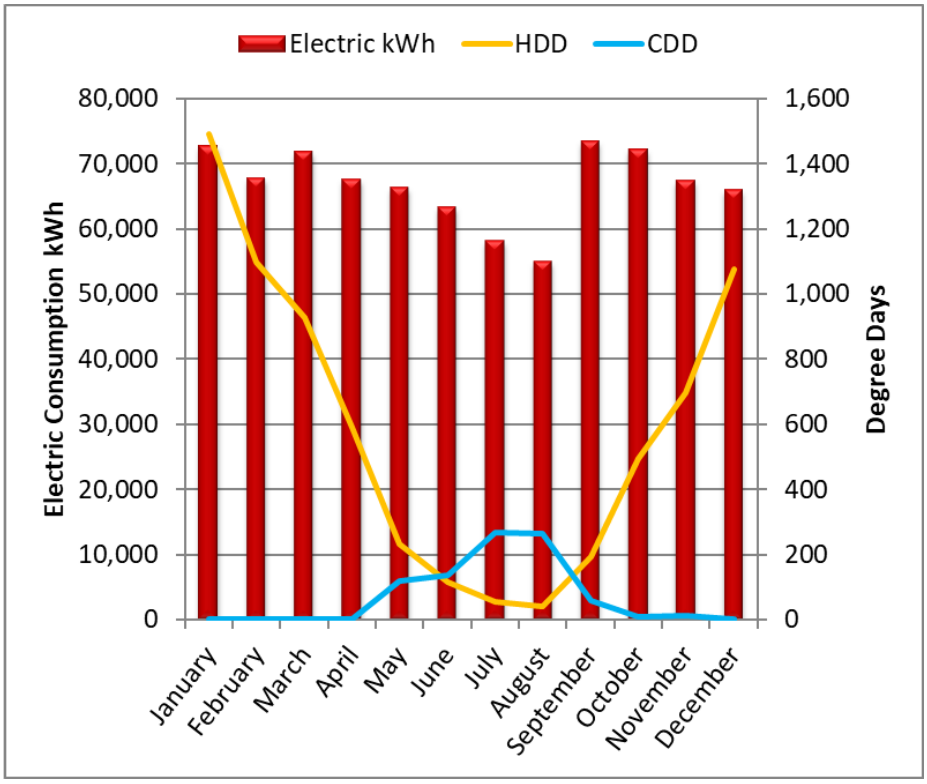
Liberty Utilities provides the electrical service to the facility.

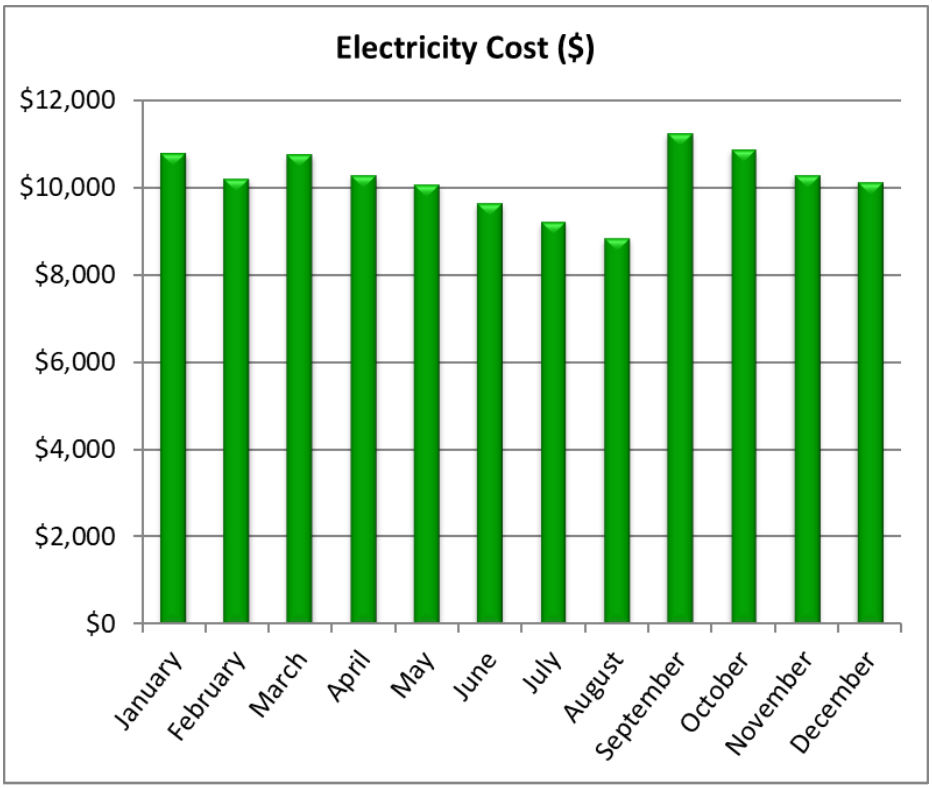
The consumption pattern for the period under consideration remains mostly constant with a small dip during the summer months. The slight seasonal variation in the consumption is primarily attributed to less usage during the summer, while the static base load primarily consists of lighting and powering all electrical devices throughout the facility.

"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
January	72,742	$0.148	$10,794
February	67,742	$0.151	$10,213
March	71,743	$0.150	$10,763
April	67,542	$0.153	$10,303
May	66,348	$0.152	$10,087
June	63,344	$0.152	$9,638
July	58,143	$0.158	$9,210
August	54,942	$0.161	$8,860
September	73,342	$0.153	$11,248
October	72,141	$0.151	$10,872
November	67,342	$0.153	$10,292
December	65,943	$0.154	$10,126
TOTAL/AVERAGE	**801,314**	**$0.153**	**$122,407**


Electric kWh
HDD
CDD
Electric Consumption kWh
Degree Days
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
1,600
1,400
1,200
1,000
800
600
400
200
0
January
February
March
April
May
June
July
August
September
October
November
December


Electricity Cost ($)
$12,000
$10,000
$8,000
$6,000
$4,000
$2,000
$0
January
February
March
April
May
June
July
August
September
October
November
December

Propane

There is limited propane service provided to the facility for cooking purposes in the kitchen and some classroom and laboratory functions. The annual total consumption of propane is estimated at roughly 1,400 gallons. Dead River Company provides the fuel to the school.

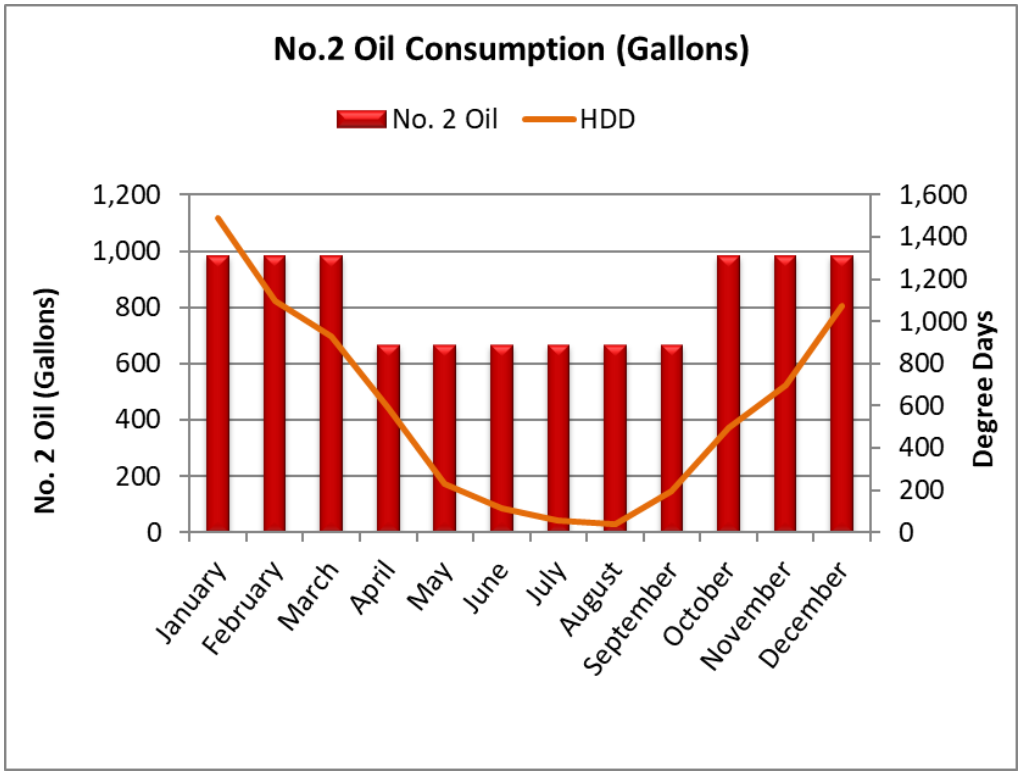
Fuel Oil

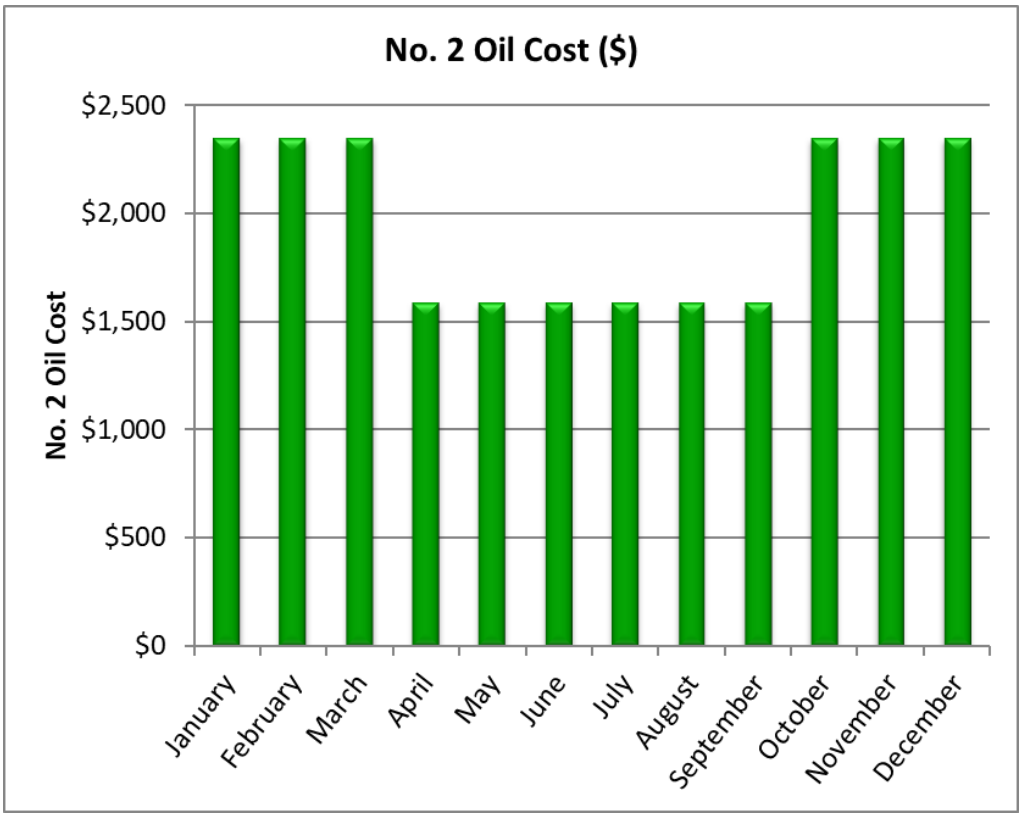
Dead River Company provides the fuel oil to the facility. The deliveries are made on an as-needed basis and the totals listed below are averaged across months. The underground storage tank is located near the main entrance of the school and has a total rated capacity of 10,000 gallons. Additionally, there is a 275-gallon day tank located adjacent to the boiler room.

The primary use of the fuel oil is for domestic water heating and as a supplemental heating source for the school when the wood chip boiler is in operation. The consumption pattern for the period under consideration varies seasonally. The seasonal variation in the consumption is primarily attributed to the supplemental heating loads, while the static base load primarily consists of domestic water heating.

"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.

Fuel Oil Consumption & Cost Data			
Delivery Month	Delivery (gallons)	Unit Cost (per gallon)	Total Cost
January	985	$2.38	$2,347
February	985	$2.38	$2,347
March	985	$2.38	$2,347
April	667	$2.38	$1,589
May	667	$2.38	$1,589
June	667	$2.38	$1,589
July	667	$2.38	$1,589
August	667	$2.38	$1,589
September	667	$2.38	$1,589
October	985	$2.38	$2,347
November	985	$2.38	$2,347
December	985	$2.38	$2,347
TOTAL/AVERAGE	**9,909**	**$2.38**	**$23,618.85**


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


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

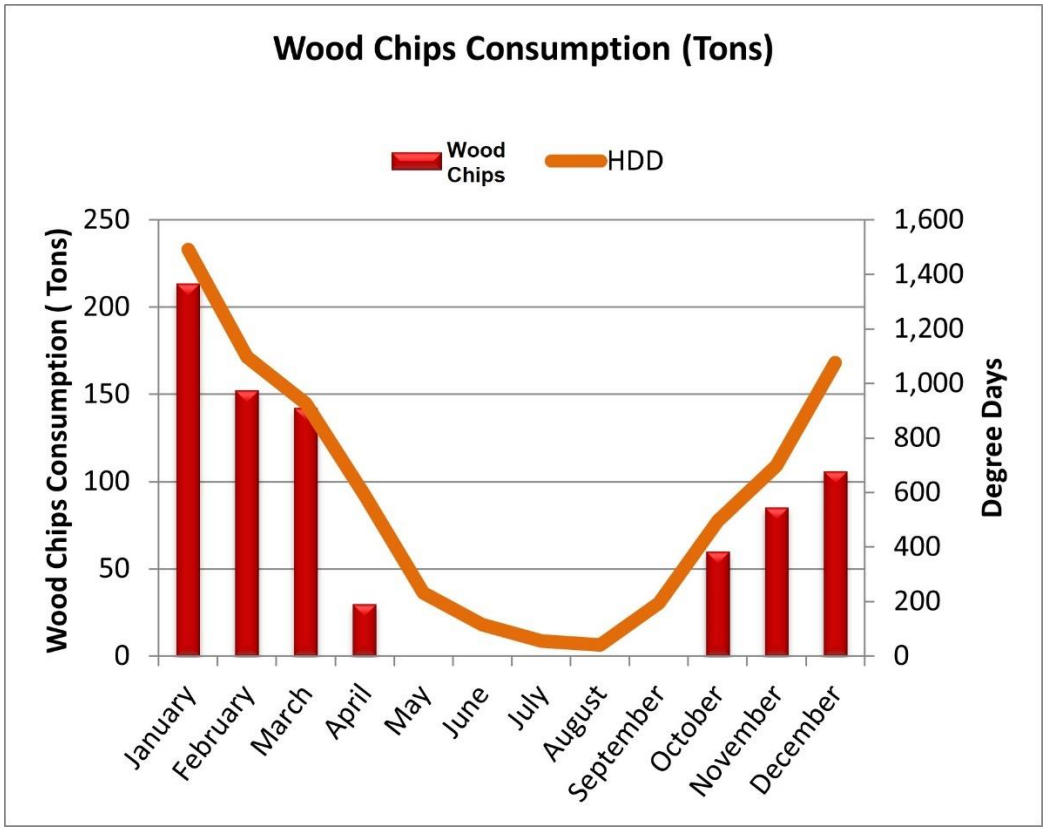
Wood Pellet

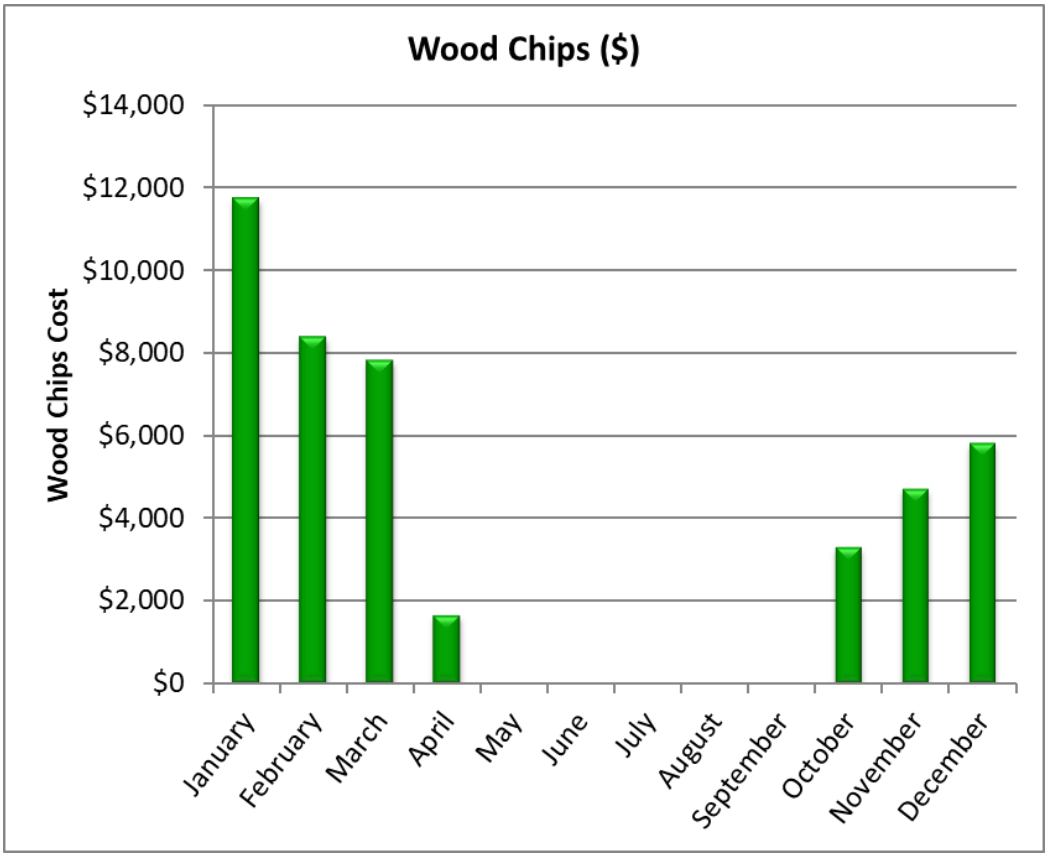
Cousineau Forest Products provides the wood chips to the facility. The deliveries are made on an as-needed basis and the totals listed below are averaged across months. The storage tank is located in the wood chip plant adjacent to the boiler and has a total rated capacity of roughly 60 tons.

The primary use of the wood chips is for space heating. The consumption pattern for the period under consideration varies seasonally. The seasonal variation in the consumption is primarily attributed to the heating loads.

"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.

Wood Pellet Consumption & Cost Data			
Delivery Month	Delivery (tons)	Unit Cost (per ton)	Total Cost
January	213	$55.00	$11,734.25
February	152	$55.00	$8,380.90
March	142	$55.00	$7,828.15
April	30	$55.00	$1,637.35
May	0	$0.00	$0.00
June	0	$0.00	$0.00
July	0	$0.00	$0.00
August	0	$0.00	$0.00
September	0	$0.00	$0.00
October	60	$55.00	$3,287.90
November	85	$55.00	$4,690.95
December	106	$55.00	$5,814.60
TOTAL/AVERAGE	**789**	**$55.00**	**$43,374.10**


Wood Chips Consumption (Tons)
Wood Chips
HDD
Wood Chips Consumption (Tons)
Degree Days
250
200
150
100
50
0
1,600
1,400
1,200
1,000
800
600
400
200
0
January
February
March
April
May
June
July
August
September
October
November
December


Wood Chips ($)
Wood Chips Cost
$14,000
$12,000
$10,000
$8,000
$6,000
$4,000
$2,000
$0
January
February
March
April
May
June
July
August
September
October
November
December

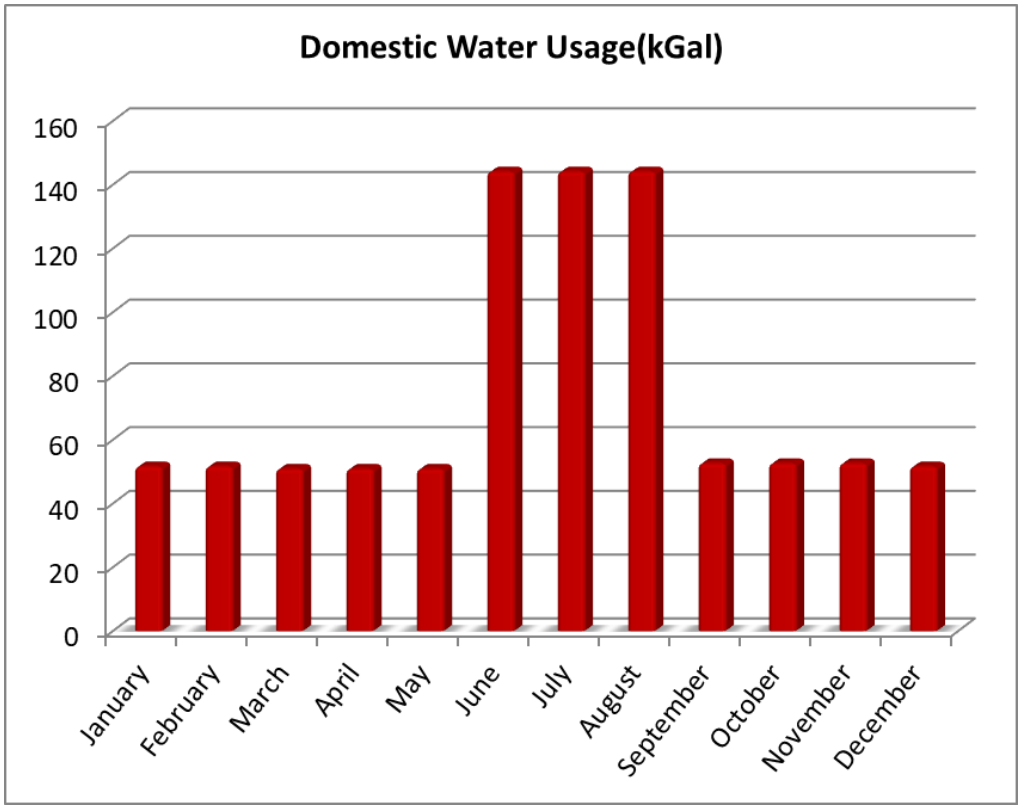
Water and Sewer

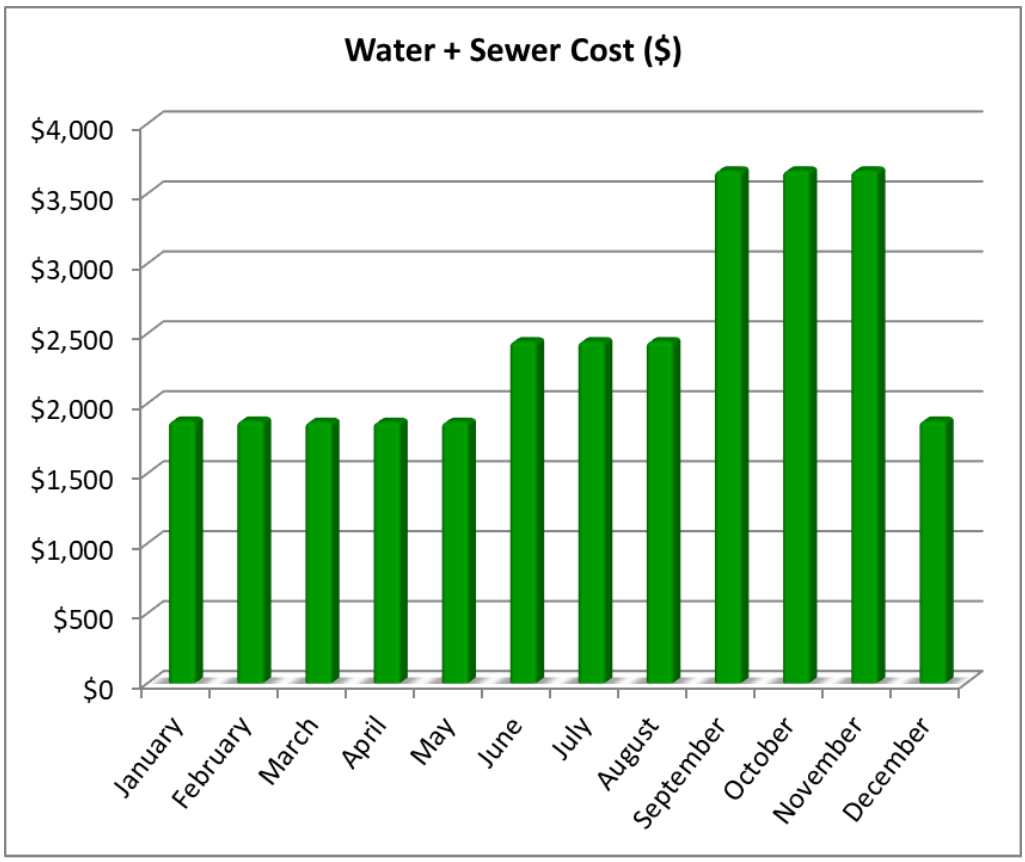
The Town of Hanover satisfies the water and sewer requirements of the facility. The billing for the water and sewer is quarterly.

The water consumption pattern spikes somewhat during the summer months due to irrigation of the playing fields.

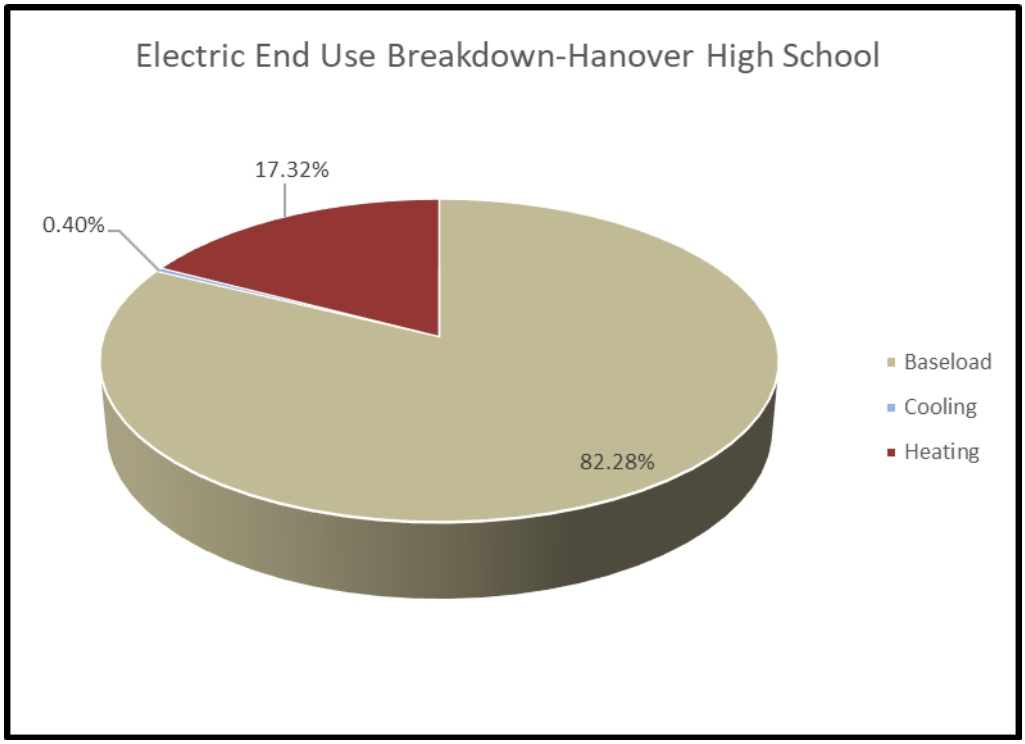
Based on the 2022 water and sewer usage and costs provided, the average blended price paid during the year was $32.89 per kilogallon. The total annual consumption for the 12-month period analyzed is 898 kgal for a total cost of $29,526.

Water & Sewer Consumption & Cost Data			
Billing Month	Consumption (kGal)	Unit Cost (per kGal)	Total Cost
January	52	$36.30	$1,874
February	52	$36.30	$1,874
March	51	$36.67	$1,865
April	51	$36.67	$1,865
May	51	$36.67	$1,865
June	144	$16.94	$2,441
July	144	$16.94	$2,441
August	144	$16.94	$2,441
September	53	$69.61	$3,662
October	53	$69.61	$3,662
November	53	$69.61	$3,662
December	52	$36.30	$1,874
TOTAL/AVERAGE	**898**	**$32.89**	**$29,526**


Domestic Water Usage(kGal)
160
140
120
100
80
60
40
20
0
January
February
March
April
May
June
July
August
September
October
November
December


Water + Sewer Cost ($)
$4,000
$3,500
$3,000
$2,500
$2,000
$1,500
$1,000
$500
$0
January
February
March
April
May
June
July
August
September
October
November
December

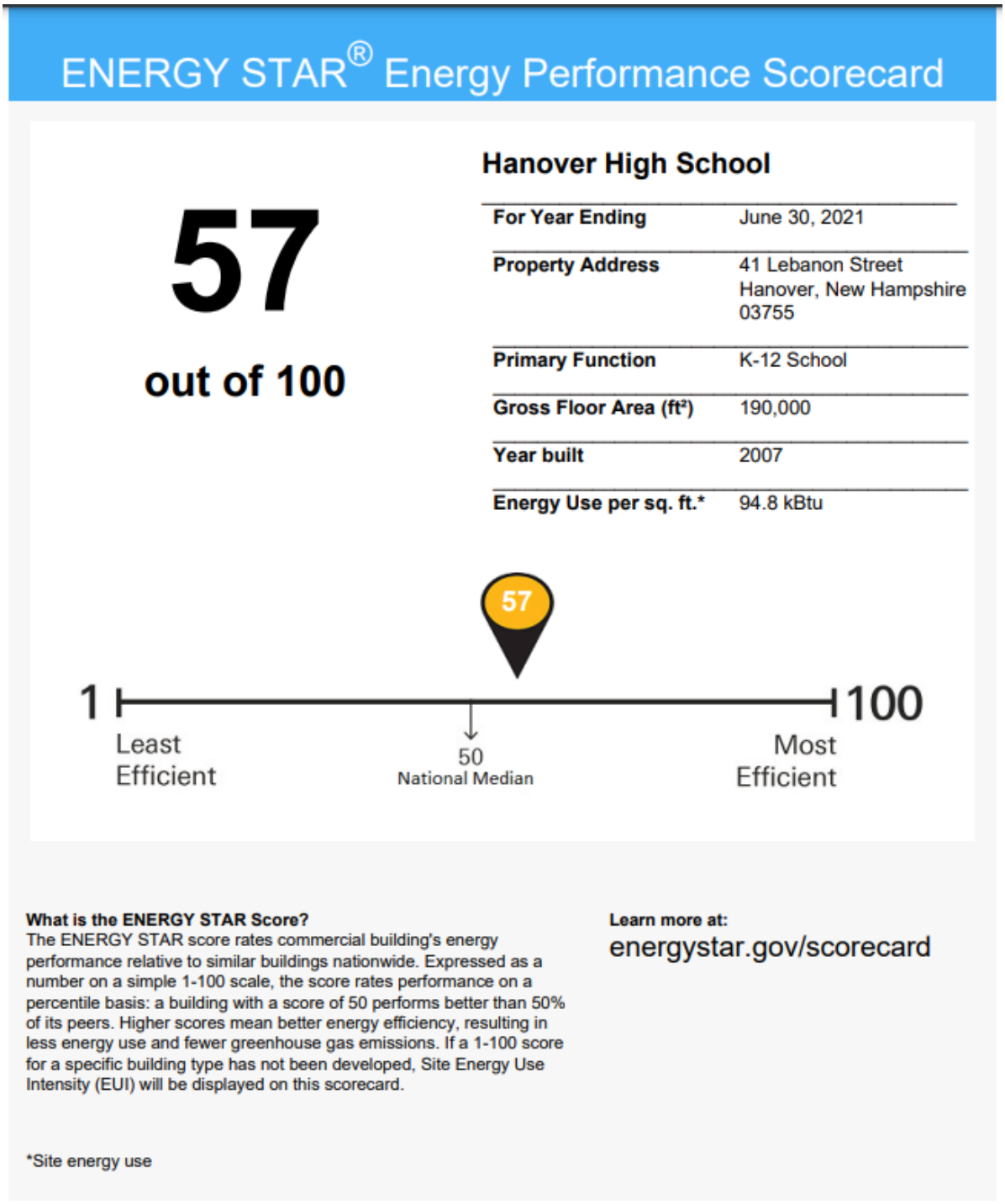
End Use Energy Distribution



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, Hanover High School is performing slightly above the national average level.



ENERGY STAR® Energy Performance Scorecard

57

out of 100

Hanover High School

For Year Ending	June 30, 2021
Property Address	41 Lebanon Street Hanover, New Hampshire 03755
Primary Function	K-12 School
Gross Floor Area (ft²)	190,000
Year built	2007
Energy Use per sq. ft.*	94.8 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: March 10, 2023

9. Energy Conservation Measures

Bureau Veritas has conducted an Energy Audit on Hanover High 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 1 Energy Conservation Measure (ECM) 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	$76,868 (In Current Dollars)
Estimated Annual Cost Savings Related to ECMs	$43,187 (In Current Dollars)
Net Effective ECM Payback	1.78 Years
Estimated Annual Energy Savings	14.9%
Estimated Annual Utility Cost Savings *(excluding water)*	18.0%
Estimated Annual Water Cost Savings	18.5%

Solar Rooftop Photovoltaic Analysis	
Estimated number of panels	1,812
Estimated kW Rating	570.70 kW
Potential Annual kWh Produced	700,315 kW
% of Current Electricity Load	87.4%
Investment Cost	$3,189,287
Estimated Energy Cost Savings	$106,979
Payback without Incentives	29.81 Years
Payback with All Incentives	22.06 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)	3,148.74 kBTU/SF
Post ECM Site Energy Use Intensity (EUI)	3,145 kBTU/SF
Source Energy Use Intensity (EUI)	
Current Source Energy Use Intensity (EUI)	7,917 kBTU/SF
Post ECM Source Energy Use Intensity (EUI)	7,903 kBTU/SF
Building Cost Intensity (BCI)	
Current Building Cost Intensity	$110.23/SF
Post ECM Building Cost Intensity	$90.58/SF
Greenhouse Gas Emissions Reduction *(from recommended ECM's)*	
Current Annual CO2e Emissions from Building Operation	372.4 MtCO2e/Yr (not incl. wood chips)
Total Annual CO2 Emissions Reduced	53.5 MtCO2e/Yr
Estimated Annual Thermal Energy Reduction	771.3 MMBTU
Total Cars off the Road (Equivalent)*	12
Total Acres of Pine Trees Planted (Equivalent)*	12

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 Energy Conservation Measure (ECM) for this property.

List of Recommended Energy Conservation Measures For Hanover High School

		Description of ECM	Location	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)	Electricity	Water									
				($)	($)	($)	(kWh)	(kGal)	(Mmbtu)	($MtCO_2$/Yr)	($)	($)	($)	(Yrs.)		($)	(Yrs.)
1	Title:	Replace Existing Linear Fluorescent Lamps	Location: Throughout School	$40,797	$0	$40,797	237,146	0	809	56.11	$36,226	$2,482	$38,708	1.05	11.33	$421,296	15.00
	Attribute:	Replace 606x F44T8 with F44LED; Replace 358x F42T8 with F42LED; Replace 49x F43T8 with F43LED; Replace 10x F41T8 with F41LED; Replace 60x F43T5-HO with F43T5LED-HO; Replace 297x F42T5 with F42T5LED															
2	Title:	Replace High Intensity Discharge Lamps With LED	Location: Site	$6,205	$0	$6,205	14,016	0	48	3.32	$2,141	$1,058	$3,199	1.94	6.15	$31,980	15.00
	Attribute:	Replace 12x ShoeBox Parking Lights-400W with 150Watt LED; Replace 1x Flood Lights:-250W with 50Watt LED															
3	Title:	Install Low Flow Tankless Restroom Fixtures	Location:	$19,839	$0	$19,839	0	185	0	0.00	$0	$0	$6,079	3.26	3.66	$52,730	15.00
	Attribute:	Replace 19x; 1GPF urinals with 0.125 GPF -Wall Mount urinal and															
Totals for No/Low Cost Items				**$0**	**$0**	**$0**	**0**	**0**	**0**	**0.00**	**$0**	**$0**	**$0**	**0.00**			
Total For Capital Cost				**$66,841**	**$0**	**$66,841**	**251,162**	**2**	**185**	**59.43**	**$38,367**	**$3,540**	**$47,985**	**1.39**			
		Interactive Savings Discount @ 10%					-25,116	0	-18	-5.94	-$3,837	-$354	-$4,799				
		Total Contingency Expenses @ 15%		$10,026		$10,026											
Total for Improvements				**$76,868**	**$0**	**$76,868**	**226,045**	**1**	**166**	**53.48**	**$34,530**	**$3,186**	**$43,187**	**1.78**			

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 school’s main heating is provided by the wood chip boiler serving a hydronic system. Three oil boilers provide backup heating as well as providing domestic hot water. Additional fossil-fueled equipment consists of a propane-fired range. Propane is also used in some classrooms and labs; at this time Bureau Veritas has no recommendation for a viable substitute for gas jets in science classrooms. Bureau Veritas proposes the electrification replacements be scheduled so that the equipment with the longer remaining useful life is changed out last.

The U.S. EPA has determined that wood is a carbon-neutral fuel, therefore this analysis recommends retaining the wood chip boiler and replacing it with the same at the end of its useful life. (https://www.epa.gov/sites/default/files/2018-04/documents/biomass_policy_statement_2018_04_23.pdf)

Fossil Fuel Burning Systems

	Asset Description	Input Capacity (MBH)	Quantity	EUL	RUL	Fuel
1	Boiler, 4835 MBH	4835	1	30	15	Natural Gas
2	Boiler, 4835 MBH	4835	1	30	15	Natural Gas
3	Boiler, 4835 MBH	4835	1	30	15	Natural Gas
4	Range, 260 MBH	260	1	30	8	Propane

Net-Zero Project Schedule																					
						0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
	Action	Attributes	Cost/Unit	Quantity	Initial Investment	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	Total
1	Implement All Non- Renewable Measures	Package	$76,868		$76,868		$76,868															$76,868
2	Install Solar PV System	571 kW	$3,189,287	1	$3,189,287				$637,857		$637,857		$637,857		$637,857		$637,857					$3,189,287
3	Install New Electrical Service/Switchboard	460V, 600A	$51,210	1	$51,210															$51,210		$51,210
4	Replace propane kitchen range with electric model	6-burner	$10,500	1	$10,500									$10,500								$10,500
5	Install Heat Pump Boilers	1,386 MBH	$462,000	1	$462,000																$462,000	$462,000
6	Decommission Oil Boilers	4,835 MBH	$12,500	3	$12,500																$12,500	$12,500
7	Remove Fuel Storage Tank 1	10,000 GAL	$15,000	1	$15,000																$15,000	$15,000
8	Removen Fuel Storage Tank 2	1,000 GAL	$1,000	1	$1,000																$1,000	$1,000
	Totals				**$3,818,365**	$0	$76,868	$0	$637,857	$0	$637,857	$0	$637,857	$10,500	$637,857	$0	$637,857	$0	$0	$51,210	$490,500	$3,818,365
	Escalated at 3% Inflation					$0	$78,483	$0	$664,944	$0	$673,082	$0	$678,916	$11,215	$683,477	$0	$687,225	$0	$0	$55,544	$533,043	$4,065,931

Analysis

1. Implement Energy Conservation Measures identified in this report.
2. Install photovoltaic energy systems.
3. Install additional electrical service to accommodate added electrical load from new heat pump boilers.
4. Replace propane kitchen range with electric range at the end of its useful life.
5. Remove oil boilers and install heat pump boilers.
6. Remove unneeded oil storage tanks.

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?	To be determined
Is the property located in a state eligible for net metering?	Yes

A solar feasibility analysis of the site has resulted in the building containing a more than sufficient amount of roof area for solar electricity generation. The analysis through the use of National Renewable Energy Laboratory's solar photovoltaic software assisted in calculating the potential electricity generated from the allocated land and roof area set for solar photovoltaic installment. The allocated roof area was determined by looking at the roof and surrounding areas at a bird's eye view. Also detailed in the report are incentives and rebates that can potentially bring down the installation cost of the ECMs and result in a higher return on investment and quicker payback period.

The approach taken in the solar photovoltaic (PV) roof analysis begins with surveying the roof and determining areas on the roof where solar PV panels can potentially be installed.

1) Conducting a preliminary sizing of solar PV panels on the roofs and on the ground and its potential electricity production for its first year of installment using the National Renewable Energy Laboratory (NREL) PV WATTS Software.
2) Calculate energy and cost savings for the site as a sole proprietor of the system capable of collecting state, local, and federal tax credits and incentives and interconnecting and selling the renewable energy electrical production to the building.

Bureau Veritas has done a preliminary study on the rooftop solar photovoltaic application at the site.

Solar Rooftop Photovoltaic Analysis	
Estimated number of panels	1,812
Estimated kW Rating	570.70 kW
Potential Annual kWh Produced	700,315 kW
Percent of Current Electricity Load	87.4%
Investment Cost	$3,189,287
Estimated Energy Cost Savings	$106,979
Payback without Incentives	29.81 Years
Payback with All Incentives	22.06 Years

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. Modules of cells 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 connect to existing AC infrastructure to power lights, motors, and other loads.

12. Net Zero Gap Analysis

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

Net Zero Energy Analysis					
		Propane	No. 2 Oil	Electric	MMBTU
--		(Therms / Gal)	(Gal)	(kWh)	(MMBtu)
(a)	Existing Net Annual Energy Consumption	1,391	9,909	801,314	5,175
(b)	Projected First Year, Annual Energy Savings from Non-Renewable Energy Measures	0	0	226,045	771
(c) = (a)-(b)	Projected Annual Consumption Post Non-Renewable Energy Measures	**1,391**	**9,909**	**575,269**	**4,404**
(d)	Projected Energy Consumption Post Electrification and Fossil Fuel Conversion	--		721,779	2,463
(e)	Projected First Year, Annual Energy Savings from Renewable Energy Measures			700,315	2389.47
(f) = (d)-(e)	Projected Energy Consumption Post Renewable + Non-Renewable Energy Implementation + Electrification			21,464	73

Net Zero Financial Analysis	
Total Projected Initial Investment for Recommended Non-Renewable Measures	$76,868 (in current dollars)
Total Projected Initial Investment for Electrification	$552,210
Total Projected Initial Investment for Recommended Renewable Measures	$3,189,287
Total project initial investment	$3,818,365

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

✗	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 Hanover High School, 41 Lebanon Street, 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 1

2 - FRONT ELEVATION 2

3 - LEFT ELEVATION

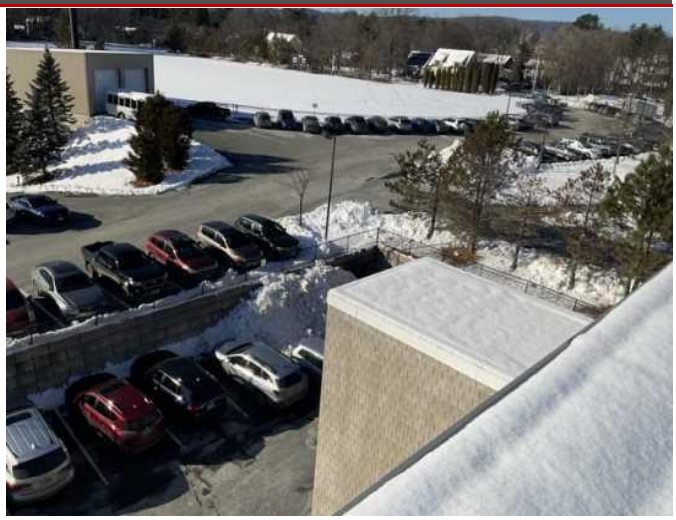
4 - REAR ELEVATION 1

5 - REAR ELEVATION 2

6 - RIGHT ELEVATION

Photographic Overview

7 - WOOD CHIP PLANT



8 - PRIMARY PARKING AREA

9 - ADDITIONAL PARKING

10 - DRIVE AISLE

11 - FOOTBALL FIELD

12 - LANDSCAPING OVERVIEW

Photographic Overview

13 - POLE LIGHT

14 - OVERVIEW OF ROOFS

15 - OVERVIEW OF ROOFS

16 - OIL-FIRED BOILERS

17 - WOOD CHIP BOILER

18 - WOOD CHIP STORAGE CONTAINER

Photographic Overview

19 - AIR HANDLER

20 - ROOFTOP PACKAGED UNIT

21 - BASEBOARD RADIATOR

22 - FAN COIL UNIT

23 - UNIT VENTILATOR

24 - EXHAUST FANS

Photographic Overview

25 - DUCTLESS SPLIT SYSTEM

26 - DOMESTIC STORAGE TANK

27 - RESTROOM FIXTURES

28 - MAIN ELECTRICAL EQUIPMENT

29 - EMERGENCY GENERATOR

30 - AUTOMATIC TRANSFER SWITCHES

Photographic Overview

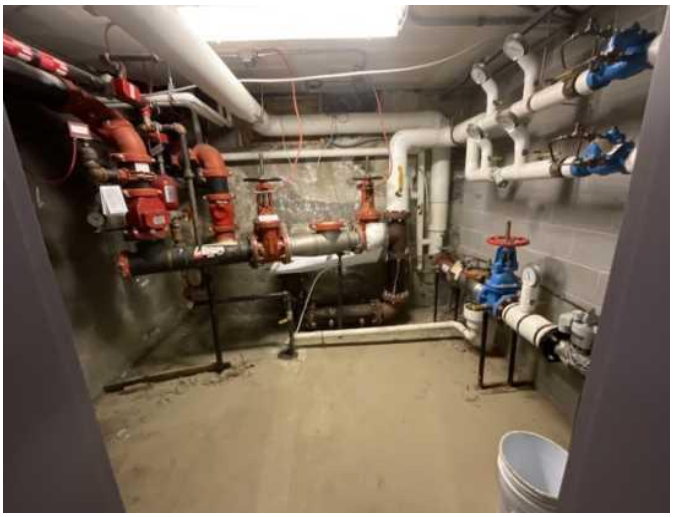
31 - INTERIOR LIGHTING SYSTEM

32 - EXTERIOR LIGHT FIXTURE

33 - FIRE ALARM PANEL

34 - FIRE ALARM SYSTEM

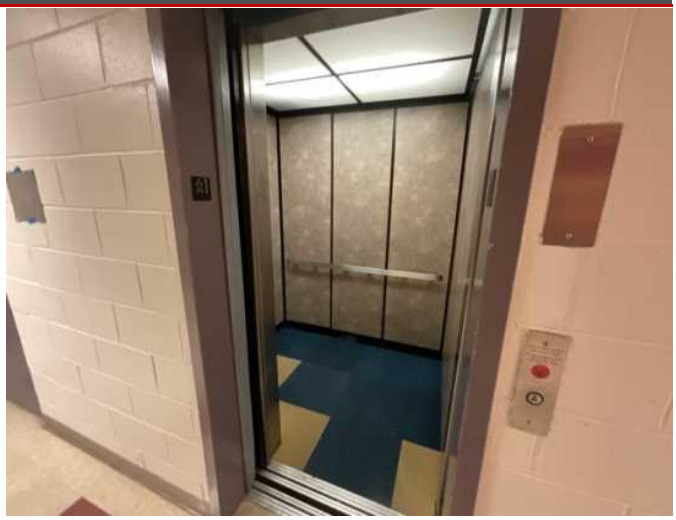
35 - SECURITY/SURVEILLANCE SYSTEM



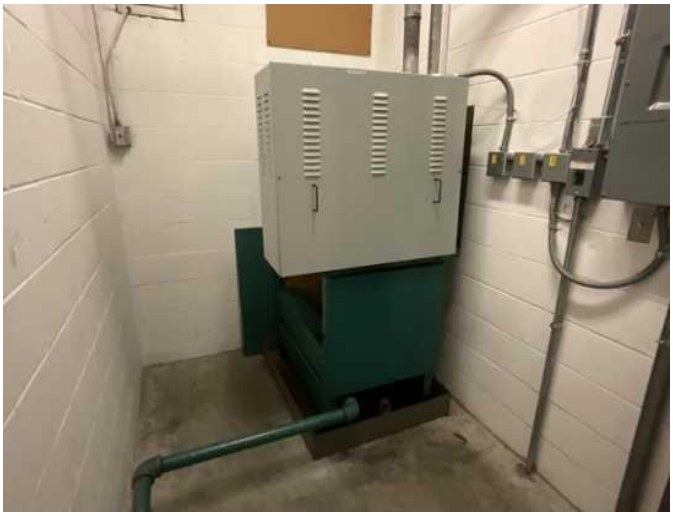
36 - FIRE SUPPRESSION SYSTEM

Photographic Overview

37 - SPRINKLER HEAD

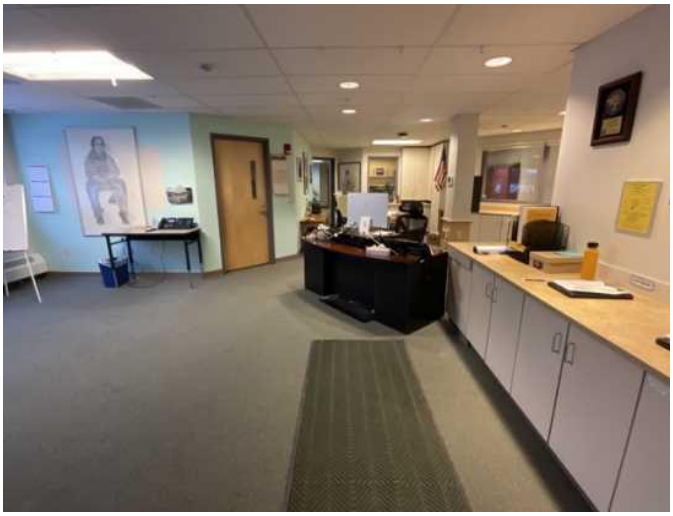


38 - ELEVATOR



39 - ELEVATOR MACHINERY

40 - LOBBY

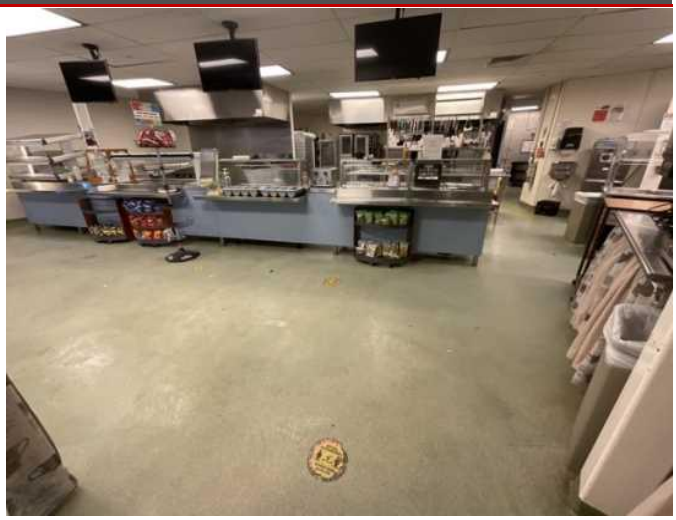


41 - MAIN OFFICE

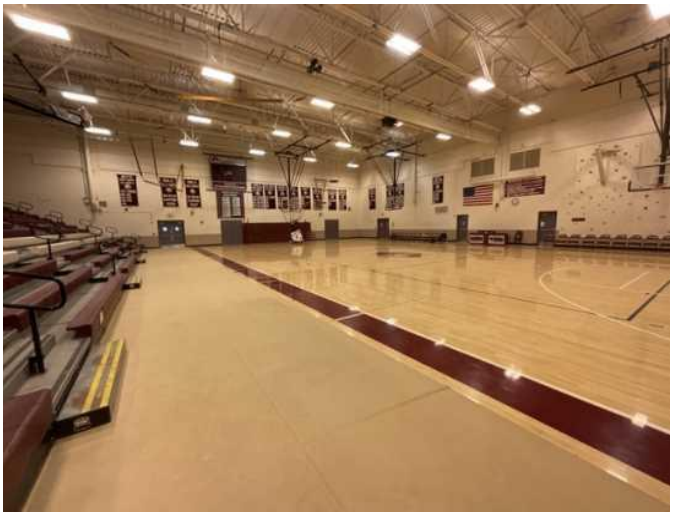
42 - HALLWAY

Photographic Overview

43 - CAFETERIA



44 - KITCHEN



45 - GYMNASIUM

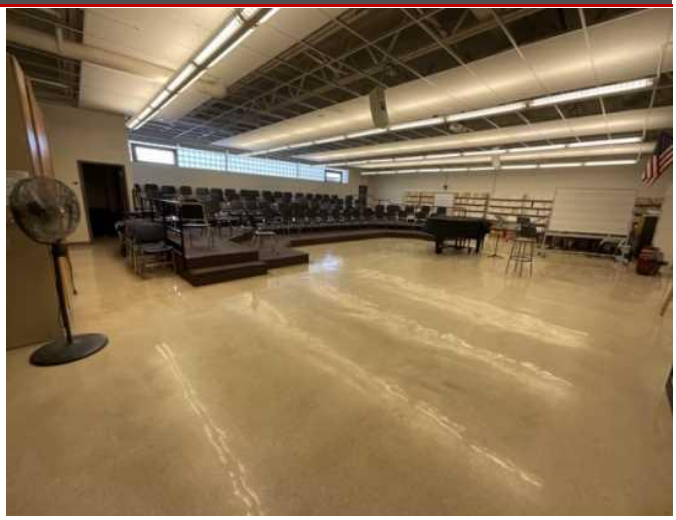
46 - AUDITORIUM

47 - LIBRARY

48 - GUIDANCE OFFICE

Photographic Overview

49 - FAB LAB



50 - CHORUS ROOM

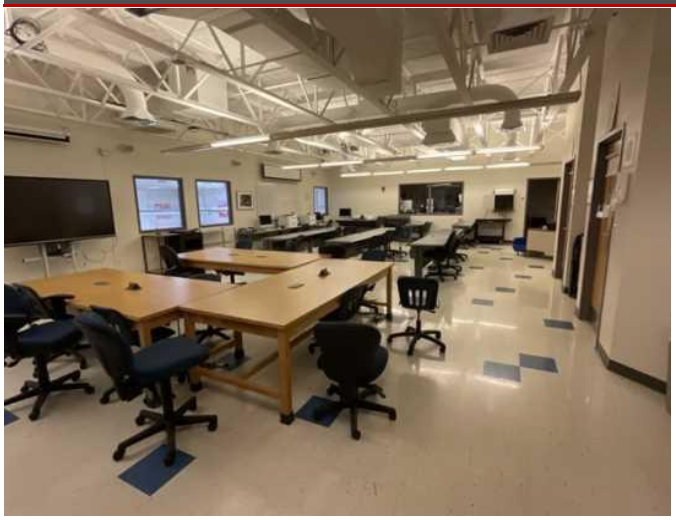
51 - MEETING ROOM

52 - CLASSROOM

53 - CLASSROOM

54 - ART ROOM

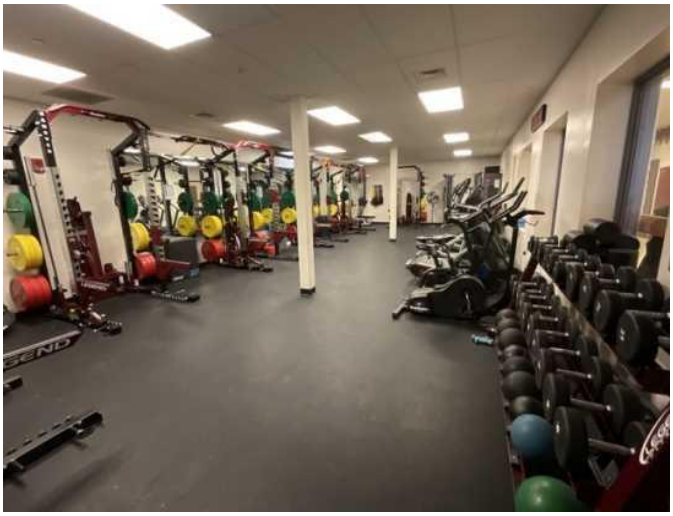
Photographic Overview



55 - STEM LAB

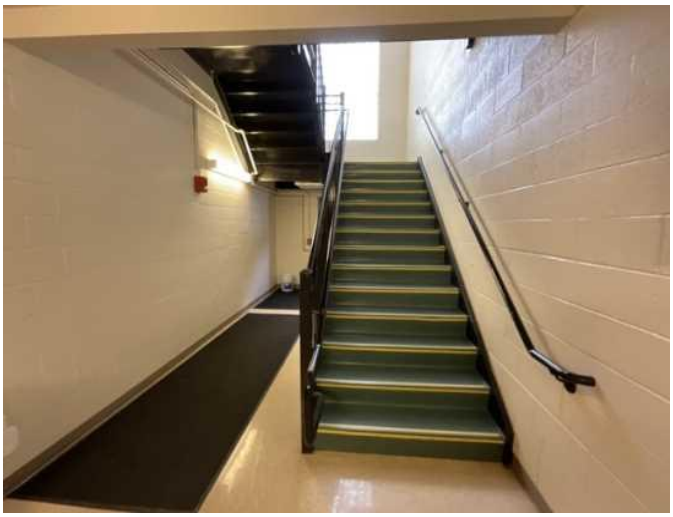
56 - DIGITAL ARTS LAB

57 - SCIENCE CLASSROOM



58 - WEIGHT ROOM

59 - RESTROOM



60 - STAIRWELL

Appendix B:
Site and Floor Plans

Site Plan

Project Number	Project Name
158531.22R000-004.379	Hanover High School School Administrative Unit 70
Source	**On-Site Date**
Google	December 21-23, 2022

BUREAU VERITAS

OCCUPANT LOAD	EXIT CAPACITY
BUILDING 1 GROUND FLOOR – 76 FIRST FLOOR – 890 SECOND FLOOR – 938 THIRD FLOOR – 340 TOTAL = 2244	BUILDING 1 GROUND FLOOR – DOORS 102"/.2 = 510 FIRST FLOOR – DOORS 502"/.2 = 2510 SECOND FLOOR – DOORS 102"/.2 = 510; STAIRS 226"/.3 = 753; TOTAL = 1263 THIRD FLOOR – STAIRS 120/.3 = 400
BUILDING 2 GROUND FLOOR – 5 FIRST FLOOR – 357 SECOND FLOOR – 189 TOTAL = 551	BUILDING 2 GROUND FLOOR – DOORS 56"/.2 = 280; STAIRS 47"/.3 = 157; TOTAL = 437 FIRST FLOOR – DOORS 340"/.2 = 1700 SECOND FLOOR – DOORS 102"/.2 = 510
BUILDING 3 GROUND FLOOR – 6 FIRST FLOOR – 263 SECOND FLOOR – 8 TOTAL = 277	BUILDING 3 GROUND FLOOR – DOORS 40"/.2 = 200; STAIRS 62"/.3 = 207; TOTAL = 407 FIRST FLOOR – DOORS 358"/.2 = 1790 SECOND FLOOR – STAIRS 42"/.3 = 140
BUILDING 4 GROUND FLOOR – 0 FIRST FLOOR – 1900 SECOND FLOOR – 0 TOTAL = 1900	BUILDING 4 GROUND FLOOR – 0 FIRST FLOOR – DOORS 408"/.2 = 2040 SECOND FLOOR – 0
BUILDING 5 GROUND FLOOR – 114 FIRST FLOOR – 468 SECOND FLOOR – 227 TOTAL = 809	BUILDING 5 GROUND FLOOR – DOORS 170"/.2 = 850 FIRST FLOOR – DOORS 294"/.2 = 1470 SECOND FLOOR – DOORS 68/.2 = 340; STAIRS 48"/.3 = 160; TOTAL = 500
MAXIMUM TRAVEL DISTANCE TO EXIT: 200' (E), 250' (A), SPRINKLER PROTECTED	

WOODCHIP BOILER PLANT – REFER TO DRAWING AS.07

CODE DATA

APPLICABLE CODES:

INTERNATIONAL BUILDING CODE – 2000 EDITION
BOCA NATIONAL BUILDING CODE – 1999 EDITION
NFPA 101 LIFE SAFETY CODE – 2003 EDITION

USE GROUP CLASSIFICATIONS:

BUILDING 1: E – EDUCATIONAL (CLASSROOMS)
B – BUSINESS (ADMINISTRATIVE OFFICES)

BUILDING 2: A2 – ASSEMBLY (CAFETERIA)
A3 – ASSEMBLY (MEDIA)
E – EDUCATIONAL (CLASSROOMS)

BUILDING 3: E – EDUCATIONAL (CLASSROOMS)
B – BUSINESS (ADMINISTRATIVE OFFICES)

BUILDING 4: A3 – ASSEMBLY (GYMNASIUM)
E – EDUCATIONAL

BUILDING 5: A1 – THEATER
E – EDUCATIONAL
F1 – FACTORY (SHOP AREAS)

CONSTRUCTION TYPES:

BUILDING 1: 3B NONCOMBUSTIBLE/COMBUSTIBLE, UNPROTECTED

BUILDING 2: 5B COMBUSTIBLE, UNPROTECTED

BUILDING 3: 3B NONCOMBUSTIBLE/COMBUSTIBLE, UNPROTECTED

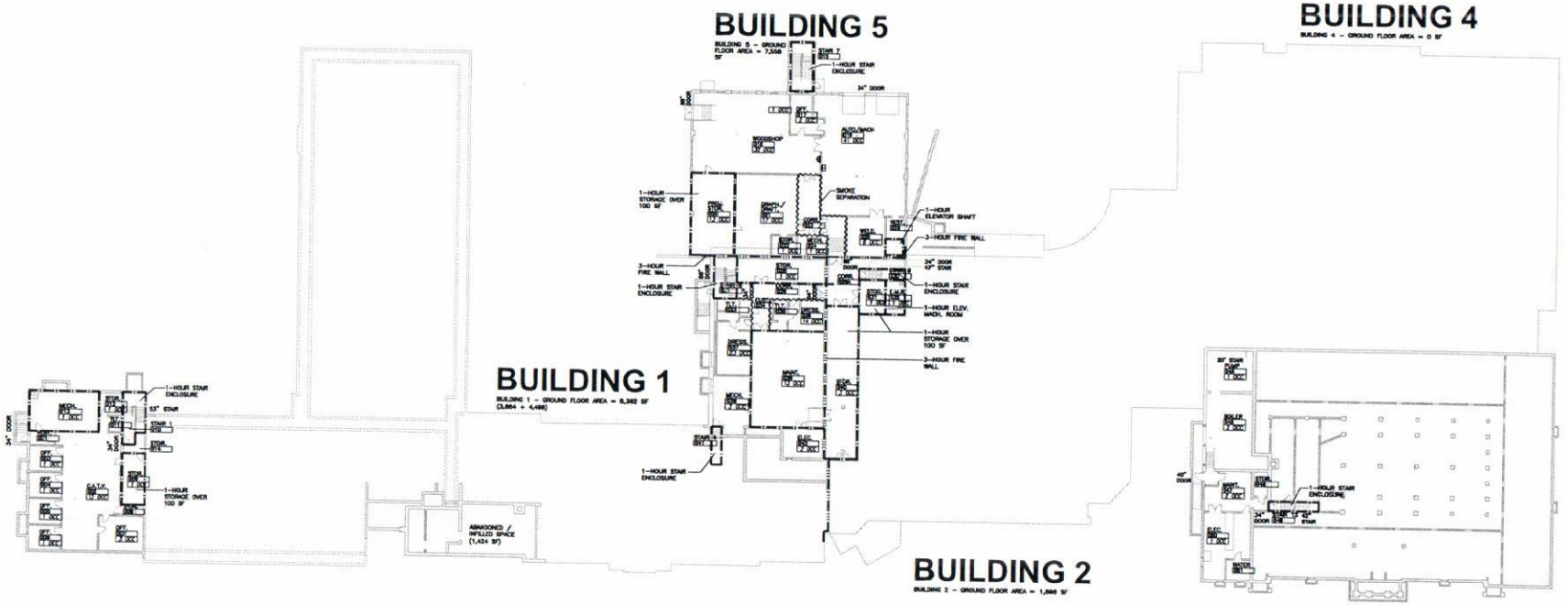
BUILDING 4: 2C (BOCA) 2B (IBC) NONCOMBUSTIBLE, UNPROTECTED

BUILDING 5: 3B NONCOMBUSTIBLE/COMBUSTIBLE, UNPROTECTED

FULL AUTOMATIC SPRINKLER SYSTEM

BUILDING AREAS

	BLDG 1	BLDG 2	BLDG 3	BLDG 4	BLDG 5	GROSS
GROUND FLOOR	8,362	1,898	2,777	0	7,558	20,595
FIRST FLOOR	39,322	19,836	18,077	20,486	7,569	105,290
SECOND FLOOR	39,409	7,772	1,986	0	3,221	52,388
THIRD FLOOR	12,373	0	0	0	0	12,373
TOTAL	99,466	29,506	22,840	20,486	18,348	190,646



0.0 OVERALL GROUND FLOOR PLAN
SCALE: 1" = 24'-0" (1:288)

WALL RATING KEY
3 HOUR RATED
2 HOUR RATED
1 HOUR RATED
SMOKE SEPARATION

NORTH

BANWELL ARCHITECTS
THE CARRIAGE HOUSE
81 MECHANIC STREET
LEBANON, NH 03766
P.O. BOX 630
MONTPELIER, VT 05602
TEL: (603) 448-3388 FAX: (603) 448-3778
TEL: (802) 223-8882 FAX: (802) 223-8883
e-mail address: staff@banwell-architects.com

PROJECT LOCATION:
LEBANON STREET
HANOVER, NH

PROJECT:
HANOVER HIGH SCHOOL
DRESDEN SCHOOL
DISTRICT

DRAWING TITLE:
OVERALL GROUND FLOOR PLAN

REVISION	DATE
1	05/02/05
2	05/13/05

PROJECT NO: 426 H

DATE: 04.15.2005

A1.01

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WOODCHIP BOILER PLANT – REFER TO DRAWING A5.07

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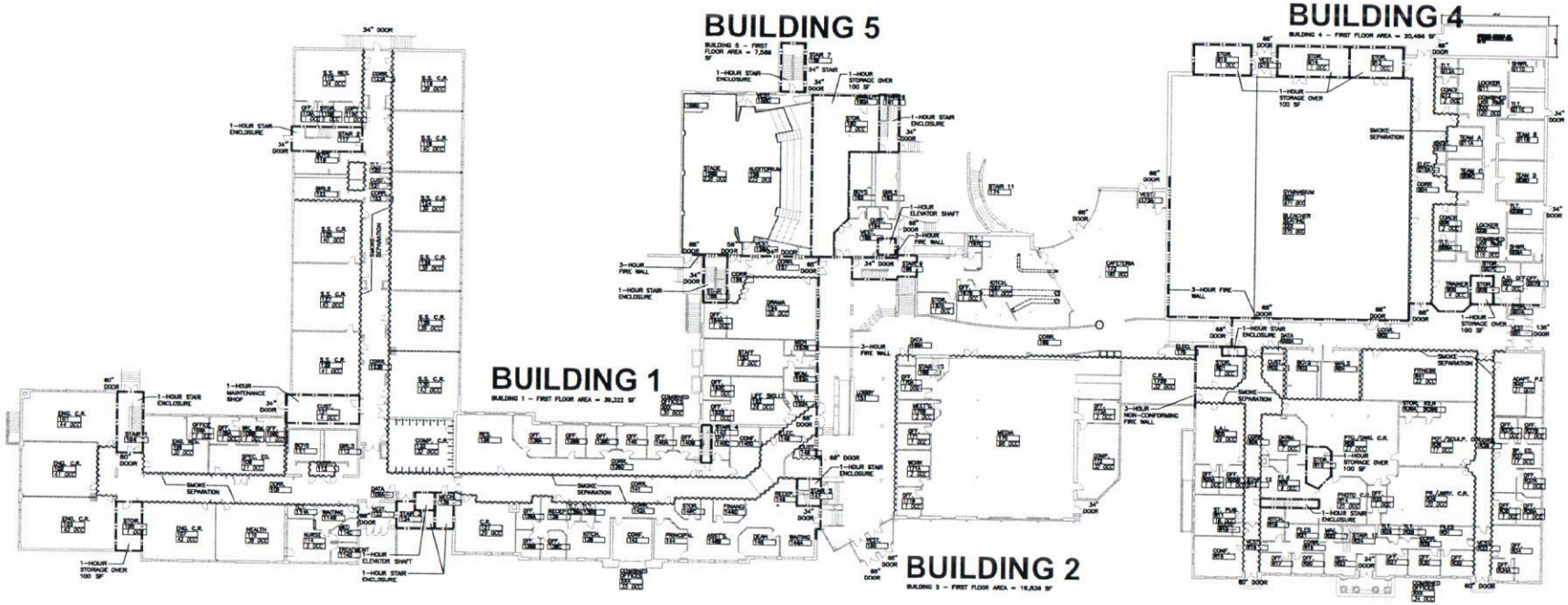
THIRD FLOOR	12,373	0	0	0	0	12,373
TOTAL	99,466	29,506	22,840	20,486	18,348	190,646



1.0 OVERALL FIRST FLOOR PLAN
SCALE: 1" = 24'-0" (1:288)

WALL RATING KEY
- 3 HOUR RATED
- 2 HOUR RATED
- 1 HOUR RATED
- SMOKE SEPARATION

BANWELL ARCHITECTS

THE CARRIAGE HOUSE
6 SOUTH PARK STREET
LEBANON, NH 03766
(603) 448-3223
FAX (603) 448-3227

P.O. BOX 830
18 STATE STREET
MONTPELIER, VT 05602
(802) 223-2851
FAX (802) 223-2852
e-mail address: staff@banwell-architects.com

PROJECT LOCATION:
LEBANON STREET
HANOVER, NH

PROJECT:
HANOVER HIGH SCHOOL
DRESDEN SCHOOL
DISTRICT

DRAWING TITLE:
OVERALL FIRST FLOOR PLAN

REVISION	DATE
2	05/03/05
1	09/13/05

PROJECT NO: 426 H
DATE: 04.15.2005

A1.02

OCCUPANT LOAD	EXIT CAPACITY
BUILDING 1 GROUND FLOOR – 76 FIRST FLOOR – 890 SECOND FLOOR – 938 THIRD FLOOR – 340 TOTAL = 2244	BUILDING 1 GROUND FLOOR – DOORS 102"/.2 = 510 FIRST FLOOR – DOORS 502"/.2 = 2510 SECOND FLOOR – DOORS 102"/.2 = 510; STAIRS 226"/.3 = 753; TOTAL = 1263 THIRD FLOOR – STAIRS 120/.3 = 400
BUILDING 2 GROUND FLOOR – 5 FIRST FLOOR – 357 SECOND FLOOR – 189 TOTAL = 551	BUILDING 2 GROUND FLOOR – DOORS 56"/.2 = 280; STAIRS 47"/.3 = 157; TOTAL = 437 FIRST FLOOR – DOORS 340"/.2 = 1700 SECOND FLOOR – DOORS 102"/.2 = 510
BUILDING 3 GROUND FLOOR – 6 FIRST FLOOR – 263 SECOND FLOOR – 8 TOTAL = 277	BUILDING 3 GROUND FLOOR – DOORS 40"/.2 = 200; STAIRS 62"/.3 = 207; TOTAL = 407 FIRST FLOOR – DOORS 358"/.2 = 1790 SECOND FLOOR – STAIRS 42"/.3 = 140
BUILDING 4 GROUND FLOOR – 0 FIRST FLOOR – 1900 SECOND FLOOR – 0 TOTAL = 1900	BUILDING 4 GROUND FLOOR – 0 FIRST FLOOR – DOORS 408"/.2 = 2040 SECOND FLOOR – 0
BUILDING 5 GROUND FLOOR – 114 FIRST FLOOR – 468 SECOND FLOOR – 227 TOTAL = 809	BUILDING 5 GROUND FLOOR – DOORS 170"/.2 = 850 FIRST FLOOR – DOORS 294"/.2 = 1470 SECOND FLOOR – DOORS 68/.2 = 340; STAIRS 48"/.3 = 160; TOTAL = 500
MAXIMUM TRAVEL DISTANCE TO EXIT: 200' (E), 250' (A), SPRINKLER PROTECTED	

WOODCHIP BOILER PLANT – REFER TO DRAWING A5.07

CODE DATA

APPLICABLE CODES:

INTERNATIONAL BUILDING CODE – 2000 EDITION
BOCA NATIONAL BUILDING CODE – 1999 EDITION
NFPA 101 LIFE SAFETY CODE – 2003 EDITION

USE GROUP CLASSIFICATIONS:

BUILDING 1: E – EDUCATIONAL (CLASSROOMS)
B – BUSINESS (ADMINISTRATIVE OFFICES)

BUILDING 2: A2 – ASSEMBLY (CAFETERIA)
A3 – ASSEMBLY (MEDIA)
E – EDUCATIONAL (CLASSROOMS)

BUILDING 3: E – EDUCATIONAL (CLASSROOMS)
B – BUSINESS (ADMINISTRATIVE OFFICES)

BUILDING 4: A3 – ASSEMBLY (GYMNASIUM)
E – EDUCATIONAL

BUILDING 5: A1 – THEATER
E – EDUCATIONAL
F1 – FACTORY (SHOP AREAS)

CONSTRUCTION TYPES:

BUILDING 1: 3B NONCOMBUSTIBLE/COMBUSTIBLE, UNPROTECTED

BUILDING 2: 5B COMBUSTIBLE, UNPROTECTED

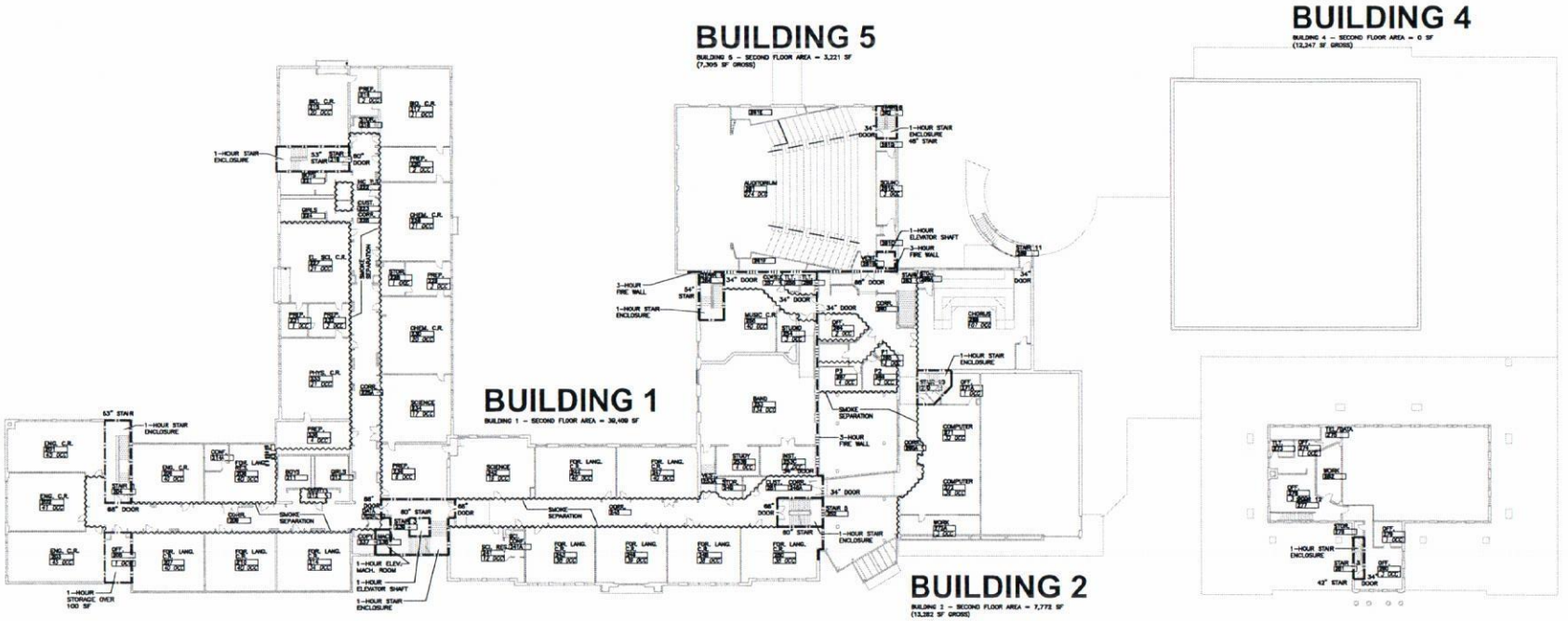
BUILDING 3: 3B NONCOMBUSTIBLE/COMBUSTIBLE, UNPROTECTED

BUILDING 4: 2C (BOCA) 2B (IBC) NONCOMBUSTIBLE, UNPROTECTED

BUILDING 5: 3B NONCOMBUSTIBLE/COMBUSTIBLE, UNPROTECTED

FULL AUTOMATIC SPRINKLER SYSTEM

BUILDING AREAS						
	BLDG 1	BLDG 2	BLDG 3	BLDG 4	BLDG 5	GROSS
GROUND FLOOR	8,362	1,898	2,777	0	7,558	20,595
FIRST FLOOR	39,322	19,836	16,077	20,486	7,569	105,290
SECOND FLOOR	39,409	7,772	1,986	0	3,221	52,388
THIRD FLOOR	12,373	0	0	0	0	12,373
TOTAL	99,466	29,506	22,840	20,486	18,348	190,646



2.0 OVERALL SECOND FLOOR PLAN
SCALE: 1" = 24'-0" (1:288)

WALL RATING KEY
3 HOUR RATED
2 HOUR RATED
1 HOUR RATED
SMOKE SEPARATION

BANWELL ARCHITECTS
THE CARRIAGE HOUSE
6 SOUTH PARK STREET
LEBANON, NH 03766
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P.O. BOX 830
18 STATE STREET
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PHONE (802) 223-2221
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e-mail address: staff@banwell-architects.com

PROJECT LOCATION:
LEBANON STREET
HANOVER, NH

PROJECT:
HANOVER HIGH SCHOOL
DRESDEN SCHOOL
DISTRICT

DRAWING TITLE:
OVERALL SECOND FLOOR PLAN

REVISION	DATE
1	05/03/05
2	05/13/05

PROJECT NO:
426 H

DATE:
04.15.2005

A1.03

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-70 Dresden School District		
Name of Building:	Hanover High School	Building #:	1 - into 5 Building Sections
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?	1924, 1935, 1963, Reno. 1938/39, Reno 2006/07			
No. of Stories?	Floors 3			
Total Site Area?	+/- Acres 28.25			
Total Building Area?	Sq Ft 190,000			
Parking	Open Parking	Enclosed Parking	Partly Enclosed Parking	Is parking Heated?
Parking Area?	+/- 33,450	0 Sqft	0 Sqft	YES / NO
Area Heated (%)	100 %			
Area Cooled (%)	20 % | Cooling Equipment Redundancy? N // N+1 // N+2 // >2N			
Total Conditioned Area (%)	20 %			
Primary Heating System?	Wood Chip Fired Hot Water			
Secondary Heating System?	#2 oil Hot water			
If Oil Used for Heating- Tank Capacity	10,000 Gallons	1 No. of Tanks		
Primary Cooling System & Capacity?	1 Chiller / 13 RTU / 15 splits			
Do Any HVAC Systems Use R-11, R-12 or R-22 Refrigerants?	R-22 / R410A / R410A			

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

Building Occupancy/Schedule		
Facility Occupancy (avg. people ea. day)	800	
After Hours Facility Occupancy (avg. people /day)	15	
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	2:30 AM/PM - 5:00 AM/PM	7:00 AM/PM - 8:20 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	3:30 AM/PM - 5:00 AM/PM	: AM/PM - : AM/PM
Saturday	: AM/PM - : AM/PM	: AM/PM - : AM/PM
Sunday	9:00 AM/PM - 1:00 AM/PM	2:00 AM/PM - 5:00 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	3/28/2022	
2. HVAC Mechanical, Electric, Plumbing?	9/21/2022	Inspection date is only for HVAC mechanical equipment. Elect. Plumb. n/a
3. Life-Safety/Fire?	08/2022	
4. Roofs?	2018	Composite Shingles on Building 3

Key Questions	Response
Major Capital Improvements in Last 3 yrs.	1 artificial Turf Athletic Field / site & drainage repair
Planned Capital Expenditure for Next Year?	
Age of the Roof?	1984 / 1992 / 2003
What bldg. Systems Are Responsibilities of Tenants? (HVAC/Roof/Interior/Exterior/Paving)	N/A

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 + 13	
Air Quality – Annual Frequency of Filter Check	Choose an item. Every 4 months	

Utility Metering		
	Qty	Comments?
# of Elevators	2	Hydraulic/Traction
# of Electric Meters	3	
# of Nat. Gas Meters	n/a	
# of Water Meters	3	
# of Backup Generator	1	Generator Fuel? 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?		

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)?	Yes	

Building Appliances		
	Value	Additional Comments?
Percentage of Energy Star Certified Refrigerators	%	
Percentage of Refrigerators older than 8 years	100 %	10-15 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				aging UST 10,000 gallon installed 1991
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			
	GENERAL SITE					
9	Are there any problems with erosion, storm water drainage or areas of paving that do not drain?		X			One catch basin needs to be rebuilt.

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			
15	Are there any roof leaks?	X				Repaired as needed. No leaks at this time.
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				Our Gymnasium
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				Building Renovation 2007

Energy & FCA Audit
Pre-Survey Questionnaire

26	Have any ADA improvements been made to the property?	X				Building Renovation 2004
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	☒	☐	☐	

Tony Davis
Signature of person Interviewed or completing form

Date 9/29/2022

Appendix D:
Accessibility Review and Photos

Visual Survey - 2010 ADA Standards for Accessible Design

Property Name: Hanover High School

BV Project Number: 158531.22R000-004.379

Facility History & Interview

	Question	Yes	No	Unk	Comments
1	Has an accessibility study been previously performed? If so, when?	X			
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		

Hanover High School: Accessibility Issues

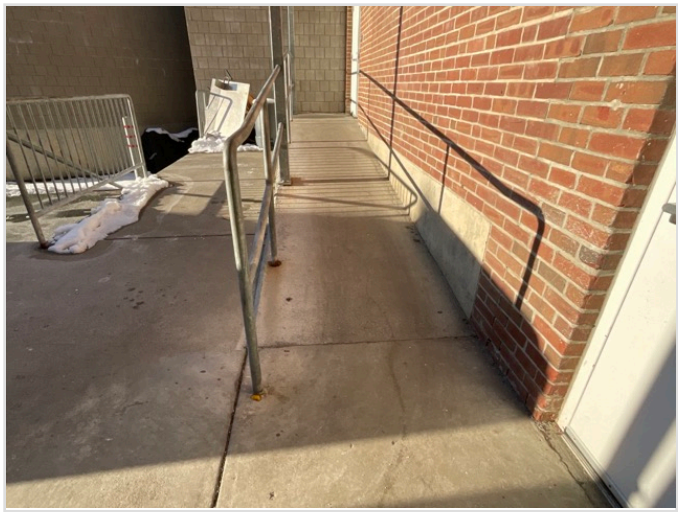
Category	Major Issues (ADA study recommended)	Moderate Issues (ADA study recommended)	Minor Issues	None*
Parking				
Exterior Accessible Route				
Building Entrances				
Interior Accessible Route				
Elevators				
Public Restrooms				
Kitchens/Kitchenettes	**NA**			
Playgrounds & Swimming Pools	**NA**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

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

Hanover High School: Photographic Overview

OVERVIEW OF ACCESSIBLE PARKING AREA

CLOSE-UP OF STALL



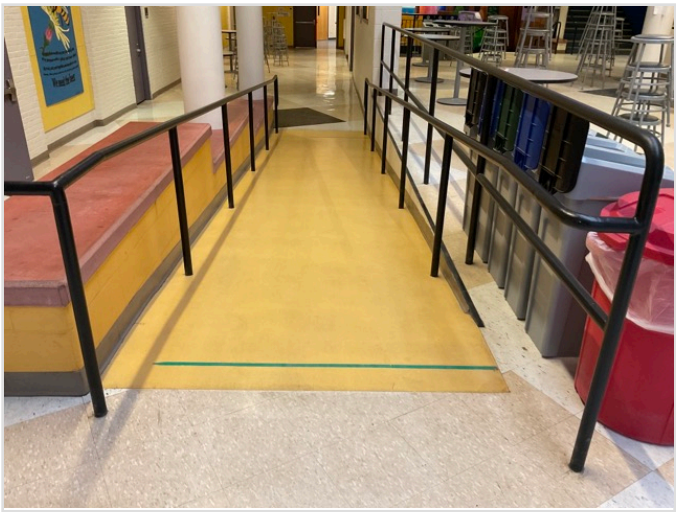
ACCESSIBLE RAMP

ACCESSIBLE PATH

MAIN ENTRANCE

ADDITIONAL ENTRANCE

Hanover High School: Photographic Overview



ACCESSIBLE INTERIOR RAMP

ACCESSIBLE INTERIOR PATH

LOBBY LOOKING AT CABS

IN-CAB CONTROLS

TOILET STALL OVERVIEW

SINK, FAUCET HANDLES AND ACCESSORIES

Appendix E:
Component Condition Report

Component Condition Report | Hanover High School

UF L3 Code	Location	Condition	Asset/Component/Repair	Quantity	RUL	ID
Structure						
B1080	Stairwells	Good	Stair Treads, Raised Rubber Tile	3,600 SF	13	4728438
B1080	Stairwells	Good	Stair/Ramp Rails, Metal, Refinish	9,800 LF	8	4728382
Facade						
B2010	Building Exterior	Fair	Exterior Walls, any painted surface, Prep & Paint	6,800 SF	6	4728428
B2010	Building exterior	Fair	Exterior Walls, Insulated Finishing System (EIFS)	5,400 SF	15	4803690
B2020	Building Exterior	Fair	Window, Aluminum Double-Glazed, 16-25 SF	44	15	4728269
B2020	Building Exterior	Fair	Storefront, Glazing & Framing	750 SF	15	4728223
B2020	Cafeteria	Good	Screens & Shutters, Rolling Security Shutter, 55 to 100 SF	1	18	4728259
B2020	Building Exterior	Fair	Window, Aluminum Double-Glazed, 28-40 SF	3	15	4728424
B2020	Building Exterior	Fair	Storefront, Glazing & Framing	2,650 SF	15	4728457
B2020	Building Exterior	Fair	Window, Aluminum Double-Glazed, 16-25 SF	186	15	4728407
B2050	Throughout building	Fair	Automatic Door Opener, Accessibility, Pedestal or Wall-Mounted	18	8	4728396
B2050	Building Exterior	Fair	Overhead Door, Residential Garage, 7'x8' (56 SF)	2	15	4728268
B2050	Building Exterior	Fair	Exterior Door, Aluminum-Framed & Glazed, Standard Swing	14	15	4728350
B2050	Building Exterior	Fair	Exterior Door, Steel, Standard	11	25	4728367
B2050	Wood Chip Plant	Fair	Overhead/Dock Door, Aluminum, 12'x12' (144 SF)	2	15	4728452
Roofing						
B3010	Roof	Fair	Roofing, Metal	2,800 SF	25	4728475
B3010	Roof	Fair	Roofing, Single-Ply Membrane, EPDM	37,500 SF	5	4728214
B3010	Roof	Poor	Roofing, Single-Ply Membrane, TPO/PVC	33,400 SF	2	4728420
B3010		Poor	Roofing, Single-Ply Membrane, TPO/PVC	34,500 SF	2	4744001
B3010	Roof	Fair	Roofing, Asphalt Shingle, 20-Year Standard	8,200 SF	5	4728430
B3060	Roof	Fair	Roof Skylight, per SF of glazing	380 SF	15	4728338
B3060	Roof	Fair	Roof Skylight, per unit, up to 20 SF	12	15	4728307
Interiors						
C1020	Throughout building	Fair	Interior Window, Fixed, 6 SF	58	25	4728321
C1030	Throughout building	Fair	Door Hardware, School, per Door	440	15	4728482
C1030	Throughout building	Fair	Interior Door, Wood, Solid-Core	312	25	4728399
C1030	Throughout building	Fair	Interior Door, Steel, Standard	102	25	4728463
C1030	Throughout building	Fair	Interior Door, Aluminum-Framed & Glazed, Standard Swing	16	25	4728219
C1070	Throughout building	Fair	Suspended Ceilings, Acoustical Tile (ACT)	122,000 SF	15	4728471
C1090	Restrooms	Fair	Toilet Partitions, Plastic/Laminate	55	10	4728293
C1090	Throughout building	Fair	Lockers, Steel-Baked Enamel, 12" W x 15" D x 72" H	800	10	4728263
C2010	Throughout building	Good	Wall Finishes, any surface, Prep & Paint	225,000 SF	8	4728217
C2030	Weight Room	Fair	Flooring, Rubber Tile	2,600 SF	5	4728426
C2030	Offices	Fair	Flooring, Carpet, Commercial Standard	4,800 SF	6	4728245
C2030	Throughout building	Fair	Flooring, Vinyl Tile (VCT)	168,000 SF	9	4728445
C2030	Restrooms	Good	Flooring, any surface, w/ Epoxy Coating, Prep & Paint	4,200 SF	9	4728309

UF L3 Code	Location	Condition	Asset/Component/Repair	Quantity	RUL	ID
C2030	Gymnasium	Good	Flooring, Maple Sports Floor, Refinish	13,000 SF	9	4728242
C2050	Throughout building	Good	Ceiling Finishes, exposed irregular elements, Prep & Paint	38,000 SF	8	4728344
Conveying						
D1010	Elevator	Fair	Elevator Cab Finishes, Standard	2	8	4728275
D1010	Elevator	Fair	Passenger Elevator, Hydraulic, 3 Floors, Renovate	1	14	4728403
D1010	Elevator	Fair	Passenger Elevator, Hydraulic, 3 Floors, Renovate	1	3	4728316
Plumbing						
D2010	Kitchen	Fair	Sink/Lavatory, Commercial Kitchen, 1-Bowl	1	15	4728384
D2010	Wood Chip Plant	Fair	Backflow Preventer, Domestic Water	1	13	4728337
D2010	Kitchen	Fair	Sink/Lavatory, Commercial Kitchen, 3-Bowl	1	15	4728340
D2010	Room 226a	Fair	Emergency Plumbing Fixtures, Eye Wash & Shower Station	1	10	4728262
D2010	Room 045	Fair	Storage Tank, Domestic Water	1	15	4728477
D2010	Classrooms	Fair	Sink/Lavatory, Vanity Top, Stainless Steel	44	15	4728324
D2010	Throughout building	Fair	Sink/Lavatory, Service Sink, Laundry	12	15	4728294
D2010	Throughout building	Fair	Drinking Fountain, Wall-Mounted, Bi-Level	9	8	4728210
D2010	Utility closets	Fair	Sink/Lavatory, Service Sink, Floor	11	20	4728248
D2010	Restrooms	Fair	Toilet, Commercial Water Closet	74	15	4728465
D2010	Restrooms	Fair	Sink/Lavatory, Wall-Hung, Vitreous China	71	15	4728277
D2010	Restrooms	Fair	Urinal, Standard	19	15	4728400
D2030	Room 018	Fair	Pump, Sump	2	5	4728437
D2030	Throughout building	Fair	Plumbing System, Rain Water Drainage, High Density	190,000 SF	25	4728224
D2030	Room 019	Fair	Pump, Sump	1	5	4728276
D2060	Room 047	Fair	Air Compressor, Tank-Style	1	4	4728374
D2060	Wood Chip Plant	Fair	Air Compressor, Tank-Style	1	4	4728310
D2060	Room 018	Fair	Air Compressor, Tank-Style	1	10	4728450
HVAC						
D3010	IT Office	Fair	Supplemental Components, Tank Monitoring System, Fuel Oil	1	10	4728398
D3010	Room 047	Fair	Storage Tank, Fuel, Interior	1	10	4728480
D3020	Room 045	Fair	Boiler Supplemental Components, Expansion Tank [EX-4]	1	25	4728257
D3020	Wood Chip Plant	Fair	Solid Fuel Boiler Supplemental Equipment, Firebox	1	5	4728432
D3020	Room 045	Fair	Boiler Supplemental Components, Expansion Tank [EX-2]	1	25	4728389
D3020	Room 046	Fair	Boiler, Oil, HVAC [BLR-2]	1	15	4728233
D3020	Throughout building	Fair	Unit Heater, Hydronic	6	10	4728251
D3020	Wood Chip Plant	Fair	Solid Fuel Boiler Supplemental Equipment, Hopper and Chute Feeder	1	5	4728346
D3020	Room 046	Fair	Boiler, Oil, HVAC [BLR-3]	1	15	4728308
D3020	Wood Chip Plant	Fair	Solid Fuel Steam Boiler	1	10	4728315
D3020	Room 045	Fair	Boiler Supplemental Components, Expansion Tank [EX-1]	1	25	4728451
D3020	Room 046	Fair	Boiler, Oil, HVAC [BLR-1]	1	15	4728390
D3020	Room 045	Fair	Boiler Supplemental Components, Expansion Tank [EX-3]	1	25	4728243
D3020	Throughout building	Fair	Radiator, Hydronic, Baseboard (per LF)	99,999 LF	15	4728487

Component Condition Report | Hanover High School

UF L3 Code	Location	Condition	Asset/Component/Repair	Quantity	RUL	ID
D3030	Roof	Fair	Split System Ductless, Single Zone	1	9	4728453
D3030	Throughout building	Fair	Unit Ventilator, approx/nominal 2 Ton, 300 to 750 CFM	7	10	4728381
D3030	Roof	Fair	Split System Ductless, Single Zone	1	8	4728383
D3030	Roof	Fair	Split System Ductless, Single Zone	1	9	4728440
D3030	Roof	Fair	Split System Ductless, Single Zone	1	9	4728282
D3030	Roof	Fair	Split System Ductless, Single Zone	1	3	4728359
D3030	Roof	Fair	Split System Ductless, Single Zone	1	8	4728368
D3030	Throughout building	Fair	Unit Ventilator, approx/nominal 3 Ton, 751 to 1250 CFM	80	10	4728476
D3030	Roof	Fair	Split System Ductless, Single Zone	1	3	4728488
D3030	Roof	Fair	Split System Ductless, Single Zone	1	9	4728401
D3030	Roof	Good	Split System Ductless, Single Zone	1	10	4728415
D3030	Roof	Fair	Split System Ductless, Single Zone	1	9	4728429
D3030	Roof	Fair	Split System Ductless, Single Zone	1	9	4728461
D3030	Roof	Fair	Split System Ductless, Single Zone	1	9	4728279
D3030	Roof	Fair	Split System Ductless, Single Zone	1	9	4728394
D3030	Roof	Fair	Split System Ductless, Single Zone	1	9	4728358
D3030	Building exterior	Fair	Chiller, Air-Cooled	1	8	4728281
D3030	Roof	Fair	Split System Ductless, Single Zone	1	3	4728410
D3050	Roof	Fair	Packaged Unit, RTU, Pad or Roof-Mounted [RTU-6]	1	3	4728320
D3050	Room 045	Fair	Pump, Distribution, HVAC Heating Water [CP-7]	1	8	4728411
D3050	Room 046	Fair	Pump, Distribution, HVAC Heating Water [CP-4]	1	8	4728296
D3050	Room 045	Fair	Pump, Distribution, HVAC Heating Water	1	8	4728302
D3050	Room 045	Fair	Pump, Distribution, HVAC Heating Water [CP-6]	1	8	4728352
D3050	Roof	Fair	Packaged Unit, RTU, Pad or Roof-Mounted [RTU-12]	1	3	4728479
D3050	Roof	Fair	Air Handler, Exterior AHU [AHU-1]	1	3	4728218
D3050	Roof	Fair	Packaged Unit, RTU, Pad or Roof-Mounted [RTU-8]	1	3	4728436
D3050	Roof	Fair	Packaged Unit, RTU, Pad or Roof-Mounted [RTU-11]	1	4	4728226
D3050	Attic	Fair	Air Handler, Interior AHU, Easy/Moderate Access [MZU-1]	1	15	4728304
D3050	Roof	Fair	Air Handler, Exterior AHU [AHU-2]	1	3	4728319
D3050	Roof	Fair	Packaged Unit, RTU, Pad or Roof-Mounted [RTU-3]	1	3	4728285
D3050	Roof	Fair	Packaged Unit, RTU, Pad or Roof-Mounted [RTU-5]	1	3	4728313
D3050	Roof	Fair	Packaged Unit, RTU, Pad or Roof-Mounted [RTU-13]	1	4	4728333
D3050	Room 046	Fair	Pump, Distribution, HVAC Heating Water [CP-5]	1	8	4728462
D3050	Roof	Fair	Packaged Unit, RTU, Pad or Roof-Mounted [RTU-10]	1	4	4728395
D3050	Throughout building	Fair	HVAC System, Hydronic Piping, 2-Pipe	190,000 SF	25	4728208
D3050	Throughout building	Fair	Fan Coil Unit, Hydronic Terminal, 1201 to 1800 CFM	20	10	4728357
D3050	Roof	Fair	Packaged Unit, RTU, Pad or Roof-Mounted [RTU-14]	1	3	4728334
D3050	Room 045	Fair	Pump, Distribution, HVAC Heating Water	1	8	4728414
D3050	Throughout building	Fair	HVAC System, Ductwork, High Density	190,000 SF	15	4728409
D3050	Roof	Fair	Packaged Unit, RTU, Pad or Roof-Mounted [RTU-1]	1	3	4728361

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UF L3 Code	Location	Condition	Asset/Component/Repair	Quantity	RUL	ID
D3050	Roof	Fair	Packaged Unit, RTU, Pad or Roof-Mounted [RTU-9]	1	3	4728299
D3050	Roof	Fair	Packaged Unit, RTU, Pad or Roof-Mounted [RTU-4]	1	3	4728335
D3050	Roof	Fair	Packaged Unit, RTU, Pad or Roof-Mounted [RTU-7]	1	3	4728387
D3050	Room 046	Fair	Pump, Distribution, HVAC Heating Water [CP-3]	1	8	4728221
D3050	Roof	Fair	Packaged Unit, RTU, Pad or Roof-Mounted [RTU-2]	1	3	4728261
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 28" Damper [EF-35]	1	3	4728385
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 10" Damper [EF-32]	1	3	4728474
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 16" Damper [EF-21]	1	3	4728237
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 16" Damper [EF-27]	1	3	4728464
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 12" Damper [EF-15]	1	3	4728416
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 16" Damper [EF-11]	1	3	4728393
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 12" Damper [EF-6]	1	3	4728484
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 16" Damper [EF-16]	1	3	4728227
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 12" Damper [EF-21]	1	3	4728272
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 12" Damper [EF-19]	1	3	4728273
D3060	Wood Chip Plant	Fair	Axial Flow Fan, In-Line, 2 HP Motor	1	5	4728412
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 10" Damper [EF-20]	1	3	4728249
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 10" Damper [EF-14]	1	3	4728466
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 16" Damper [TCNHBLE8]	1	3	4728246
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 16" Damper [EF-26]	1	3	4728234
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 12" Damper [EF-39]	1	3	4728271
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 12" Damper [EF-28]	1	3	4728421
D3060	Wood Chip Plant	Fair	Axial Flow Fan, In-Line, 2 HP Motor	1	5	4728290
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 24" Damper [EF-1]	1	3	4728486
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 16" Damper [EF-12]	1	3	4728305
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 10" Damper [EF-33]	1	5	4728306
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 24" Damper [EF-18]	1	3	4728330
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 24" Damper [EF-3]	1	3	4728460
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 10" Damper [EF-22]	1	3	4728317
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 24" Damper [EF-23]	1	3	4728467
D3060	Building exterior	Fair	Exhaust Fan, Roof or Wall-Mounted, 24" Damper [Inaccessible]	1	3	4728239
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 10" Damper [EF-22]	1	4	4728422
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 24" Damper [EF-17]	1	3	4728322
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 10" Damper [EF-19]	1	3	4728230
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 16" Damper [TCNHBLE8]	1	3	4728413
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 16" Damper [EF-34]	1	3	4728231
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 10" Damper [EF-7]	1	3	4728431
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 12" Damper [TCNHBLE7]	1	3	4728327
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 16" Damper [EF-5]	1	3	4728378
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 10" Damper [EF-8]	1	3	4728260

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UF L3 Code	Location	Condition	Asset/Component/Repair	Quantity	RUL	ID
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 12" Damper [EF-30]	1	3	4728434
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 24" Damper [EF-31]	1	3	4728371
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 24" Damper [EF-25]	1	3	4728353
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 24" Damper [EF-24]	1	3	4728291
D3060	Roof	Fair	Exhaust Fan, Roof or Wall-Mounted, 16" Damper [EF-2]	1	3	4728454
Fire Protection						
D4010	Wood Chip Plant	Fair	Backflow Preventer, Fire Suppression	1	14	4728360
D4010	Room 051	Fair	Backflow Preventer, Fire Suppression	1	14	4728435
D4010	Kitchen	Fair	Fire Suppression System, Commercial Kitchen, per LF of Hood	40 LF	10	4728287
D4010	Throughout building	Fair	Fire Suppression System, Existing Sprinkler Heads, by SF	190,000 SF	10	4728405
D4010	Room 051	Fair	Backflow Preventer, Fire Suppression	1	14	4728258
Electrical						
D5010	Room 050	Good	Automatic Transfer Switch, ATS	1	21	4728455
D5010	Building exterior	Good	Generator, Diesel	1	21	4728222
D5010	Room 050	Good	Automatic Transfer Switch, ATS	1	21	4728448
D5020	Room 050	Fair	Switchboard, 277/480 V	1	24	4728379
D5020	Room 050	Fair	Switchboard, 277/480 V	1	24	4728362
D5020	Utility closet	Fair	Distribution Panel, 120/208 V [DPL-21]	1	15	4728439
D5020	Room 018	Fair	Distribution Panel, 120/208 V [DPL5G]	1	15	4728441
D5020	Room 050	Fair	Secondary Transformer, Dry, Stepdown [T-1]	1	13	4728283
D5020	Room 050	Fair	Secondary Transformer, Dry, Stepdown [T-2]	1	13	4728323
D5030	Room 045	Fair	Variable Frequency Drive, VFD, by HP of Motor, Replace/Install	2	10	4728256
D5030	Throughout building	Good	Variable Frequency Drive, VFD, by HP of Motor, Replace/Install	1	17	4728472
D5030	Wood Chip Plant	Fair	Variable Frequency Drive, VFD, by HP of Motor, Replace/Install	2	10	4728489
D5030	IT Attic	Good	Variable Frequency Drive, VFD, by HP of Motor, Replace/Install	1	17	4728417
D5030	Throughout building	Fair	Electrical System, Wiring & Switches, High Density/Complexity	190,000 SF	25	4728377
D5030	Room 045	Fair	Variable Frequency Drive, VFD, by HP of Motor, Replace/Install	3	10	4728254
D5040	Throughout building	Fair	Interior Lighting System, Full Upgrade, Very High Density or High-End Fixtures	190,000 SF	5	4728318
Fire Alarm & Electronic Systems						
D6030	Auditorium	Fair	Sound System, Theater/Auditorium/Church	12,000 SF	10	4728336
D7010	Throughout building	Fair	Access Control Devices, Card Reader	36	5	4728331
D7030	Throughout building	Fair	Security/Surveillance System, Full System Upgrade, Average Density	190,000 SF	9	4728397
D7050	Throughout building	Fair	Fire Alarm System, Full System Upgrade, Standard Addressable, Upgrade/Install	190,000 SF	8	4728388
D7050	Lobby	Fair	Fire Alarm Panel, Fully Addressable	1	8	4728402
D7050	IT Office	Fair	Fire Alarm Panel, Fully Addressable	1	8	4728473
D8010	Throughout building	Fair	BAS/HVAC Controls, Basic System or Legacy Upgrades, Upgrade/Install	190,000 SF	3	4728280
Equipment & Furnishings						
E1030	Kitchen	Fair	Foodservice Equipment, Exhaust Hood, 3 to 6 LF	1	8	4728418
E1030	Kitchen	Fair	Foodservice Equipment, Refrigerator, 2-Door Reach-In	1	5	4728370
E1030	Kitchen	Fair	Foodservice Equipment, Range/Oven, 6-Burner	1	8	4728265

UF L3 Code	Location	Condition	Asset/Component/Repair	Quantity	RUL	ID
E1030	Kitchen	Fair	Foodservice Equipment, Convection Oven, Double	1	3	4728343
E1030	Kitchen	Fair	Foodservice Equipment, Exhaust Hood, 8 to 10 LF	1	8	4728391
E1030	Kitchen	Fair	Foodservice Equipment, Dishwasher Commercial	1	3	4728363
E1030	Kitchen	Fair	Foodservice Equipment, Walk-In, Evaporator for Refigerator/Freezer	1	3	4728341
E1030	Kitchen	Fair	Foodservice Equipment, Food Warmer, Proofing Cabinet on Wheels	1	3	4728372
E1030	Kitchen	Fair	Foodservice Equipment, Walk-In, Freezer	1	10	4728442
E1030	Kitchen	Fair	Foodservice Equipment, Refrigerator, 2-Door Reach-In	1	5	4728266
E1030	Kitchen	Fair	Foodservice Equipment, Ice Cream Dispenser, Soft Serve	1	3	4728264
E1030	Kitchen	Fair	Foodservice Equipment, Prep Table Refrigerated, Salad/Sandwich	4	3	4728255
E1030	Kitchen	Fair	Foodservice Equipment, Walk-In, Evaporator for Refigerator/Freezer	1	3	4728469
E1030	Kitchen	Fair	Foodservice Equipment, Griddle	1	5	4728342
E1030	Kitchen	Fair	Foodservice Equipment, Walk-In, Refrigerator	1	10	4728314
E1030	Kitchen	Fair	Foodservice Equipment, Refrigerator, Undercounter 2-Door	1	5	4728470
E1030	Kitchen	Fair	Foodservice Equipment, Exhaust Hood, 8 to 10 LF	1	8	4728240
E1030	Kitchen	Fair	Foodservice Equipment, Refrigerator, Undercounter 2-Door	1	5	4728345
E1030	Site	Fair	Foodservice Equipment, Trash Compactor, 600 LB	1	5	4728364
E1030	Kitchen	Fair	Foodservice Equipment, Grill	1	5	4728373
E1030	Roof	Fair	Foodservice Equipment, Walk-In, Condenser for Refigerator/Freezer	1	3	4728235
E1030	Roof	Fair	Foodservice Equipment, Walk-In, Condenser for Refigerator/Freezer	1	3	4728406
E1040	Room 230	Fair	Laboratory Equipment, Exhaust Hood, Constant Volume 6 LF	1	8	4728297
E1040	Room 226	Fair	Laboratory Equipment, Exhaust Hood, Constant Volume 6 LF	1	8	4728408
E1040	Building exterior	Fair	Laboratory Equipment, Dust Collection System	1	15	4728355
E1040	Room 226a	Fair	Laboratory Equipment, Exhaust Hood, Constant Volume 6 LF	1	8	4728213
E1040	Throughout building	Fair	Healthcare Equipment, Defibrillator (AED), Cabinet-Mounted	3	5	4728286
E1040	Classrooms	Fair	Laboratory Equipment, Lab Sink, Epoxy Resin	99,999	15	4728349
E1070	Auditorium	Fair	Theater & Stage Equipment, Flameproof Curtain, Medium Weight Velour	6,000 SF	8	4728292
E2010	Classrooms	Fair	Casework, Countertop, Plastic Laminate	740 LF	10	4728351
E2010	Classrooms	Fair	Casework, Cabinetry, Hardwood Standard	850 LF	10	4728458
E2010	Auditorium	Fair	Fixed Seating, Auditorium/Theater, Metal Cushioned Standard	364	10	4728215
E2010	Gymnasium	Fair	Bleachers, Telescoping Power-Operated, 16 to 30 Tier (per Seat)	1,008	10	4728236
Special Construction & Demo						
F1020	Site	Fair	Ancillary Building, Wood-Framed or CMU, Basic/Minimal	220 SF	20	4728278
F1020	Site	Fair	Ancillary Building, Wood-Framed or CMU, Standard	440 SF	20	4728250
F1020	Site	Fair	Ancillary Building, Wood-Framed or CMU, Basic/Minimal	330 SF	20	4728253
F1020	Site	Fair	Ancillary Building, Wood-Framed or CMU, Basic/Minimal	130 SF	20	4728423
F1020	Site	Good	Ancillary Building, Greenhouse, Truss Frame w/ Plastic Walls & Roof	240 SF	23	4728356
F1020	Site	Fair	Ancillary Building, Wood-Framed or CMU, Basic/Minimal	340 SF	20	4728348
Pedestrian Plazas & Walkways						
G2020	Site	Good	Parking Lots, Pavement, Asphalt, Seal & Stripe	94,000 SF	4	4728446
G2020	Site	Fair	Parking Lots, Pavement, Asphalt, Mill & Overlay	94,000 SF	10	4728375

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UF L3 Code	Location	Condition	Asset/Component/Repair	Quantity	RUL	ID
G2030	Site	Good	Sidewalk, Concrete, Large Areas	4,200 SF	35	4728404
G2030	Site	Poor	Sidewalk, Asphalt	4,800 SF	1	4728289
Athletic, Recreational & Playfield Areas						
G2050	Site	Fair	Outdoor Spectator Seating, Bleachers, Aluminum Benches (per Seat)	160	10	4728447
G2050	Site	Good	Sports Apparatus, Football, Goal Post	2	22	4728232
G2050	Site	Poor	Athletic Surfaces & Courts, Track Surface, Rubber	41,500 SF	1	4728301
G2050	Site	Fair	Sports Apparatus, Scoreboard, Electronic Standard	1	10	4728444
G2050	Site	Failed	Sports Apparatus, Scoreboard, Electronic Standard	1	0	4728443
G2050	Site	Fair	Outdoor Spectator Seating, Bleachers, Aluminum Benches (per Seat)	800	10	4728220
G2050	Site	Good	Playfield Surfaces, Artificial Play Turf	81,500 SF	12	4728216
G2050	Gymnasium	Good	Sports Apparatus, Basketball, Backboard/Rim/Pole	6	18	4728376
G2050	Gymnasium	Good	Sports Apparatus, Scoreboard, Electronic Standard	2	18	4728284
G2050	Site	Fair	Musco Sports Field Lighting, Pole Light Fixture w/ Lamps	4	35	4728478
Sitework						
G2060	Site	Fair	Park Bench, Wood/Composite/Fiberglass	4	10	4728325
G2060	Site	Fair	Bike Rack, Fixed 6-10 Bikes	4	10	4728347
G2060	Site	Fair	Bike Rack, Portable 6-10 Bikes	3	3	4728332
G2060	Site	Fair	Fences & Gates, Fence, Chain Link 4'	3,800 LF	25	4728468
G2060	Site	Good	Retaining Wall, Concrete Masonry Unit (CMU)	2,800 SF	30	4728366
G2060	Site	Fair	Fences & Gates, Fence, Wood Split 2-Rail	1,200 LF	5	4728298
G2060	Site	Fair	Picnic Table, Metal Powder-Coated	8	5	4728425
G2060	Site	Fair	Trash Receptacle, Medium-Duty Metal or Precast	6	5	4728427
G2060	Site	Poor	Fences & Gates, Fence, Chain Link 6'	750 LF	1	4728228
G2060	Site	Fair	Signage, Property, Building or Pole-Mounted, Replace/Install	2	3	4728433
G4050	Building exterior	Good	Exterior Fixture w/ Lamp, any type, w/ LED Replacement	4	16	4728209
G4050	Building exterior	Good	Exterior Fixture w/ Lamp, any type, w/ LED Replacement	12	16	4728354
G4050	Site	Fair	Pole Light Fixture w/ Lamps, any type 20' High, w/ LED Replacement, Replace/Install	1	10	4728380
G4050	Building exterior	Good	Exterior Fixture w/ Lamp, any type, w/ LED Replacement	42	16	4728483
G4050	Site	Fair	Pole Light Fixture w/ Lamps, any type 30' High, w/ LED Replacement, Replace/Install	12	10	4728456
Utilities						
G3060	Site	Poor	Storage Tank, Site Fuel, Underground, Replace/Install	1	2	4728267

Appendix F:
Replacement Reserves

Replacement Reserves Report

Hanover High School

3/15/2023

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
Hanover High School	$8,000	$257,140	$1,288,251	$1,213,473	$220,037	$2,272,374	$67,345	$0	$1,696,205	$1,853,952	$4,911,141	$287,229	$2,323,990	$162,860	$203,595	$409,968,033	$134,153	$17,520	$1,794,535	$276,528	$351,849	**$429,308,209**
Grand Total	**$8,000**	**$257,140**	**$1,288,251**	**$1,213,473**	**$220,037**	**$2,272,374**	**$67,345**	**$0**	**$1,696,205**	**$1,853,952**	**$4,911,141**	**$287,229**	**$2,323,990**	**$162,860**	**$203,595**	**$409,968,033**	**$134,153**	**$17,520**	**$1,794,535**	**$276,528**	**$351,849**	**$429,308,209**

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
B1080	Stairwells	4728438	Stair Treads, Raised Rubber Tile, Replace	18	5	13	3600	SF	$10.00	$36,000														$36,000								**$36,000**
B1080	Stairwells	4728382	Stair/Ramp Rails, Metal, Refinish	10	2	8	9800	LF	$1.50	$14,700									$14,700										$14,700			**$29,400**
B2010	Building Exterior	4728428	Exterior Walls, any painted surface, Prep & Paint	10	4	6	6800	SF	$3.00	$20,400							$20,400										$20,400					**$40,800**
B2010	Building exterior	4803690	Exterior Walls, Insulated Finishing System (EIFS), Replace	30	15	15	5400	SF	$23.00	$124,200																$124,200						**$124,200**
B2020	Building Exterior	4728269	Window, Aluminum Double-Glazed, 16-25 SF, Replace	30	15	15	44	EA	$950.00	$41,800																$41,800						**$41,800**
B2020	Building Exterior	4728424	Window, Aluminum Double-Glazed, 28-40 SF, Replace	30	15	15	3	EA	$1,250.00	$3,750																$3,750						**$3,750**
B2020	Building Exterior	4728407	Window, Aluminum Double-Glazed, 16-25 SF, Replace	30	15	15	186	EA	$950.00	$176,700																$176,700						**$176,700**
B2020	Building Exterior	4728223	Storefront, Glazing & Framing, Replace	30	15	15	750	SF	$55.00	$41,250																$41,250						**$41,250**
B2020	Building Exterior	4728457	Storefront, Glazing & Framing, Replace	30	15	15	2650	SF	$55.00	$145,750																$145,750						**$145,750**
B2020	Cafeteria	4728259	Screens & Shutters, Rolling Security Shutter, 55 to 100 SF, Replace	20	2	18	1	EA	$2,000.00	$2,000																			$2,000			**$2,000**
B2050	Building Exterior	4728350	Exterior Door, Aluminum-Framed & Glazed, Standard Swing, Replace	30	15	15	14	EA	$1,300.00	$18,200																$18,200						**$18,200**
B2050	Building Exterior	4728268	Overhead Door, Residential Garage, 7'x8' (56 SF), Replace	30	15	15	2	EA	$950.00	$1,900																$1,900						**$1,900**
B2050	Wood Chip Plant	4728452	Overhead/Dock Door, Aluminum, 12'x12' (144 SF), Replace	30	15	15	2	EA	$4,400.00	$8,800																$8,800						**$8,800**
B2050	Throughout building	4728396	Automatic Door Opener, Accessibility, Pedestal or Wall-Mounted, Replace	15	7	8	18	EA	$2,500.00	$45,000									$45,000													**$45,000**
B3010	Roof	4728430	Roofing, Asphalt Shingle, 20-Year Standard, Replace	20	15	5	8200	SF	$3.80	$31,160						$31,160																**$31,160**
B3010	Roof	4728420	Roofing, Single-Ply Membrane, TPO/PVC, Replace	20	18	2	33400	SF	$17.00	$567,800			$567,800																			**$567,800**
B3010	Hanover High School	4744001	Roofing, Single-Ply Membrane, TPO/PVC, Replace	20	18	2	34500	SF	$17.00	$586,500			$586,500																			**$586,500**
B3010	Roof	4728214	Roofing, Single-Ply Membrane, EPDM, Replace	20	15	5	37500	SF	$11.00	$412,500						$412,500																**$412,500**
B3060	Roof	4728338	Roof Skylight, per SF of glazing, Replace	30	15	15	380	SF	$50.00	$19,000																$19,000						**$19,000**
B3060	Roof	4728307	Roof Skylight, per unit, up to 20 SF, Replace	30	15	15	12	EA	$1,300.00	$15,600																$15,600						**$15,600**
C1030	Throughout building	4728482	Door Hardware, School, per Door, Replace	30	15	15	440	EA	$400.00	$176,000																$176,000						**$176,000**
C1070	Throughout building	4728471	Suspended Ceilings, Acoustical Tile (ACT), Replace	25	10	15	122000	SF	$3.50	$427,000																$427,000						**$427,000**
C1090	Restrooms	4728293	Toilet Partitions, Plastic/Laminate, Replace	20	10	10	55	EA	$750.00	$41,250											$41,250											**$41,250**
C1090	Throughout building	4728263	Lockers, Steel-Baked Enamel, 12" W x 15" D x 72" H, Replace	20	10	10	800	EA	$500.00	$400,000											$400,000											**$400,000**
C2010	Throughout building	4728217	Wall Finishes, any surface, Prep & Paint	10	2	8	225000	SF	$1.50	$337,500									$337,500										$337,500			**$675,000**
C2030	Restrooms	4728309	Flooring, any surface, w/ Epoxy Coating, Prep & Paint	10	1	9	4200	SF	$12.00	$50,400										$50,400										$50,400		**$100,800**
C2030	Weight Room	4728426	Flooring, Rubber Tile, Replace	15	10	5	2600	SF	$9.00	$23,400						$23,400															$23,400	**$46,800**
C2030	Throughout building	4728445	Flooring, Vinyl Tile (VCT), Replace	15	6	9	168000	SF	$5.00	$840,000										$840,000												**$840,000**
C2030	Offices	4728245	Flooring, Carpet, Commercial Standard, Replace	10	4	6	4800	SF	$7.50	$36,000							$36,000										$36,000					**$72,000**
C2030	Gymnasium	4728242	Flooring, Maple Sports Floor, Refinish	10	1	9	13000	SF	$5.00	$65,000										$65,000										$65,000		**$130,000**
C2050	Throughout building	4728344	Ceiling Finishes, exposed irregular elements, Prep & Paint	10	2	8	38000	SF	$2.50	$95,000									$95,000										$95,000			**$190,000**
D1010	Elevator	4728316	Passenger Elevator, Hydraulic, 3 Floors, Renovate	30	27	3	1	EA	$70,000.00	$70,000				$70,000																		**$70,000**
D1010	Elevator	4728275	Elevator Cab Finishes, Standard, Replace	15	7	8	2	EA	$9,000.00	$18,000									$18,000													**$18,000**
D1010	Elevator	4728403	Passenger Elevator, Hydraulic, 3 Floors, Renovate	30	16	14	1	EA	$70,000.00	$70,000															$70,000							**$70,000**
D2010	Room 045	4728477	Storage Tank, Domestic Water, Replace	30	15	15	1	EA	$6,000.00	$6,000																$6,000						**$6,000**
D2010	Wood Chip Plant	4728337	Backflow Preventer, Domestic Water, Replace	30	17	13	1	EA	$3,200.00	$3,200														$3,200								**$3,200**
D2010	Throughout building	4728210	Drinking Fountain, Wall-Mounted, Bi-Level, Replace	15	7	8	9	EA	$1,500.00	$13,500									$13,500													**$13,500**
D2010	Room 226a	4728262	Emergency Plumbing Fixtures, Eye Wash & Shower Station, Replace	20	10	10	1	EA	$2,300.00	$2,300											$2,300											**$2,300**
D2010	Kitchen	4728384	Sink/Lavatory, Commercial Kitchen, 1-Bowl, Replace	30	15	15	1	EA	$1,600.00	$1,600																$1,600						**$1,600**
D2010	Kitchen	4728340	Sink/Lavatory, Commercial Kitchen, 3-Bowl, Replace	30	15	15	1	EA	$2,500.00	$2,500																$2,500						**$2,500**
D2010	Classrooms	4728324	Sink/Lavatory, Vanity Top, Stainless Steel, Replace	30	15	15	44	EA	$1,200.00	$52,800																$52,800						**$52,800**
D2010	Throughout building	4728294	Sink/Lavatory, Service Sink, Laundry, Replace	30	15	15	12	EA	$900.00	$10,800																$10,800						**$10,800**
D2010	Restrooms	4728465	Toilet, Commercial Water Closet, Replace	30	15	15	74	EA	$1,300.00	$96,200																$96,200						**$96,200**
D2010	Restrooms	4728277	Sink/Lavatory, Wall-Hung, Vitreous China, Replace	30	15	15	71	EA	$1,500.00	$106,500																$106,500						**$106,500**
D2010	Restrooms	4728400	Urinal, Standard, Replace	30	15	15	19	EA	$1,100.00	$20,900																$20,900						**$20,900**
D2010	Utility closets	4728248	Sink/Lavatory, Service Sink, Floor, Replace	35	15	20	11	EA	$800.00	$8,800																					$8,800	**$8,800**
D2030	Room 018	4728437	Pump, Sump, Replace	15	10	5	2	EA	$4,270.00	$8,540						$8,540															$8,540	**$17,080**
D2030	Room 019	4728276	Pump, Sump, Replace	15	10	5	1	EA	$4,270.00	$4,270						$4,270															$4,270	**$8,540**
D2060	Room 047	4728374	Air Compressor, Tank-Style, Replace	20	16	4	1	EA	$10,600.00	$10,600					$10,600																	**$10,600**
D2060	Wood Chip Plant	4728310	Air Compressor, Tank-Style, Replace	20	16	4	1	EA	$41,400.00	$41,400					$41,400																	**$41,400**
D2060	Room 018	4728450	Air Compressor, Tank-Style, Replace	20	10	10	1	EA	$15,900.00	$15,900											$15,900											**$15,900**
D3010	IT Office	4728398	Supplemental Components, Tank Monitoring System, Fuel Oil, Replace	20	10	10	1	EA	$11,000.00	$11,000											$11,000											**$11,000**
D3010	Room 047	4728480	Storage Tank, Fuel, Interior, Replace	25	15	10	1	EA	$2,600.00	$2,600											$2,600											**$2,600**
D3020	Wood Chip Plant	4728432	Solid Fuel Boiler Supplemental Equipment, Firebox, Replace	20	15	5	1	EA	$13,500.00	$13,500						$13,500																**$13,500**

Replacement Reserves Report

Hanover High School

3/15/2023

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
D3020	Wood Chip Plant	4728346	Solid Fuel Boiler Supplemental Equipment, Hopper and Chute Feeder, Replace	20	15	5	1	EA	$13,500.00	$13,500						$13,500																	**$13,500**
D3020	Wood Chip Plant	4728315	Solid Fuel Steam Boiler, , Replace	25	15	10	1	EA	$277,300.00	$277,300											$277,300												**$277,300**
D3020	Room 046	4728233	Boiler, Oil, HVAC, Replace	30	15	15	1	EA	$135,000.00	$135,000																$135,000							**$135,000**
D3020	Room 046	4728308	Boiler, Oil, HVAC, Replace	30	15	15	1	EA	$135,000.00	$135,000																$135,000							**$135,000**
D3020	Room 046	4728390	Boiler, Oil, HVAC, Replace	30	15	15	1	EA	$135,000.00	$135,000																$135,000							**$135,000**
D3020	Throughout building	4728251	Unit Heater, Hydronic, Replace	20	10	10	6	EA	$2,900.00	$17,400											$17,400												**$17,400**
D3020	Throughout building	4728487	Radiator, Hydronic, Baseboard (per LF), Replace	30	15	15	99999	LF	$150.00	$14,999,850																$14,999,850							**$14,999,850**
D3030	Building exterior	4728281	Chiller, Air-Cooled, Replace	25	17	8	1	EA	$39,700.00	$39,700									$39,700														**$39,700**
D3030	Roof	4728359	Split System Ductless, Single Zone, Replace	15	12	3	1	EA	$3,500.00	$3,500				$3,500															$3,500				**$7,000**
D3030	Roof	4728488	Split System Ductless, Single Zone, Replace	15	12	3	1	EA	$6,100.00	$6,100				$6,100															$6,100				**$12,200**
D3030	Roof	4728410	Split System Ductless, Single Zone, Replace	15	12	3	1	EA	$3,500.00	$3,500				$3,500															$3,500				**$7,000**
D3030	Roof	4728383	Split System Ductless, Single Zone, Replace	15	7	8	1	EA	$4,800.00	$4,800									$4,800														**$4,800**
D3030	Roof	4728368	Split System Ductless, Single Zone, Replace	15	7	8	1	EA	$4,800.00	$4,800									$4,800														**$4,800**
D3030	Roof	4728453	Split System Ductless, Single Zone, Replace	15	6	9	1	EA	$4,800.00	$4,800										$4,800													**$4,800**
D3030	Roof	4728440	Split System Ductless, Single Zone, Replace	15	6	9	1	EA	$4,800.00	$4,800										$4,800													**$4,800**
D3030	Roof	4728282	Split System Ductless, Single Zone, Replace	15	6	9	1	EA	$4,800.00	$4,800										$4,800													**$4,800**
D3030	Roof	4728401	Split System Ductless, Single Zone, Replace	15	6	9	1	EA	$3,500.00	$3,500										$3,500													**$3,500**
D3030	Roof	4728429	Split System Ductless, Single Zone, Replace	15	6	9	1	EA	$6,100.00	$6,100										$6,100													**$6,100**
D3030	Roof	4728461	Split System Ductless, Single Zone, Replace	15	6	9	1	EA	$4,800.00	$4,800										$4,800													**$4,800**
D3030	Roof	4728279	Split System Ductless, Single Zone, Replace	15	6	9	1	EA	$4,800.00	$4,800										$4,800													**$4,800**
D3030	Roof	4728394	Split System Ductless, Single Zone, Replace	15	6	9	1	EA	$4,800.00	$4,800										$4,800													**$4,800**
D3030	Roof	4728358	Split System Ductless, Single Zone, Replace	15	6	9	1	EA	$4,800.00	$4,800										$4,800													**$4,800**
D3030	Throughout building	4728381	Unit Ventilator, approx/nominal 2 Ton, 300 to 750 CFM, Replace	20	10	10	7	EA	$7,400.00	$51,800											$51,800												**$51,800**
D3030	Throughout building	4728476	Unit Ventilator, approx/nominal 3 Ton, 751 to 1250 CFM, Replace	20	10	10	80	EA	$9,000.00	$720,000											$720,000												**$720,000**
D3030	Roof	4728415	Split System Ductless, Single Zone, Replace	15	5	10	1	EA	$4,800.00	$4,800											$4,800												**$4,800**
D3050	Room 045	4728411	Pump, Distribution, HVAC Heating Water, Replace	25	17	8	1	EA	$6,100.00	$6,100									$6,100														**$6,100**
D3050	Room 046	4728296	Pump, Distribution, HVAC Heating Water, Replace	25	17	8	1	EA	$6,100.00	$6,100									$6,100														**$6,100**
D3050	Room 045	4728302	Pump, Distribution, HVAC Heating Water, Replace	25	17	8	1	EA	$7,600.00	$7,600									$7,600														**$7,600**
D3050	Room 045	4728352	Pump, Distribution, HVAC Heating Water, Replace	25	17	8	1	EA	$6,100.00	$6,100									$6,100														**$6,100**
D3050	Room 046	4728462	Pump, Distribution, HVAC Heating Water, Replace	25	17	8	1	EA	$6,100.00	$6,100									$6,100														**$6,100**
D3050	Room 045	4728414	Pump, Distribution, HVAC Heating Water, Replace	25	17	8	1	EA	$7,600.00	$7,600									$7,600														**$7,600**
D3050	Room 046	4728221	Pump, Distribution, HVAC Heating Water, Replace	25	17	8	1	EA	$6,100.00	$6,100									$6,100														**$6,100**
D3050	Roof	4728320	Packaged Unit, RTU, Pad or Roof-Mounted, Replace	20	17	3	1	EA	$7,500.00	$7,500				$7,500																			**$7,500**
D3050	Roof	4728479	Packaged Unit, RTU, Pad or Roof-Mounted, Replace	20	17	3	1	EA	$40,000.00	$40,000				$40,000																			**$40,000**
D3050	Roof	4728218	Air Handler, Exterior AHU, Replace	20	17	3	1	EA	$97,000.00	$97,000				$97,000																			**$97,000**
D3050	Roof	4728436	Packaged Unit, RTU, Pad or Roof-Mounted, Replace	20	17	3	1	EA	$7,500.00	$7,500				$7,500																			**$7,500**
D3050	Roof	4728319	Air Handler, Exterior AHU, Replace	20	17	3	1	EA	$97,000.00	$97,000				$97,000																			**$97,000**
D3050	Roof	4728285	Packaged Unit, RTU, Pad or Roof-Mounted, Replace	20	17	3	1	EA	$9,000.00	$9,000				$9,000																			**$9,000**
D3050	Roof	4728313	Packaged Unit, RTU, Pad or Roof-Mounted, Replace	20	17	3	1	EA	$7,500.00	$7,500				$7,500																			**$7,500**
D3050	Roof	4728334	Packaged Unit, RTU, Pad or Roof-Mounted, Replace	20	17	3	1	EA	$40,000.00	$40,000				$40,000																			**$40,000**
D3050	Roof	4728361	Packaged Unit, RTU, Pad or Roof-Mounted, Replace	20	17	3	1	EA	$40,000.00	$40,000				$40,000																			**$40,000**
D3050	Roof	4728299	Packaged Unit, RTU, Pad or Roof-Mounted, Replace	20	17	3	1	EA	$7,500.00	$7,500				$7,500																			**$7,500**
D3050	Roof	4728335	Packaged Unit, RTU, Pad or Roof-Mounted, Replace	20	17	3	1	EA	$9,000.00	$9,000				$9,000																			**$9,000**
D3050	Roof	4728387	Packaged Unit, RTU, Pad or Roof-Mounted, Replace	20	17	3	1	EA	$7,500.00	$7,500				$7,500																			**$7,500**
D3050	Roof	4728261	Packaged Unit, RTU, Pad or Roof-Mounted, Replace	20	17	3	1	EA	$20,000.00	$20,000				$20,000																			**$20,000**
D3050	Roof	4728226	Packaged Unit, RTU, Pad or Roof-Mounted, Replace	20	16	4	1	EA	$40,000.00	$40,000					$40,000																		**$40,000**
D3050	Roof	4728333	Packaged Unit, RTU, Pad or Roof-Mounted, Replace	20	16	4	1	EA	$20,000.00	$20,000					$20,000																		**$20,000**
D3050	Roof	4728395	Packaged Unit, RTU, Pad or Roof-Mounted, Replace	20	16	4	1	EA	$40,000.00	$40,000					$40,000																		**$40,000**
D3050	Throughout building	4728357	Fan Coil Unit, Hydronic Terminal, 1201 to 1800 CFM, Replace	20	10	10	20	EA	$3,840.00	$76,800											$76,800												**$76,800**
D3050	Attic	4728304	Air Handler, Interior AHU, Easy/Moderate Access, Replace	30	15	15	1	EA	$31,000.00	$31,000																$31,000							**$31,000**
D3050	Throughout building	4728409	HVAC System, Ductwork, High Density, Replace	30	15	15	190000	SF	$6.00	$1,140,000																$1,140,000							**$1,140,000**
D3060	Wood Chip Plant	4728412	Axial Flow Fan, In-Line, 2 HP Motor, Replace	20	15	5	1	EA	$3,500.00	$3,500						$3,500																	**$3,500**
D3060	Wood Chip Plant	4728290	Axial Flow Fan, In-Line, 2 HP Motor, Replace	20	15	5	1	EA	$3,500.00	$3,500						$3,500																	**$3,500**
D3060	Roof	4728385	Exhaust Fan, Roof or Wall-Mounted, 28" Damper, Replace	20	17	3	1	EA	$4,000.00	$4,000				$4,000																			**$4,000**
D3060	Roof	4728474	Exhaust Fan, Roof or Wall-Mounted, 10" Damper, Replace	20	17	3	1	EA	$1,200.00	$1,200				$1,200																			**$1,200**
D3060	Roof	4728237	Exhaust Fan, Roof or Wall-Mounted, 16" Damper, Replace	20	17	3	1	EA	$2,400.00	$2,400				$2,400																			**$2,400**
D3060	Roof	4728464	Exhaust Fan, Roof or Wall-Mounted, 16" Damper, Replace	20	17	3	1	EA	$2,400.00	$2,400				$2,400																			**$2,400**
D3060	Roof	4728416	Exhaust Fan, Roof or Wall-Mounted, 12" Damper, Replace	20	17	3	1	EA	$1,400.00	$1,400				$1,400																			**$1,400**

Replacement Reserves Report

Hanover High School

3/15/2023

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
D3060	Roof	4728393	Exhaust Fan, Roof or Wall-Mounted, 16" Damper, Replace	20	17	3	1	EA	$2,400.00	$2,400				$2,400																		**$2,400**
D3060	Roof	4728484	Exhaust Fan, Roof or Wall-Mounted, 12" Damper, Replace	20	17	3	1	EA	$1,400.00	$1,400				$1,400																		**$1,400**
D3060	Roof	4728227	Exhaust Fan, Roof or Wall-Mounted, 16" Damper, Replace	20	17	3	1	EA	$2,400.00	$2,400				$2,400																		**$2,400**
D3060	Roof	4728272	Exhaust Fan, Roof or Wall-Mounted, 12" Damper, Replace	20	17	3	1	EA	$1,400.00	$1,400				$1,400																		**$1,400**
D3060	Roof	4728273	Exhaust Fan, Roof or Wall-Mounted, 12" Damper, Replace	20	17	3	1	EA	$1,400.00	$1,400				$1,400																		**$1,400**
D3060	Roof	4728249	Exhaust Fan, Roof or Wall-Mounted, 10" Damper, Replace	20	17	3	1	EA	$1,200.00	$1,200				$1,200																		**$1,200**
D3060	Roof	4728466	Exhaust Fan, Roof or Wall-Mounted, 10" Damper, Replace	20	17	3	1	EA	$1,200.00	$1,200				$1,200																		**$1,200**
D3060	Roof	4728246	Exhaust Fan, Roof or Wall-Mounted, 16" Damper, Replace	20	17	3	1	EA	$2,400.00	$2,400				$2,400																		**$2,400**
D3060	Roof	4728234	Exhaust Fan, Roof or Wall-Mounted, 16" Damper, Replace	20	17	3	1	EA	$2,400.00	$2,400				$2,400																		**$2,400**
D3060	Roof	4728271	Exhaust Fan, Roof or Wall-Mounted, 12" Damper, Replace	20	17	3	1	EA	$1,400.00	$1,400				$1,400																		**$1,400**
D3060	Roof	4728421	Exhaust Fan, Roof or Wall-Mounted, 12" Damper, Replace	20	17	3	1	EA	$1,400.00	$1,400				$1,400																		**$1,400**
D3060	Roof	4728486	Exhaust Fan, Roof or Wall-Mounted, 24" Damper, Replace	20	17	3	1	EA	$3,000.00	$3,000				$3,000																		**$3,000**
D3060	Roof	4728305	Exhaust Fan, Roof or Wall-Mounted, 16" Damper, Replace	20	17	3	1	EA	$2,400.00	$2,400				$2,400																		**$2,400**
D3060	Roof	4728330	Exhaust Fan, Roof or Wall-Mounted, 24" Damper, Replace	20	17	3	1	EA	$3,000.00	$3,000				$3,000																		**$3,000**
D3060	Roof	4728460	Exhaust Fan, Roof or Wall-Mounted, 24" Damper, Replace	20	17	3	1	EA	$3,000.00	$3,000				$3,000																		**$3,000**
D3060	Roof	4728317	Exhaust Fan, Roof or Wall-Mounted, 10" Damper, Replace	20	17	3	1	EA	$1,200.00	$1,200				$1,200																		**$1,200**
D3060	Roof	4728467	Exhaust Fan, Roof or Wall-Mounted, 24" Damper, Replace	20	17	3	1	EA	$3,000.00	$3,000				$3,000																		**$3,000**
D3060	Building exterior	4728239	Exhaust Fan, Roof or Wall-Mounted, 24" Damper, Replace	20	17	3	1	EA	$3,000.00	$3,000				$3,000																		**$3,000**
D3060	Roof	4728322	Exhaust Fan, Roof or Wall-Mounted, 24" Damper, Replace	20	17	3	1	EA	$3,000.00	$3,000				$3,000																		**$3,000**
D3060	Roof	4728230	Exhaust Fan, Roof or Wall-Mounted, 10" Damper, Replace	20	17	3	1	EA	$1,200.00	$1,200				$1,200																		**$1,200**
D3060	Roof	4728413	Exhaust Fan, Roof or Wall-Mounted, 16" Damper, Replace	20	17	3	1	EA	$2,400.00	$2,400				$2,400																		**$2,400**
D3060	Roof	4728231	Exhaust Fan, Roof or Wall-Mounted, 16" Damper, Replace	20	17	3	1	EA	$2,400.00	$2,400				$2,400																		**$2,400**
D3060	Roof	4728431	Exhaust Fan, Roof or Wall-Mounted, 10" Damper, Replace	20	17	3	1	EA	$1,200.00	$1,200				$1,200																		**$1,200**
D3060	Roof	4728327	Exhaust Fan, Roof or Wall-Mounted, 12" Damper, Replace	20	17	3	1	EA	$1,400.00	$1,400				$1,400																		**$1,400**
D3060	Roof	4728378	Exhaust Fan, Roof or Wall-Mounted, 16" Damper, Replace	20	17	3	1	EA	$2,400.00	$2,400				$2,400																		**$2,400**
D3060	Roof	4728260	Exhaust Fan, Roof or Wall-Mounted, 10" Damper, Replace	20	17	3	1	EA	$1,200.00	$1,200				$1,200																		**$1,200**
D3060	Roof	4728434	Exhaust Fan, Roof or Wall-Mounted, 12" Damper, Replace	20	17	3	1	EA	$1,400.00	$1,400				$1,400																		**$1,400**
D3060	Roof	4728371	Exhaust Fan, Roof or Wall-Mounted, 24" Damper, Replace	20	17	3	1	EA	$3,000.00	$3,000				$3,000																		**$3,000**
D3060	Roof	4728353	Exhaust Fan, Roof or Wall-Mounted, 24" Damper, Replace	20	17	3	1	EA	$3,000.00	$3,000				$3,000																		**$3,000**
D3060	Roof	4728291	Exhaust Fan, Roof or Wall-Mounted, 24" Damper, Replace	20	17	3	1	EA	$3,000.00	$3,000				$3,000																		**$3,000**
D3060	Roof	4728454	Exhaust Fan, Roof or Wall-Mounted, 16" Damper, Replace	20	17	3	1	EA	$2,400.00	$2,400				$2,400																		**$2,400**
D3060	Roof	4728422	Exhaust Fan, Roof or Wall-Mounted, 10" Damper, Replace	20	16	4	1	EA	$1,200.00	$1,200					$1,200																	**$1,200**
D3060	Roof	4728306	Exhaust Fan, Roof or Wall-Mounted, 10" Damper, Replace	20	15	5	1	EA	$1,200.00	$1,200						$1,200																**$1,200**
D4010	Throughout building	4728405	Fire Suppression System, Existing Sprinkler Heads, by SF, Replace	25	15	10	190000	SF	$1.07	$203,300										$203,300												**$203,300**
D4010	Wood Chip Plant	4728360	Backflow Preventer, Fire Suppression, Replace	30	16	14	1	EA	$6,600.00	$6,600														$6,600								**$6,600**
D4010	Room 051	4728435	Backflow Preventer, Fire Suppression, Replace	30	16	14	1	EA	$5,200.00	$5,200														$5,200								**$5,200**
D4010	Room 051	4728258	Backflow Preventer, Fire Suppression, Replace	30	16	14	1	EA	$10,500.00	$10,500														$10,500								**$10,500**
D4010	Kitchen	4728287	Fire Suppression System, Commercial Kitchen, per LF of Hood, Replace	20	10	10	40	LF	$400.00	$16,000										$16,000												**$16,000**
D5020	Room 050	4728283	Secondary Transformer, Dry, Stepdown, Replace	30	17	13	1	EA	$25,000.00	$25,000													$25,000									**$25,000**
D5020	Room 050	4728323	Secondary Transformer, Dry, Stepdown, Replace	30	17	13	1	EA	$7,600.00	$7,600													$7,600									**$7,600**
D5020	Utility closet	4728439	Distribution Panel, 120/208 V, Replace	30	15	15	1	EA	$6,000.00	$6,000															$6,000							**$6,000**
D5020	Room 018	4728441	Distribution Panel, 120/208 V, Replace	30	15	15	1	EA	$8,000.00	$8,000															$8,000							**$8,000**
D5030	Room 045	4728256	Variable Frequency Drive, VFD, by HP of Motor, Replace/Install	20	10	10	2	EA	$5,300.00	$10,600										$10,600												**$10,600**
D5030	Wood Chip Plant	4728489	Variable Frequency Drive, VFD, by HP of Motor, Replace/Install	20	10	10	2	EA	$5,300.00	$10,600										$10,600												**$10,600**
D5030	Room 045	4728254	Variable Frequency Drive, VFD, by HP of Motor, Replace/Install	20	10	10	3	EA	$5,300.00	$15,900										$15,900												**$15,900**
D5030	Throughout building	4728472	Variable Frequency Drive, VFD, by HP of Motor, Replace/Install	20	3	17	1	EA	$5,300.00	$5,300																		$5,300				**$5,300**
D5030	IT Attic	4728417	Variable Frequency Drive, VFD, by HP of Motor, Replace/Install	20	3	17	1	EA	$5,300.00	$5,300																		$5,300				**$5,300**
D5040	Throughout building	4728318	Interior Lighting System, Full Upgrade, Very High Density or High-End Fixtures, Replace	20	15	5	190000	SF	$7.00	$1,330,000						$1,330,000																**$1,330,000**
D6030	Auditorium	4728336	Sound System, Theater/Auditorium/Church, Replace	20	10	10	12000	SF	$1.50	$18,000										$18,000												**$18,000**
D7010	Throughout building	4728331	Access Control Devices, Card Reader, Replace	10	5	5	36	EA	$1,200.00	$43,200						$43,200										$43,200						**$86,400**
D7030	Throughout building	4728397	Security/Surveillance System, Full System Upgrade, Average Density, Replace	15	6	9	190000	SF	$2.00	$380,000									$380,000													**$380,000**
D7050	Throughout building	4728388	Fire Alarm System, Full System Upgrade, Standard Addressable, Upgrade/Install	20	12	8	190000	SF	$3.00	$570,000								$570,000														**$570,000**
D7050	Lobby	4728402	Fire Alarm Panel, Fully Addressable, Replace	15	7	8	1	EA	$15,000.00	$15,000								$15,000														**$15,000**
D7050	IT Office	4728473	Fire Alarm Panel, Fully Addressable, Replace	15	7	8	1	EA	$15,000.00	$15,000								$15,000														**$15,000**
D8010	Throughout building	4728280	BAS/HVAC Controls, Basic System or Legacy Upgrades, Upgrade/Install	15	12	3	190000	SF	$2.50	$475,000				$475,000															$475,000			**$950,000**
E1030	Kitchen	4728343	Foodservice Equipment, Convection Oven, Double, Replace	10	7	3	1	EA	$9,500.00	$9,500				$9,500									$9,500									**$19,000**
E1030	Kitchen	4728363	Foodservice Equipment, Dishwasher Commercial, Replace	10	7	3	1	EA	$21,500.00	$21,500				$21,500									$21,500									**$43,000**
E1030	Kitchen	4728341	Foodservice Equipment, Walk-In, Evaporator for Refigerator/Freezer, Replace	15	12	3	1	EA	$4,600.00	$4,600				$4,600															$4,600			**$9,200**

Replacement Reserves Report

Hanover High School

3/15/2023

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
E1030	Kitchen	4728372	Foodservice Equipment, Food Warmer, Proofing Cabinet on Wheels, Replace	15	12	3	1	EA	$1,700.00	$1,700				$1,700															$1,700			**$3,400**
E1030	Kitchen	4728264	Foodservice Equipment, Ice Cream Dispenser, Soft Serve, Replace	10	7	3	1	EA	$8,100.00	$8,100				$8,100										$8,100								**$16,200**
E1030	Kitchen	4728255	Foodservice Equipment, Prep Table Refrigerated, Salad/Sandwich, Replace	15	12	3	4	EA	$4,700.00	$18,800				$18,800															$18,800			**$37,600**
E1030	Kitchen	4728469	Foodservice Equipment, Walk-In, Evaporator for Refigerator/Freezer, Replace	15	12	3	1	EA	$4,600.00	$4,600				$4,600															$4,600			**$9,200**
E1030	Roof	4728235	Foodservice Equipment, Walk-In, Condenser for Refigerator/Freezer, Replace	15	12	3	1	EA	$6,300.00	$6,300				$6,300															$6,300			**$12,600**
E1030	Roof	4728406	Foodservice Equipment, Walk-In, Condenser for Refigerator/Freezer, Replace	15	12	3	1	EA	$6,300.00	$6,300				$6,300															$6,300			**$12,600**
E1030	Kitchen	4728370	Foodservice Equipment, Refrigerator, 2-Door Reach-In, Replace	15	10	5	1	EA	$4,600.00	$4,600						$4,600														$4,600		**$9,200**
E1030	Kitchen	4728266	Foodservice Equipment, Refrigerator, 2-Door Reach-In, Replace	15	10	5	1	EA	$4,600.00	$4,600						$4,600														$4,600		**$9,200**
E1030	Kitchen	4728342	Foodservice Equipment, Griddle, Replace	15	10	5	1	EA	$7,000.00	$7,000						$7,000														$7,000		**$14,000**
E1030	Kitchen	4728470	Foodservice Equipment, Refrigerator, Undercounter 2-Door, Replace	15	10	5	1	EA	$1,700.00	$1,700						$1,700														$1,700		**$3,400**
E1030	Kitchen	4728345	Foodservice Equipment, Refrigerator, Undercounter 2-Door, Replace	15	10	5	1	EA	$1,700.00	$1,700						$1,700														$1,700		**$3,400**
E1030	Site	4728364	Foodservice Equipment, Trash Compactor, 600 LB, Replace	20	15	5	1	EA	$13,000.00	$13,000						$13,000																**$13,000**
E1030	Kitchen	4728373	Foodservice Equipment, Grill, Replace	15	10	5	1	EA	$7,000.00	$7,000						$7,000														$7,000		**$14,000**
E1030	Kitchen	4728418	Foodservice Equipment, Exhaust Hood, 3 to 6 LF, Replace	15	7	8	1	EA	$3,300.00	$3,300									$3,300													**$3,300**
E1030	Kitchen	4728265	Foodservice Equipment, Range/Oven, 6-Burner, Replace	15	7	8	1	EA	$6,000.00	$6,000									$6,000													**$6,000**
E1030	Kitchen	4728391	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	4728240	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	4728442	Foodservice Equipment, Walk-In, Freezer, Replace	20	10	10	1	EA	$25,000.00	$25,000											$25,000											**$25,000**
E1030	Kitchen	4728314	Foodservice Equipment, Walk-In, Refrigerator, Replace	20	10	10	1	EA	$15,000.00	$15,000											$15,000											**$15,000**
E1040	Room 230	4728297	Laboratory Equipment, Exhaust Hood, Constant Volume 6 LF, Replace	15	7	8	1	EA	$4,000.00	$4,000									$4,000													**$4,000**
E1040	Room 226	4728408	Laboratory Equipment, Exhaust Hood, Constant Volume 6 LF, Replace	15	7	8	1	EA	$4,000.00	$4,000									$4,000													**$4,000**
E1040	Room 226a	4728213	Laboratory Equipment, Exhaust Hood, Constant Volume 6 LF, Replace	15	7	8	1	EA	$4,000.00	$4,000									$4,000													**$4,000**
E1040	Building exterior	4728355	Laboratory Equipment, Dust Collection System, Replace	30	15	15	1	EA	$10,530.00	$10,530																$10,530						**$10,530**
E1040	Classrooms	4728349	Laboratory Equipment, Lab Sink, Epoxy Resin, Replace	30	15	15	99999	EA	$2,450.00	$244,997,550																$244,997,550						**$244,997,550**
E1040	Throughout building	4728286	Healthcare Equipment, Defibrillator (AED), Cabinet-Mounted, Replace	10	5	5	3	EA	$1,500.00	$4,500						$4,500										$4,500						**$9,000**
E1070	Auditorium	4728292	Theater & Stage Equipment, Flameproof Curtain, Medium Weight Velour, Replace	15	7	8	6000	SF	$15.00	$90,000									$90,000													**$90,000**
E2010	Classrooms	4728351	Casework, Countertop, Plastic Laminate, Replace	15	5	10	740	LF	$50.00	$37,000											$37,000											**$37,000**
E2010	Classrooms	4728458	Casework, Cabinetry, Hardwood Standard, Replace	20	10	10	850	LF	$300.00	$255,000											$255,000											**$255,000**
E2010	Auditorium	4728215	Fixed Seating, Auditorium/Theater, Metal Cushioned Standard, Replace	20	10	10	364	EA	$350.00	$127,400											$127,400											**$127,400**
E2010	Gymnasium	4728236	Bleachers, Telescoping Power-Operated, 16 to 30 Tier (per Seat), Replace	20	10	10	1008	EA	$750.00	$756,000											$756,000											**$756,000**
F1020	Site	4728278	Ancillary Building, Wood-Framed or CMU, Basic/Minimal, Replace	35	15	20	220	SF	$60.00	$13,200																				$13,200		**$13,200**
F1020	Site	4728250	Ancillary Building, Wood-Framed or CMU, Standard, Replace	35	15	20	440	SF	$100.00	$44,000																				$44,000		**$44,000**
F1020	Site	4728253	Ancillary Building, Wood-Framed or CMU, Basic/Minimal, Replace	35	15	20	330	SF	$60.00	$19,800																				$19,800		**$19,800**
F1020	Site	4728423	Ancillary Building, Wood-Framed or CMU, Basic/Minimal, Replace	35	15	20	130	SF	$60.00	$7,800																				$7,800		**$7,800**
F1020	Site	4728348	Ancillary Building, Wood-Framed or CMU, Basic/Minimal, Replace	35	15	20	340	SF	$60.00	$20,400																				$20,400		**$20,400**
G2020	Site	4728446	Parking Lots, Pavement, Asphalt, Seal & Stripe	5	1	4	94000	SF	$0.45	$42,300					$42,300					$42,300					$42,300					$42,300		**$169,200**
G2020	Site	4728375	Parking Lots, Pavement, Asphalt, Mill & Overlay	25	15	10	94000	SF	$3.50	$329,000											$329,000											**$329,000**
G2030	Site	4728289	Sidewalk, Asphalt, Replace	25	24	1	4800	SF	$5.50	$26,400		$26,400																				**$26,400**
G2050	Site	4728443	Sports Apparatus, Scoreboard, Electronic Standard, Replace	25	25	0	1	EA	$8,000.00	$8,000	$8,000																					**$8,000**
G2050	Site	4728301	Athletic Surfaces & Courts, Track Surface, Rubber, Replace	10	9	1	41500	SF	$5.00	$207,500		$207,500										$207,500										**$415,000**
G2050	Site	4728447	Outdoor Spectator Seating, Bleachers, Aluminum Benches (per Seat), Replace	25	15	10	160	EA	$120.00	$19,200											$19,200											**$19,200**
G2050	Site	4728444	Sports Apparatus, Scoreboard, Electronic Standard, Replace	25	15	10	1	EA	$8,000.00	$8,000											$8,000											**$8,000**
G2050	Site	4728220	Outdoor Spectator Seating, Bleachers, Aluminum Benches (per Seat), Replace	25	15	10	800	EA	$120.00	$96,000											$96,000											**$96,000**
G2050	Gymnasium	4728376	Sports Apparatus, Basketball, Backboard/Rim/Pole, Replace	25	7	18	6	EA	$9,500.00	$57,000																			$57,000			**$57,000**
G2050	Gymnasium	4728284	Sports Apparatus, Scoreboard, Electronic Standard, Replace	25	7	18	2	EA	$8,000.00	$16,000																			$16,000			**$16,000**
G2050	Site	4728216	Playfield Surfaces, Artificial Play Turf, Replace	15	3	12	81500	SF	$20.00	$1,630,000													$1,630,000									**$1,630,000**
G2060	Site	4728228	Fences & Gates, Fence, Chain Link 6', Replace	40	39	1	750	LF	$21.00	$15,750		$15,750																				**$15,750**
G2060	Site	4728332	Bike Rack, Portable 6-10 Bikes, Replace	15	12	3	3	EA	$500.00	$1,500				$1,500															$1,500			**$3,000**
G2060	Site	4728298	Fences & Gates, Fence, Wood Split 2-Rail, Replace	15	10	5	1200	LF	$15.00	$18,000						$18,000														$18,000		**$36,000**
G2060	Site	4728425	Picnic Table, Metal Powder-Coated, Replace	20	15	5	8	EA	$700.00	$5,600						$5,600																**$5,600**
G2060	Site	4728427	Trash Receptacle, Medium-Duty Metal or Precast, Replace	20	15	5	6	EA	$700.00	$4,200						$4,200																**$4,200**
G2060	Site	4728325	Park Bench, Wood/Composite/Fiberglass, Replace	20	10	10	4	EA	$600.00	$2,400											$2,400											**$2,400**
G2060	Site	4728347	Bike Rack, Fixed 6-10 Bikes, Replace	20	10	10	4	EA	$800.00	$3,200											$3,200											**$3,200**
G2060	Site	4728433	Signage, Property, Building or Pole-Mounted, Replace/Install	20	17	3	2	EA	$1,500.00	$3,000				$3,000																		**$3,000**
G3060	Site	4728267	Storage Tank, Site Fuel, Underground, Replace/Install	25	23	2	1	EA	$60,000.00	$60,000			$60,000																			**$60,000**
G4050	Site	4728380	Pole Light Fixture w/ Lamps, any type 20' High, w/ LED Replacement, Replace/Install	20	10	10	1	EA	$4,000.00	$4,000											$4,000											**$4,000**
G4050	Site	4728456	Pole Light Fixture w/ Lamps, any type 30' High, w/ LED Replacement, Replace/Install	20	10	10	12	EA	$6,800.00	$81,600											$81,600											**$81,600**
G4050	Building exterior	4728209	Exterior Fixture w/ Lamp, any type, w/ LED Replacement, Replace	20	4	16	4	EA	$800.00	$3,200																	$3,200					**$3,200**

Replacement Reserves Report

Hanover High School

3/15/2023

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
G4050	Building exterior	4728354	Exterior Fixture w/ Lamp, any type, w/ LED Replacement, Replace	20	4	16	12	EA	$600.00	$7,200																	$7,200					**$7,200**
G4050	Building exterior	4728483	Exterior Fixture w/ Lamp, any type, w/ LED Replacement, Replace	20	4	16	42	EA	$400.00	$16,800																	$16,800					**$16,800**
Totals, Unescalated											**$8,000**	**$249,650**	**$1,214,300**	**$1,110,500**	**$195,500**	**$1,960,170**	**$56,400**	**$0**	**$1,339,000**	**$1,420,900**	**$3,654,350**	**$207,500**	**$1,630,000**	**$110,900**	**$134,600**	**$263,142,880**	**$83,600**	**$10,600**	**$1,054,100**	**$157,700**	**$194,810**	**$277,935,460**
Totals, Escalated (3.0% inflation, compounded annually)											**$8,000**	**$257,140**	**$1,288,251**	**$1,213,473**	**$220,037**	**$2,272,374**	**$67,345**	**$0**	**$1,696,205**	**$1,853,952**	**$4,911,141**	**$287,229**	**$2,323,990**	**$162,860**	**$203,595**	**$409,968,033**	**$134,153**	**$17,520**	**$1,794,535**	**$276,528**	**$351,849**	**$429,308,209**

Appendix G:
Equipment Inventory List

B20 OTHER

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
1	4728396	B2050	**Automatic Door Opener**	Accessibility, Pedestal or Wall-Mounted		Hanover High School	Throughout building				2015		18

D10 Conveying

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
1	4728403	D1010	**Passenger Elevator**	Hydraulic, 3 Floors	2100 LB	Hanover High School	Elevator	ThyssenKrupp	EP12530	EV7816	2006		
2	4728316	D1010	**Passenger Elevator**	Hydraulic, 3 Floors	2100 LB	Hanover High School	Elevator	Dover	AP-80-15	E-57308	1979		

D20 Plumbing

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
1	4728477	D2010	**Storage Tank**	Domestic Water	1000 GAL	Hanover High School	Room 045	Cemline Corporation	No tag/plate found	56831	2007		
2	4728337	D2010	**Backflow Preventer**	Domestic Water	1.5 IN	Hanover High School	Wood Chip Plant	Watts	909M1QTRP	434257	2005		
3	4728437	D2030	**Pump**	Sump	3 HP	Hanover High School	Room 018				2012		2
4	4728276	D2030	**Pump**	Sump	3 HP	Hanover High School	Room 019				2012		
5	4728374	D2060	**Air Compressor**	Tank-Style	5 HP	Hanover High School	Room 047	Champion	00S-05693	559-5650	2006		
6	4728310	D2060	**Air Compressor**	Tank-Style	30 HP	Hanover High School	Wood Chip Plant	Champion	CASRSA	D020455	2006		
7	4728450	D2060	**Air Compressor**	Tank-Style	10 HP	Hanover High School	Room 018	Ingersoll Rand	2475N7.5	0512280201	2012		

D30 HVAC

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
1	4728398	D3010	**Supplemental Components**	Tank Monitoring System, Fuel Oil		Hanover High School	IT Office						
2	4728480	D3010	**Storage Tank**	Fuel, Interior	275 GAL	Hanover High School	Room 047				2007		
3	4728390	D3020	**Boiler** [BLR-1]	Oil, HVAC	4835 MBH	Hanover High School	Room 046	Buderus	GE615/16	63130084-00-5202-0071	2007		
4	4728233	D3020	**Boiler** [BLR-2]	Oil, HVAC	4835 MBH	Hanover High School	Room 046	Buderus	GE615/16	63130084-00-5202-0067	2007		
5	4728308	D3020	**Boiler** [BLR-3]	Oil, HVAC	4835 MBH	Hanover High School	Room 046	Buderus	GE615/16	63130084-00-5202-0073	2007		
6	4728487	D3020	**Radiator**	Hydronic, Baseboard (per LF)		Hanover High School	Throughout building				2007		99999
7	4728251	D3020	**Unit Heater**	Hydronic	148 MBH	Hanover High School	Throughout building	Vulcan	HV-204		2012		6
8	4728451	D3020	**Boiler Supplemental Components** [EX-1]	Expansion Tank	370 GAL	Hanover High School	Room 045	Taco	CA1400	E08138	2007		
9	4728389	D3020	**Boiler Supplemental Components** [EX-2]	Expansion Tank	370 GAL	Hanover High School	Room 045	Taco	CA1400	E08945	2007		
10	4728243	D3020	**Boiler Supplemental Components** [EX-3]	Expansion Tank	370 GAL	Hanover High School	Room 045	Taco	CA1400	E08133	2007		
11	4728257	D3020	**Boiler Supplemental Components** [EX-4]	Expansion Tank	60 GAL	Hanover High School	Room 045	No tag/plate found	No tag/plate found	No tag/plate found	2007		
12	4728281	D3030	**Chiller**	Air-Cooled	26 TON	Hanover High School	Building exterior	McQuay	AGZ026BS27	STNU050800067	2005		
13	4728453	D3030	**Split System Ductless**	Single Zone	2 TON	Hanover High School	Roof	Mitsubishi Electric	MUY-GL24NA	6002086T	2016		
14	4728383	D3030	**Split System Ductless**	Single Zone	2 TON	Hanover High School	Roof	Mitsubishi Electric	MUY-GL24NA	5002715T	2015		
15	4728440	D3030	**Split System Ductless**	Single Zone	2 TON	Hanover High School	Roof	Mitsubishi Electric	MUY-GL24NA	6001262T	2016		
16	4728282	D3030	**Split System Ductless**	Single Zone	2 TON	Hanover High School	Roof	Mitsubishi Electric	MUY-GL24NA	6001266T	2016		
17	4728359	D3030	**Split System Ductless**	Single Zone	1 TON	Hanover High School	Roof	Mitsubishi Electric	MU17NN	7001177T	2007		
18	4728368	D3030	**Split System Ductless**	Single Zone	2 TON	Hanover High School	Roof	Mitsubishi Electric	MUY-GL24NA	5002806T	2015		
19	4728488	D3030	**Split System Ductless**	Single Zone	2.5 TON	Hanover High School	Roof	Mitsubishi Electric	MXZ30TN2	52006906D	2005		
20	4728401	D3030	**Split System Ductless**	Single Zone	.75 TON	Hanover High School	Roof	Mitsubishi Electric	MUZ-A09NA	6004288T	2016		
21	4728415	D3030	**Split System Ductless**	Single Zone	2 TON	Hanover High School	Roof	Mitsubishi Electric	MXZ-2C20NA2	7ZP07528	2017		
22	4728429	D3030	**Split System Ductless**	Single Zone	3 TON	Hanover High School	Roof	Mitsubishi Electric	MUY-D36NA	6001057T	2016		
23	4728461	D3030	**Split System Ductless**	Single Zone	2 TON	Hanover High School	Roof	Mitsubishi Electric	MUY-GL24NA	6002898T	2016		
24	4728279	D3030	**Split System Ductless**	Single Zone	2 TON	Hanover High School	Roof	Mitsubishi Electric	MUY-GL24NA	Inaccessible	2016		
25	4728394	D3030	**Split System Ductless**	Single Zone	2 TON	Hanover High School	Roof	Mitsubishi Electric	MUY-GL24NA	6000948T	2016		
26	4728358	D3030	**Split System Ductless**	Single Zone	2 TON	Hanover High School	Roof	Mitsubishi Electric	MUY-GL24NA	6002897T	2016		
27	4728410	D3030	**Split System Ductless**	Single Zone	1 TON	Hanover High School	Roof	Mitsubishi Electric	Illegible	Illegible	2006		
28	4728381	D3030	**Unit Ventilator**	approx/nominal 2 Ton, 300 to 750 CFM		Hanover High School	Throughout building						7
29	4728476	D3030	**Unit Ventilator**	approx/nominal 3 Ton, 751 to 1250 CFM	Varies	Hanover High School	Throughout building						80
30	4728302	D3050	**Pump**	Distribution, HVAC Heating Water	15 HP	Hanover High School	Room 045	Taco	Illegible	Illegible	2005		
31	4728414	D3050	**Pump**	Distribution, HVAC Heating Water	15 HP	Hanover High School	Room 045	Taco	Illegible	Illegible	2005		
32	4728221	D3050	**Pump** [CP-3]	Distribution, HVAC Heating Water	5 HP	Hanover High School	Room 046	Taco	Inaccessible	Inaccessible	2005		
33	4728296	D3050	**Pump** [CP-4]	Distribution, HVAC Heating Water	5 HP	Hanover High School	Room 046	Taco	Inaccessible	Inaccessible	2005		
34	4728462	D3050	**Pump** [CP-5]	Distribution, HVAC Heating Water	5 HP	Hanover High School	Room 046	Taco	Inaccessible	Inaccessible	2005		
35	4728352	D3050	**Pump** [CP-6]	Distribution, HVAC Heating Water	5 HP	Hanover High School	Room 045	Taco	KV4007	No tag/plate found	2005		
36	4728411	D3050	**Pump** [CP-7]	Distribution, HVAC Heating Water	5 HP	Hanover High School	Room 045	Taco	No tag/plate found	No tag/plate found	2005		

37	4728218	D3050	**Air Handler** [AHU-1]	Exterior AHU	16000 CFM	Hanover High School	Roof	McQuay	RDS800CYY	FBOU051000465	2005
38	4728319	D3050	**Air Handler** [AHU-2]	Exterior AHU	16000 CFM	Hanover High School	Roof	McQuay	RDS800CYY	FBOU051000471	2005
39	4728304	D3050	**Air Handler** [MZU-1]	Interior AHU, Easy/Moderate Access	5800 CFM	Hanover High School	Attic	Nesbitt	WA18P4	ML11HF	2007
40	4728357	D3050	**Fan Coil Unit**	Hydronic Terminal, 1201 to 1800 CFM	Varies	Hanover High School	Throughout building				20
41	4728361	D3050	**Packaged Unit** [RTU-1]	RTU, Pad or Roof-Mounted	16 TON	Hanover High School	Roof	AAON, Inc.	RM-016-3-0	200511-AMWM01359	2005
42	4728395	D3050	**Packaged Unit** [RTU-10]	RTU, Pad or Roof-Mounted	16 TON	Hanover High School	Roof	AAON, Inc.	RM-016-3-0	200602-AMWM01466	2006
43	4728226	D3050	**Packaged Unit** [RTU-11]	RTU, Pad or Roof-Mounted	16 TON	Hanover High School	Roof	AAON, Inc.	RM-016-3-0	200602-AMWM01465	2006
44	4728479	D3050	**Packaged Unit** [RTU-12]	RTU, Pad or Roof-Mounted	16 TON	Hanover High School	Roof	AAON, Inc.	RM-016-3-0	200602-AMWM01464	2005
45	4728333	D3050	**Packaged Unit** [RTU-13]	RTU, Pad or Roof-Mounted	10 TON	Hanover High School	Roof	AAON, Inc.	RM-010-3-0	200602-AMWM01462	2006
46	4728334	D3050	**Packaged Unit** [RTU-14]	RTU, Pad or Roof-Mounted	16 TON	Hanover High School	Roof	AAON, Inc.	RM-016-3-0	200511-AMWM01357	2005
47	4728261	D3050	**Packaged Unit** [RTU-2]	RTU, Pad or Roof-Mounted	10 TON	Hanover High School	Roof	AAON, Inc.	RM-010-3-0	200511-AMWJ01348	2005
48	4728285	D3050	**Packaged Unit** [RTU-3]	RTU, Pad or Roof-Mounted	4 TON	Hanover High School	Roof	Carrier	50XP-048	4005G31610	2005
49	4728335	D3050	**Packaged Unit** [RTU-4]	RTU, Pad or Roof-Mounted	4 TON	Hanover High School	Roof	Carrier	50XP-048	4005G31611	2005
50	4728313	D3050	**Packaged Unit** [RTU-5]	RTU, Pad or Roof-Mounted	3 TON	Hanover High School	Roof	Carrier	50XP-036	4005G31649	2005
51	4728320	D3050	**Packaged Unit** [RTU-6]	RTU, Pad or Roof-Mounted	3 TON	Hanover High School	Roof	Carrier	50XP-036	4005G31646	2005
52	4728387	D3050	**Packaged Unit** [RTU-7]	RTU, Pad or Roof-Mounted	3 TON	Hanover High School	Roof	Carrier	50XP-036	4005G31647	2005
53	4728436	D3050	**Packaged Unit** [RTU-8]	RTU, Pad or Roof-Mounted	3 TON	Hanover High School	Roof	Carrier	50XP-036	4005G31648	2005
54	4728299	D3050	**Packaged Unit** [RTU-9]	RTU, Pad or Roof-Mounted	3 TON	Hanover High School	Roof	Carrier	50XP-036	4005G31645	2005
55	4728412	D3060	**Axial Flow Fan**	In-Line, 2 HP Motor	10000 CFM	Hanover High School	Wood Chip Plant	Inaccessible	Inaccessible	Inaccessible	2007
56	4728290	D3060	**Axial Flow Fan**	In-Line, 2 HP Motor	10000 CFM	Hanover High School	Wood Chip Plant	Inaccessible	Inaccessible	Inaccessible	2007
57	4728486	D3060	**Exhaust Fan** [EF-1]	Roof or Wall-Mounted, 24" Damper	2600 CFM	Hanover High School	Roof	Cook	180VCRH	127S859512-00/000701	2005
58	4728393	D3060	**Exhaust Fan** [EF-11]	Roof or Wall-Mounted, 16" Damper	1150 CFM	Hanover High School	Roof	Cook	135ACE	127S859512-00/0026401	2005
59	4728305	D3060	**Exhaust Fan** [EF-12]	Roof or Wall-Mounted, 16" Damper	1150 CFM	Hanover High School	Roof	Cook	135ACE	127S859512-00/0026402	2005
60	4728466	D3060	**Exhaust Fan** [EF-14]	Roof or Wall-Mounted, 10" Damper	200 CFM	Hanover High School	Roof	Cook	90ACEM	127S859512-00/0025002	2005
61	4728416	D3060	**Exhaust Fan** [EF-15]	Roof or Wall-Mounted, 12" Damper	550 CFM	Hanover High School	Roof	Cook	120ACE	127S859512-00/0002401	2005
62	4728227	D3060	**Exhaust Fan** [EF-16]	Roof or Wall-Mounted, 16" Damper	1040 CFM	Hanover High School	Roof	Cook	120ACE	127S859512-00/0027801	2005
63	4728322	D3060	**Exhaust Fan** [EF-17]	Roof or Wall-Mounted, 24" Damper	2500 CFM	Hanover High School	Roof	Cook	180ACE	127S859512-00/0029301	2005
64	4728330	D3060	**Exhaust Fan** [EF-18]	Roof or Wall-Mounted, 24" Damper	2500 CFM	Hanover High School	Roof	Cook	180ACE	127S859512-00/0030801	2005
65	4728230	D3060	**Exhaust Fan** [EF-19]	Roof or Wall-Mounted, 10" Damper	200 CFM	Hanover High School	Roof	Cook	90ACEH	127S859512-00/0003901	2005
66	4728273	D3060	**Exhaust Fan** [EF-19]	Roof or Wall-Mounted, 12" Damper	501 CFM	Hanover High School	Roof	Cook	90ACEH	127S859512-00/0032402	2005
67	4728454	D3060	**Exhaust Fan** [EF-2]	Roof or Wall-Mounted, 16" Damper	1250 CFM	Hanover High School	Roof	Cook	135VCR	127S859512-00/0005301	2005
68	4728249	D3060	**Exhaust Fan** [EF-20]	Roof or Wall-Mounted, 10" Damper	300 CFM	Hanover High School	Roof	Cook	90ACEM	127S859512-00/0007201	2005
69	4728272	D3060	**Exhaust Fan** [EF-21]	Roof or Wall-Mounted, 12" Damper	600 CFM	Hanover High School	Roof	Cook	120ACE	127S859512-00/0008601	2005
70	4728237	D3060	**Exhaust Fan** [EF-21]	Roof or Wall-Mounted, 16" Damper	2000 CFM	Hanover High School	Roof	Greenheck	CUE-141-B-X	05631430	2005
71	4728317	D3060	**Exhaust Fan** [EF-22]	Roof or Wall-Mounted, 10" Damper	300 CFM	Hanover High School	Roof	Cook	90ACEH	127S859512-00/0010101	2005
72	4728422	D3060	**Exhaust Fan** [EF-22]	Roof or Wall-Mounted, 10" Damper	300 CFM	Hanover High School	Roof	Cook	90ACEH	127S859512-00/0000701	2006
73	4728467	D3060	**Exhaust Fan** [EF-23]	Roof or Wall-Mounted, 24" Damper	2500 CFM	Hanover High School	Roof	Cook	180ACE	127S859512-00/0030802	2005
74	4728291	D3060	**Exhaust Fan** [EF-24]	Roof or Wall-Mounted, 24" Damper	2500 CFM	Hanover High School	Roof	Cook	180ACE	127S859512-00/0030803	2005
75	4728353	D3060	**Exhaust Fan** [EF-25]	Roof or Wall-Mounted, 24" Damper	2500 CFM	Hanover High School	Roof	Cook	180ACE	127S859512-00/0030804	2005
76	4728234	D3060	**Exhaust Fan** [EF-26]	Roof or Wall-Mounted, 16" Damper	1040 CFM	Hanover High School	Roof	Cook	120ACE	127S859512-00/0027802	2005
77	4728464	D3060	**Exhaust Fan** [EF-27]	Roof or Wall-Mounted, 16" Damper	1040 CFM	Hanover High School	Roof	Cook	120ACE	127S859512-00/0027803	2005
78	4728421	D3060	**Exhaust Fan** [EF-28]	Roof or Wall-Mounted, 12" Damper	501 CFM	Hanover High School	Roof	Cook	90ACEH	127S859512-00/0032401	2005

79	4728460	D3060	**Exhaust Fan** [EF-3]	Roof or Wall-Mounted, 24" Damper	2375 CFM	Hanover High School	Roof	Cook	180VCRH	127S859512-00/0011501	2005		
80	4728434	D3060	**Exhaust Fan** [EF-30]	Roof or Wall-Mounted, 12" Damper	501 CFM	Hanover High School	Roof	Cook	90ACEH	127S859512-00/0032403	2005		
81	4728371	D3060	**Exhaust Fan** [EF-31]	Roof or Wall-Mounted, 24" Damper	2100 CFM	Hanover High School	Roof	Cook	150ACE	127S859512-00/0013501	2005		
82	4728474	D3060	**Exhaust Fan** [EF-32]	Roof or Wall-Mounted, 10" Damper	300 CFM	Hanover High School	Roof	Cook	90ACE	127S859512-00/0015001	2005		
83	4728306	D3060	**Exhaust Fan** [EF-33]	Roof or Wall-Mounted, 10" Damper	300 CFM	Hanover High School	Roof	Cook	100ACE	127S859512-00/0000701	2007		
84	4728231	D3060	**Exhaust Fan** [EF-34]	Roof or Wall-Mounted, 16" Damper	1700 CFM	Hanover High School	Roof	Cook	135ACE	127S859512-00/0016401	2005		
85	4728385	D3060	**Exhaust Fan** [EF-35]	Roof or Wall-Mounted, 28" Damper	6000 CFM	Hanover High School	Roof	Cook	270ACE	127S859512-00/0017901	2005		
86	4728271	D3060	**Exhaust Fan** [EF-39]	Roof or Wall-Mounted, 12" Damper	700 CFM	Hanover High School	Roof	Cook	120ACE	127S859512-00/0019401	2005		
87	4728378	D3060	**Exhaust Fan** [EF-5]	Roof or Wall-Mounted, 16" Damper	1500 CFM	Hanover High School	Roof	Cook	150ACE	127S859512-00/0033901	2005		
88	4728484	D3060	**Exhaust Fan** [EF-6]	Roof or Wall-Mounted, 12" Damper	800 CFM	Hanover High School	Roof	Cook	120ACE	127S859512-00/0022201	2005		
89	4728431	D3060	**Exhaust Fan** [EF-7]	Roof or Wall-Mounted, 10" Damper	200 CFM	Hanover High School	Roof	Cook	90ACEM	127S859512-00/0023601	2005		
90	4728260	D3060	**Exhaust Fan** [EF-8]	Roof or Wall-Mounted, 10" Damper	200 CFM	Hanover High School	Roof	Cook	90ACEM	127S859512-00/0025001	2005		
91	4728239	D3060	**Exhaust Fan**	Roof or Wall-Mounted, 24" Damper	5000 CFM	Hanover High School	Building exterior	Cook	Inaccessible	Inaccessible	2005		
92	4728327	D3060	**Exhaust Fan** [TCNHBLE7]	Roof or Wall-Mounted, 12" Damper	960 CFM	Hanover High School	Roof	Cook	100TCNH-BLE	127S859512-00/0000701	2005		
93	4728246	D3060	**Exhaust Fan** [TCNHBLE8]	Roof or Wall-Mounted, 16" Damper	1180 CFM	Hanover High School	Roof	Cook	120TCNH-BLE	127S859512-00/0003601	2005		
94	4728413	D3060	**Exhaust Fan** [TCNHBLE8]	Roof or Wall-Mounted, 16" Damper	1180 CFM	Hanover High School	Roof	Cook	120TCNH-BLE	127S859512-00/0003602	2005		

D40 Fire Protection

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
1	4728360	D4010	**Backflow Preventer**	Fire Suppression	4 IN	Hanover High School	Wood Chip Plant	Ames	2000SS	1519300606	2006		
2	4728435	D4010	**Backflow Preventer**	Fire Suppression	3 IN	Hanover High School	Room 051	Watts	994	030080611	2006		
3	4728258	D4010	**Backflow Preventer**	Fire Suppression	6 IN	Hanover High School	Room 051	Ames	2000SS	1472610905	2006		
4	4728287	D4010	**Fire Suppression System**	Commercial Kitchen, per LF of Hood		Hanover High School	Kitchen	Ansul			2012		40

D50 Electrical

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
1	4728222	D5010	**Generator**	Diesel	100 KW	Hanover High School	Building exterior	Olympian	O100P1	182356/55	2018		
2	4728455	D5010	**Automatic Transfer Switch**	ATS	260 AMP	Hanover High School	Room 050	ASCO	No tag/plate found	316131RE	2018		
3	4728448	D5010	**Automatic Transfer Switch**	ATS	104 AMP	Hanover High School	Room 050	ASCO	No tag/plate found	316130RE	2018		
4	4728283	D5020	**Secondary Transformer** [T-1]	Dry, Stepdown	225 KVA	Hanover High School	Room 050	Square D	225T3HISEE	20484269-163	2005		
5	4728323	D5020	**Secondary Transformer** [T-2]	Dry, Stepdown	45 KVA	Hanover High School	Room 050	Square D	45T3HISEE	20484269-215	2005		
6	4728379	D5020	**Switchboard**	277/480 V	1600 AMP	Hanover High School	Room 050	Square D			2006		
7	4728362	D5020	**Switchboard**	277/480 V	1600 AMP	Hanover High School	Room 050	Square D			2006		
8	4728439	D5020	**Distribution Panel** [DPL-21]	120/208 V	400 AMP	Hanover High School	Utility closet	Square D	No tag/plate found	No tag/plate found	2007		
9	4728441	D5020	**Distribution Panel** [DPL5G]	120/208 V	800 AMP	Hanover High School	Room 018	Square D	No tag/plate found	No tag/plate found	2007		
10	4728256	D5030	**Variable Frequency Drive**	VFD, by HP of Motor	5 HP	Hanover High School	Room 045	Yaskawa	CIMR-ZU4A0005FAA	1W1575951710020	2012		2
11	4728472	D5030	**Variable Frequency Drive**	VFD, by HP of Motor	5 HP	Hanover High School	Throughout building	AC Tech	MHB250BN	019670546	2019		
12	4728489	D5030	**Variable Frequency Drive**	VFD, by HP of Motor	5 HP	Hanover High School	Wood Chip Plant	Danfoss-Graham	No tag/plate found	No tag/plate found	2012		2
13	4728417	D5030	**Variable Frequency Drive**	VFD, by HP of Motor	2 HP	Hanover High School	IT Attic	AC Tech	MHB220BN	019730546	2019		
14	4728254	D5030	**Variable Frequency Drive**	VFD, by HP of Motor	5 HP	Hanover High School	Room 045	Yaskawa	CIMR-ZU4A0005FAA	1W1575951710028	2012		3

D70 Electronic Safety & Security

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
1	4728402	D7050	**Fire Alarm Panel**	Fully Addressable		Hanover High School	Lobby	Simplex	No tag/plate found	No tag/plate found			
2	4728473	D7050	**Fire Alarm Panel**	Fully Addressable		Hanover High School	IT Office	Simplex	No tag/plate found	No tag/plate found			

E10 Equipment

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
1	4728343	E1030	**Foodservice Equipment**	Convection Oven, Double		Hanover High School	Kitchen	Blodgett			2015		
2	4728363	E1030	**Foodservice Equipment**	Dishwasher Commercial		Hanover High School	Kitchen	CMA	180-VL	269802	2015		

3	4728418	E1030	**Foodservice Equipment**	Exhaust Hood, 3 to 6 LF	Hanover High School	Kitchen	CaptiveAire Systems			2015		
4	4728391	E1030	**Foodservice Equipment**	Exhaust Hood, 8 to 10 LF	Hanover High School	Kitchen	CaptiveAire Systems			2015		
5	4728240	E1030	**Foodservice Equipment**	Exhaust Hood, 8 to 10 LF	Hanover High School	Kitchen	CaptiveAire Systems			2015		
6	4728372	E1030	**Foodservice Equipment**	Food Warmer, Proofing Cabinet on Wheels	Hanover High School	Kitchen				2010		
7	4728342	E1030	**Foodservice Equipment**	Griddle	Hanover High School	Kitchen	Imperial Electric			2012		
8	4728373	E1030	**Foodservice Equipment**	Grill	Hanover High School	Kitchen				2012		
9	4728264	E1030	**Foodservice Equipment**	Ice Cream Dispenser, Soft Serve	Hanover High School	Kitchen	Taylor Crown	794-27	M1034425	2015		
10	4728255	E1030	**Foodservice Equipment**	Prep Table Refrigerated, Salad/Sandwich	Hanover High School	Kitchen				2010		4
11	4728265	E1030	**Foodservice Equipment**	Range/Oven, 6-Burner	Hanover High School	Kitchen	Vulcan			2015		
12	4728370	E1030	**Foodservice Equipment**	Refrigerator, 2-Door Reach-In	Hanover High School	Kitchen	Turbo Air	TGM-48R	No tag/plate found	2012		
13	4728266	E1030	**Foodservice Equipment**	Refrigerator, 2-Door Reach-In	Hanover High School	Kitchen	True Manufacturing Co	T-43	8676342	2012		
14	4728470	E1030	**Foodservice Equipment**	Refrigerator, Undercounter 2-Door	Hanover High School	Kitchen	Beverage-Air Corporation	SP48-12	No tag/plate found	2012		
15	4728345	E1030	**Foodservice Equipment**	Refrigerator, Undercounter 2-Door	Hanover High School	Kitchen	Hoshizaki	SR48A-18M	J80480J	2012		
16	4728364	E1030	**Foodservice Equipment**	Trash Compactor, 600 LB	Hanover High School	Site	No tag/plate found	No tag/plate found	No tag/plate found	2007		
17	4728235	E1030	**Foodservice Equipment**	Walk-In, Condenser for Refigerator/Freezer	Hanover High School	Roof	Inaccessible	Inaccessible	Inaccessible	2010		
18	4728406	E1030	**Foodservice Equipment**	Walk-In, Condenser for Refigerator/Freezer	Hanover High School	Roof	Inaccessible	Inaccessible	Inaccessible	2010		
19	4728341	E1030	**Foodservice Equipment**	Walk-In, Evaporator for Refigerator/Freezer	Hanover High School	Kitchen	Inaccessible	Inaccessible	Inaccessible	2010		
20	4728469	E1030	**Foodservice Equipment**	Walk-In, Evaporator for Refigerator/Freezer	Hanover High School	Kitchen	Inaccessible	Inaccessible	Inaccessible	2010		
21	4728442	E1030	**Foodservice Equipment**	Walk-In, Freezer	Hanover High School	Kitchen				2012		
22	4728314	E1030	**Foodservice Equipment**	Walk-In, Refrigerator	Hanover High School	Kitchen				2012		
23	4728355	E1040	**Laboratory Equipment**	Dust Collection System	Hanover High School	Building exterior	AAF	1853118-001	AR506-0003	2007		
24	4728297	E1040	**Laboratory Equipment**	Exhaust Hood, Constant Volume 6 LF	Hanover High School	Room 230				2015		
25	4728408	E1040	**Laboratory Equipment**	Exhaust Hood, Constant Volume 6 LF	Hanover High School	Room 226				2015		
26	4728213	E1040	**Laboratory Equipment**	Exhaust Hood, Constant Volume 6 LF	Hanover High School	Room 226a				2015		
27	4728286	E1040	**Healthcare Equipment**	Defibrillator (AED), Cabinet-Mounted	Hanover High School	Throughout building						3

G20 OTHER

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
1	4728478	G2050	**Musco Sports Field Lighting**	Pole Light Fixture w/ Lamps		Hanover High School	Site				2007		4

G30 Liquid & Gas Site Utilities

Index	ID	UFCode	Component Description	Attributes	Capacity	Building	Location Detail	Manufacturer	Model	Serial	Dataplate Yr	Barcode	Qty
1	4728267	G3060	**Storage Tank**	Site Fuel, Underground	10000 GAL	Hanover High School	Site				1991		

Appendix H:
Lighting System Schedule

SEE LIGHTING ECM

Appendix I:
Energy Conservation Measures Calculation

UIC	Replace Existing Linear Fluorescent Lamps
EAL2-S	Location: Throughout School
Attributes:	Replace 606x F44T8 with F44LED; Replace 358x F42T8 with F42LED; Replace 49x F43T8 with F43LED; Replace 10x F41T8 with F41LED; Replace 60x F43T5-HO with F43T5LED-HO; Replace 297x F42T5 with F42T5LED

Existing Lighting System

	Throughout	Throughout	Throughout	Throughout	Throughout	Throughout	Stairwell- BiLevel Lighting
Current Type of Lamp: *(Select)*	F44T8	F42T8	F43T8	F41T8	F43T5-HO	F42T5	-
Current Annual Avg Hrs of Operation:	4,732 hrs	4,732 hrs	4,732 hrs	4,732 hrs	4,732 hrs	4,732 hrs	hrs
Existing Number of Fixtures:	606	358	49	10	60	297	0

Proposed Lighting System

Proposed Lamp Replacement: *(Select)*	F44LED	F42LED	F43LED	F41LED	F43T5LED-HO	F42T5LED	-
Proposed Annual Avg. Hours of Operation	4,732 hrs	4,732 hrs	4,732 hrs	4,732 hrs	4,732 hrs	4,732 hrs	hrs
Proposed Number of Fixtures:	606	358	49	10	60	297	0
Proposed Lighting Control: *(Select)*	Light Switch	Light Switch	Light Switch	Light Switch	Light Switch	Light Switch	Light Switch
No. of Lighting Controls:	46 Qty	28 Qty	8 Qty	1 Qty	5 Qty	16 Qty	0 Qty

Energy Saving Calculation

Estimated Annual Energy Savings	120,439 kWh	40,657 kWh	8,973 kWh	639 kWh	24,275 kWh	42,162 kWh	0 kWh
Are The Ballast's Being Replaced: *(Select)*	No	No	No	No	No	No	No
Estimated Material Cost:	$9,696 $	$2,864 $	$588 $	$40 $	$1,440 $	$5,120 $	$0 $
Estimated Labor Cost:	$8,732 $	$2,579 $	$530 $	$36 $	$648 $	$2,140 $	$0 $
Total Installation Cost:	$18,428 $	$5,443 $	$1,118 $	$76 $	$2,088 $	$7,260 $	$0 $

Estimated Total Material Cost:	$19,748 $$	Estimated Total Labor Cost:	$21,049	Total kWh Saving		237,146 kWh
Electric Rate:	$0.15 $$	**Total Initial Investment For Retrofit**	$40,797	Estimated Annual O&M Cost Savings		$2,482
				Estimated Annual Cost Savings		$38,708
Simple Pay back Period	1.05 Yrs	*Type of Recommendation*	**Capital Cost ECM Recommendation**			

ECM DESCRIPTION:

Fluorescent lighting is recommended for areas where color sensitivity is an important criterion (e.g., offices or small parts assembly rooms). Fluorescent tubes are currently available that produce a higher light output (more lumens per watt) than standard fluorescent tubes. There are efficient 40-watt lamps that produce 8% to 10% more light than standard lamps. The 34-watt fluorescent tubes use 15% less power than standard lamps, while producing about 8% less light. Since the human eye responds to light exponen-tially, rather than linearly, the difference is often unnoticeable. "T8" fluorescent lamps use only 32 watts, but existing fixtures must be replaced. Therefore, BV recommends retrofitting all the existing fixtures with new 17.5W LED Tube lamps. The LED tubes provide a 180 degree light dispersal, and can be retrofitted in the existing ligt fixture. The LED tubes are rated at 50,000 hrs as compared to 20,000 to 30,000 hrs ratings for conventional fluorescent lamps.

It is important to replace all lamps when re-lamping a fluorescent fixture, never mix energy-efficient and standard lamps with the same ballast. Ensure that the fluorescent ballast is compatible with the energy-efficient lamps. It must be noted that when switching from T-12 magnetic ballast to T8 lamps, the ballasts should be replaced with instant start electrical ballast. Also it should be noted that when installing an occupancy sensor/motion sensor, rapid start electronic ballast should be used.

SUMMARY:

Initial Investment: $40,797 Simple Payback: 1.05 Years

Annual Cost Savings: $38,708

UIC	Replace High Intensity Discharge Lamps With LED
EAL9-S	Location: Site
Attributes:	Replace 12x ShoeBox Parking Lights-400W with 150Watt LED; Replace 1x Flood Lights:-250W with 50Watt LED

	Pole lights	*Pole lights*						
Existing Lamp & Fixture Type	ShoeBox Parking Lights-400W	Flood Lights:-250W	-	-	-	-	-	-
Fixture Mounting Height	26 - 30 ft	15 - 20 ft						
Proposed Replacement Type:	LED	LED	LED	LED	LED	LED	LED	LED
Number of Lamps to Be Replaced :	12	1						
Current Annual Avg Hrs of Operation:	4,380 hrs	4,380 hrs	hrs	hrs	hrs	hrs	hrs	hrs
Proposed Annual Avg. Hours of Operation	4,380 hrs	4,380 hrs	hrs	hrs	hrs	hrs	hrs	hrs
Proposed Replacement:	150Watt	50Watt	-	-	-	-	-	-
Proposed Lighting Control: *(Select)*	Light Switch	Light Switch	Light Switch	Light Switch	Light Switch	Light Switch	Light Switch	Light Switch
No. of Lighting Controls:	0 Qty	0 Qty	0 Qty	0 Qty	0 Qty	0 Qty	0 Qty	0 Qty
Estimated Annual Energy Savings	13,140 kWh	876 kWh	0 kWh	0 kWh	0 kWh	0 kWh	0 kWh	0 kWh
Total labor Cost *(Includes Bucket Truck Fees if Applicable)*	$3,361 $$	$261 $$	$0 $$	$0 $$	$0 $$	$0 $$	$0 $$	$0 $$
Estimated Material Cost:	$2,520 $$	$63 $$	$0 $$	$0 $$	$0 $$	$0 $$	$0 $$	$0 $$
Cost For Retrofit	$5,881 $$	$324 $$	$0 $$	$0 $$	$0 $$	$0 $$	$0 $$	$0 $$

Total Initial Investment For Retrofit	$6,205 $	Total kWh Saving	14,016	Electric Rate:	$0.15 $	Energy Cost Savings:	$2,141 $	
Total O&M Savings:	$1,058 $	Total Cost Savings:	$3,199		Simple Pay back Period	1.94 Yrs		
	Type of Recommendation		Capital Cost ECM Recommendation					

ECM Description:

Exterior and site lighting at the site is currently provided by High Intensity Discharge (HID) lighting. Significant savings can be achieved in terms of energy usage as well as in life-cycle performance terms with more energy efficient lighting technologies like Light Emitting Diodes (LED) and induction lighting. Induction and LED lighting with dimmable controls and no re-strike delay capabilities can be easily tied into a building management controls and/or photo-sensor controls to reduce light output and energy consumption. Apply that over ten years plus reduced replacement costs compared to HID lamps and it makes sense to go with LED/induction lighting.

The LED lights are rated 100,000hrs after which the illumination levels drop below 70%. LED's are gaining more popularity and acceptance over the time and are considered ideal replacement for parking and street lightings along with site illumination lights. The new LED lights consume less than a third of the power as consumed by the HID and last up to five times longer, in addition to this the LED's can be easily dimmed as per the requirement.

SUMMARY;

Initial Investment: $6,205 Annual Cost Savings: $3,199 Simple Payback Period: 1.94 Yrs

UIC	**Install Low Flow Tankless Restroom Fixtures**
EAP4	**Location:**
Attribute:	Replace 19x; 1GPF urinals with 0.125 GPF -Wall Mount urinal and

ECM FOR DETERMINING WATER SAVINGS IN COMMERCIAL PROPERTIES

Number of Males	400	
Number of Females	400	
Number of Occupied Days Per Week (Max 7)	5	
Number of Occupied Weeks/Year (Max 52)	44	
Number of Urinals To Be Retrofitted	19	
Number of Water Closets To Be Retrofitted	4	
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*	3	(Select)

Urinal Water Savings

Do you want to make any changes to the Urinals?	Yes	
Estimated Existing Use of Urinal/Day/Man	80%	
Existing Gallons Per Flush Ratings For Urinal Flushes	1.00	GPF
Proposed Urinal	0.125 GPF -Wall Mount	
GPF of Proposed Urinal Flush Valve** ***(1992 EpACT Energy Act Mandates 1.0GPF Max on Urinals)*	0.125	GPF

Water Closet Water Savings

Tankless Water Closets

Do you want to make any changes to the Water Closets?		No	
Existing Gallons Per Flush Ratings For Water Closet Flushes		0.00	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		4	
GPF of Proposed Dual Flush- Water Closet Valve* **(Federal Law Requires All Flushes Not To Exceed 1.6 GPF)*	*Solid Waste (20%)*	0.00	GPF
	Liquid Waste (80%)	0.00	GPF
Estimated Annual Water Savings From Male Users		0.00	kGal
Estimated Annual Water Savings From Female Users		0.00	kGal

Water & Cost Saving Calculations

Water Savings Calculation

Water Savings By The Use of Low Flow Water Closet Flush Valves/Yr	0.00	kgal
Water Savings By The Use of Low Flow Urinal Flush Valves/ Yr	184.80	kgal
Total Annual Water Savings in kgal	184.80	kgal

Cost Savings Calculations

Enter Water Tariff Rate ($/1000Gal)	$32.89	
Estimated Cost Savings From Water	$6,079	

Estimated Cost of Retrofit

Material Cost for Low Flow Urinal(s)	$2,824	
Labor Cost for Installing New Urinal(s)	$17,015	
Material Cost For Replacing Existing Flush Valves With Low Flow - Dual Flush Valves	$0	
Labor Cost For Water Closet *(Up For Liquid Waste And Down For Solid Waste)*	$0	
Estimated Total Cost For Retrofit	$19,839	
Simple Pay Back Period	3.26	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:	$19,839	Simple Payback Period:	3.26 Yrs
Annual Cost Savings:	$6,079		

Appendix J:
Solar Photovoltaic Feasibility Study

UIC	Install Fixed Tilt Solar Photovoltaic System
EAR1	Location: Hanovr HS
Attributes:	Install fixed tilt 570.7KW Solar Photovoltaic System consisting of 436.6kW Solar Carport PV System; 134.1kW Rooftop Fixed Array PV System;

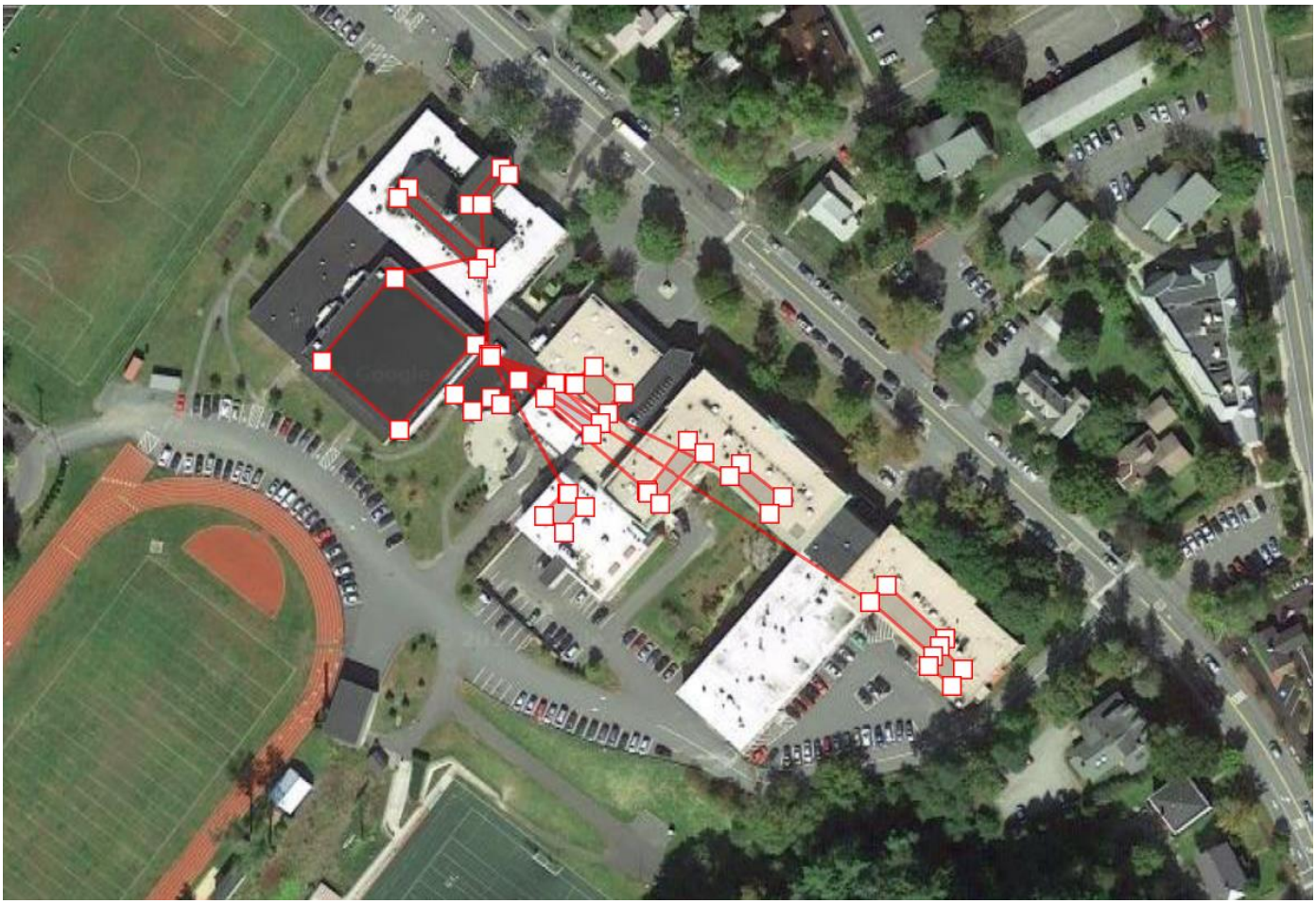
Select State: New Hampshire **Electric Rate:** $0.15 $/KWH Annual Electric Consumption: 801,314 KWh

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	Building	134	134	426	164,518	164,518	$25,131	$689,032	27.4	$0	$179,148	$0	$0	20.3
2	Solar Carports	Carports South	112	112	355	137,040	137,040	$20,934	$639,667	30.6	$0	$166,313	$0	$0	22.6
3	Solar Carports	Carports Track	115	115	365	140,966	140,966	$21,534	$657,992	30.6	$0	$171,078	$0	$0	22.6
4	Solar Carports	Soccer North	121	121	383	147,956	147,956	$22,601	$690,061	30.5	$0	$179,416	$0	$0	22.6
5	Solar Carports	Soccer West	90	90	284	109,835	109,835	$16,778	$512,535	30.5	$0	$133,259	$0	$0	22.6
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	
		0	5	571	1,812	700,315.0	700,315	$106,979	$3,189,287	29.81	$0	$829,215	$0	$0	22.06

Solar Rooftop Photovoltaic Analysis		
Total Number of Roofs	5	
Estimated Number of Panels	1,812	
Estimated KW Rating	571	kW
Potential Annual KWh Produced	700,315	kWh
% of Current Electricity Load	87.4%	

Financial Analysis		
Investment Cost	$3,189,287	
Estimated Energy Cost Savings	$106,979	
Potential Rebates	$829,215	
Potential Annual Incentives	$0	
Payback without Incentives	29.8	years
Incentive Payback but without SRECS	22.1	years
Payback with All Incentives	22.1	years

Solar PV Layout - Building



Project Number	Project Name
158531.22R000-004.379	Hanover High School
Source	
NREL	Onsite Date: December 21-23, 2022

RESULTS

Print Results

164,518 kWh/Year*

System output may range from 156,868 to 171,789 kWh per year near this location.

*Click **HERE** for more information.*

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)
January	2.82	10,003
February	3.63	11,515
March	4.80	16,305
April	5.26	16,165
May	5.61	17,183
June	5.73	16,715
July	6.40	19,146
August	5.66	17,040
September	4.73	14,092
October	3.26	10,503
November	2.55	8,319
December	2.15	7,531
Annual	4.38	164,517

Location and Station Identification

Requested Location	41 lebanon st, hanover, new hampshire
Weather Data Source	Lat, Lng: 43.69, -72.3 1.1 mi
Latitude	43.69° N
Longitude	72.30° W

PV System Specifications

DC System Size	134.1 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)

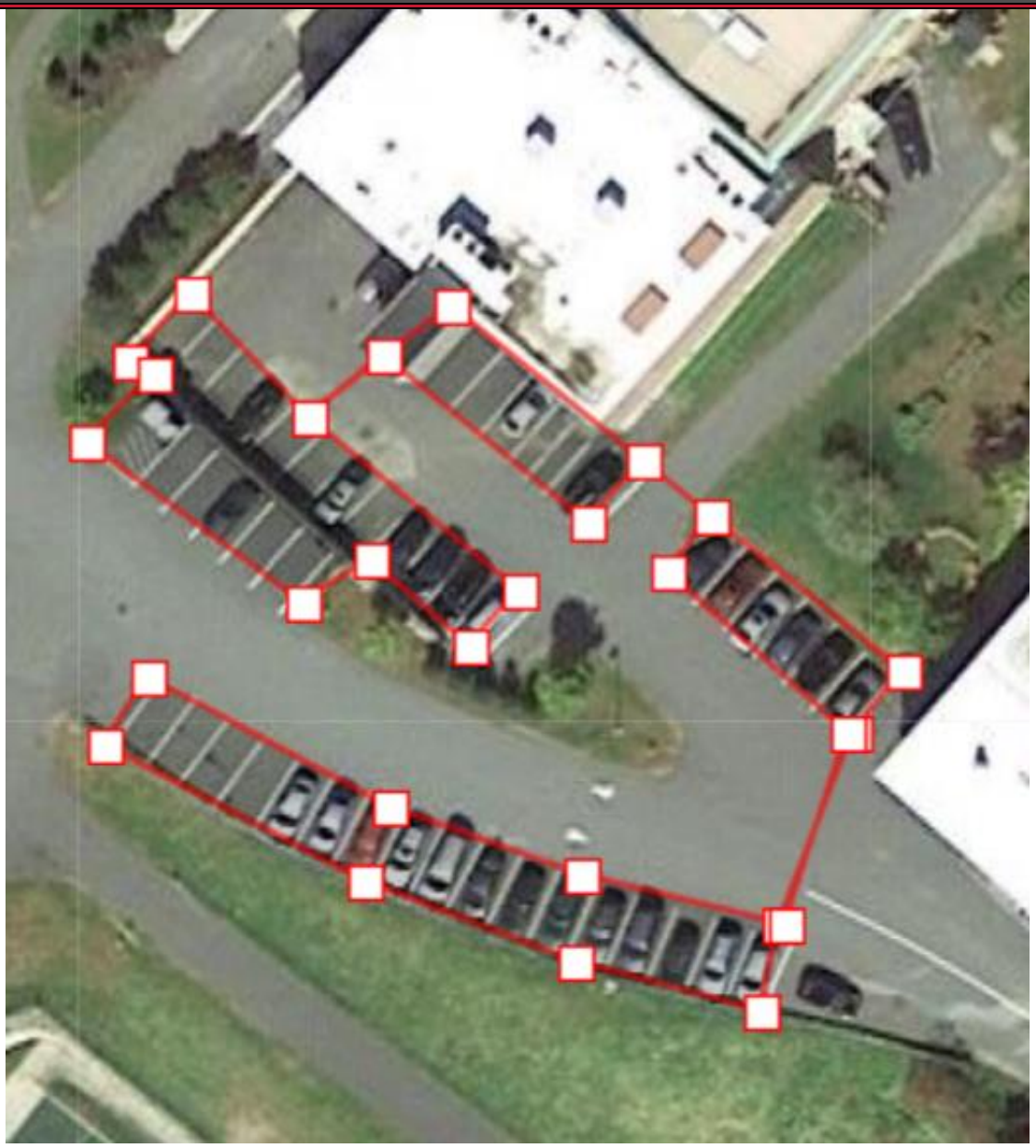
Monthly Irradiance Loss

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Performance Metrics

DC Capacity Factor	14.0%

Solar PV Layout - Carports South



Project Number	Project Name
158531.22R000-004.379	Hanover High School
Source	
NREL	Onsite Date: December 21-23, 2022

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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

137,040 kWh/Year*

System output may range from 130,668 to 143,097 kWh per year near this location.

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)
January	2.82	8,333
February	3.63	9,592
March	4.80	13,582
April	5.26	13,465
May	5.61	14,313
June	5.73	13,923
July	6.40	15,948
August	5.66	14,194
September	4.73	11,739
October	3.26	8,749
November	2.55	6,929
December	2.15	6,273
Annual	4.38	137,040

Location and Station Identification

Requested Location	41 Lebanon Street Hanover, New Hampshire
Weather Data Source	Lat, Lng: 43.69, -72.3 1.1 mi
Latitude	43.69° N
Longitude	72.30° W

PV System Specifications

DC System Size	111.7 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)

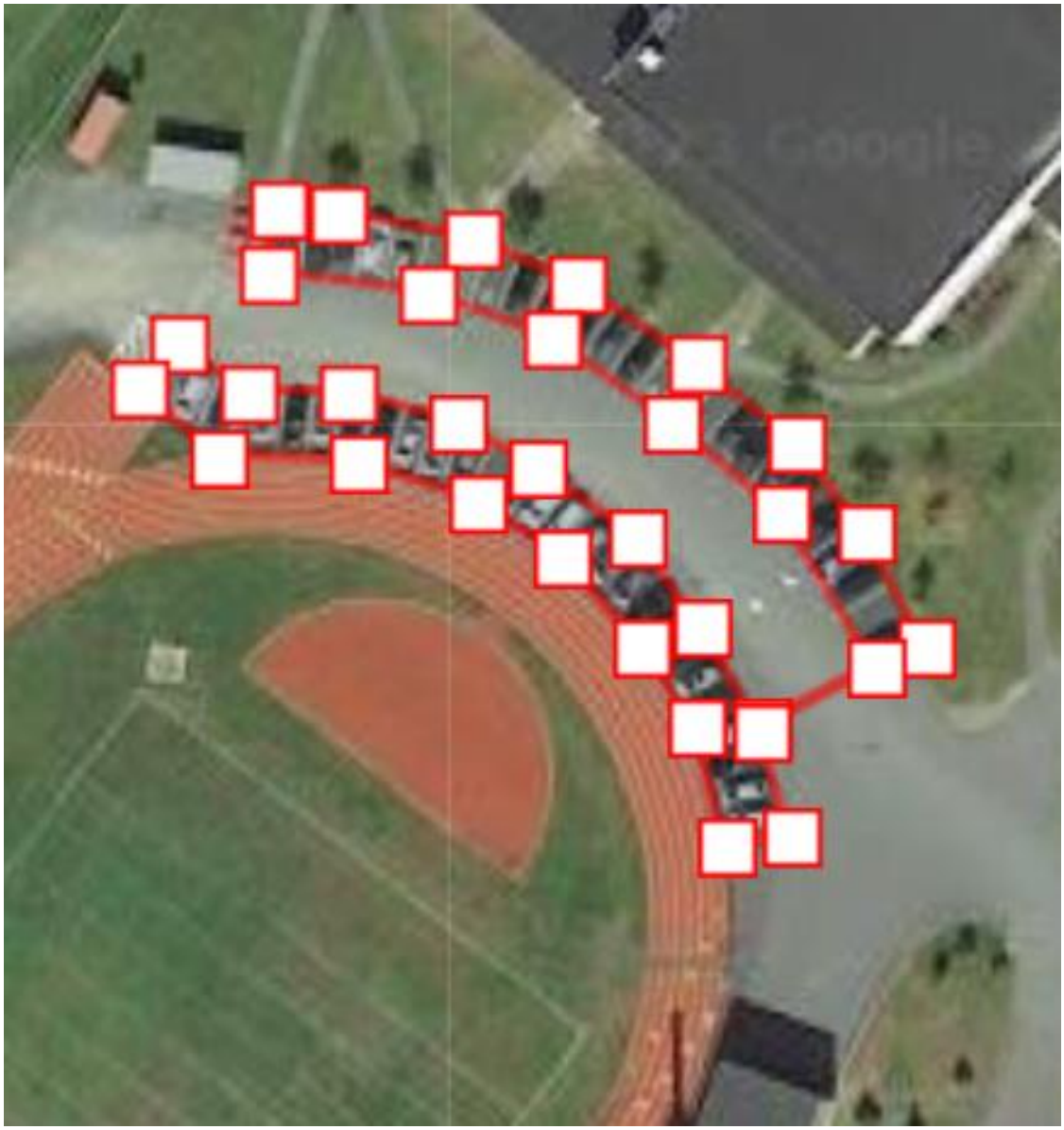
Monthly Irradiance Loss	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Performance Metrics

DC Capacity Factor	14.0%

BUREAU VERITAS

Solar PV Layout – Carports @ Track



Project Number	Project Name
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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

140,966 kWh/Year*

System output may range from 134,411 to 147,197 kWh per year near this location.

Month	Solar Radiation (kWh / m² / day)	AC Energy (kWh)
January	2.82	8,571
February	3.63	9,867
March	4.80	13,971
April	5.26	13,851
May	5.61	14,723
June	5.73	14,322
July	6.40	16,465
August	5.66	14,691
September	4.73	12,075
October	3.26	8,959
November	2.85	7,128
December	2.15	6,453
Annual	4.38	140,966

Location and Station Identification

Requested Location	41 Lebanon Street Hanover, New Hampshire
Weather Data Source	Lat, Lng: 43.69, -72.3 1.1 mi
Latitude	43.69° N
Longitude	72.30° W

PV System Specifications

DC System Size	114.9 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)

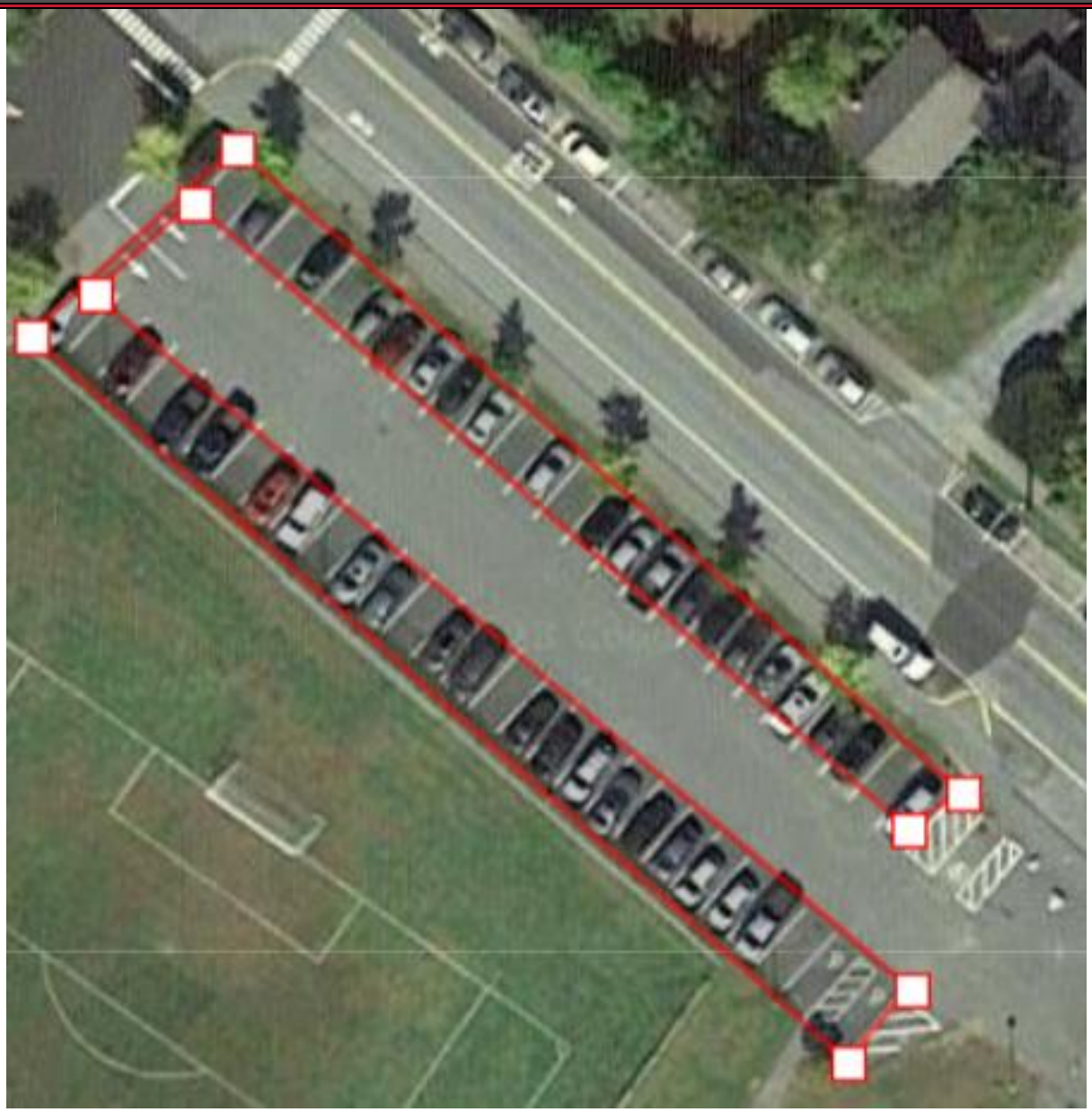
Monthly Irradiance Loss	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Performance Metrics

DC Capacity Factor	14.01%

BUREAU VERITAS

Solar PV Layout – Soccer North



Project Number	Project Name
158531.22R000-004.379	Hanover High School
Source	
NREL	Onsite Date: December 21-23, 2022

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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

147,956 kWh/Year*

System output may range from 141,076 to 154,495 kWh per year near this location.

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)
January	2.82	8,996
February	3.63	10,356
March	4.80	14,664
April	5.26	14,538
May	5.61	15,453
June	5.73	15,032
July	6.40	17,218
August	5.66	15,325
September	4.73	12,674
October	3.26	9,446
November	2.58	7,481
December	2.15	6,773
Annual	4.38	147,956

Location and Station Identification

Requested Location	41 Lebanon Street Hanover, New Hampshire
Weather Data Source	Lat, Lng: 43.69, -72.3 1.1 mi
Latitude	43.69° N
Longitude	72.30° W

PV System Specifications

DC System Size	120.6 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	Nov	Dec
	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Performance Metrics

DC Capacity Factor	14.0%

Solar PV Layout – Soccer West

Project Number	Project Name
158531.22R000-004.379	Hanover High School
Source	
NREL	Onsite Date: December 21-23, 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 lesser 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

109,835 kWh/Year*

System output may range from 104,727 to 114,689 kWh per year near this location.

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)
January	2.82	6,683
February	3.63	7,688
March	4.80	10,884
April	5.26	10,789
May	5.61	11,468
June	5.73	11,156
July	6.40	12,778
August	5.66	11,373
September	4.73	9,406
October	3.26	7,011
November	2.56	5,556
December	2.16	5,842
Annual	4.39	109,834

Location and Station Identification

Requested Location	41 Lebanon Street Hanover, New Hampshire
Weather Data Source	Lat, Lng: 43.69, -72.3 1.1 mi
Latitude	43.69° N
Longitude	72.30° W

PV System Specifications

DC System Size	89.5 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	Nov	Dec
	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Performance Metrics

DC Capacity Factor	14.8%

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).