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Local Government Energy Program
Energy Audit Final Report

Borough of Freehold

Public Library
28 East Main Street
Freehold, NJ 07728

Project Number: LGEA55

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EXECUTIVE SUMMARY

The Freehold Public Library is a single-story building with a basement comprising a total conditioned floor area of 4,000 square feet. The original library structure was built in 1903, and there have been no major renovations or additions since then. The following chart provides an overview of current energy usage in the building based on the analysis period of December 2008 through November 2009:

Table 1: State of Building—Energy Usage

	Electric Usage, kWh/yr	Gas Usage, Therms/yr	Current Annual Cost of Energy, $	Site Energy Use Intensity, kBtu/sq ft yr	Joint Energy Consumption, MMBtu/yr
Current	21,716	2,271	7,652	76.6	301
Proposed	17,452	2,284	6,866	73.3	288
Savings	4,264	-13	786	3.3	13
% Savings	20	-1	10	4	4

There may be energy procurement opportunities for the Library to reduce annual utility costs, which are $930 higher, when compared to the average estimated NJ commercial utility rates.

SWA has entered energy information about the Library into the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* energy benchmarking system. The Library is categorized as a non-eligible ("Other") space type. Because it is an "Other" space type, there is no rating available. Consequently, the Library is not eligible to receive a national energy performance rating at this time. The Site Energy Use Intensity is 76.6$\frac{kBtu}{ft^2-yr}$ compared to the national average of a building consuming 104$\frac{kBtu}{ft^2-yr}$. See ECM section for guidance on how to improve the building's rating.

Based on the current state of the building and its energy use, SWA recommends implementing various energy conservation measures from the savings detailed in Table 1. The measures are categorized by payback period in Table 2 below:

Table 2: Energy Conservation Measure Recommendations

ECMs	Savings ($)	Simple Payback Period (years)	Initial Investment, $	CO2 Savings, lbs/yr
0-5 Year	250	1.3	333	2,026
5-10 Year	646	7.7	4,997	4,222
>10 year	123	10.9	1,338	1,243
Total	1,019	6.5	6,668	7,491

SWA estimates that implementing the recommended ECMs is equivalent to removing approximately 1 car from the roads each year or avoiding the need of 23 trees to absorb the annual CO_2 generated.

Other recommendations to increase building efficiency pertaining to operations and maintenance and capital improvements are listed below:

Further Recommendations:

SWA recommends that the Library further explore the following:

- Capital Improvements
  - Increase insulation levels at attic
  - Replace cast iron radiators
- Operations and Maintenance
  - Replace attic insulation
  - Maintain roofs
  - Insulate hot water piping
  - Weather-strip/Air-seal
  - Repair/seal wall cracks and penetrations
  - Provide water efficient fixtures and controls
  - Purchase Energy Star equipment as needed
  - Use smart power electric strips
  - Create an energy educational program

Financial Incentives and Other Program Opportunities

There are various incentive programs that the Borough of Freehold could apply for that could also help lower the cost of installing the ECMs. Please refer to Appendix F for details.

The Borough of Freehold Library is an original Carnegie Library that is most likely labeled as a historic building. SWA recommends that the Borough of Freehold proceed to follow the list of 5 ECMs that have been recommended within the scope of work. At the time of this report, the Direct Install program through the New Jersey Office of Clean Energy provides the most relevant and best suited incentives for this building. Lighting installations as well as the installation of the programmable thermostat should be implemented immediately. SWA recommends that the electric domestic hot water heater is removed at the time of the next required service milestone and should be replaced with a natural gas-fired unit. In addition to the Energy Conservation Measures (ECMs), SWA also recommends that a routine, preventative maintenance plan is followed to ensure that the building operates efficiently. Routine maintenance will also extend the life of the building and avoid future maintenance costs. Work such as air-sealing and increasing attic insulation will have a slight impact on energy savings but will also improve comfort and durability of the building.

INTRODUCTION

Launched in 2008, the LGEA Program provides subsidized energy audits for municipal and local government-owned facilities, including offices, courtrooms, town halls, police and fire stations, sanitation buildings, transportation structures, schools and community centers. The Program will subsidize up to 100% of the cost of the audit. The Board of Public Utilities (BPUs) Office of Clean Energy has assigned TRC Solutions to administer the Program.

Steven Winter Associates, Inc. (SWA) is a 37-year-old architectural/engineering research and consulting firm, with specialized expertise in green technologies and procedures that improve the safety, performance, and cost effectiveness of buildings. SWA has a long-standing commitment to creating energy-efficient, cost-saving and resource-conserving buildings. As consultants on the built environment, SWA works closely with architects, developers, builders, and local, state, and federal agencies to develop and apply sustainable, 'whole building' strategies in a wide variety of building types: commercial, residential, educational and institutional.

SWA performed an energy audit and assessment for the Library at 28 East Main Street. The process of the audit included facility visits on February 17, 2010, benchmarking and energy bills analysis, assessment of existing conditions, energy modeling, energy conservation measures and other recommendations for improvements. The scope of work includes providing a summary of current building conditions, current operating costs, potential savings, and investment costs to achieve these savings. The facility description includes energy usage, occupancy profiles and current building systems along with a detailed inventory of building energy systems, recommendations for improvement and recommendations for energy purchasing and procurement strategies.

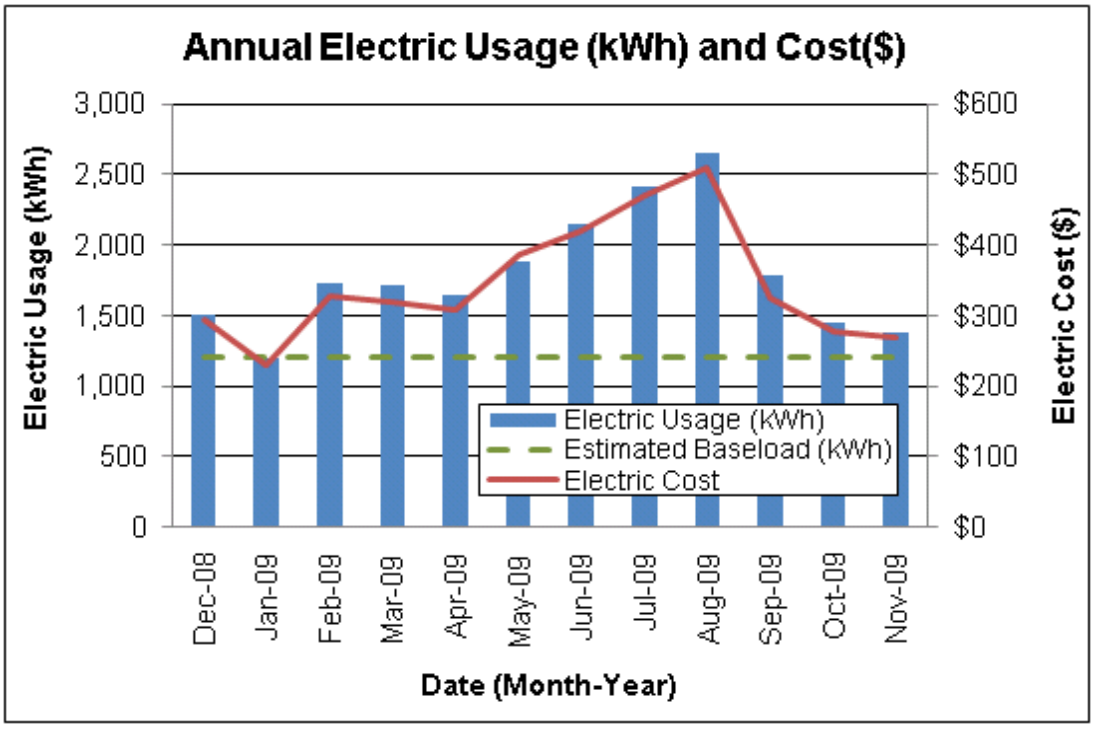
The goal of this Local Government Energy Audit (LGEA) is to provide sufficient information to the Borough of Freehold to make decisions regarding the implementation of the most appropriate and most cost-effective energy conservation measures for the library.

HISTORICAL ENERGY CONSUMPTION

1.1 Energy usage, load profile and cost analysis

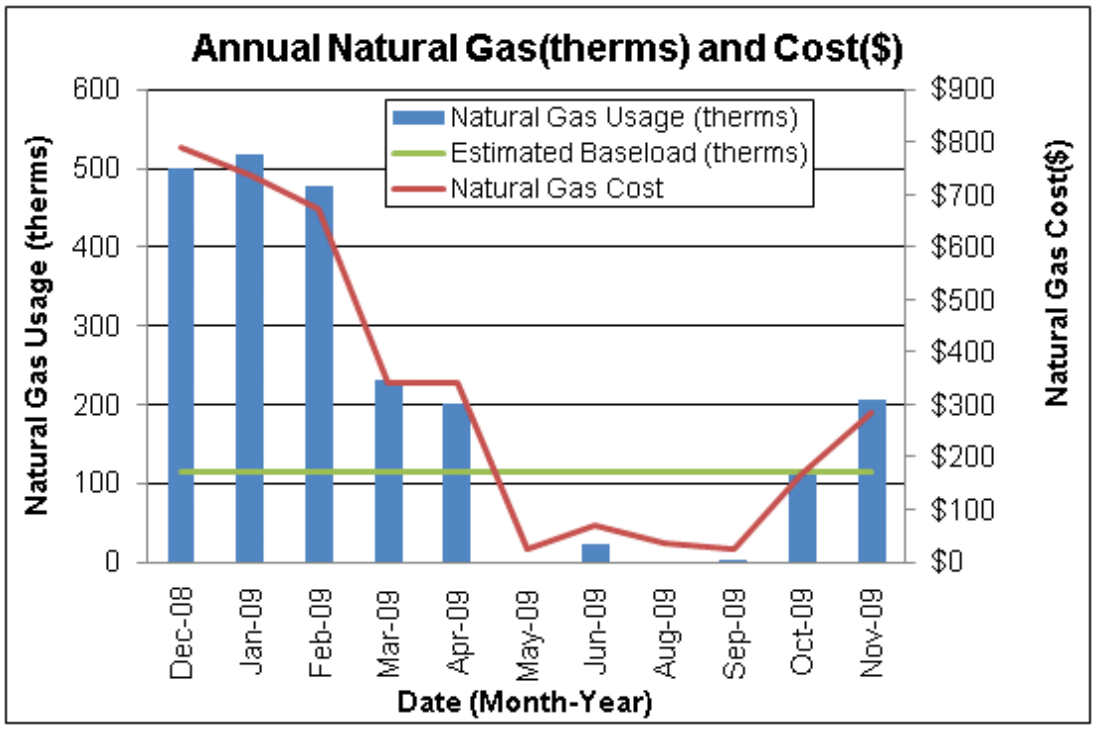
SWA reviewed utility bills from February 2008 through January 2010 that were received from the utility companies supplying the library with electric and natural gas. A 12 month period of analysis from December 2008 through November 2009 was used for all calculations and for purposes of benchmarking the building.

Electricity - The Library is currently served by one electric meter. The Library currently buys electricity from JCP&L at **an average aggregated rate of $0.192/kWh**. The Library purchased **approximately 21,716 kWh, or $4,157 worth of electricity,** in the previous year. The average monthly demand was 14.9 kW and the annual peak demand was 15.7 kW.

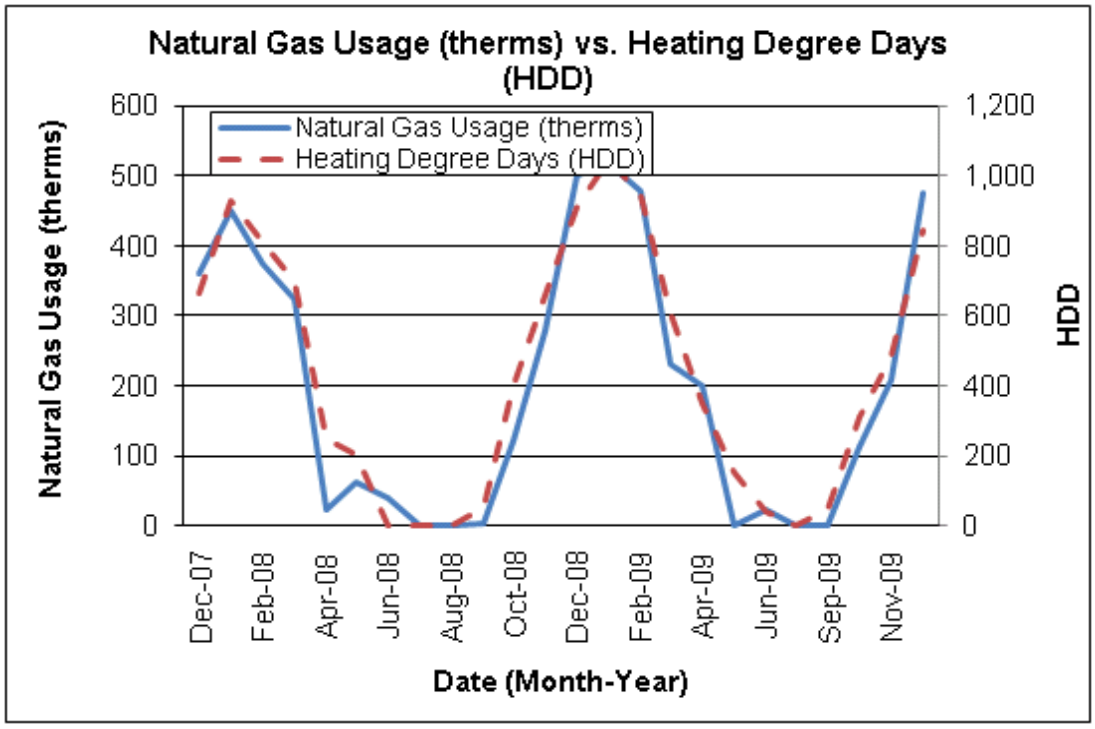


In the above chart, electric usage increases during the summer when air conditioning is used. The estimated baseload is formed primarily by electric domestic hot water, lighting and appliances within the building.

Natural gas - The Library is currently served by one meter for natural gas. The Library currently buys natural gas from New Jersey Natural Gas Co. at **an average aggregated rate of $1.539/therm**. The Library purchased **approximately 2,271 therms or $3,495 worth of natural gas** in the previous year.



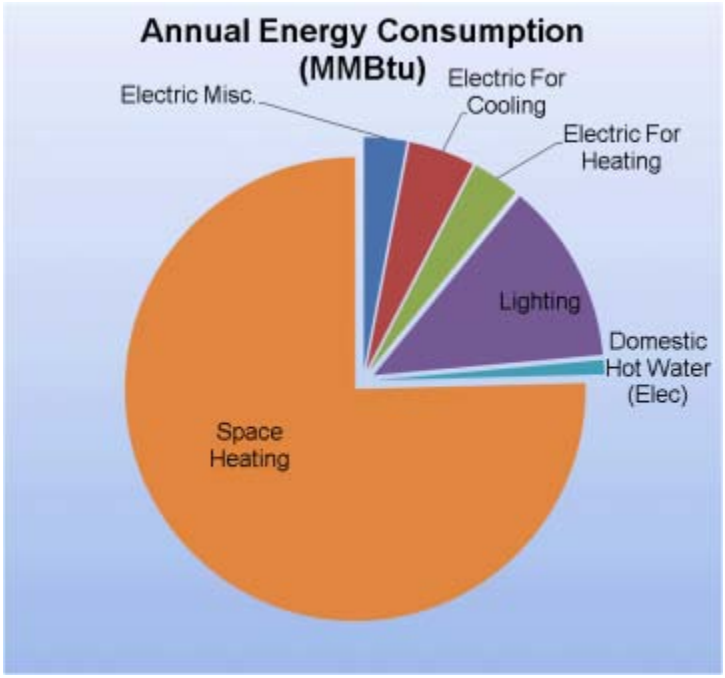
Natural Gas usage in relation to costs.

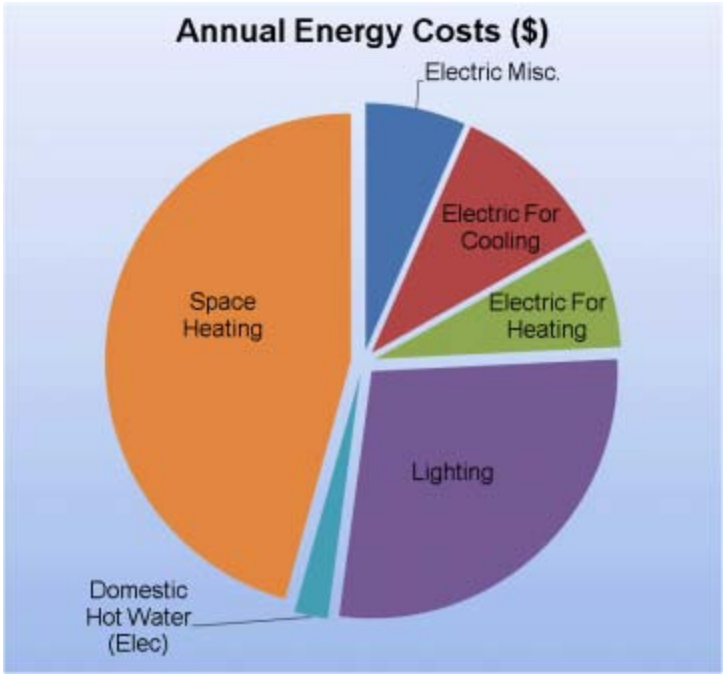


The above chart shows that the natural gas usage curve follows the heating degree days curve closely. Heating Degree Days are used as a metric for estimating heating required by a building based on location. Heating Degree Days are based on average outdoor temperatures.

The following graphs, pie charts, and table show energy use for the Library based on utility bills for the 12 month period. Note: electrical cost at $56/MMBtu of energy is 4 times as expensive as natural gas at $15/MMBtu

Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Misc.	9	3%	$506	7%	56
Electric For Cooling	14	5%	$786	10%	56
Electric For Heating	10	3%	$562	7%	56
Lighting	38	13%	$2,135	28%	56
Domestic Hot Water (Elec)	3	1%	$169	2%	56
Space Heating (Gas)	227	75%	$3,495	46%	15
Totals	301	100%	$7,652	100%	
Total Electric Usage	74	25%	$4,157	54%	56
Total Gas Usage	227	75%	$3,495	46%	15
Totals	301	100%	$7,652	100%	

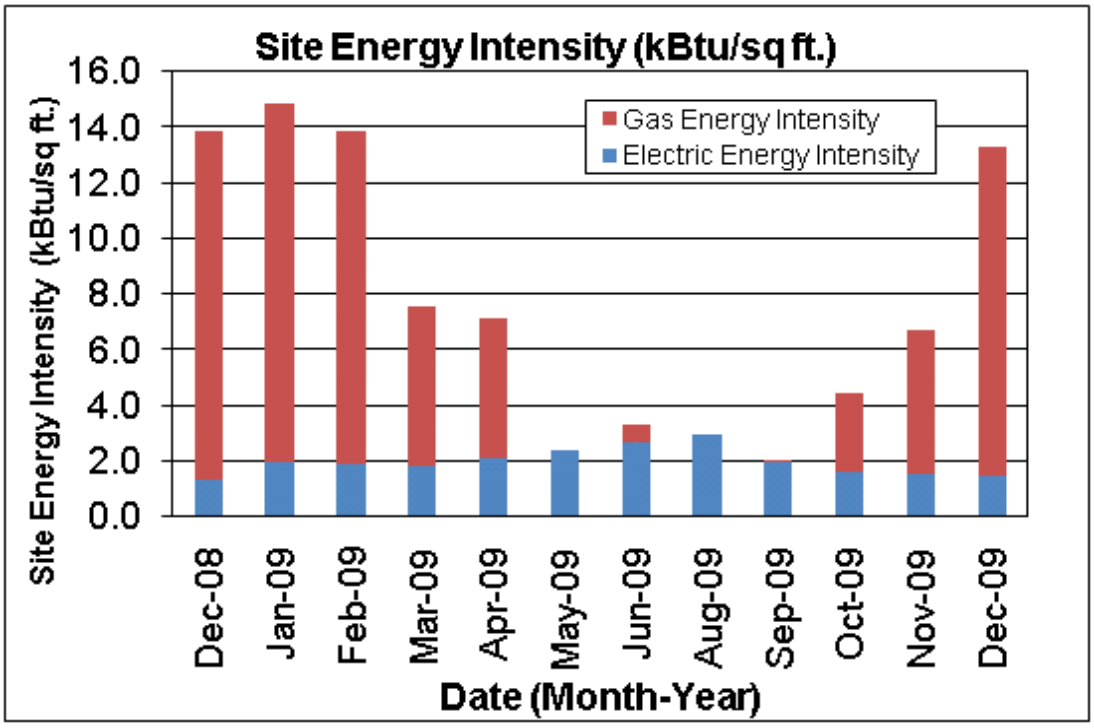




1.2. Energy benchmarking

SWA has entered energy information about the library in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* energy benchmarking system. The library is categorized as a non-eligible ("Other") space type. Because it is an "Other" space type, there is no rating available. Consequently, the library is not eligible to receive a national energy performance rating at this time. The Site Energy Use Intensity is 76.6 $\frac{kBtu}{ft^2-yr}$ compared to the national average of a building consuming 104.0 $\frac{kBtu}{ft^2-yr}$. See ECM section for guidance on how to improve the building's rating.

Due to the nature of its calculation based upon a survey of existing buildings of varying usage, the national average for "Other" space types is very subjective, and is not an absolute bellwether for gauging performance. Additionally, should the Municipality desire to reach this average there are other large scale and financially less advantageous improvements that can be made, such as envelope window, door and insulation upgrades that would help the building reach this goal.



Per the LGEA program requirements, SWA has assisted the borough of Freehold to create an *Energy Star Portfolio Manager* account and share the library's information to allow future data to be added and tracked using the benchmarking tool. SWA has shared this Portfolio Manager account information with the Municipality (user name of "boroughoffreehold" with a password of "*freehold")* and TRC Solutions.

1.2.1. Tariff analysis

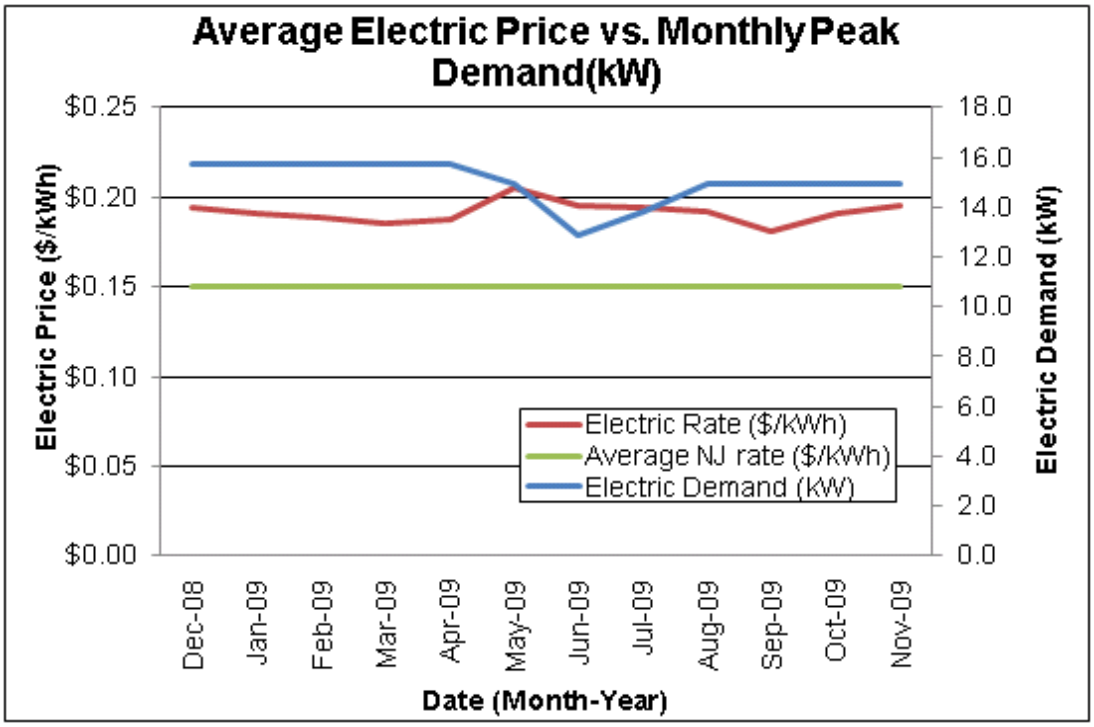
As part of the utility bill analysis, SWA evaluated the current utility rates and tariffs. Tariffs are typically assigned to buildings based on size and building type.

Tariff analysis is performed to determine if the rate that a municipality is contracted to pay with each utility provider is the best rate possible resulting in the lowest costs for electric and gas provision. Typically, the natural gas prices increase during the heating months when natural gas is used by the hot water boiler units. Some high gas price per therm fluctuations in the summer may be due to high energy costs that recently occurred and low use caps for the non-heating months. Typically, electricity prices also increase during the cooling months when electricity is used by the air conditioning units.

The supplier charges a market-rate price based on use, and the billing does not break down demand costs for all periods because usage and demand are included in the rate. Currently, the borough of Freehold is paying a general service rate for natural gas. Demand is not broken out in the bill. Thus the building pays for fixed costs such as meter reading charges during the summer months. The building is direct metered and currently purchases electricity at a general service rate for usage with an additional charge for electrical demand factored into each monthly bill. There general service rate for electric charges are market-rate based on use. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year.

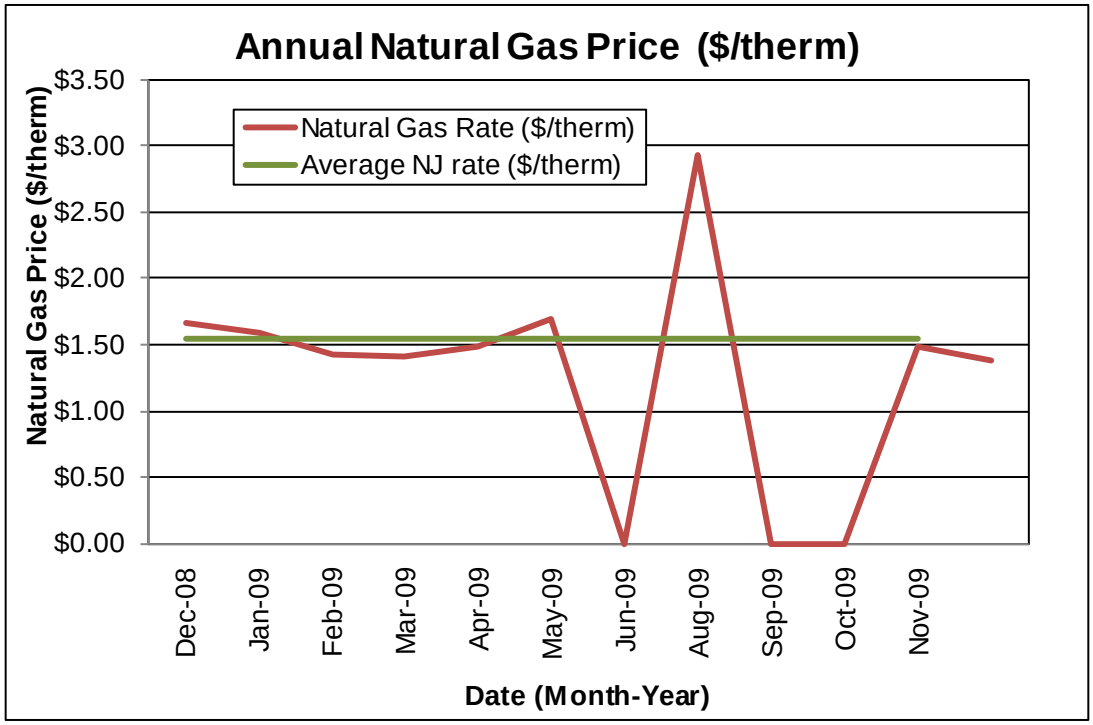
1.2.2. Energy Procurement strategies

The average estimated NJ commercial utility rates for electric are $0.150/kWh, while the Library pays an average rate of $0.192/kWh. The average rate was determined by dividing the total annual cost by the total annual consumption for the building. Building's with a small floor area (typically 5,000 or less) will exhibit a higher average rate since the energy usage density will be slightly higher with a smaller building. The Library's annual electric utility costs are $904 higher, when compared to the average estimated NJ commercial utility rates. Electric bill analysis shows fluctuations up to 12% over the most recent 12 month period.



The above chart shows that the average annual electric rate ($/kWh) is much higher than NJ state averages. Buildings with smaller floor areas are typically higher than the NJ state average; however there may be energy procurement opportunities.

The average estimated NJ commercial utility rates for gas are $1.550/therm, while the Library pays a rate of $1.539/therm. Natural gas bill analysis shows fluctuations up to 53% over the most recent 12 month period.



The above chart shows that during medium to high usage months, the natural gas rate ($/therm) is in line with average NJ rates. During the summer months, natural gas is not used however the building is still charged a minimum charge per utility meter. This minimum charge causes a sharp spike to appear in the above graph.

Utility rate fluctuations may have been caused by adjustments between estimated and actual meter readings; others may be due to unusual high and recent escalating energy costs.

SWA recommends that the Library further explore opportunities of purchasing electricity from third-party suppliers in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the library. Appendix C contains a complete list of third-party energy suppliers for the Borough of Freehold service area.

EXISTING FACILITY AND SYSTEMS DESCRIPTION

This section gives an overview of the current state of the facility and systems. Please refer to the Proposed Further Recommendations section for recommendations for improvement.

Based on visits from SWA on dates, the following data was collected and analyzed.

2.1. Building Characteristics

- Free-standing, single-story, slab below grade building with basement.
- Constructed in 1903 with no additions or architectural alterations.
- Approximately 4,000 square feet of conditioned space
- The building houses a pubic library, office, lunch room, storage rooms, and boiler room.

2.2. Building occupancy profiles

- Typical occupancy of fifty hours per week.
- The building is open on weekdays from 9:00 AM to 5:00 PM and 7:00 PM to 9:00 PM on Monday, Wednesday and Thursday evenings. On Saturdays the library is open from 9:00 AM to 1:00 PM. It is closed on Sundays and on Saturday's in July and August.
- The library is occupied by 5 library employees and a fluctuating amount of visitors.

2.3. Building envelope

This is an overview of the current state of the building. SWA has included recommendations to improve the efficiency and sustainability of the building. Implementing the suggestions will reduce the energy demand.

2.3.1. Exterior Walls

Water damaged brick sections, ineffective downspouts, and sections with missing or deteriorated caulking.

2.3.2. Roof

The mostly sloped roof has a darker colored asphalt shingle type finish. The condition of the five-year-old roof was visually inspected from the exterior and found to be age appropriate. The low sloped/flat roof is finished with EPDM. Leaks were reported and signs of water damage were visible on some ceiling tiles located in the children's and adult wings.

Foil backed fiberglass batt insulation was seen to be installed between the trusses below the roof sheathing with vent baffles sandwiched between. Some rows of roof insulation were ripped or hanging loose, not properly attached to the sheathing.

Damaged/missing roof insulation and ceiling tile with water stains

2.3.3. Base

The building's base is a 4" concrete slab-on grade with a perimeter footing and concrete block stem walls. Besides the visible water penetration mentioned in section 2.2.1.Exterior Walls, there weren't any moisture or water-related issues reported or detected.

2.3.4. Windows

Windows were found to be low-e type, double-glazed, mostly fixed aluminum frame units in good condition, except for some exterior caulking that was found to be cracked or missing.



Cracked caulking at windows

2.3.5. Exterior doors

The aluminum exterior doors were inspected and observed to be in overall good condition, except for some weather-stripping that started to show wear-and-tear at the time of the inspection, and front doors that did not completely close.



Doors not closing completely and missing weather stripping

2.3.6. Building air tightness

The Library building is over 100 years old and has many areas of infiltration as is appropriate with the age of the building. Areas such as the ceiling on the main floor show signs of water damage or disrupted insulation, which do not provide an adequate air or thermal barrier. The exterior surface of the building has many areas that have settled overtime, allowing infiltration around some window and door frames. All doors showed signs of worn weather-stripping, that allows conditioned air to leak out of the building.

The air tightness of buildings helps to maximize other implemented energy measures and investments, and minimizes long-term maintenance and repair cost.

2.4. Mechanical Systems

The Library building is an older, historical building that has minimal heating, cooling and ventilation requirements. The entire system is controlled by building occupants, which were observed to operate heating and cooling equipment on an as needed basis.

Equipment

The Freehold Library is heated by a single Crown boiler with a heating output of 199 MBH and a thermal efficiency of 82.6%. This unit was installed in 2002 and was observed in good condition. The building is not centrally cooled, however a single Friedrich window AC unit was observed in one of the Main floor windows. A comprehensive Equipment List can be found in Appendix A.

Crown Boiler

Distribution Systems

The heating to the building spaces is provided by the Crown boiler via cast iron radiators located throughout the Main floor and stairwells. There is also one Modine, ceiling-mounted unit heater located in the basement level. All cast iron radiators as well as the Modine unit heater are fed hot water via a central hot water loop.

Cast iron radiator located in stairwell

Modine unit heater mounted in Basement level

Controls

Each floor of the Library building is equipped with a thermostat. The Main level contains a programmable thermostat that regulates the amount of heat received from the cast iron radiators. The Basement level contains a non-programmable thermostat that regulates the amount of heat received from the Modine unit heater.

Non-programmable thermostat in Basement

The window AC unit is not controlled by either thermostat but instead by non-programmable controls built into the unit itself.

2.4.1. Domestic Hot Water

The domestic hot water (DHW) for the Borough of Freehold Library is provided by a Bradford-White electric hot water heater with 40 gallons of storage and 2 electric coil heating elements.


Bradford-White electric DHW heater

This heater has 40% estimated useful operating life remaining and appears in good condition.

2.5. Electrical systems

2.5.1. Lighting

See attached lighting schedule in Appendix B for a complete inventory of lighting throughout the building including estimated power consumption and proposed lighting recommendations.

Interior Lighting - The Library currently contains mostly inefficient T12 fluorescent fixtures, chandeliers and wall sconces with self-ballasted bulbs. Based on measurements of lighting levels for each space, there are no vastly over-illuminated areas. There are some concerns with both interior and exterior visibility in a few places. Some issues will be addressed by upgrading lights to a newer technology as part of the recommendation; however building staff should increase lighting levels as necessary by increasing the power of each lamp. Each level of the building consists of 1 main area that is consistently occupied. Due to the size of each general area, occupancy sensors are not recommended since they would not be able to reduce runtime of light fixtures and would not provide energy savings.

General lighting consisting of T12 fixtures with magnetic ballasts

Exit Lights - Exit signs were found to be LED type.

Exterior Lighting - The exterior lighting surveyed during the building audit was found to be a mix of Metal Halide lamp and CFL fixtures. Exterior lighting is controlled by timers.

2.5.2. Appliances and process

SWA has conducted a general survey of larger, installed equipment. Appliances and other miscellaneous equipment account for a significant portion of electrical usage within the building. Typically, appliances are referred to as “plug-load” equipment, since they are not inherent to the building’s systems, but rather plug into an electrical outlet. Equipment such as process motors, computers, computer servers, radio and dispatch equipment, refrigerators, vending machines, printers, etc. all create an electrical load on the building that is hard to separate out from the rest of the building’s energy usage based on utility analysis.

2.5.3. Elevators

The Library does not have an installed elevator.

2.5.4. Other electrical systems

There are not currently any other significant energy-impacting electrical systems installed at the Library.

RENEWABLE AND DISTRIBUTED ENERGY MEASURES

Renewable energy is defined as any power source generated from sources which are naturally replenished, such as sunlight, wind and geothermal. Technology for renewable energy is improving, and the cost of installation is decreasing, due to both demand and the availability of state and federal government-sponsored funding. Renewable energy reduces the need for using either electricity or fossil fuel, therefore lowering costs by reducing the amount of energy purchased from the utility company. Technology such as photovoltaic panels or wind turbines, use natural resources to generate electricity on the site. Geothermal systems offset the thermal loads in a building by using water stored in the ground as either a heat sink or heat source. Solar thermal collectors heat a specified volume of water, reducing the amount of energy required to heat water using building equipment. Cogeneration or CHP allows you to generate electricity locally, while also taking advantage of heat wasted during the generation process.

3.1. Existing systems

Currently there are no renewable energy systems installed in the building.

3.2. Evaluated Systems

SWA evaluated the following renewable and distributed energy measure possibilities: wind, solar photovoltaic, solar thermal collectors, combined heat and power, and geothermal.

Solar Photovoltaic

Based on utility analysis and a study of roof conditions, the Library is not a good candidate for a Solar Panel installation. There is insufficient roof space for panels to reasonably supplement the power consumption of the building. In addition, based on the age of the building, an in-depth structural analysis would need to be completed in order to determine if the roof is capable of supporting solar panels. The cost of the structural analysis would be included in the installed cost of the PV system and make the measure no longer cost effective.

Solar Thermal Collectors

Solar thermal collectors are not cost-effective for this building and would not be recommended due to the insufficient and intermittent use of domestic hot water throughout the building to justify the expenditure.

Geothermal

The Library is not a good candidate for geothermal installation since it would require replacement of the entire existing HVAC system, of which major components still have between 20% and 68% remaining useful life.

Combined Heat and Power

The Library is not a good candidate for CHP installation and would not be cost-effective due to the size and operations of the building. Typically, CHP is best suited for buildings with a high electrical baseload to accommodate the electricity generated, as well as a means for using waste heat generated. Typical applications include buildings with an absorption chiller, where waste heat would be used efficiently.

PROPOSED ENERGY CONSERVATION MEASURES

Energy Conservation Measures (ECMs) are recommendations determined for the building based on improvements over current building conditions. ECMs have been determined for the building based on installed cost, as well as energy and cost-savings opportunities.

Recommendations: Energy Conservation Measures

ECM#	Description of ECMs with 0-5 Year Payback
1	Install (8) new CFL lamps
2	Install (1) new LED exit sign
3	Install Programmable Thermostat for unit heater
	Description of ECMs with 5-10 Year Payback
4	Install (49) new T8 fluorescent light fixtures
	Description of ECMs with >10 Year Payback
5	Replace electric DHW with gas-fired unit

Assumptions: Discount Rate: 3.2%; Energy Price Escalation Rate: 0%
Note: A 0.0 electrical demand reduction/month indicates that it is very low/negligible

ECM#1: *Install (8) new CFL lamps*

On the day of the site visit, SWA completed a lighting inventory of the Borough of Freehold Library (see Appendix B). The existing lighting inventory contained 8 inefficient incandescent lamps. SWA recommends that each incandescent lamp is replaced with a more efficient, Compact Fluorescent Lamp (CFL). CFLs are capable of providing equivalent or better light output while using less power.

Installation cost:

Estimated installed cost: $80 (includes $24 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

Economics:

ECM #	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
1	80	882	0.2	0	0.8	24	193	5	967	0.4	11	2	2	800	8,153

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA also assumed an aggregated 5 hrs/yr to replace aging burnt out lamps vs. newly installed.

Rebates/financial incentives:

- *None*

Please see Appendix F for more information on Incentive Programs.

ECM#2: *Install (1) new LED exit sign*

On the day of the site visit, SWA completed a lighting inventory of the Borough of Freehold Library (see Appendix B). The existing lighting inventory contained 1 inefficient fluorescent exit sign. SWA recommends that this exit sign is replaced with a new, more efficient LED exit sign. LED exit signs can provide significant energy savings since they operate 24 hours per day.

Installation cost:

Estimated installed cost: $151 (includes $30 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

Economics:

ECM #	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
2	131	145	0.0	0	0.1	3	31	15	463	4.2	3	0	0	232	260

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA also assumed an aggregated 5 hrs/yr to replace aging burnt out lamps vs. newly installed.

Rebates/financial incentives:

- *NJ Clean Energy – SmartStart – LED Exit Signs ($20 per fixture)*

Please see Appendix F for more information on Incentive Programs.

ECM#3: *Install programmable thermostat for unit heater*

On the day of the site visit, SWA observed that the Modine, ceiling mounted unit heater was controlled by a non-programmable thermostat. This unit heater is connected to the boiler hot water loop and is constantly set at the maximum temperature (72ºF). SWA recommends installing a programmable thermostat to reduce the heat output of this unit heater at nights and on weekends when the Library is not occupied.

Installation cost:

Estimated installed cost: $122 (includes $30 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program, ENERGY STAR®*

Economics:

ECM #	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
3	122	0	0.0	17	0.4	0	26	15	392	4.7	2	0	0	186	187

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumed that temperatures would be setback based on the operation schedule of the building.

Rebates/financial incentives:

- *None*

Please see Appendix F for more information on Incentive Programs.

ECM#4: *Install (49) new T8 fluorescent fixtures*

On the day of the site visit, SWA completed a lighting inventory of the Borough of Freehold Library (see Appendix B). The existing lighting inventory contained mostly inefficient T12 fluorescent fixtures with magnetic ballasts. SWA recommends replacing each existing fixture with more efficient, T8 fluorescent fixtures with electronic ballasts. T8 fixtures with electronic ballasts provide equivalent or better light output while reducing energy consumption by 30% when compared to a T12 fixture with magnetic ballast.

Installation cost:

Estimated installed cost: $4,997 (includes $1,470 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

Economics:

ECM #	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
4	4,997	2,358	0.5	0	2.0	193	646	15	9,686	7.7	1	0	0	2,601	4,222

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA also assumed an aggregated 5 hrs/yr to replace aging burnt out lamps vs. newly installed.

Rebates/financial incentives:

- *NJ Clean Energy – SmartStart – T8 fixtures with electronic ballasts ($15 per fixture)*

Please see Appendix F for more information on Incentive Programs.

ECM#5: *Replace electric DHW heater with gas unit*

On the day of the site visit, SWA observed that the domestic hot water (DHW) loads of the building were met by an electric, 40 gallon DHW heater. Electric DHW heaters consume electricity constantly in order to keep stored hot water at a set temperature. SWA recommends that this unit is replaced with a gas-fired unit. Upgrading this unit will not result in energy savings but will result in cost savings by switching to a less expensive fuel.

Installation cost:

Estimated installed cost: $1,338 (includes $392 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

Economics:

ECM #	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
5	1,338	879	0.2	-30	0.0	0	123	10	1,226	10.9	0	0	0	105	1,243

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumed cost savings based on average utility costs calculated for the Library building.

Rebates/financial incentives:

- *NJ Clean Energy – SmartStart – Gas Water Heaters <50 gallons ($50 per unit)*

Please see Appendix F for more information on Incentive Programs.

PROPOSED FURTHER RECOMMENDATIONS

Capital Improvements

Capital Improvements are recommendations for the building that may not be cost-effective at the current time, but that could yield a significant long-term payback. These recommendations should typically be considered as part of a long-term capital improvement plan. Capital improvements should be considered if additional funds are made available, or if the installed costs can be shared with other improvements, such as major building renovations. SWA recommends the following capital improvements for the Library building:

- Increase insulation levels at attic to prevent loss of heated air – Increasing insulation levels and insuring an even thermal barrier will prevent the loss of expensive heated air, increase comfort as well as help prevent ice damming that is forming on the roof during the winter season.

- Replace cast iron radiators with newer units that provide a better heat transfer – The existing cast iron radiators were observed to contain many layers of paint that may be affecting the amount of heat that is transferred to building.

Operations and Maintenance

Operations and Maintenance measures consist of low/no cost measures that are within the capability of the current building staff to handle. These measures typically require little investment, and they yield a short payback period. These measures may address equipment settings or staff operations that, when addressed will reduce energy consumption or costs.

- Replace missing, torn or displace insulation batts at the attic level - insulate space above the ceiling tiles and plug all ceiling penetrations. All missing tiles should be put back into place. Increasing insulation levels as a capital improvement measure is preferred.

- Maintain roofs – SWA recommends regular maintenance to verify water is draining correctly.

- Insulate heating hot water and domestic hot water piping – SWA observed that heating hot water and domestic hot water piping were missing insulation on the supply side near the heating units. SWA recommends installing insulation on all supply pipes to prevent loss of heat through pipe walls.

- Provide weather-stripping/air-sealing - SWA observed that exterior door weather-stripping was beginning to deteriorate in places. Doors and vestibules should be observed annually for deficient weather-stripping and replaced as needed. The perimeter of all window frames should also be regularly inspected, and any missing or deteriorated caulking should be re-caulked to provide an unbroken seal around the window frames. Any other accessible gaps or penetrations in the thermal envelope penetrations should also be sealed with caulk or spray foam.

- Repair/seal wall cracks and penetrations - SWA recommends as part of the maintenance program installing weep holes, installing proper flashing and correct masonry efflorescence, and sealing wall cracks and penetrations wherever necessary in order to keep insulation dry and effective.

- Provide water-efficient fixtures and controls - Adding controlled on/off timers on all lavatory faucets is a cost-effective way to reduce domestic hot water demand and save water. Building staff can also easily install faucet aerators and/or low-flow fixtures to reduce water consumption. There are many retrofit options, which can be installed now or incorporated as equipment is replaced. Routine maintenance practices that identify and quickly address water leaks are a low-cost way to save water and energy. Retrofitting with more efficient water-consumption fixtures/appliances will reduce energy consumption for water heating, while also decreasing water/sewer bills.

- SWA recommends that the building considers purchasing the most energy-efficient equipment, including Energy Star labeled appliances, when equipment is installed or replaced. More information can be found in the "Products" section of the Energy Star website at: http://www.energystar.gov.

- Use smart power electric strips - in conjunction with occupancy sensors to power down computer equipment when left unattended for extended periods of time.

- Create an energy educational program - that teaches how to minimize energy use. The U.S. Department of Energy offers free information for hosting energy efficiency educational programs and plans. For more information please visit: http://www1.eere.energy.gov/education/.

APPENDIX A: EQUIPMENT LIST

Inventory

Building System	Description	Location	Make/ Model	Fuel	Space Served	Date Installed	Estimated Remaining Useful Life %
Heating	Sealed combustion, 241,000 BTUH input, 199,000 BTUH output, 82.6% thermal efficiency	Mechanical room, basement	Crown Boiler Company, Model #BSI241ENFZZPSU, Serial #CROWNB000302403	Natural Gas	All Areas	2002	68%
Heating	Unit heater, convective unit, non-programmable thermostat set at 70F (max. temperature)	Children's book area, basement	Modine, Model #NA, Serial #NA	Hot water loop	Children's book area, basement	1990	20%
Heating	Cast iron hot water radiators, no nameplate info, programmable thermostat set for 68F	Main floor areas, stairwell	No nameplate info available	Hot water loop	Main floor, stairwell	1970	10%
Cooling	Friedrich window AC unit, no nameplate info	Mounted in Library window	Friedrich, no nameplate info	Electricity	Library	2007	88%
Domestic Hot Water	Bradford-White electric hot water heater, 4500W upper, 4500W lower, 40 gallons	Bathroom, Basement level	Bradford-White, Energy Saver, Hydrojet, Model #MI4055DS13, Serial #KJ2089415	Electricity	All Areas	2002	40%
Lighting	See Appendix A	-	-	-	-	-	-

Note: The remaining useful life of a system (in %) is an estimate based on the system date of built and existing conditions derived from visual inspection.

Appendix B: Lighting Study

Location			Existing Fixture Information												Retrofit Information												Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
1	GF	Corridor	Screw-in	N	CFL	1	1	23	S	11	339	0	23	86	N/A	Screw-in	CFL	N	S	1	1	23	11	339	0	23	86	0	0	0
2	GF	Computer Lab	Parabolic	E	4T8	5	3	32	S	11	339	10	490	1,976	N/A	Parabolic	4T8	E	S	5	3	32	11	339	10	490	1,976	0	0	0
3	GF	Corridor	Screw-in	N	CFL	4	1	23	S	11	339	0	92	343	N/A	Screw-in	CFL	N	S	4	1	23	11	339	0	92	343	0	0	0
4	**GF**	**Corridor**	**HID**	**N**	**Hal**	**1**	**1**	**50**	**S**	**11**	**339**	**13**	**63**	**235**	**CFL**	**Screw-in**	**CFL**	**N**	**S**	**1**	**1**	**15**	**11**	**339**	**0**	**15**	**56**	**179**	**0**	**179**
5	GF	Quiet study	Screw-in	N	CFL	3	1	23	S	11	339	0	69	257	N/A	Screw-in	CFL	N	S	3	1	23	11	339	0	69	257	0	0	0
6	GF	Quiet study	Parabolic	E	4T8	8	2	32	S	11	339	6	518	2,088	N/A	Parabolic	4T8	E	S	8	2	32	11	339	6	518	2,088	0	0	0
7	GF	Reading area	Screw-in	N	CFL	9	2	50	S	11	339	0	900	3,356	N/A	Screw-in	CFL	N	S	9	2	50	11	339	0	900	3,356	0	0	0
8	GF	Reading area	Exit Sign	N	LED	2	1	5	N	24	365	1	11	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	11	105	0	0	0
9	GF	Reading area	Screw-in	N	CFL	1	1	23	S	11	339	0	23	86	N/A	Screw-in	CFL	N	S	1	1	23	11	339	0	23	86	0	0	0
10	GF	Stacks	Parabolic	E	4T8	50	3	32	S	11	339	10	4,810	19,764	N/A	Parabolic	4T8	E	S	50	3	32	11	339	10	4,810	19,764	0	0	0
11	**GF**	**Stacks**	**HID**	**N**	**Hal**	**4**	**1**	**100**	**S**	**11**	**339**	**25**	**425**	**1,865**	**CFL**	**Screw-in**	**CFL**	**N**	**S**	**4**	**1**	**35**	**11**	**339**	**0**	**140**	**523**	**1,342**	**0**	**1,342**
12	GF	Corridor	Screw-in	N	CFL	10	1	23	S	11	339	0	230	856	N/A	Screw-in	CFL	N	S	10	1	23	11	339	0	230	856	0	0	0
13	GF	Corridor	Screw-in	N	CFL	1	3	23	S	11	339	0	69	257	N/A	Screw-in	CFL	N	S	1	3	23	11	339	0	69	257	0	0	0
14	**GF**	**Heritage room**	**Screw-in**	**N**	**Inc**	**6**	**1**	**100**	**S**	**2**	**339**	**0**	**600**	**407**	**CFL**	**Screw-in**	**CFL**	**N**	**S**	**6**	**1**	**35**	**2**	**339**	**0**	**210**	**143**	**264**	**0**	**264**
15	GF	Heritage room	Screw-in	N	CFL	16	1	23	S	2	339	0	368	250	N/A	Screw-in	CFL	N	S	16	1	23	2	339	0	368	250	0	0	0
16	GF	Heritage room	Screw-in	N	CFL	2	3	23	S	2	339	0	138	94	N/A	Screw-in	CFL	N	S	2	3	23	2	339	0	138	94	0	0	0
17	GF	Area near Quiet study	Screw-in	N	CFL	12	1	23	S	11	339	0	276	1,029	N/A	Screw-in	CFL	N	S	12	1	23	11	339	0	276	1,029	0	0	0
18	GF	Quiet study	Screw-in	N	CFL	5	2	50	S	11	339	0	500	1,865	N/A	Screw-in	CFL	N	S	5	2	50	11	339	0	500	1,865	0	0	0
19	GF	Fiction / Mystery Stacks	Parabolic	E	4T8	42	3	32	S	11	339	10	4,042	16,602	N/A	Parabolic	4T8	E	S	42	3	32	11	339	10	4,042	16,602	0	0	0
20	GF	Fiction / Mystery Stacks	Parabolic	E	4T8	30	3	32	S	11	339	10	2,890	11,868	N/A	Parabolic	4T8	E	S	30	3	32	11	339	10	2,890	11,868	0	0	0
21	GF	Fiction / Mystery Stacks	Screw-in	N	CFL	10	2	50	S	11	339	0	1,000	3,729	N/A	Screw-in	CFL	N	S	10	2	50	11	339	0	1,000	3,729	0	0	0
22	**GF**	**Fiction / Mystery Stacks**	**HID**	**N**	**Hal**	**2**	**1**	**100**	**S**	**11**	**339**	**25**	**225**	**932**	**CFL**	**Screw-in**	**CFL**	**N**	**S**	**2**	**1**	**35**	**11**	**339**	**0**	**70**	**261**	**671**	**0**	**671**
23	GF	Fiction / Mystery Stacks	Exit Sign	N	LED	2	1	5	N	24	365	1	11	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	11	105	0	0	0
24	GF	Circulation desk	Screw-in	N	CFL	15	2	50	S	11	339	0	1,500	5,594	N/A	Screw-in	CFL	N	S	15	2	50	11	339	0	1,500	5,594	0	0	0
25	GF	Circulation desk	Screw-in	N	CFL	8	2	50	S	11	339	0	800	2,983	N/A	Screw-in	CFL	N	S	8	2	50	11	339	0	800	2,983	0	0	0
26	GF	Corridor	Screw-in	N	CFL	4	1	23	S	11	339	0	92	343	N/A	Screw-in	CFL	N	S	4	1	23	11	339	0	92	343	0	0	0
27	GF	Corridor	Screw-in	N	CFL	1	3	23	S	11	339	0	69	257	N/A	Screw-in	CFL	N	S	1	3	23	11	339	0	69	257	0	0	0
28	**GF**	**Main entrance corridor**	**HID**	**N**	**Hal**	**19**	**1**	**250**	**S**	**11**	**339**	**63**	**4,813**	**22,176**	**CFL**	**Screw-in**	**CFL**	**N**	**S**	**19**	**1**	**85**	**11**	**339**	**0**	**1,615**	**6,022**	**16,154**	**0**	**16,154**
29	**GF**	**Main entrance corridor**	**HID**	**N**	**Hal**	**10**	**1**	**100**	**S**	**4**	**339**	**25**	**1,025**	**1,696**	**CFL**	**Screw-in**	**CFL**	**N**	**S**	**10**	**1**	**35**	**4**	**339**	**0**	**350**	**476**	**1,220**	**0**	**1,220**
30	GF	Main entrance corridor	Screw-in	N	CFL	3	1	23	S	11	339	0	69	257	N/A	Screw-in	CFL	N	S	3	1	23	11	339	0	69	257	0	0	0
31	GF	Main entrance corridor	Exit Sign	N	LED	2	1	5	N	24	365	1	11	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	11	105	0	0	0
32	GF	Main entrance corridor	Screw-in	N	CFL	1	2	50	S	11	339	0	100	373	N/A	Screw-in	CFL	N	S	1	2	50	11	339	0	100	373	0	0	0
33	GF	Main entrance corridor	Screw-in	N	CFL	23	1	23	S	11	339	0	529	1,973	N/A	Screw-in	CFL	N	S	23	1	23	11	339	0	529	1,973	0	0	0
34	**GF**	**Main entrance corridor**	**HID**	**N**	**Hal**	**12**	**1**	**25**	**S**	**11**	**339**	**6**	**306**	**1,387**	**CFL**	**Screw-in**	**CFL**	**N**	**S**	**12**	**1**	**10**	**11**	**339**	**0**	**120**	**447**	**940**	**0**	**940**
35	GF	Corridor	Screw-in	N	CFL	6	1	23	S	11	339	0	138	515	N/A	Screw-in	CFL	N	S	6	1	23	11	339	0	138	515	0	0	0
36	GF	Corridor	Screw-in	N	CFL	23	3	23	S	11	339	0	1,587	5,918	N/A	Screw-in	CFL	N	S	23	3	23	11	339	0	1,587	5,918	0	0	0
37	**GF**	**Childrens stacks**	**HID**	**N**	**Hal**	**6**	**1**	**25**	**S**	**11**	**339**	**6**	**156**	**694**	**CFL**	**Screw-in**	**CFL**	**N**	**S**	**6**	**1**	**10**	**11**	**339**	**0**	**60**	**224**	**470**	**0**	**470**
38	GF	Childrens stacks	Screw-in	N	CFL	49	1	50	S	11	339	0	2,460	9,136	N/A	Screw-in	CFL	N	S	49	1	50	11	339	0	2,460	9,136	0	0	0
39	GF	Childrens stacks	Screw-in	N	CFL	15	1	23	S	11	339	0	345	1,287	N/A	Screw-in	CFL	N	S	15	1	23	11	339	0	345	1,287	0	0	0
40	GF	Childrens stacks	Screw-in	N	CFL	16	1	23	S	11	339	0	368	1,372	N/A	Screw-in	CFL	N	S	16	1	23	11	339	0	368	1,372	0	0	0
41	GF	Gathering room	Screw-in	N	CFL	16	1	23	S	11	339	0	368	1,372	N/A	Screw-in	CFL	N	S	16	1	23	11	339	0	368	1,372	0	0	0
42	GF	Gathering room	Screw-in	N	CFL	10	3	23	S	11	339	0	690	2,573	N/A	Screw-in	CFL	N	S	10	3	23	11	339	0	690	2,573	0	0	0
43	GF	Gathering room	Screw-in	N	CFL	5	1	13	S	11	339	0	65	242	N/A	Screw-in	CFL	N	S	5	1	13	11	339	0	65	242	0	0	0
44	GF	Gathering room	Exit Sign	N	LED	2	1	5	N	24	365	1	11	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	11	105	0	0	0
45	GF	Childrens bathroom	Parabolic	E	2T8	1	2	17	S	11	338	3	37	136	N/A	Parabolic	2T8	E	S	1	2	17	11	339	3	37	139	0	0	0
46	GF	Kitchen	Parabolic	E	2T8	1	2	17	S	11	339	3	37	138	N/A	Parabolic	2T8	E	S	1	2	17	11	339	3	37	138	0	0	0
47	GF	Reading room	Screw-in	N	CFL	8	1	23	S	11	339	0	184	686	N/A	Screw-in	CFL	N	S	8	1	23	11	339	0	184	686	0	0	0
48	GF	Stacks	Screw-in	N	CFL	11	3	23	S	11	339	0	759	2,830	N/A	Screw-in	CFL	N	S	11	3	23	11	339	0	759	2,830	0	0	0
49	**GF**	**Stacks**	**HID**	**N**	**Hal**	**3**	**1**	**100**	**S**	**11**	**339**	**25**	**325**	**1,398**	**CFL**	**Screw-in**	**CFL**	**N**	**S**	**3**	**1**	**35**	**11**	**339**	**0**	**105**	**392**	**1,007**	**0**	**1,007**
50	GF	Stacks	Exit Sign	N	LED	2	1	5	N	24	365	1	11	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	11	105	0	0	0
51	GF	Entrance to Storybook Coffee	Screw-in	N	CFL	1	1	23	S	11	339	0	23	86	N/A	Screw-in	CFL	N	S	1	1	23	11	339	0	23	86	0	0	0
52	GF	Entrance to Storybook Coffee	Screw-in	N	CFL	1	1	15	S	11	339	0	15	56	N/A	Screw-in	CFL	N	S	1	1	15	11	339	0	15	56	0	0	0
53	GF	Picture books	Screw-in	N	CFL	1	3	23	S	11	339	0	69	257	N/A	Screw-in	CFL	N	S	1	3	23	11	339	0	69	257	0	0	0
54	GF	Employees Staff Closet	Parabolic	E	2T8	6	2	17	S	2	339	3	207	151	N/A	Parabolic	2T8	E	S	6	2	17	2	339	3	207	151	0	0	0
55	GF	Circulation desk	Parabolic	E	2T8	7	2	17	S	11	339	3	241	966	N/A	Parabolic	2T8	E	S	7	2	17	11	339	3	241	966	0	0	0
56	GF	Breakroom	Parabolic	E	2T8	2	2	17	S	11	339	3	71	276	N/A	Parabolic	2T8	E	S	2	2	17	11	339	3	71	276	0	0	0
57	GF	Closet	Parabolic	E	2T8	2	1	17	S	2	339	2	36	26	N/A	Parabolic	2T8	E	S	2	1	17	2	339	2	36	26	0	0	0
58	GF	Exit Corridor	Parabolic	E	2T8	2	2	17	S	11	339	3	71	276	N/A	Parabolic	2T8	E	S	2	2	17	11	339	3	71	276	0	0	0
59	GF	Exit Corridor	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
60	GF	Electrical closet	Parabolic	E	2T8	2	2	17	S	2	339	3	71	50	N/A	Parabolic	2T8	E	S	2	2	17	2	339	3	71	50	0	0	0
61	GF	Administration	Screw-in	N	CFL	8	1	23	S	11	339	0	184	686	N/A	Screw-in	CFL	N	S	8	1	23	11	339	0	184	686	0	0	0

Location			Existing Fixture Information												Retrofit Information													Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
62	GF	Administration	Screw-in	N	CFL	3	3	23	S	11	339	0	207	772	N/A	Screw-in	CFL	N	S	3	3	23	11	339	0	207	772	0	0	0
63	GF	Closet	Parabolic	E	2'T8	1	2	17	S	2	339	3	37	25	N/A	Parabolic	2'T8	E	S	1	2	17	2	339	3	37	25	0	0	0
64	GF	Administration	Parabolic	E	2'T8	6	2	17	S	11	339	3	207	828	N/A	Parabolic	2'T8	E	S	6	2	17	11	339	3	207	828	0	0	0
65	GF	Conference room	Parabolic	E	2'T8	6	2	17	S	5	339	3	207	376	N/A	Parabolic	2'T8	E	S	6	2	17	5	339	3	207	376	0	0	0
66	GF	Conference room	Screw-in	N	CFL	3	1	23	S	5	339	0	69	117	N/A	Screw-in	CFL	N	S	3	1	23	5	339	0	69	117	0	0	0
67	GF	Bathroom	Parabolic	E	2'T8	1	2	17	S	2	339	3	37	25	N/A	Parabolic	2'T8	E	S	1	2	17	2	339	3	37	25	0	0	0
68	GF	Office	Parabolic	E	2'T8	4	2	17	S	11	339	3	139	552	N/A	Parabolic	2'T8	E	S	4	2	17	11	339	3	139	552	0	0	0
69	**GF**	**Men's bathroom**	**Parabolic**	**E**	**2'T8**	**4**	**2**	**17**	**S**	**11**	**339**	**3**	**139**	**552**	**C**	**Parabolic**	**2'T8**	**E**	**OS**	**4**	**2**	**17**	**8.25**	**339**	**3**	**139**	**414**	**0**	**138**	**138**
70	GF	Men's bathroom	Parabolic	E	4'T8	2	1	32	S	11	339	3	67	261	N/A	Parabolic	4'T8	E	S	2	1	32	11	339	3	67	261	0	0	0
71	GF	Men's bathroom	Screw-in	N	CFL	1	1	23	S	11	339	0	23	86	N/A	Screw-in	CFL	N	S	1	1	23	11	339	0	23	86	0	0	0
72	GF	Women's bathroom	Screw-in	N	CFL	2	1	23	S	11	339	0	46	172	N/A	Screw-in	CFL	N	S	2	1	23	11	339	0	46	172	0	0	0
73	**GF**	**Women's bathroom**	**Parabolic**	**E**	**2'T8**	**5**	**2**	**17**	**S**	**11**	**339**	**3**	**173**	**690**	**C**	**Parabolic**	**2'T8**	**E**	**OS**	**5**	**2**	**17**	**8.25**	**339**	**3**	**173**	**517**	**0**	**172**	**172**
74	GF	Women's bathroom	Parabolic	E	4'T8	1	3	32	S	11	339	10	106	366	N/A	Parabolic	4'T8	E	S	1	3	32	11	339	10	106	366	0	0	0
75	GF	Entrance	Screw-in	N	CFL	4	1	19	T	4	339	0	76	103	N/A	Screw-in	CFL	N	T	4	1	19	4	339	0	76	103	0	0	0
76	Ext	Exterior	Screw-in	N	CFL	6	1	19	T	12	365	0	114	499	N/A	Screw-in	CFL	N	T	6	1	19	12	365	0	114	499	0	0	0
77	Ext	Exterior	Screw-in	N	CFL	5	2	26	T	12	365	0	260	1,139	N/A	Screw-in	CFL	N	T	5	2	26	12	365	0	260	1,139	0	0	0
78	**Ext**	**Exterior Parking**	**HID**	**N**	**MH**	**8**	**1**	**400**	**T**	**12**	**365**	**100**	**3,300**	**17,520**	**PSMH**	**HID**	**PSMH**	**N**	**T**	**8**	**1**	**275**	**12**	**365**	**59**	**2,259**	**11,703**	**5,817**	**0**	**5,817**
Totals:						**593**	**126**	**2,845**				**397**	**40,819**	**160,792**						**593**	**126**	**2,165**				**34,525**	**132,417**	**28,065**	**310**	**28,375**

Rows Highlighed Yellow Indicate an Energy Conservation Measure is recommended for that space

Proposed Lighting Summary Table			
Total Gross Floor Area (SF)	4,000		
Average Power Cost ($/kWh)	0.1920		
Total Interior Lighting	**Existing**	**Proposed**	**Savings**
Annual Consumption (kWh)	11,136	7,752	**3,384**
Lighting Power (watts)	5,560	3,809	**1,752**
Lighting Power Density (watts/SF)	1.39	0.95	**0.44**
Estimated Cost of Fixture Replacement ($)	4,766		
Estimated Cost of Controls Improvements ($)	0		
Total Consumption Cost Savings ($)	**1,112**		

Legend:

Fixture Type	Lamp Type	Control Type	Ballast Type	Retrofit Category
Exit Sign	LED	N (None)	N/A (None)	N/A (None)
Screw-in	Inc (Incandescent)	S (Switch)	E (Electronic)	T8 (Installl new T8)
Pin	1'T5	OS (Occupancy Sensor)	M (Magnetic)	T5 (Install new T5)
Parabolic	2'T5	T (Timer)		CFL (Install new CFL)
Recessed	3'T5	PC (Photocell)		LEDex (Install new LED Exit)
2'U-shape	4'T5	D (Dimming)		LED (Install new LED)
Circiline	2'T8	DL (Daylight Sensor)		D (Delamping)
Exterior	3'T8	M (Microphonic Sensor)		C (Controls Only)
HID (High Intensity Discharge)	4'T8			
	6'T8			
	8'T8			
	2'T12			
	3'T12			
	4'T12			
	6'T12			
	8'T12			
	CFL (Compact Fluorescent Lightbulb)			
	MR16			
	Halogen			
	MV (Mercury Vapor)			
	MH (Metal Halide)			
	HPS (High Pressure Sodium			
	LPS (Low Pressure Sodium)			

APPENDIX C: THIRD PARTY ENERGY SUPPLIERS

http://www.state.nj.us/bpu/commercial/shopping.html

Third Party Electric Suppliers for JCPL Service Territory	Telephone & Web Site
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
BOC Energy Services, Inc. 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 www.boc.com
Commerce Energy, Inc. 4400 Route 9 South, Suite 100 Freehold, NJ 07728	(800) 556-8457 www.commerceenergy.com
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 www.newenergy.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
FirstEnergy Solutions 300 Madison Avenue Morristown, NJ 07926	(800) 977-0500 www.fes.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.com
Integrys Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 www.integrysenergy.com
Liberty Power Delaware, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(866) 769-3799 www.libertypowercorp.com
Liberty Power Holdings, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(800) 363-7499 www.libertypowercorp.com
Pepco Energy Services, Inc. 112 Main St. Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Suez Energy Resources NA, Inc. 333 Thornall Street, 6th Floor Edison, NJ 08837	(888) 644-1014 www.suezenergyresources.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com

Third Party Gas Suppliers for NJNG Service Territory	Telephone & Web Site
Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109	(800) 628-9427 www.cooperativenet.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 www.gesc.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
Intelligent Energy 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	(800) 724-1880 www.intelligentenergy.org
Metromedia Energy, Inc. 6 Industrial Way Eatontown, NJ 07724	(877) 750-7046 www.metromediaenergy.com
MxEnergy, Inc. 510 Thornall Street, Suite 270 Edison, NJ 08837	(800) 375-1277 www.mxenergy.com
NATGASCO (Mitchell Supreme) 532 Freeman Street Orange, NJ 07050	(800) 840-4427 www.natgasco.com
NJ Gas & Electric 1 Bridge Plaza, Fl. 2 Fort Lee, NJ 07024	(866) 568-0290 www.NewJerseyGasElectric.com
Pepco Energy Services, Inc. 112 Main Street Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
Woodruff Energy 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 www.woodruffenergy.com

APPENDIX D: GLOSSARY AND METHOD OF CALCULATIONS

Glossary of ECM Terms

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Net ECM Cost: The net ECM cost is the cost experienced by the customer, which is typically the total cost (materials + labor) of installing the measure minus any available incentives. Both the total cost and the incentive amounts are expressed in the summary for each ECM.

Annual Energy Cost Savings (AECS): This value is determined by the audit firm based on the calculated energy savings (kWh or Therm) of each ECM and the calculated energy costs of the building.

Lifetime Energy Cost Savings (LECS): This measure estimates the energy cost savings over the lifetime of the ECM. It can be a simple estimation based on fixed energy costs. If desired, this value can factor in an annual increase in energy costs as long as the source is provided.

Simple Payback: This is a simple measure that displays how long the ECM will take to break-even based on the annual energy and maintenance savings of the measure.

ECM Lifetime: This is included with each ECM so that the owner can see how long the ECM will be in place and whether or not it will exceed the simple payback period. Additional guidance for calculating ECM lifetimes can be found below. This value can come from manufacturer's rated lifetime or warranty, the ASHRAE rated lifetime, or any other valid source.

Operating Cost Savings (OCS): This calculation is an annual operating savings for the ECM. It is the difference in the operating, maintenance, and / or equipment replacement costs of the existing case versus the ECM. In the case where an ECM lifetime will be longer than the existing measure (such as LED lighting versus fluorescent) the operating savings will factor in the cost of replacing the units to match the lifetime of the ECM. In this case or in one where one-time repairs are made, the total replacement / repair sum is averaged over the lifetime of the ECM.

Return on Investment (ROI): The ROI is expresses the percentage return of the investment based on the lifetime cost savings of the ECM. This value can be included as an annual or lifetime value, or both.

Net Present Value (NPV): The NPV calculates the present value of an investment's future cash flows based on the time value of money, which is accounted for by a discount rate (assumes bond rate of 3.2%).

Internal Rate of Return (IRR): The IRR expresses an annual rate that results in a break-even point for the investment. If the owner is currently experiencing a lower return on their capital than the IRR, the project is financially advantageous. This measure also allows the owner to compare ECMs against each other to determine the most appealing choices.

Gas Rate and Electric Rate ($/therm and $/kWh): The gas rate and electric rate used in the financial analysis is the total annual energy cost divided by the total annual energy usage for the 12 month billing period studied. The graphs of the monthly gas and electric rates reflect the total monthly energy costs divided by the monthly usage, and display how the average rate fluctuates throughout the year. The average annual rate is the only rate used in energy savings calculations.

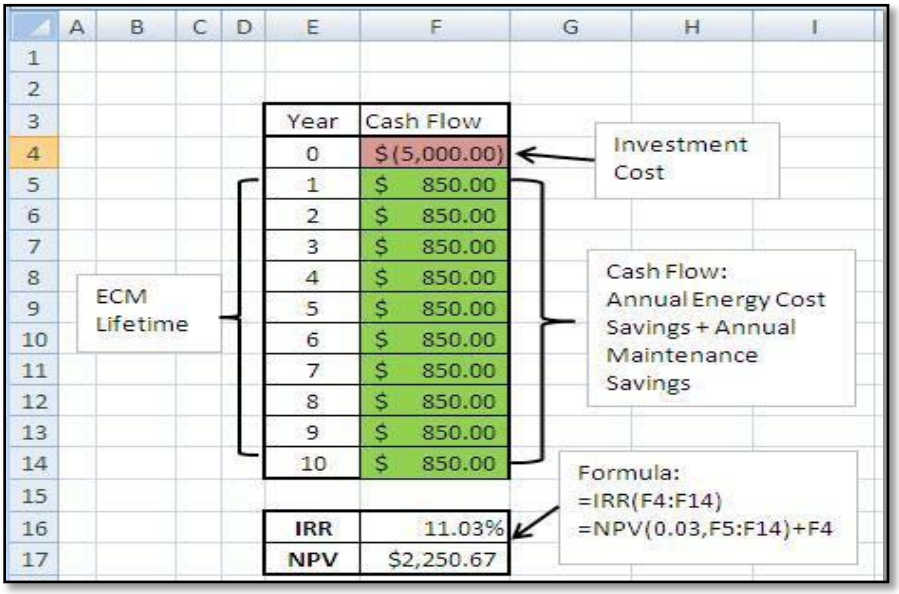
Calculation References

Term	Definition
ECM	Energy Conservation Measure
AOCS	Annual Operating Cost Savings
AECS	Annual Energy Cost Savings
LOCS*	Lifetime Operating Cost Savings
LECS	Lifetime Energy Cost Savings
LCS	Lifetime Cost Savings
NPV	Net Present Value
IRR	Internal Rate of Return
DR	Discount Rate
Net ECM Cost	Total ECM Cost – Incentive
LECS	AECS X ECM Lifetime
AOCS	LOCS / ECM Lifetime
LCS	LOCS+LECS
Simple Payback	Net ECM Cost / (AECS + AOCS)
Lifetime ROI	(LECS + LOCS – Net ECM Cost) / Net ECM Cost
Annual ROI	(Lifetime ROI / Lifetime) = [(AECS + OCS) / Net ECM Cost – (1 / Lifetime)]

* The lifetime operating cost savings are all avoided operating, maintenance, and/or component replacement costs over the lifetime of the ECM. This can be the sum of any annual operating savings, recurring or bulk (i.e. one-time repairs) maintenance savings, or the savings that comes from avoiding equipment replacement needed for the existing measure to meet the lifetime of the ECM (e.g. lighting change outs).

Excel NPV and IRR Calculation

In Excel, function =IRR (values) and =NPV(rate, values) are used to quickly calculate the IRR and NPV of a series of annual cash flows. The investment cost will typically be a negative cash flow at year 0 (total cost - incentive) with years 1 through the lifetime receiving a positive cash flow from the annual energy cost savings and annual maintenance savings. The calculations in the example below are for an ECM that saves $850 annually in energy and maintenance costs (over a 10 year lifetime) and takes $5,000 to purchase and install after incentives:



Solar PV ECM Calculation

There are several components to the calculation:

Costs:	Material of PV system including panels, mounting and net-metering + Labor
Energy Savings:	Reduction of kWh electric cost for life of panel, 25 years
Incentive 1:	NJ Renewable Energy Incentive Program (REIP), for systems of size 50kW or less, $1/Watt incentive subtracted from installation cost
Incentive 2:	Solar Renewable Energy Credits (SRECs) – Market-rate incentive. Calculations assume $600/Megawatt hour consumed per year for a maximum of 15 years; added to annual energy cost savings for a period of 15 years. (Megawatt hour used is rounded to nearest 1,000 kWh)
Assumptions:	A Solar Pathfinder device is used to analyze site shading for the building and determine maximum amount of full load operation based on available sunlight. When the Solar Pathfinder device is not implemented, amount of full load operation based on available sunlight is assumed to be 1,180 hours in New Jersey.

Total lifetime PV energy cost savings =
kWh produced by panel * [$/kWh cost * 25 years + $600/Megawatt hour /1000 * 15 years]

ECM and Equipment Lifetimes

Determining a lifetime for equipment and ECM's can sometimes be difficult. The following table contains a list of lifetimes that the NJCEP uses in its commercial and industrial programs. Other valid sources are also used to determine lifetimes, such as the DOE, ASHRAE, or the manufacturer's warranty.

Lighting is typically the most difficult lifetime to calculate because the fixture, ballast, and bulb can all have different lifetimes. Essentially the ECM analysis will have different operating cost savings (avoided equipment replacement) depending on which lifetime is used.

When the bulb lifetime is used (rated burn hours / annual burn hours), the operating cost savings is just reflecting the theoretical cost of replacing the existing case bulb and ballast over the life of the recommended bulb. Dividing by the bulb lifetime will give an annual operating cost savings.

When a fixture lifetime is used (e.g. 15 years) the operating cost savings reflects the avoided bulb and ballast replacement cost of the existing case over 15 years minus the projected bulb and ballast replacement cost of the proposed case over 15 years. This will give the difference of the equipment replacement costs between the proposed and existing cases and when divided by 15 years will give the annual operating cost savings.

New Jersey Clean Energy Program Commercial & Industrial Lifetimes

Measure	Life Span
Commercial Lighting — New	15
Commercial Lighting — Remodel/Replacement	15
Commercial Custom — New	18
Commercial Chiller Optimization	18
Commercial Unitary HVAC — New - Tier 1	15
Commercial Unitary HVAC — Replacement - Tier 1	15
Commercial Unitary HVAC — New - Tier 2	15
Commercial Unitary HVAC — Replacement Tier 2	15
Commercial Chillers — New	25
Commercial Chillers — Replacement	25
Commercial Small Motors (1-10 HP) — New or Replacement	20
Commercial Medium Motors (11-75 HP) — New or Replacement	20
Commercial Large Motors (76-200 HP) — New or Replacement	20
Commercial VSDs — New	15
Commercial VSDs — Retrofit	15
Commercial Comprehensive New Construction Design	18
Commercial Custom — Replacement	18
Industrial Lighting — New	15
Industrial Lighting — Remodel/Replacement	15
Industrial Unitary HVAC — New - Tier 1	15
Industrial Unitary HVAC — Replacement - Tier 1	15
Industrial Unitary HVAC — New - Tier 2	15
Industrial Unitary HVAC — Replacement Tier 2	15
Industrial Chillers — New	25
Industrial Chillers — Replacement	25
Industrial Small Motors (1-10 HP) — New or Replacement	20
Industrial Medium Motors (11-75 HP) — New or Replacement	20
Industrial Large Motors (76-200 HP) — New or Replacement	20
Industrial VSDs — New	15
Industrial VSDs — Retrofit	15
Industrial Custom — Non-Process	18
Industrial Custom — Process	10
Small Commercial Gas Furnace — New or Replacement	20
Small Commercial Gas Boiler — New or Replacement	20
Small Commercial Gas DHW — New or Replacement	10
C&I Gas Absorption Chiller — New or Replacement	25
C&I Gas Custom — New or Replacement (Engine Driven Chiller)	25
C&I Gas Custom — New or Replacement (Gas Efficiency Measures)	18
O&M savings	3
Compressed Air (GWh participant)	8

APPENDIX E: STATEMENT OF ENERGY PERFORMANCE FROM ENERGY STAR

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Borough of Freehold - Public Library

Building ID: 2208268
For 12-month Period Ending: November 30, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: April 09, 2010

Facility	Facility Owner	Primary Contact for this Facility
Borough of Freehold - Public Library 28 1/2 East Main Street Freehold, NJ 07728	Borough of Freehold 51 West Main Street Freehold, NJ 07728	Joseph Bellina 51 West Main Street Freehold, NJ 07728

Year Built: 1903
Gross Floor Area (ft²): 4,000

Energy Performance Rating[2] (1-100) N/A

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	74,095
Natural Gas (kBtu)[4]	232,229
Total Energy (kBtu)	306,324

Energy Intensity[5]	
Site (kBtu/ft²/yr)	77
Source (kBtu/ft²/yr)	123

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	24

Electric Distribution Utility
FirstEnergy - Jersey Central Power & Lt Co

National Average Comparison	
National Average Site EUI	104
National Average Source EUI	246
% Difference from National Average Source EUI	-50%
Building Type	Library

Stamp of Certifying Professional

Based on the conditions observed at the time of my visit to this building, I certify that the information contained within this statement is accurate.

Certifying Professional
N/A

Meets Industry Standards[6] for Indoor Environmental Conditions:	
Ventilation for Acceptable Indoor Air Quality	**N/A**
Acceptable Thermal Environmental Conditions	**N/A**
Adequate Illumination	**N/A**

Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Natural Gas values in units of volume (e.g. cubic feet) are converted to kBtu with adjustments made for elevation based on Facility zip code.
5. Values represent energy intensity, annualized to a 12-month period.
6. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

EPA Form 5900-16

APPENDIX F: INCENTIVE PROGRAMS

New Jersey Clean Energy Pay for Performance

The NJ Clean Energy Pay for Performance (P4P) Program relies on a network of Partners who provide technical services to clients. LGEA participating clients who are not receiving Direct Energy Efficiency and Conservation Block Grants are eligible for P4P. SWA is an eligible Partner and can develop an Energy Reduction Plan for each project with a whole-building traditional energy audit, a financial plan for funding the energy measures and an installation construction schedule.

The Energy Reduction Plan must define a comprehensive package of measures capable of reducing a building's energy consumption by 15+%. P4P incentives are awarded upon the satisfactory completion of three program milestones: submittal of an Energy Reduction Plan prepared by an approved Program Partner, installation of the recommended measures and completion of a Post-Construction Benchmarking Report. The incentives for electricity and natural gas savings will be paid based on actual savings, provided that the minimum 15%performance threshold savings has been achieved.

For further information, please see: http://www.njcleanenergy.com/commercial-industrial/programs/pay-performance/existing-buildings .

Direct Install 2010 Program

Direct Install is a division of the New Jersey Clean Energy Programs's Smart Start Buildings. It is a turn-key program for small to mid-sized facilities to aid in upgrading equipment to more efficient types. It is designed to cut overall energy costs by upgrading lighting, HVAC and other equipment with energy efficient alternatives. The program pays **up to 80%** of the retrofit costs, including equipment cost and installation costs.

Eligibility:

- Existing small and mid-sized commercial and industrial facilities with peak electrical demand **below 200 kW** within 12 months of applying
- Must be located in New Jersey
- Must be served by one of the state's public, regulated or natural gas companies
    - Electric: Atlantic City Electric, Jersey Central Power & Light, Orange Rockland Electric, PSE&G
    - Natural Gas: Elizabethtown Gas, New Jersey Natural Gas, PSE&G, South Jersey Gas

For the most up to date information on contractors in New Jersey who participate in this program, go to: http://www.njcleanenergy.com/commercial-industrial/programs/direct-install

Smart Start

New Jersey's SmartStart Building Program is administered by New Jersey's Office of Clean Energy. The program also offers design support for larger projects and technical assistance for smaller projects. If your project specifications do not fit into anything defined by the program, there are even incentives available for custom projects.

There are a number of improvement options for commercial, industrial, institutional, government, and agricultural projects throughout New Jersey. Alternatives are designed to enhance quality while building in energy efficiency to save money. Project categories included in this program are New

Construction and Additions, Renovations, Remodeling and Equipment Replacement.

For the most up to date information on how to participate in this program, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings.

Renewable Energy Incentive Program

The Renewable Energy Incentive Program (REIP) provides incentives that reduce the upfront cost of installing renewable energy systems, including solar, wind, and sustainable biomass. Incentives vary depending upon technology, system size, and building type. Current incentive levels, participation information, and application forms can be found at the website listed below.

Solar Renewable Energy Credits (SRECs) represent all the clean energy benefits of electricity generated from a solar energy system. SRECs can be sold or traded separately from the power, providing owners a source of revenue to help offset the cost of installation. All solar project owners in New Jersey with electric distribution grid-connected systems are eligible to generate SRECs. Each time a system generates 1,000 kWh of electricity an SREC is earned and placed in the customer's account on the web-based SREC tracking system.

For the most up to date information on how to participate in this program, go to: http://www.njcleanenergy.com/renewable-energy/home/home.

Utility Sponsored Programs

Check with your local utility companies for further opportunities that may be available.

Federal and State Sponsored Programs

Other federal and state sponsored funding opportunities may be available, including BLOCK and R&D grant funding. For more information, please check http://www.dsireusa.org/.

APPENDIX G: ENERGY CONSERVATION MEASURES

Energy Conservation Measures																		
ECM #	ECM description	Cost Source	Est. installed cost, $	Est. incentives, $	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
1	Install (8) new CFL lamps	RS Means	80	0	80	882	0.2	0	0.8	24	193	5	967	0.4	11	2	2	800	1,579
2	Install (1) new LED exit sign	RS Means	151	20	131	145	0.0	0	0.1	3	31	15	463	4.2	3	0	0	232	260
3	Install programmable thermostat for unit heater	Energy Star	122	0	122	0	0.0	17	0.4	0	26	15	392	4.7	2	0	0	186	187
4	Install (49) new T8 fluorescent fixtures	RS Means	5,732	735	4,997	2,358	0.5	0	2.0	193	646	15	9,686	7.7	1	0	0	2,601	4,222
5	Replace electric DHW heater with gas unit	RS Means	1,388	50	1,338	879	0.2	-30	0.0	0	123	10	1,226	10.9	0	0	0	105	1,243
	TOTALS		**7,473**	**805**	**6,668**	**4,264**	**0.9**	**-13**	**3.3**	**220**	**1,019**	**-**	**12,734**	**6.5**	**-**	**-**	**-**	**3,924**	**7,491**

Assumptions: Discount Rate: 3.2%; Energy Price Escalation Rate: 0%
Note: A 0.0 electrical demand reduction/month indicates that it is very low/negligible

APPENDIX H: METHOD OF ANALYSIS

Assumptions and tools

Energy modeling tool:	Established/standard industry assumptions, eQUEST
Cost estimates:	RS Means 2009 (Facilities Maintenance & Repair Cost Data) RS Means 2009 (Building Construction Cost Data) RS Means 2009 (Mechanical Cost Data) Published and established specialized equipment material and labor costs Cost estimates also based on utility bill analysis and prior experience with similar projects

Disclaimer

This engineering audit was prepared using the most current and accurate fuel consumption data available for the site. The estimates that it projects are intended to help guide the owner toward best energy choices. The costs and savings are subject to fluctuations in weather, variations in quality of maintenance, changes in prices of fuel, materials, and labor, and other factors. Although we cannot guarantee savings or costs, we suggest that you use this report for economic analysis of the building and as a means to estimate future cash flow.

THE RECOMMENDATIONS PRESENTED IN THIS REPORT ARE BASED ON THE RESULTS OF ANALYSIS, INSPECTION, AND PERFORMANCE TESTING OF A SAMPLE OF COMPONENTS OF THE BUILDING SITE. ALTHOUGH CODE-RELATED ISSUES MAY BE NOTED, SWA STAFF HAVE NOT COMPLETED A COMPREHENSIVE EVALUATION FOR CODE-COMPLIANCE OR HEALTH AND SAFETY ISSUES. THE OWNER(S) AND MANAGER(S) OF THE BUILDING(S) CONTAINED IN THIS REPORT ARE REMINDED THAT ANY IMPROVEMENTS SUGGESTED IN THIS SCOPE OF WORK MUST BE PERFORMED IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL LAWS AND REGULATIONS THAT APPLY TO SAID WORK. PARTICULAR ATTENTION MUST BE PAID TO ANY WORK WHICH INVOLVES HEATING AND AIR MOVEMENT SYSTEMS, AND ANY WORK WHICH WILL INVOLVE THE DISTURBANCE OF PRODUCTS CONTAINING MOLD, ASBESTOS, OR LEAD.