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Local Government Energy Program
Energy Audit Final Report

Township of Bloomfield

Municipal Building
1 Municipal Plaza
Bloomfield, NJ 07003

Project Number: LGEA94

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EXECUTIVE SUMMARY

The Township of Bloomfield Municipal Building is a two-story building with basement comprising a total conditioned floor area of 28,000 square feet. The original structure was built in 1920 and there have been numerous alterations since then. The following chart provides a comparison of the current building energy usage based on the period from July 2010 through June 2011 with the proposed energy usage resulting from the installation of recommended Energy Conservation Measures (ECMs) excluding any renewable energy:

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)	Source Energy Use Intensity (kBtu/sq ft /yr)	Joint Energy Consumption (MMBtu/yr)
Current	404,552	7,513	$73,271	76.1	45	2,132
Proposed	357,491	6,862	$62,533	68.1	23	1,906
Savings	47,061	650	$10,738*	8.1	22	226
% Savings	11.6%	8.7%	14.7%	10.6%	48.4%	10.6%
Proposed Renewable Energy	0	0	$0	0.0	0.0	0
*Includes operation and maintenance savings; **Includes SRECS						

SWA has entered energy information about the Municipal Building into the U.S. Environmental Protection Agency's (EPA) ENERGY STAR Portfolio Manager Energy Benchmarking system. The building has an ENERGY STAR rating of 43 and a Site Energy Utilization of 71 kBtu/sqft/yr.

Recommendations

Based on the current state of the building and its energy use, SWA recommends implementing the following Energy Conservation Measures:

Table 2: Energy Conservation Measure Recommendations

ECMs	First Year Savings ($)	Simple Payback Period	Initial Investment ($)	CO2 Savings (lbs/yr)
0-5 Year	$2,056	0.6	$1,314	22,256
5-10 Year	$7,689	9.6	$55,008	59,165
>10 year	N/A	N/A	N/A	N/A
Total	$10,738	5.2	$56,321	81,422
Proposed Renewable Energy	$0		$0	

In addition to these ECMs, SWA recommends:

- Capital Investment opportunities – measures that would contribute to reducing energy usage but require significant capital resources as well as long-term financial planning
    - Install premium motors when replacements are required - Select NEMA Premium motors when replacing motors that have reached the end of their useful operating lives.
    - Apply appropriate air-sealing strategies around all exterior wall penetrations (including electrical, plumbing and HVAC).
    - Replace all original, single-glazed windows with a low-E, double glazed type.
    - Replace and maintain damaged door units.
- Operation and Maintenance (O&M) measures that would contribute to reducing energy usage at low cost – not cost
    - Inspect and replace cracked/ineffective caulk.
    - Maintain/ inspect all roof surfaces on a regular basis.
    - Replace and maintain sealants at all windows for airtight performance.

- Install insulated door separating spaces with different temperature conditions.

There may be energy procurement opportunities for the Township of Bloomfield to reduce annual utility costs, which are $3,607 higher when compared to the average estimated NJ commercial utility rates. SWA recommends further negotiation with energy suppliers, listed in Appendix C.

Environmental Benefits

SWA estimates that implementing the recommended ECMs is equivalent to removing approximately 7 cars from the roads each year or is equivalent of planting 198 trees to absorb CO_2 from the atmosphere.

Energy Conservation Measure Implementation

SWA recommends that the Township of Bloomfield implement the following Energy Conservation Measures using an appropriate Incentive Programs for reduced capital cost:

Recommended ECMs	Incentive Program (Appendix F for details)
48 New CFL fixtures to be installed with incentives	Direct Install
22 New occupancy sensors to be installed with incentives	Smart Start, Direct Install
Install (25) New T8 Fixtures With Incentives	Smart Start, Direct Install
Replace existing 4 ton Carrier Weathermaker packaged rooftop heat pump with an Energy Star® certified unit	Smart Start, Direct Install
Install (8) new PSMH fixtures with incentives	Smart Start, Direct Install
Replace (9) old refrigerators with compact ENERGY STAR® refrigerators and two (2) old refrigerators with 18 cu ft Energy Star models	NA
Replace existing Sanyo DX split system with an Energy Star® certified unit	Smart Start, Direct Install
Replace existing Trane condenser with an Energy Star® certified unit	Smart Start, Direct Install

Appendix H contains an Energy Conservation Measures table which ranks each ECM by Simple Payback.

INTRODUCTION

Launched in 2008, the Local Government Energy Audit (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 Energy Services to administer the Program.

Steven Winter Associates, Inc. (SWA) is a 38-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 Municipal Building at 1 Municipal Plaza, Bloomfield, NJ. The process of the audit included facility visits on July 13th, 2011, 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 is to provide sufficient information to the Township of Bloomfield to make decisions regarding the implementation of the most appropriate and most cost-effective energy conservation measures for the Municipal Building.

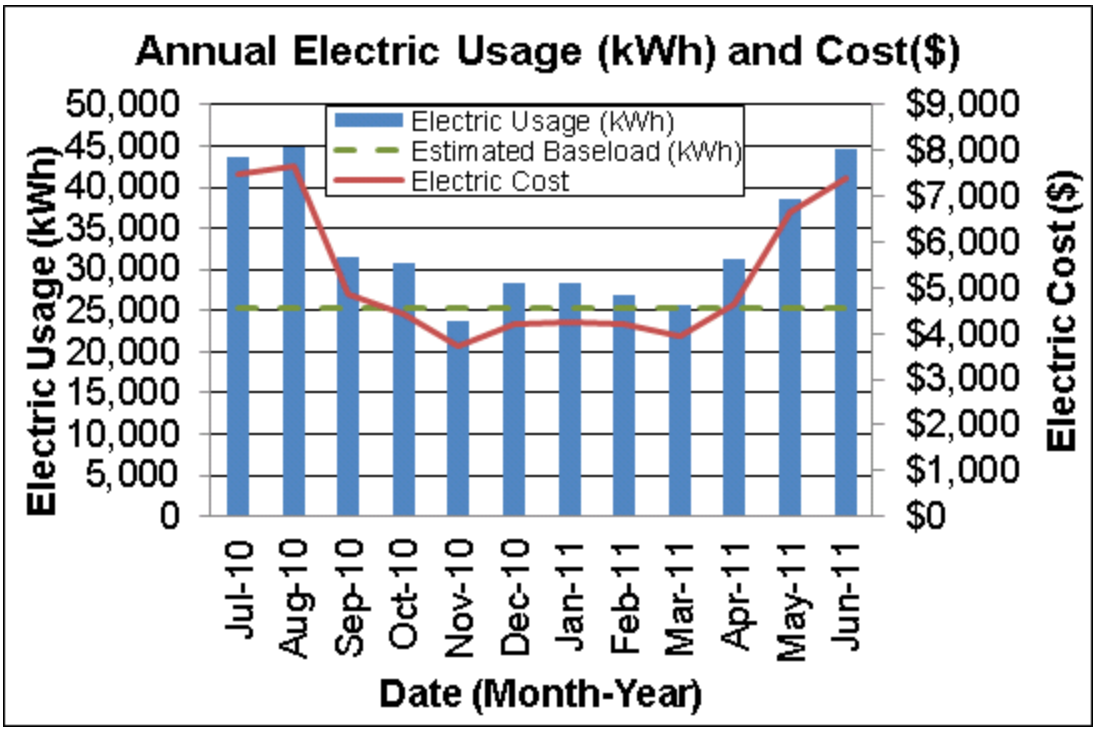
HISTORICAL ENERGY CONSUMPTION

Energy usage, load profile and cost analysis

SWA reviewed utility bills from February 2010 through July 2011 that were received from the utility companies supplying the Municipal Building with electric and natural gas. A 12 month period of analysis from July 2010 through June 2011 was used for all calculations and for purposes of benchmarking the building.

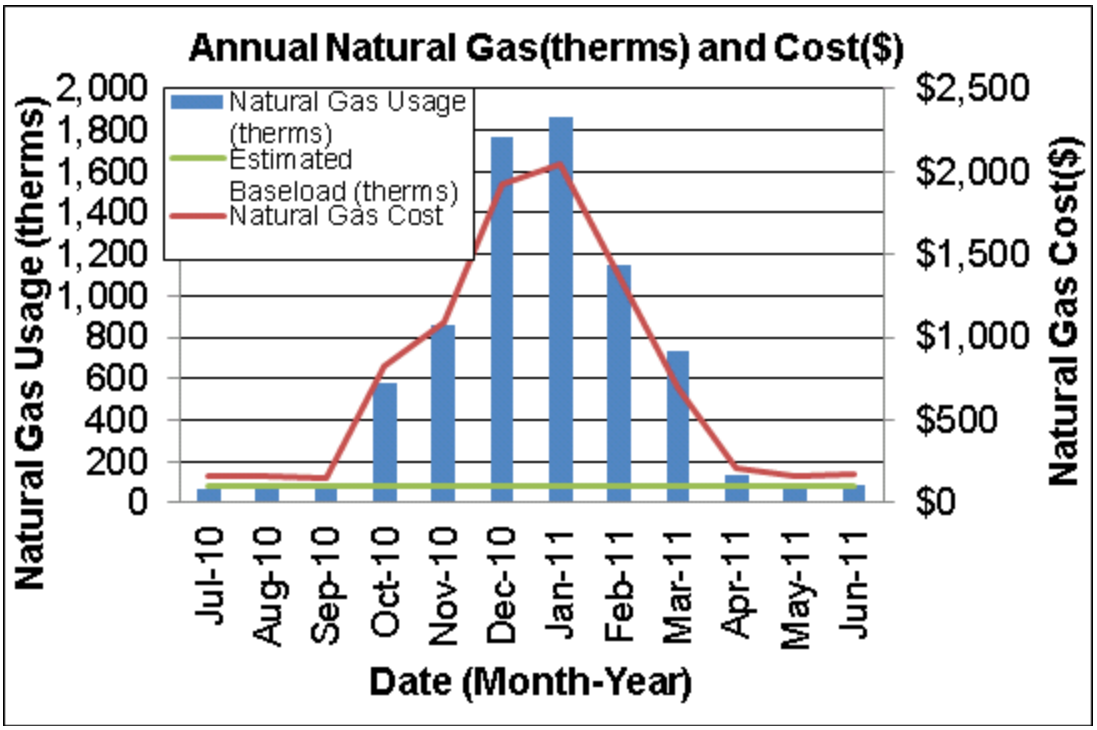
Electricity - The Municipal Building is currently served by one electric meter. The Municipal Building currently buys electricity from PSEG at **an average aggregated rate of $0.159/kWh** and consumed **approximately 404,552 kWh, or $64,290 worth of electricity,** in the previous year. The average monthly demand was 73.3 kW and the annual peak demand was 109.2 kW.

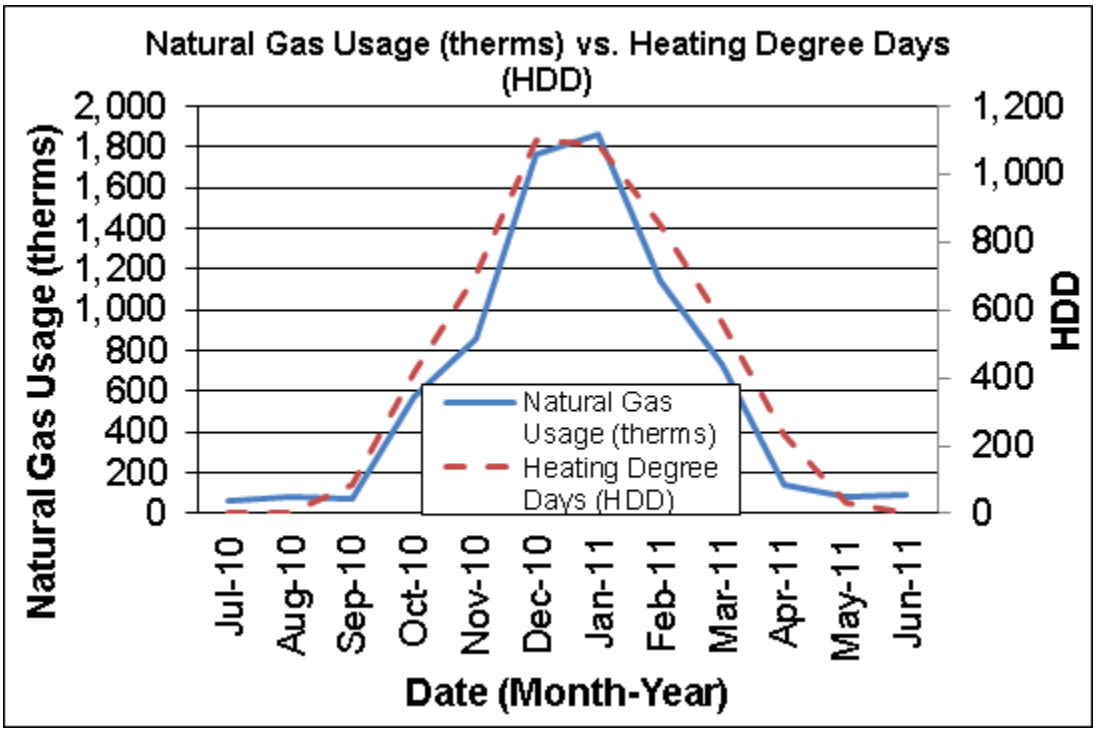
The chart below shows the monthly electric usage and costs. The dashed green line represents the approximate baseload or minimum electric usage required to operate the Municipal Building.



Natural gas - The Municipal Building is currently served by one meter for natural gas. The Municipal Building currently buys natural gas from PSEG at **an average aggregated rate of $1.195/therm** and consumed **approximately 7,513 therms, or $8,981 worth of natural gas,** in the previous year.

The chart below shows the monthly natural gas usage and costs. The green line represents the approximate baseload or minimum natural gas usage required to operate the Municipal Building.

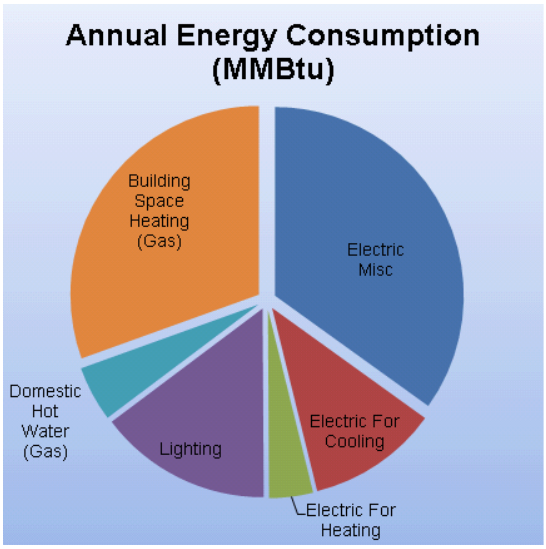


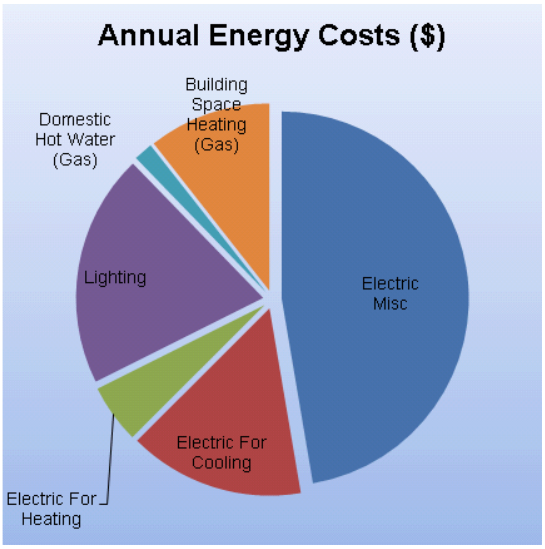


The chart above shows the monthly natural gas usage along with the heating degree days or HDD. Heating degree days is the difference of the average daily temperature and a base temperature, on a particular day. The heating degree days are zero for the days when the average temperature exceeds the base temperature. SWA's analysis used a base temperature of 65 degrees Fahrenheit.

The following graphs, pie charts, and table show energy use for the Municipal Building based on utility bills for the 12 month period. Note: electrical cost at $47/MMBtu of energy is almost four times as expensive as natural gas at $12/MMBtu

Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Misc	745	35%	$34,675	47%	47
Electric For Cooling	239	11%	$11,134	15%	47
Electric For Heating	80	4%	$3,734	5%	47
Lighting	317	15%	$14,746	20%	47
Domestic Hot Water (Gas)	101	5%	$1,210	2%	12
Building Space Heating (Gas)	650	30%	$7,771	11%	12
Totals	2,132	100%	$73,271	100%	
Total Electric Usage	1,380	65%	$64,290	88%	47
Total Gas Usage	751	35%	$8,981	12%	12
Totals	2,132	100%	$73,271	100%	





Energy Benchmarking

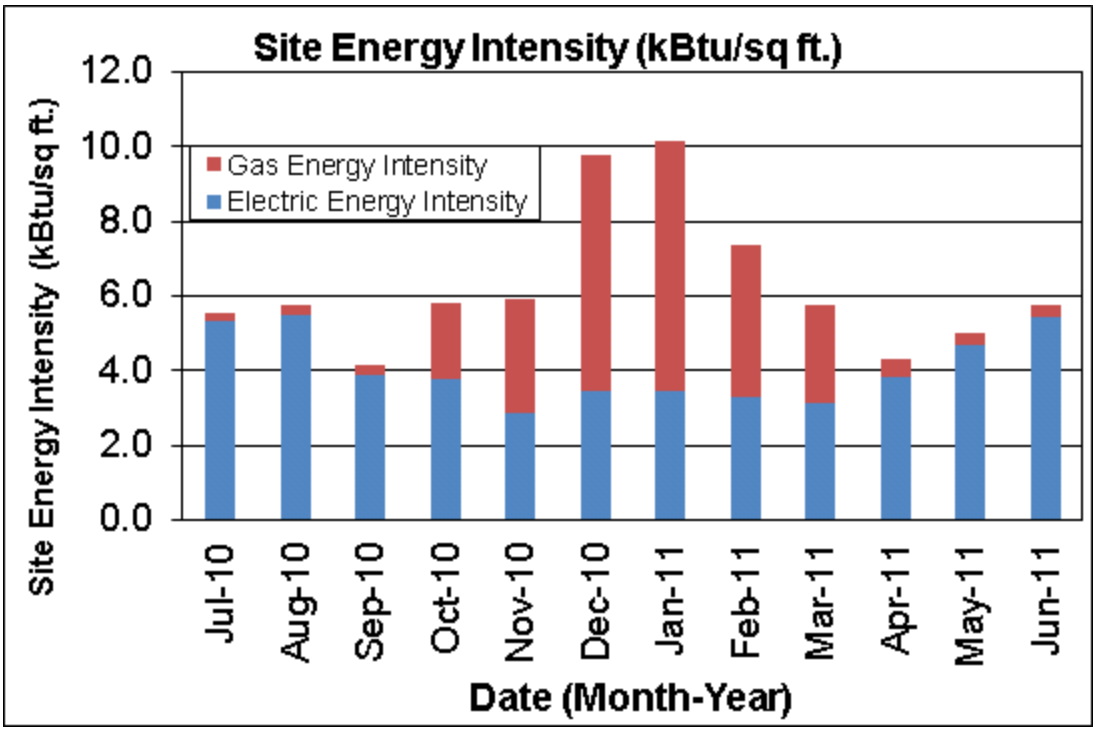
SWA has entered energy information about the Municipal Building in the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® Portfolio Manager Energy benchmarking system. Based on the data entered into the Portfolio Manager software, the building has an Energy Performance Rating of 43 out of a possible 100 points. For reference, a score of 69 is required for LEED for Existing Buildings certification and a score of 75 is required for ENERGY STAR® certification.

The ENERGY STAR® Portfolio Manager uses a national survey conducted by the U.S. Energy Information Administration (EIA). This national survey, known as the Commercial Building Energy Consumption Survey (CBECS), is conducted every four years, and gathers data on building characteristics and energy use from thousands of buildings across the United States.

The Portfolio Manager software uses this data to create a database by building type. By entering the building parameters and utility data into the software, Portfolio Manager is able to generate a performance scale from 1-100 by comparing it to similar office buildings. This 100 point scale determines how well the building performs relative to other buildings across the country, regardless of climate and other differentiating factors. A score of 43 shows the building is 7% below the national average.

The below average Energy Performance Rating of the Municipal Building can be attributed to the older inefficient boiler plant that was installed and operational during the billing analysis period, as well as the inefficient lighting fixtures that are installed, and the lack of high efficiency cooling equipment in the building.

The Site Energy Use Intensity is 76 kBtu/sqft/yr compared to the national average of an office building consuming 71 kBtu/sqft/yr. This is a 7% difference between the buildings intensity and the national average. See ECM section for guidance on how to improve the building's rating.



Per the LGEA program requirements, SWA has assisted the Township of Bloomfield to create an ENERGY STAR® Portfolio Manager account and share the Municipal Building facilities information to allow future data to be added and tracked using the benchmarking tool. SWA has shared this Portfolio Manager account information with the Township of Bloomfield (user name of "Bloomfield" with a password of "Bloomfield") and TRC Energy Services (user name of "TRC-LGEA").

Tariff analysis

Tariff analysis can help determine if the Township of Bloomfield is paying the lowest rate possible for electric and gas service. Tariffs are typically assigned to buildings based on size

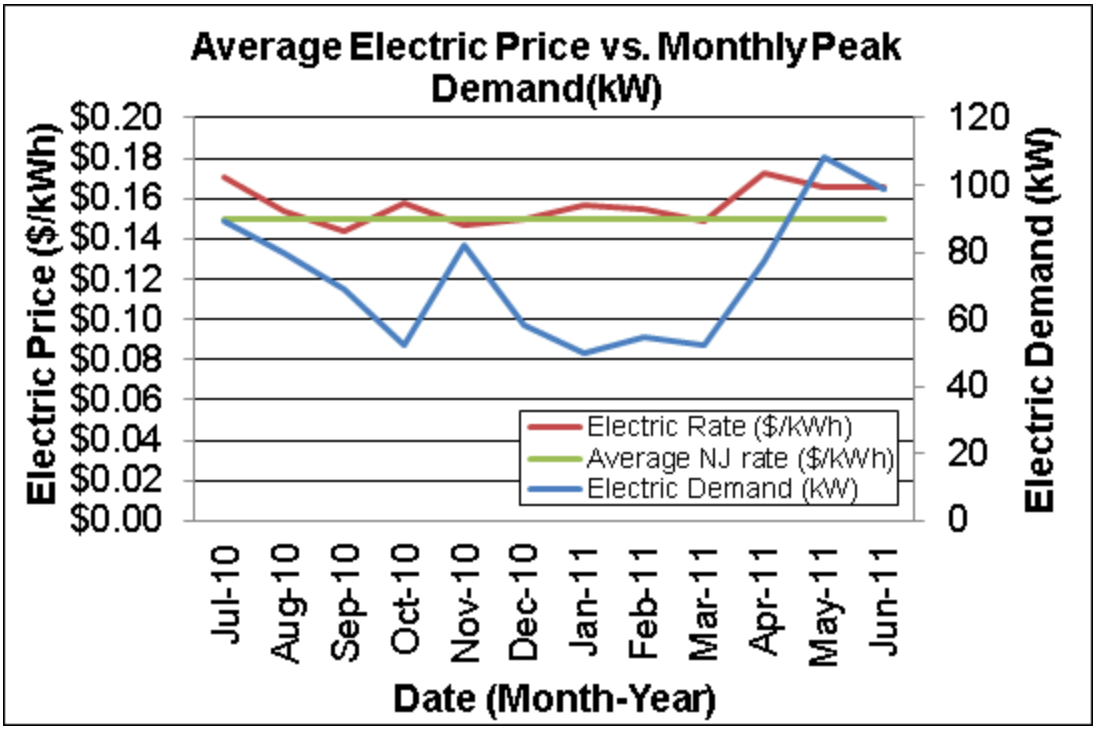
and building type. Rate fluctuations are expected during periods of peak usage. Natural gas prices often increase during winter months since large volumes of natural gas is needed for heating equipment. Similarly, electricity prices often increase during the summer months when additional electricity is needed for cooling equipment.

As part of the utility bill analysis, SWA evaluated the current utility rates and tariffs for the Township of Bloomfield. The Municipal Building is currently paying a general service rate for natural gas including fixed costs such as meter reading charges. The electric use for the building is direct-metered and purchased at a general service rate with an additional charge for electrical demand factored into each monthly bill. The general service rate is a market-rate based on electric usage and electric demand. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year.

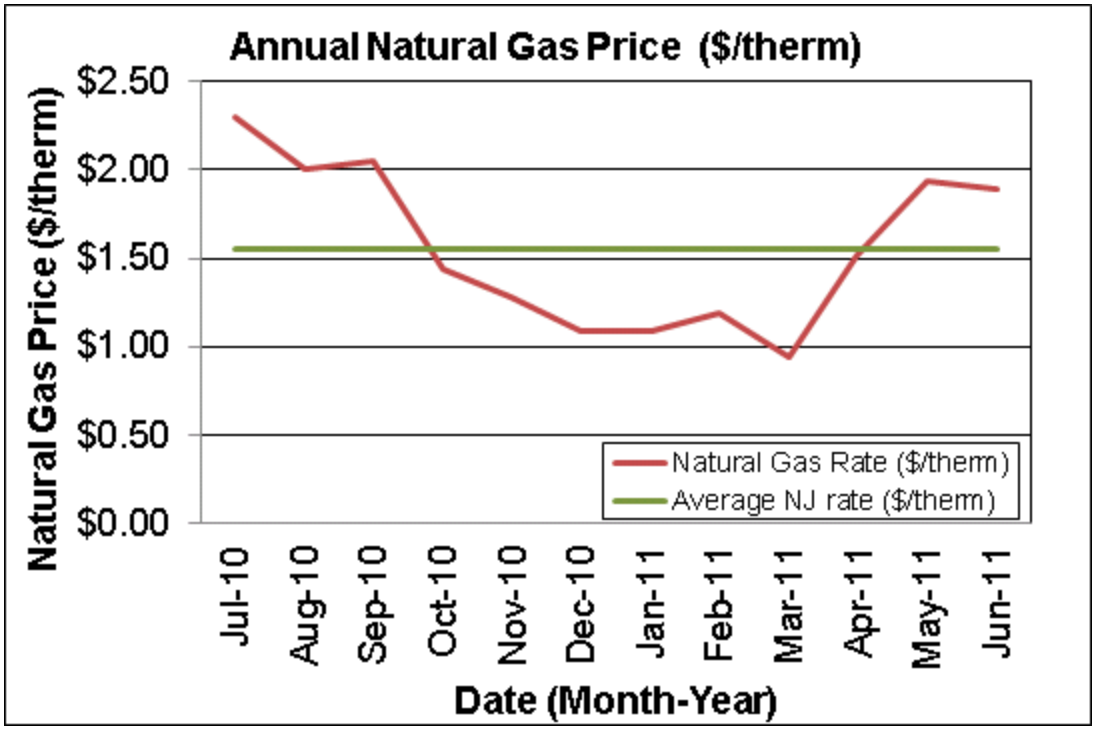
Energy Procurement strategies

Billing analysis was conducted using an average aggregated rate which is estimated based on the total cost divided by the total energy usage for each utility over a 12 month period from July 2010 to June 2011. Average aggregated rates do not separate demand charges from usage, and instead provide a metric of inclusive cost per unit of energy. Average aggregated rates are used in order to equitably compare building utility rates to average utility rates throughout the state of New Jersey.

The average estimated NJ commercial utility rates for electric are $0.150/kWh, while the Municipal Building pays a rate of $0.159/kWh. The Municipal Building annual electric utility costs are $3,607 higher, when compared to the average estimated NJ commercial utility rates. Electric bill analysis shows fluctuations up to 17% over the most recent 12 month period.



The average estimated NJ commercial utility rates for gas are $1.550/therm, while the Municipal Building pays a rate of $1.195/therm. Natural gas bill analysis shows fluctuations up to 54% over the billing analysis period.



Utility rate fluctuations in the summer months are caused by a combination of fixed fees and low natural gas consumption.

SWA recommends that the Municipal Building 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 Municipal Building. Appendix C contains a complete list of third-party energy suppliers for the Township of Bloomfield 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 Wednesday, July 13, 2011, the following data was collected and analyzed.

Building Characteristics

The Township of Bloomfield Municipal Building is a two-story, 28,000 square feet building with a finished basement. It was originally constructed in 1920 with numerous alterations completed in since. It houses municipal offices, conference rooms and storage rooms.

Partial Northwest Façade

Partial Southeast Façade

Partial Southwest Façade

South Annex

Building Occupancy Profiles

Its occupancy is approximately 30 administrative employees and a fluctuating amount of visitors in the 10 to 20 persons range daily from 8:30 AM to 4:30 PM. There are public meetings between 7:00 PM and 10:00 PM one day a week and night time cleaning hours between 4:30 PM to 6:00 PM.

Building Envelope

Due to unfavorable weather conditions (min. 18 deg. F delta-T in/outside and no/low wind), no exterior envelope infrared (IR) images were taken during the field audit.

General Note: All findings and recommendations on the exterior envelope (base, walls, roofs, doors and windows) are based on the energy auditors' experience and expertise, on construction document reviews (if available) and on detailed visual analysis, as far as accessibility and weather conditions allowed at the time of the field audit.

Exterior Walls

The exterior wall envelope is mostly constructed of brick masonry units, over concrete block with 0 inches of assumed insulation. Other areas are constructed of brick masonry units, and over 3-1/2" framing with 0 inches of assumed insulation. The interior is mostly painted gypsum wallboard and painted concrete block.

Note: Wall insulation levels could not be verified in the field and are based on reports from maintenance personnel.

Exterior and interior wall surfaces were inspected during the field audit. They were found to be in overall good, age-appropriate condition with only a few signs of uncontrolled moisture, air-leakage or other energy-compromising issues detected on all facades.

The following specific exterior wall problem spots and areas were identified:

Typical exterior wall surfaces and cracked bricks and mortar joints and un-sealed exterior wall penetrations around through-the-wall air conditioners.

Roof

The building's roof is predominantly a medium-pitch gable type over a wood structure, with a asphalt shingle finish. Other parts of the building are also covered by a flat and parapet type over steel decking with a dark colored EPDM single membrane finish and gravel ballast.

This roof system was installed two in 2009. One and a half inches of foam board roof insulation, and three and a half inches of fiberglass batt roof insulation were recorded.

Note: Roof insulation levels could visually be verified in the field by non-destructive methods.

Roofs, related flashing, gutters and downspouts were inspected during the field audit. They were reported to be in overall good, age-appropriate condition, with no signs of uncontrolled moisture, air-leakage or other energy-compromising issues detected on all roof areas.

The following existing roof systems were identified:

Typical attic and roof insulation and typical roof systems

Base

The building's base is composed of a below grade slab floor with a perimeter foundation and no detectable slab edge/perimeter insulation.

Slab/perimeter insulation levels could not be verified in the field and are based on reports from building management.

The building's base and its perimeter were inspected for signs of uncontrolled moisture or water presence and other energy-compromising issues. Overall the base was reported to be in good condition with no signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

Windows

The building contains several different types of windows:

1. Unit fixed and double-hung type windows with an insulated aluminum frame, clear double glazing and interior roller blinds. The windows are located throughout the building.

2. Unit (fixed and casement) type windows with a wood frame, clear single glazing and no interior or exterior shading devices. The windows are located throughout the building.

3. Hopper type windows with a wood frame, clear single glazing and no interior or exterior shading devices. The windows are located throughout the building.

4. Casement type windows with an aluminum clad frame, clear double glazing and no interior or exterior shading devices. The windows are located in the basement only.

Windows, shading devices, sills, related flashing and caulking were inspected as far as accessibility allowed for signs of moisture, air-leakage and other energy compromising issues. Overall, the windows were found to be in acceptable/ age appropriate condition with only a few signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

The following specific window problem spots were identified:

Typical installed windows with damaged window frames
and single-glazed windows with ineffective frames

Exterior doors

The building contains several different types of exterior doors:

1. Solid metal type exterior doors. They are located throughout the southern portion of the building.

2. Overhead type exterior doors. They are located throughout the southern portion of the building.

3. Glass with aluminum frame type exterior doors. They are located throughout the eastern and western portions of the building.

4. Aluminum type exterior doors with glass panels. They are located in the front of the building.

All exterior doors, thresholds, related flashing, caulking and weather-stripping were inspected for signs of moisture, air-leakage and other energy-compromising issues. Overall, the doors were found to be in good condition with only a few signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

The following specific door problem spots were identified:

Typical exterior doors with damaged door to boiler room section.

Building air-tightness

Overall the field auditors found the building to be reasonably air-tight, considering the building's use and occupancy, as described in more detail earlier in this chapter.

The air tightness of buildings helps maximize all other implemented energy measures and investments, and minimizes potentially costly long-term maintenance, repair and replacement expenses.

Mechanical Systems

Heating Ventilation Air Conditioning

The Municipal Building has heating, cooling and ventilation for all occupied spaces. During the field visit there was no major comfort issues reported except that previous attempts to establish a night time setback for the VAV boxes result in a large heat gain which the units cannot overcome.

Equipment

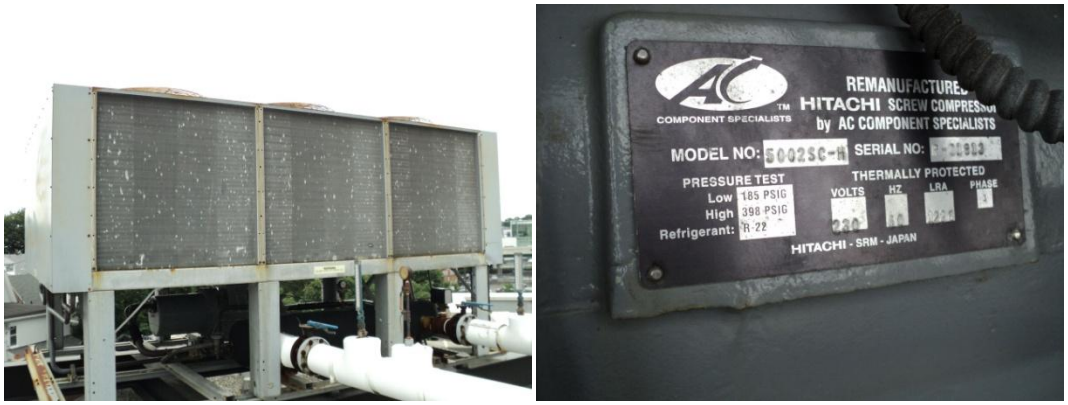
The Municipal Building is heated by two steam boilers which supply steam to perimeter radiators and steam coils in the air handler units. It is cooled by a combination of direct expansion (DX) split system units and three attic mounted air handler units that service the office spaces and council room. Conditioned air from those units then distributed through a ceiling bypass VAV system. All three air handling units are equipped with a chilled water cooling coil. A comprehensive Equipment List can be found in Appendix A.

Steam Boiler Description

Currently installed at the time of the audit are two identical low pressure steam boilers manufactured by Kewanee. They are both firebox steel boilers that were installed in 1920. They were not operational and were in the process of being demolished at the time of the audit. A

Cooling System Descriptions

Space cooling in the building is primarily provided by three attic mounted air handling units that service the office spaces and council room. Conditioned air is then distributed through a ceiling bypass VAV system. All three air handling units are equipped with chilled water cooling coils. These coils are fed by a rooftop cooling tower which operates on R-22 refrigerant and a roof mounted screw compressor. This Hitachi manufactured screw compressor model # 5002SC-H has an estimated cooling capacity of 196.9 kW or 671.9 MBH.



Existing Cooling Tower (L.) and Compressor Nameplate (R.)

The community development office is cooled by a DX split system with an indoor evaporator section and outdoor condenser unit. This unit is manufactured by Sanyo, operates on R-22 refrigerant and has a capacity of 12,000 BTUH.

Existing Sanyo Split System

The health center in the basement is cooled by a DX split system with an indoor fan coil section and outdoor condenser unit. This unit is manufactured by Luxaire, operates on R-410A refrigerant and has a capacity of 30,000 BTUH.

Existing Luxaire Split System

The remaining offices on the first floor are cooled by a Carrier Weathermaker I packaged rooftop heat pump and air handler unit that operates on R-22 and is equipped with an economizer section. Conditioned air is distributed through a ceiling bypass VAV system. Other areas in the first floor are cooled a Carrier manufactured heat pump and Trane DX split system.

Existing Carrier Trane Split System and Carrier Heat Pump (R.)

Some rooms are individually cooled by through-the-window or through-the-wall air conditioning units. These units vary in size from 12,000 BTU to 24,000 BTUH and EER from 8.4 to 9.6.

Typical through-the-window and through-the-wall air conditioners

Ventilation

The various spaces of the building are provided ventilation by outside air intake louvers on the air handling units and ducted outside air intake ducts for packaged units. The outside air louvers are not motorized to allow economizer operation when the outside air conditions are favorable.

There are also exhaust fans located on the roof, which serve the bathrooms. Not all fans were accessible during the field visit due to limited roof access. In general, the building exhaust fans have exceeded their useful operating life but otherwise appear in adequate age appropriate operating condition.

Typical bathroom exhaust fans

Distribution Systems

Air handling units have at least one motorized fan which draw in fresh air and bring it into a mixing box, where it is combined with return air from the building. A small portion of the return air is purged and vented outside prior to entering the mixing box. The mixed air inside the air handler is sent through a filter before passing through the chilled water cooling coil.

The cooling coil is only active in the cooling season. In the heating season, air passes through a steam heating coil. During moderate outside air conditions only the air supply fan will remain active to provide ventilation to the building as per code requirement. The air handler units and packaged rooftop unit are equipped with economizer mode features where a motorized outside air damper adjusts the amount of outside air intake when conditions are favorable to cool the building, or uses heat from exhaust air to heat the building, saving energy.

The Municipal Building has a Variable Air Volume (VAV) system, using VAV boxes throughout the ductwork system. The VAV boxes have a motorized modulating damper within the ductwork to adjust the amount of supply air to satisfy the temperature settings of the room(s) that it serves.

Typical distribution systems

The piping in the mechanical room was properly insulated. Insulation on hot or cold water piping is a code requirement for safety from scalding as well as thermal energy savings.

Controls

The heating and cooling equipment is controlled by a mixture of manual thermostats and digital programmable thermostats. Manual thermostats must be reset for each operating condition by hand, and do not allow for evening or weekend set backs. Each air handling unit has a dedicated programmable thermostat with a temperature set point schedule based on season and occupancy.

Typical manual (L.) and digital programmable thermostats (R.)

Domestic Hot Water

The domestic hot water (DHW) for the Municipal Building is provided by a Rheem manufactured, Power Vent Model # 42VP75FW induced draft natural gas heater with 75,000 MBH heating capacity and 75 gallons of storage capacity. It was installed in February of 2011 and has an Energy Factor of 0.57. The heater has 95% estimated useful operating life remaining and appears in good condition.

Existing Domestic Hot Water Heater and Nameplate

Electrical systems

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.

As of **July 1, 2010** magnetic ballasts most commonly used for the operation of T12 lamps will no longer be produced for commercial and industrial applications. Also, many T12 lamps will be phased out of production starting July 2012.

Interior Lighting - The Municipal Building currently contains mostly electronically ballasted T8 fixtures and a combination of fixtures with halogen bulbs, incandescent, or self-ballasted CFLs. However, there are some magnetically ballasted T12 fixtures installed in some areas. Based on measurements of lighting levels for each space, there are no vastly over-illuminated areas.

Typical Interior Lighting

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

Exterior Lighting - The exterior lighting surveyed during the building audit was found to be a mixture of high pressure sodium, metal halide, incandescent and halogen lamped fixtures. Exterior lighting is controlled by photocell controls.

Typical exterior lighting

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 and printers 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.

Installed in the building are fourteen refrigerators. Of these fourteen, three are full sized 18 cu. Ft. units. Of those three, two are older model inefficient units and one is a new model more efficient unit. The other eleven units are compact refrigerators. Of those eleven, seven are older model inefficient units and four are newer model more efficient units.

Typical older model compact refrigerator (L.), newer model compact refrigerator (R.)

Typical older model full sized (L.) refrigerator and newer model full sized refrigerator (R.)

Existing vending machines

Elevators

The Municipal Building is served by a hydraulic elevator that is capable of transport between all three floors.

Existing hydraulic motor

Other electrical systems

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

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 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. Solar photovoltaic panels and wind turbines use natural resources to generate electricity. Geothermal systems offset the thermal loads in a building by using water stored in the ground as either a heat sink or heat source. Cogeneration or Combined Heat and Power (CHP) allows for heat recovery during electricity generation.

Existing systems

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

Evaluated Systems

Solar Photovoltaic

Photovoltaic panels convert light energy received from the sun into a usable form of electricity. Panels can be connected into arrays and mounted directly onto building roofs, as well as installed onto built canopies over areas such as parking lots, building roofs or other open areas. Electricity generated from photovoltaic panels is generally sold back to the utility company through a net meter. Net-metering allows the utility to record the amount of electricity generated in order to pay credits to the consumer that can offset usage and demand costs on the electric bill. In addition to generation credits, there are incentives available called Solar Renewable Energy Credits (SRECs) that are subsidized by the state government. Specifically, the New Jersey State government pays a market-rate SREC to facilities that generate electricity in an effort to meet state-wide renewable energy requirements.

Based on utility analysis and a study of roof conditions, the Municipal Building 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.

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.

Wind

The Municipal Building is not a good candidate for wind power generation due to insufficient wind conditions in this area of New Jersey.

Geothermal

The Municipal Building 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 up to 72% of their useful life remaining.

Combined Heat and Power

The Municipal Building 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 Highly Recommended 0-5 Year Payback ECMs
1	Install (48) new CFL fixtures to be installed with incentives
2	Install (22) new occupancy sensors to be installed with incentives
	Description of Recommended 5-10 Year Payback ECMs
3	Install (25) New T8 Fixtures With Incentives
4	Replace existing 4 ton Carrier Weathmaker packaged rooftop heat pump with an Energy Star® certified unit
5	Replace (9) old refrigerators with compact ENERGY STAR® refrigerators and two (2) old refrigerators with 18 cu ft Energy Star models
6	Install (8) new PSMH fixtures with incentives
7	Replace existing Sanyo DX split system with an Energy Star® certified unit
8	Replace existing Trane condenser with an Energy Star® certified unit

In order to clearly present the overall energy opportunities for the building and ease the decision of which ECM to implement, SWA calculated each ECM independently and did not incorporate slight/potential overlaps between some of the listed ECMs (i.e. lighting change influence on heating/cooling.

ECM#1: Install (48) new CFL fixtures to be installed with incentives

On the day of the site visit, SWA completed a lighting inventory of the Township of Bloomfield Municipal Building (see Appendix B). The existing lighting inventory contained a total of 48 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: $514 (includes $240 of labor)
Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

Economics:

ECM #	ECM description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
1	48 New CFL fixtures to be installed with incentives	514	0	514	11,335	2	0	1.4	84	1,886	5	9,431	0.3	1,736	347	367	7,825	20,295

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis.

Rebates/financial incentives:

- NJ Clean Energy – Direct Install program (Up to 60% of installed cost)

Please see Appendix H for more information on Incentive Programs.

ECM#2: Install (22) new occupancy sensors to be installed with incentives

On the days of the site visits, SWA completed a lighting inventory of the Township of Bloomfield Municipal Building (see Appendix B). The building contains sixteen areas that could benefit from the installation of occupancy sensors. These areas consisted of various meeting rooms and offices that are used sporadically throughout the day and could show energy savings by having the lights turn off after a period of no occupancy. Typically, occupancy sensors have an adjustable time delay that shuts down the lights automatically if no motion is detected within a set time period. Advanced micro-phonic lighting sensors include sound detection as a means to controlling lighting operation.

Installation cost:

Estimated installed cost: $880 (includes $660 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

Economics:

ECM #	ECM description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
2	Install (22) new occupancy sensors to be installed with incentives	880	80	800	1,095	0	0	0.1	0	170	15	2,550	4.7	219	15	20	1,163	1,961

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis.

Rebates/financial incentives:

- NJ Clean Energy – SmartStart – Wall-mounted Occupancy Sensors ($20 per control)
    - Maximum Incentive Amount: $80.
- NJ Clean Energy – Direct Install program (Up to 60% of installed cost)

Please see Appendix H for more information on Incentive Programs.

ECM#3: Install (25) New T8 Fixtures to Be Installed With Incentives

On the day of the site visit, SWA completed a lighting inventory of the Township of Bloomfield Municipal Building (see Appendix B). The existing lighting inventory contains 25 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: $3,115 (includes $2,040 of labor)
Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

Economics:

ECM #	ECM description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
3	Install (25) New T8 Fixtures With Incentives	3,116	250	2,866	1,881	0	0	0.2	125	424	15	6,360	6.8	122	8	12	2,057	3,368

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 4 hrs/yr to replace aging burnt out lamps vs. newly installed.

Rebates/financial incentives:

- NJ Clean Energy - Smart Start - T8 fixtures with electronic ballasts ($15 per fixture)

Please see Appendix F for more information on Incentive Programs.

ECM#4: Replace existing 4 ton Carrier Weathmaker packaged rooftop heat pump with an ENERGY STAR® certified unit

During the field audit, SWA completed the building HVAC equipment inventory and observed spaces heated/cooled by heat pumps. Electric air-source heat pumps, often used in moderate climates, use the difference between outdoor air temperatures and indoor air temperatures to cool and heat. ENERGY STAR qualified heat pumps have a higher seasonal efficiency rating (SEER) and heating seasonal performance factor (HSPF) than standard models, which makes them about 8% percent more efficient than standard new models and 20% more efficient then older units. The labor for the recommended installations is evaluated using prevailing mechanical/electrical contractor wages. The building owner may decide to perform this work with in-house resources on a scheduled, longer timeline than otherwise performed by a contractor. SWA recommends removal of the existing 4 ton Carrier Weathermaker packaged rooftop heat pump on the first floor roof with a similarly sized ENERGY STAR® certified unit.

Installation cost:
Estimated installed cost: $9,299 (Includes $2,789 in labor cost)
Source of cost estimate: Manufacturer and Store established costs

Economics:

ECM #	ECM description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
4	Replace existing 4 ton Carrier Weathmaker packaged rooftop heat pump with an Energy Star® certified unit	9,667	368	9,299	8,356	0	0	1.0	0	1,328	15	19,920	7.0	114	8	11	6,131	14,962

Assumptions: SWA calculated the savings for this measure using measurements taken during the field audit and using the billing analysis. SWA used Energy Star site: http://www.energystar.gov/index.cfm?c=bulk_purchasing.bus_purchasing , Excel spreadsheet for Air Source Heat Pump Savings Calculator

Rebates/financial incentives:

- NJ Clean Energy - Smart Start ($92 per ton)
    - Maximum amount: $368

Please see Appendix H for more information on Incentive Programs.

ECM#5: Replace (9) old refrigerators with compact ENERGY STAR® refrigerators and two (2) refrigerators with 18 cu. ft. ENERGY STAR® models

On the day of the site visit, SWA observed that there were nine older 2.7 cu. ft. model refrigerators and two older 18 cu. ft. model refrigerators that were not ENERGY STAR® rated (using approximately 254 kWh/year for the 2.7 cu. ft. models and 380 kWh/year for the 18 cu. ft. models). Appliances, such as refrigerators that are over 10 years of age should be replaced with newer efficient models with the ENERGY STAR label. SWA recommends the replacement of the older model compact refrigerators with a 2.7 cf. ft. ENERGY STAR® and the replacement of the existing refrigerators with a 18 cu. ft. ENERGY STAR® model or equivalent. Besides saving energy, the replacement will also keep their surroundings cooler. When compared to the average electrical consumption of older equipment, ENERGY STAR equipment results in large savings. Look for the ENERGY STAR label when replacing appliances and equipment, including: window air conditioners, refrigerators, printers, computers, copy machines, etc. More information can be found in the "Products" section of the ENERGY STAR website at: http://www.energystar.gov.

Installation cost:
Estimated installed cost: $2,535 (Includes $635 in labor cost)
Source of cost estimate: Manufacturer and Store established costs

Economics:

ECM #	ECM description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
5	Replace (9) old refrigerators with compact ENERGY STAR® refrigerators and two (2) old refrigerators with 18 cu ft Energy Star models	2,535	none at this time	2,535	1,465	0	0	0.2	100	333	15	4,992	7.6	97	6	10	1,338	2,623

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the field visit and using the billing analysis aggregate utility rate.

Rebates/financial incentives:

- There is no incentive available for this measure at this time.

Please see Appendix H for more information on Incentive Programs.

ECM#6: Install eight (8) new pulse start metal halide fixtures

On the day of the site visit, SWA completed a lighting inventory of the Township of Bloomfield Municipal Building (see Appendix B). The existing lighting inventory contained eight inefficient metal halide and high pressure sodium fixtures. SWA recommends replacing them with more efficient, Pulse Start Metal Halide fixtures with electronic ballasts. Pulse Start Metal Halide fixtures with electronic ballasts provide equivalent or better light output while reducing energy consumption by 30% when compared to metal halide or high pressure sodium fixtures. .

Installation cost:

Estimated installed cost: $5,275 (includes $1,259 of labor)
Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

Economics:

ECM #	ECM description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
6	Install (8) new PSMH fixtures with incentives	5,725	200	5,525	2,681	1	0	0.3	251	677	15	10,161	8.2	84	6	9	2,370	4,800

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 2.5 hr/yr to replace aging burnt out lamps vs. newly installed.

Rebates/financial incentives:

- NJ Clean Energy - Smart Start - Pulse Start Metal Halide Fixtures ($25 per fixture)
    - Maximum Incentive Amount: $200
- NJ Clean Energy – Direct Install program (Up to 60% of the installed cost)

Please see Appendix H for more information on Incentive Programs.

ECM #7: Replace existing Sanyo DX split system with an ENERGY STAR® certified unit

During the field audit, SWA inspected an older model one ton Sanyo DX split system which was not ENERGY STAR rated. SWA recommends the replacement of this existing old and inefficient unit.

In a split-system central air conditioner, an outdoor metal cabinet contains the condenser and compressor, and an indoor cabinet contains the evaporator. Central air conditioners are more efficient than room air conditioners. In addition, they are out of the way, quiet, and convenient to operate. For an older central air conditioner, consider replacing the outdoor compressor with a modern, high-efficiency unit. Today's best air conditioners use 30%–50% less energy to produce the same amount of cooling as air conditioners made twenty years ago. Even if the air conditioner is only 10 years old, savings may be 20%–40% of the cooling energy costs by replacing it with a newer, more efficient model. Proper sizing and installation are key elements in determining air conditioner efficiency. Too large a unit will not adequately remove humidity. Too small a unit will not be able to attain a comfortable temperature on the hottest days. Improper unit location, lack of insulation, and improper duct installation can greatly diminish efficiency.

When buying an air conditioner, look for a model with a high efficiency. Central air conditioners are rated according to their seasonal energy efficiency ratio (SEER). SEER (Btu/Watt-hr) indicates the relative amount of energy needed to provide a specific cooling output. Many older systems have SEER ratings of 6 or less (excluding the years of equipment degradation). The minimum SEER allowed today is 13. Look for the ENERGY STAR® label for central air conditioners with SEER ratings of 13 or greater, but consider using air conditioning equipment with higher SEER ratings for greater savings. SEER 13 is 30% more efficient than the previous minimum SEER of 10. The "lifespan" of a central air conditioner is about 15 to 20 years. More information can be found in the “Products” section of the ENERGY STAR website at: http://www.energystar.gov.

Installation cost:
Estimated installed cost: $2,726 (includes $818 of labor)
Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

Economics:

ECM #	ECM description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1 st yr savings	kW, demand reduction/mo	therms, 1 st yr savings	kBtu/sq ft, 1 st yr savings	est. operating cost, 1 st yr savings, $	total 1 st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
7	Replace existing Sanyo DX split system with an Energy Star® certified unit	2,818	92	2,726	1,918	0	0	0.2	0	305	15	4,573	8.9	68	5	7	835	3,435

Assumptions: SWA calculated the savings for this measure using measurements taken during the field audit and using the billing analysis. SWA used Energy Star site: http://www.energystar.gov/index.cfm?c=bulk_purchasing.bus_purchasing , Excel spreadsheet for Central Air Conditioners Savings Calculator

Rebates/financial incentives:
- NJ Clean Energy - Smart Start ($92 per ton)
    - Maximum amount: $92

Please see Appendix F for more information on Incentive Programs.

ECM#8: Replace existing Trane condenser with an ENERGY STAR® certified unit

During the field audit, SWA inspected an older model Trane AC condenser which was not ENERGY STAR rated. SWA recommends the replacement of existing old and inefficient AC condensers.

In a split-system central air conditioner, an outdoor metal cabinet contains the condenser and compressor, and an indoor cabinet contains the evaporator. Central air conditioners are more efficient than room air conditioners. In addition, they are out of the way, quiet, and convenient to operate. For an older central air conditioner, consider replacing the outdoor compressor with a modern, high-efficiency unit. Today's best air conditioners use 30%–50% less energy to produce the same amount of cooling as air conditioners made twenty years ago. Even if the air conditioner is only 10 years old, savings may be 20%–40% of the cooling energy costs by replacing it with a newer, more efficient model. Proper sizing and installation are key elements in determining air conditioner efficiency. Too large a unit will not adequately remove humidity. Too small a unit will not be able to attain a comfortable temperature on the hottest days. Improper unit location, lack of insulation, and improper duct installation can greatly diminish efficiency.

When buying an air conditioner, look for a model with a high efficiency. Central air conditioners are rated according to their seasonal energy efficiency ratio (SEER). SEER (Btu/Watt-hr) indicates the relative amount of energy needed to provide a specific cooling output. Many older systems have SEER ratings of 6 or less (excluding the years of equipment degradation). The minimum SEER allowed today is 13. Look for the ENERGY STAR® label for central air conditioners with SEER ratings of 13 or greater, but consider using air conditioning equipment with higher SEER ratings for greater savings. SEER 13 is 30% more efficient than the previous minimum SEER of 10. The "lifespan" of a central air conditioner is about 15 to 20 years. More information can be found in the “Products” section of the ENERGY STAR website at: http://www.energystar.gov.

Installation cost:
Estimated installed cost: $7,560 (includes $2,495 of labor)
Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

Economics:

ECM #	ECM description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
8	Replace existing Trane condenser with an Energy Star® certified unit	7,560	460	5,308	2,905	0	0	0.4	105	567	15	8,499	9.4	60	4	7	1,317	

Assumptions: SWA calculated the savings for this measure using measurements taken during the field audit and using the billing analysis. In order to estimate savings for this measure, SWA assumed in the model an energy reduction based on the difference in efficiencies of existing vs. the proposed equipment. SWA also assumed that the existing unit requires additional annual repairs vs. a new condenser.

Rebates/financial incentives:
- NJ Clean Energy - Smart Start ($92 per ton)
    - Maximum amount: $460

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 Municipal Building:

- Install premium motors when replacements are required - Select NEMA Premium motors when replacing motors that have reached the end of their useful operating lives.
- Apply appropriate air-sealing strategies around all exterior wall penetrations (including electrical, plumbing and HVAC).
- Replace all original, single-glazed windows with a low-E, double glazed type.
- Replace and maintain damaged door units.

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.

- Inspect and replace cracked/ineffective caulk.
- Maintain/ inspect all roof surfaces on a regular basis.
- Replace and maintain sealants at all windows for airtight performance.
- Install insulated door separating spaces with different temperature conditions.
- 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	Model #	Fuel	Location	Space Served	Year Installed	Estimated Remaining Useful Life %
Heating	(2) Steam boilers, Power Flam burner	Kewanee	Natural Gas	Boiler Room	Entire Building	1920	0%
Cooling	AC-1, DX split system, Indoor Unit	Sanyo, SAP121k	Electric	Office # 200	Office # 200	~2001	33%
Cooling	ACC-1, DX split system, Condenser unit, R-22	Sanyo, SAP121C	Electric	2nd Floor Rooftop	Office # 200	~2001	33%
Cooling	ACC-1, Air cooled chiller,	Carrier	Electric	Rooftop	Entire Building	~2001	60%
Cooling	CT-1, Screw Compressor inside unit ACC-1	Hitachi, 5002SC-H, S/N R-01813	Electric	Rooftop	Entire Building	2004	72%
Cooling	AC-2, Fan coil,	Luxaire, F4P030H06T3XH	Electric	Health Center Storage Cl.	Basement Health Center	~2006	66%
Cooling	ACC-2, Condenser unit, R-410A, 30,000 BTUH	Luxaire, TCGD30S41S3A, S/N W1E0846841	Electric	Exterior	Basement Health Center	~2006	66%
Cooling	HP-1, Heat Pump, R-410A, 36,000 BTUH	Payne, PH13NA036-B	Electric	Exterior	Offices	2010	93%
Cooling	HP-2, Heat Pump, R-22, 36,000 BTUH	Carrier, 38YCA018340, S/N 3693E14089	Electric	1st Floor Rooftop	1st Floor Offices	~2001	33%
Cooling	HP-3, Packaged rooftop heat pump unit, 4 tons, 9.1 EER, 3.1 COP, 7.00 HSPF	Carrier, Weathermaker 50LJQ005---531TP	Electric	1st Floor Rooftop	1st Floor Offices	1985	0%
Cooling	ACC-3, Condenser unit, R-22, 60,000 BTUH	Trane, BTA060D-300A0, S/N Y12238425	Electric	1st Floor Rooftop	1st Floor Offices	1985	0%
Cooling	AC-3, Through-the-wall air conditioner,	LG	Electric	1st Fl. Office	1st Fl. Office	~2006	66%
Domestic Hot Water	75 gal storage, 75,000 BTUH, Energy Factor 0.57	Rheem, Power Vent, 42VP75FW	Natural Gas	Boiler Room	Entire Building	02/2011	95%
Lighting	See details - Appendix B	-	Electric	See details - Appendix B	Entire Building	2001	33%

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	2	Vestibule (203)	Recessed Parabolic	E	4'T8	1	2	32	Sw	2	240	10	74	36	N/A	Recessed Parabolic	4'T8	E	Sw	1	2	32	2	240	10	74	36	0	0	0
2	2	Office (203)	Recessed Parabolic	E	4'T8	29	2	32	Sw	8	240	10	2,146	4,120	C	Recessed Parabolic	4'T8	E	OS	29	2	32	6	240	10	2146	3090	0	1030	1030
3	2	Office (204)	Recessed Parabolic	E	4'T8	9	2	32	Sw	8	240	10	666	1,279	C	Recessed Parabolic	4'T8	E	OS	9	2	32	6	240	10	666	959	0	320	320
4	2	Office (205)	Recessed Parabolic	E	4'T8	2	2	32	Sw	8	240	10	148	284	N/A	Recessed Parabolic	4'T8	E	Sw	2	2	32	8	240	10	148	284	0	0	0
5	2	Meeting Room (205)	Recessed Parabolic	E	4'T8	2	2	32	Sw	8	240	10	148	284	N/A	Recessed Parabolic	4'T8	E	Sw	2	2	32	8	240	10	148	284	0	0	0
6	2	Office Area (201)	Recessed Parabolic	E	4'T8	16	2	32	Sw	8	240	10	1,184	2,273	N/A	Recessed Parabolic	4'T8	E	Sw	16	2	32	8	240	10	1184	2273	0	0	0
7	2	Office (209)	Parabolic Ceiling Mounted	S	4'T8	9	2	32	Sw	8	240	10	666	1,279	C	Parabolic Ceiling Mounted	4'T8	S	OS	9	2	32	6	240	10	666	959	0	320	320
8	2	Office (207)	Ceiling Mounted	S	Inc	1	2	60	Sw	8	240	0	120	230	CFL	Ceiling Mounted	CFL	S	Sw	1	2	20	8	240	0	40	77	154	0	154
9	2	Office (207)	Recessed	E	4'T8	12	1	32	Sw	8	240	5	444	852	C	Recessed	4'T8	E	OS	12	1	32	6	240	5	444	639	0	213	213
10	2	Office (211)	Parabolic Ceiling Mounted	E	4'T8	4	2	32	Sw	8	240	10	296	568	N/A	Parabolic Ceiling Mounted	4'T8	E	Sw	4	2	32	8	240	10	296	568	0	0	0
11	2	Office (213)	Recessed Parabolic	E	4'T8	5	2	32	Sw	8	240	10	370	710	C	Recessed Parabolic	4'T8	E	OS	5	2	32	6	240	10	370	533	0	178	178
12	2	Office (213)	Ceiling Mounted	E	4'T8	3	2	32	Sw	8	240	10	222	426	N/A	Ceiling Mounted	4'T8	E	Sw	3	2	32	8	240	10	222	426	0	0	0
13	2	Office (213)	Ceiling Mounted	E	4'T8	4	2	32	Sw	8	240	10	296	568	N/A	Ceiling Mounted	4'T8	E	Sw	4	2	32	8	240	10	296	568	0	0	0
14	2	Office Area (214)	Recessed Parabolic	E	4'T8	9	2	32	Sw	8	240	10	666	1,279	N/A	Recessed Parabolic	4'T8	E	Sw	9	2	32	8	240	10	666	1279	0	0	0
15	2	Vault (214)	Ceiling Mounted	S	Inc	1	1	60	Sw	8	240	0	60	115	CFL	Ceiling Mounted	CFL	S	Sw	1	1	20	8	240	0	20	38	77	0	77
16	2	Vault (203)	Ceiling Mounted	M	4'T12	1	1	40	Sw	2	240	12	52	25	T8	Ceiling Mounted	4'T8	E	Sw	1	1	32	2	240	5	37	18	7	0	7
17	2	Council Meeting Room	Ceiling Mounted	E	8'T8	3	2	59	Sw	10	240	14	396	950	N/A	Ceiling Mounted	8'T8	E	Sw	3	2	59	10	240	14	396	950	0	0	0
18	2	Council Meeting Room	Ceiling Suspended	S	CFL	8	12	14	Sw	10	240	0	1,344	3,226	N/A	Ceiling Suspended	CFL	S	Sw	8	12	14	10	240	0	1344	3226	0	0	0
19	2	Office (200)	Recessed Parabolic	E	4'T8	12	2	32	Sw	8	240	10	888	1,705	N/A	Recessed Parabolic	4'T8	E	Sw	12	2	32	8	240	10	888	1705	0	0	0
20	2	Storage Room (200)	Ceiling Mounted	M	4'T12	2	1	40	Sw	2	240	12	104	50	T8	Ceiling Mounted	4'T8	E	Sw	2	1	32	2	240	5	74	36	14	0	14
21	Attic	Storage Rm	Ceiling Mounted	E	4'T8	1	3	32	Sw	2	240	15	111	53	N/A	Ceiling Mounted	4'T8	E	Sw	1	3	32	2	240	15	111	53	0	0	0
22	Attic	Storage Rm	Wall Mounted	S	Inc	5	1	100	Sw	2	240	0	500	240	CFL	Wall Mounted	CFL	S	Sw	5	1	35	2	240	0	175	84	156	0	156
23	2	Hallway	Ceiling Mounted	S	Hal	7	1	75	N	24	240	17	641	3,689	CFL	Ceiling Mounted	CFL	S	N	7	1	25	24	240	0	175	1008	2681	0	2681
24	2	Staircase	Ceiling Mounted	S	CFL	1	1	14	N	24	240	0	14	81	N/A	Ceiling Mounted	CFL	S	N	1	1	14	24	240	0	14	81	0	0	0
25	2	Staircase	Ceiling Mounted	S	CFL	1	1	14	N	24	240	0	14	81	N/A	Ceiling Mounted	CFL	S	N	1	1	14	24	240	0	14	81	0	0	0
26	2	Bathroom Men	Ceiling Mounted	S	Inc	1	1	100	Sw	4	240	0	100	96	CFL	Ceiling Mounted	CFL	S	Sw	1	1	35	4	240	0	35	34	62	0	62
27	2	Bathroom Women	Ceiling Mounted	S	Inc	1	1	100	Sw	4	240	0	100	96	CFL	Ceiling Mounted	CFL	S	Sw	1	1	35	4	240	0	35	34	62	0	62
28	2	Hallway	Parabolic Ceiling Mounted	E	4'T8	3	2	32	N	24	240	10	222	1,279	N/A	Parabolic Ceiling Mounted	4'T8	E	N	3	2	32	24	240	10	222	1279	0	0	0
29	2	Hallway	Recessed Parabolic	E	4'T8	1	2	32	N	24	240	10	74	426	N/A	Recessed Parabolic	4'T8	E	N	1	2	32	24	240	10	74	426	0	0	0
30	2	Office (200A)	Recessed Parabolic	E	4'T8	2	2	32	Sw	8	240	10	148	284	N/A	Recessed Parabolic	4'T8	E	Sw	2	2	32	8	240	10	148	284	0	0	0
31	2	Hallway	Recessed Parabolic	E	4'T8	2	1	32	N	24	240	5	74	426	N/A	Recessed Parabolic	4'T8	E	N	2	1	32	24	240	5	74	426	0	0	0
32	2	Storage Closet	Ceiling Mounted	S	Inc	1	1	60	Sw	2	240	0	60	29	CFL	Ceiling Mounted	CFL	S	Sw	1	1	20	2	240	0	20	10	19	0	19
33	2	Staircase	Ceiling Suspended	S	Hal	1	4	75	N	24	240	66	366	2,108	CFL	Ceiling Suspended	CFL	S	N	1	4	25	24	240	0	100	576	1532	0	1532
34	2	Staircase	Ceiling Suspended	S	CFL	1	4	14	N	24	240	0	56	323	N/A	Ceiling Suspended	CFL	S	N	1	4	14	24	240	0	56	323	0	0	0
35	1	Office (101)	Parabolic Ceiling Mounted	M	4'T8	7	2	32	Sw	8	240	10	518	995	C	Parabolic Ceiling Mounted	4'T8	M	OS	7	2	32	6	240	10	518	746	0	249	249
36	1	Office (101)	Ceiling Suspended	E	4'T8	1	2	32	Sw	8	240	10	74	142	N/A	Ceiling Suspended	4'T8	E	Sw	1	2	32	8	240	10	74	142	0	0	0
37	1	Office (101)	Ceiling Suspended	E	4'T8	1	2	32	Sw	8	240	10	74	142	N/A	Ceiling Suspended	4'T8	E	Sw	1	2	32	8	240	10	74	142	0	0	0
38	1	Lunch Room (101)	Ceiling Suspended	E	4'T8	1	2	32	Sw	8	240	10	74	142	N/A	Ceiling Suspended	4'T8	E	Sw	1	2	32	8	240	10	74	142	0	0	0
39	1	Vault (101)	Ceiling Mounted	S	Inc	1	1	60	Sw	2	240	0	60	29	CFL	Ceiling Mounted	CFL	S	Sw	1	1	20	2	240	0	20	10	19	0	19
40	1	Office (103)	Ceiling Suspended	E	4'T8	4	2	32	Sw	8	240	10	296	568	N/A	Ceiling Suspended	4'T8	E	Sw	4	2	32	8	240	10	296	568	0	0	0
41	1	Office (111)	Parabolic Ceiling Mounted	E	4'T8	11	2	32	Sw	8	240	10	814	1,563	C	Parabolic Ceiling Mounted	4'T8	E	OS	11	2	32	6	240	10	814	1172	0	391	391
42	1	Vault (111)	Parabolic Ceiling Mounted	E	4'T8	1	2	32	Sw	8	240	10	74	142	N/A	Parabolic Ceiling Mounted	4'T8	E	Sw	1	2	32	8	240	10	74	142	0	0	0
43	1	Office (111)	Parabolic Ceiling Mounted	E	4'T8	3	2	32	Sw	8	240	10	222	426	N/A	Parabolic Ceiling Mounted	4'T8	E	Sw	3	2	32	8	240	10	222	426	0	0	0
44	1	Meeting Room (111)	Parabolic Ceiling Mounted	E	4'T8	4	2	32	Sw	8	240	10	296	568	N/A	Parabolic Ceiling Mounted	4'T8	E	Sw	4	2	32	8	240	10	296	568	0	0	0
45	1	Storage Room (111)	Recessed Parabolic	E	4'T8	2	2	32	Sw	2	240	10	148	71	N/A	Recessed Parabolic	4'T8	E	Sw	2	2	32	2	240	10	148	71	0	0	0
46	1	Office (109)	Parabolic Ceiling Mounted	E	4'T8	9	2	32	Sw	8	240	10	666	1,279	C	Parabolic Ceiling Mounted	4'T8	E	OS	9	2	32	6	240	10	666	959	0	320	320
47	1	Office (107)	Parabolic Ceiling Mounted	E	4'T8	9	2	32	Sw	8	240	10	666	1,279	C	Parabolic Ceiling Mounted	4'T8	E	OS	9	2	32	6	240	10	666	959	0	320	320
48	1	Staircase	Ceiling Suspended	S	Hal	1	4	75	N	24	240	66	366	2,108	CFL	Ceiling Suspended	CFL	S	N	1	4	25	24	240	0	100	576	1532	0	1532
49	1	Staircase	Ceiling Suspended	S	CFL	1	4	14	N	24	240	0	56	323	N/A	Ceiling Suspended	CFL	S	N	1	4	14	24	240	0	56	323	0	0	0
50	2	Storage Room	Ceiling Mounted	S	Inc	1	1	60	Sw	2	240	0	60	29	CFL	Ceiling Mounted	CFL	S	Sw	1	1	20	2	240	0	20	10	19	0	19
51	2	Hallway	Ceiling Suspended	S	CFL	6	4	14	N	24	240	0	336	1,935	N/A	Ceiling Suspended	CFL	S	N	6	4	14	24	240	0	336	1935	0	0	0
52	2	Office (114)	Recessed Parabolic	E	4'T8	8	2	32	Sw	8	240	10	592	1,137	C	Recessed Parabolic	4'T8	E	OS	8	2	32	6	240	10	592	852	0	284	284
53	2	Office Area (114)	Parabolic Ceiling Mounted	E	4'T8	4	2	32	Sw	8	240	10	296	568	N/A	Parabolic Ceiling Mounted	4'T8	E	Sw	4	2	32	8	240	10	296	568	0	0	0
54	2	Vault (114)	Ceiling Mounted	M	4'T12	2	1	40	Sw	2	240	12	104	50	T8	Ceiling Mounted	4'T8	E	Sw	2	1	32	2	240	5	74	36	14	0	14
55	2	Vault (114)	Ceiling Mounted	M	4'T12	1	1	40	Sw	2	240	12	52	25	T8	Ceiling Mounted	4'T8	E	Sw	1	1	32	2	240	5	37	18	7	0	7
56	2	Hallway (112)	Ceiling Mounted	S	Inc	1	1	60	N	24	240	0	60	346	CFL	Ceiling Mounted	CFL	S	N	1	1	20	24	240	0	20	115	230	0	230
57	2	Office (110)	Parabolic Ceiling Mounted	E	4'T8	9	2	32	Sw	8	240	10	666	1,279	C	Parabolic Ceiling Mounted	4'T8	E	OS	9	2	32	6	240	10	666	959	0	320	320
58	2	Office (108)	Parabolic Ceiling Mounted	E	4'T8	9	2	32	Sw	8	240	10	666	1,279	C	Parabolic Ceiling Mounted	4'T8	E	OS	9	2	32	6	240	10	666	959	0	320	320
59	2	Office (106)	Recessed Parabolic	E	4'T8	24	2	32	Sw	8	240	10	1,776	3,410	C	Recessed Parabolic	4'T8	E	OS	24	2	32	6	240	10	1776	2557	0	852	852
60	1	Computer Room	Recessed Parabolic	E	4'T8	2	2	32	Sw	8	240	10	148	284	N/A	Recessed Parabolic	4'T8	E	Sw	2	2	32	8	240	10	148	284	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)
61	1	Hallway	Recessed Parabolic	E	4'T8	3	2	32	N	24	240	10	222	1,279	N/A	Recessed Parabolic	4'T8	E	N	3	2	32	24	240	10	222	1279	0	0	0
62	1	Hallway	Parabolic Ceiling Mounted	E	4'T8	1	2	32	N	24	240	10	74	426	N/A	Parabolic Ceiling Mounted	4'T8	E	N	1	2	32	24	240	10	74	426	0	0	0
63	1	Bathroom Men	Ceiling Mounted	S	Inc	1	1	100	Sw	4	240	0	100	96	CFL	Ceiling Mounted	CFL	S	Sw	1	1	35	4	240	0	35	34	62	0	62
64	1	Storage Room	Wall Mounted	E	Inc	1	1	60	Sw	2	240	0	60	29	CFL	Wall Mounted	CFL	E	Sw	1	1	20	2	240	0	20	10	19	0	19
65	Bsmt	Office	Recessed Parabolic	E	4'T8	9	2	32	Sw	8	240	10	666	1,279	C	Recessed Parabolic	4'T8	E	OS	9	2	32	6	240	10	666	959	0	320	320
66	Bsmt	Storage Room	Parabolic Ceiling Mounted	E	4'T8	13	1	32	Sw	2	240	5	481	231	N/A	Parabolic Ceiling Mounted	4'T8	E	Sw	13	1	32	2	240	5	481	231	0	0	0
67	Bsmt	Hallway	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
68	Bsmt	Hallway	Ceiling Mounted	S	CFL	2	1	14	N	24	240	0	28	161	N/A	Ceiling Mounted	CFL	S	N	2	1	14	24	240	0	28	161	0	0	0
69	Bsmt	Storage Room	Parabolic Ceiling Mounted	E	4'T8	2	2	32	Sw	2	240	10	148	71	N/A	Parabolic Ceiling Mounted	4'T8	E	Sw	2	2	32	2	240	10	148	71	0	0	0
70	Bsmt	Hallway	Ceiling Mounted	E	4'T8	2	1	32	N	24	240	5	74	426	N/A	Ceiling Mounted	4'T8	E	N	2	1	32	24	240	5	74	426	0	0	0
71	Bsmt	Bathroom Men	Recessed	M	4'T12	3	1	40	Sw	4	240	12	156	150	T8	Recessed	4'T8	E	Sw	3	1	32	4	240	5	111	107	43	0	43
72	Bsmt	Bathroom Women	Recessed	M	4'T12	3	1	40	Sw	4	240	12	156	150	T8	Recessed	4'T8	E	Sw	3	1	32	4	240	5	111	107	43	0	43
73	Bsmt	Hallway	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
74	Bsmt	Hallway	Recessed Parabolic	E	4'T8	1	2	32	N	24	240	10	74	426	N/A	Recessed Parabolic	4'T8	E	N	1	2	32	24	240	10	74	426	0	0	0
75	Bsmt	Elevator Mech. Room	Parabolic Ceiling Mounted	M	4'T12	1	2	40	Sw	2	240	24	104	50	T8	Parabolic Ceiling Mounted	4'T8	E	Sw	1	2	32	2	240	10	74	36	14	0	14
76	Bsmt	Elevator	Recessed	M	4'T12	1	4	40	N	24	240	48	208	1,198	T8	Recessed	4'T8	E	N	1	4	32	24	240	20	148	852	346	0	346
77	Bsmt	Storage Room	Ceiling Mounted	S	Inc	2	1	60	Sw	2	240	0	120	58	CFL	Ceiling Mounted	CFL	S	Sw	2	1	20	2	240	0	40	19	38	0	38
78	Bsmt	Hallway	Parabolic Ceiling Suspended	E	4'T8	2	2	32	N	24	240	10	148	852	N/A	Parabolic Ceiling Suspended	4'T8	E	N	2	2	32	24	240	10	148	852	0	0	0
79	Bsmt	Storage Room	Ceiling Mounted	S	Inc	3	1	60	Sw	2	240	0	180	86	CFL	Ceiling Mounted	CFL	S	Sw	3	1	20	2	240	0	60	29	58	0	58
80	Bsmt	Storage Room	Ceiling Mounted	S	Inc	2	1	60	Sw	2	240	0	120	58	CFL	Ceiling Mounted	CFL	S	Sw	2	1	20	2	240	0	40	19	38	0	38
81	Bsmt	Hallway	Recessed Parabolic	E	4'T8	3	2	32	N	24	240	10	222	1,279	N/A	Recessed Parabolic	4'T8	E	N	3	2	32	24	240	10	222	1279	0	0	0
82	Bsmt	Nursing Vestibule	Recessed Parabolic	E	4'T8	4	2	32	Sw	8	240	10	296	568	N/A	Recessed Parabolic	4'T8	E	Sw	4	2	32	8	240	10	296	568	0	0	0
83	Bsmt	Office	Recessed Parabolic	E	4'T8	6	2	32	Sw	8	240	10	444	852	C	Recessed Parabolic	4'T8	E	OS	6	2	32	6	240	10	444	639	0	213	213
84	Bsmt	Nurse's Station	Recessed Parabolic	E	4'T8	6	2	32	Sw	8	240	10	444	852	C	Recessed Parabolic	4'T8	E	OS	6	2	32	6	240	10	444	639	0	213	213
85	Bsmt	Storage Room	Ceiling Suspended	M	4'T12	1	2	40	Sw	2	240	24	104	50	T8	Ceiling Suspended	4'T8	E	Sw	1	2	32	2	240	10	74	36	14	0	14
86	Bsmt	Hallway	Ceiling Mounted	S	CFL	7	2	14	N	24	365	0	196	1,717	N/A	Ceiling Mounted	CFL	S	N	7	2	14	24	365	0	196	1717	0	0	0
87	Bsmt	Hallway	Track	S	CFL	4	2	14	N	24	365	0	112	981	N/A	Track	CFL	S	N	4	2	14	24	365	0	112	981	0	0	0
88	Bsmt	Hallway	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
89	Bsmt	Bathroom	Wall Mounted	S	Inc	1	1	60	Sw	4	365	0	60	88	CFL	Wall Mounted	CFL	S	Sw	1	1	20	4	365	0	20	29	58	0	58
90	Bsmt	Storage Room	Wall Mounted	S	Inc	1	1	60	Sw	2	365	0	60	44	CFL	Wall Mounted	CFL	S	Sw	1	1	20	2	365	0	20	15	29	0	29
91	Bsmt	Dispatch Room	Recessed Parabolic	E	4'T8	4	2	32	Sw	24	365	10	296	2,593	N/A	Recessed Parabolic	4'T8	E	Sw	4	2	32	24	365	10	296	2593	0	0	0
92	Bsmt	Lunch Room	Recessed Parabolic	M	4'T12 U-Shaped	3	2	40	Sw	8	365	24	312	911	T8	Recessed Parabolic	4'T8 U-Shaped	E	Sw	3	2	32	8	365	10	222	648	263	0	263
93	Bsmt	Office	Recessed Parabolic	E	4'T8	2	2	32	Sw	8	365	10	148	432	N/A	Recessed Parabolic	4'T8	E	Sw	2	2	32	8	365	10	148	432	0	0	0
94	Bsmt	Storage Room	Recessed	M	4'T12 U-Shaped	1	2	40	Sw	2	365	24	104	76	T8	Recessed	4'T8 U-Shaped	E	Sw	1	2	32	2	365	10	74	54	22	0	22
95	Bsmt	Dispatch Room	Track	S	CFL	2	2	13	Sw	24	365	0	52	456	N/A	Track	CFL	S	Sw	2	2	13	24	365	0	52	456	0	0	0
96	Bsmt	Hallway	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
97	Bsmt	Vestibule	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
98	Bsmt	Storage Room	Parabolic Ceiling Mounted	E	4'T8	1	2	32	Sw	2	365	10	74	54	N/A	Parabolic Ceiling Mounted	4'T8	E	Sw	1	2	32	2	365	10	74	54	0	0	0
99	Bsmt	Meeting Room	Recessed Parabolic	E	4'T8	12	1	32	D	8	365	5	444	1,296	N/A	Recessed Parabolic	4'T8	E	D	12	1	32	8	365	5	444	1296	0	0	0
100	Bsmt	Meeting Room	Recessed	E	Hal	6	2	75	Sw	8	365	33	1,098	3,206	CFL	Recessed	CFL	E	Sw	6	2	25	8	365	0	300	876	2330	0	2330
101	Bsmt	Hallway	Recessed	M	4'T12 U-Shaped	4	2	40	N	24	365	24	416	3,644	T8	Recessed	4'T8 U-Shaped	E	N	4	2	32	24	365	10	296	2593	1051	0	1051
102	Bsmt	Lunch Room	Recessed	S	CFL	8	2	13	Sw	8	365	0	208	607	N/A	Recessed	CFL	S	Sw	8	2	13	8	365	0	208	607	0	0	0
103	Bsmt	Lunch Room	Ceiling Mounted	E	4'T8	1	2	32	Sw	8	365	10	74	216	N/A	Ceiling Mounted	4'T8	E	Sw	1	2	32	8	365	10	74	216	0	0	0
104	Bsmt	Lunch Room	Recessed	E	4'T8	4	1	32	Sw	8	365	5	148	432	N/A	Recessed	4'T8	E	Sw	4	1	32	8	365	5	148	432	0	0	0
105	Bsmt	Hallway	Recessed	S	CFL	2	2	13	N	24	365	0	52	456	N/A	Recessed	CFL	S	N	2	2	13	24	365	0	52	456	0	0	0
106	Bsmt	Hallway	Track	S	CFL	3	2	13	N	24	365	0	78	683	N/A	Track	CFL	S	N	3	2	13	24	365	0	78	683	0	0	0
107	Bsmt	Locker Room Men	Wall Mounted	S	CFL	1	2	13	Sw	8	365	0	26	76	N/A	Wall Mounted	CFL	S	Sw	1	2	13	8	365	0	26	76	0	0	0
108	Bsmt	Locker Room Men	Wall Mounted	S	CFL	1	2	13	Sw	8	365	0	26	76	N/A	Wall Mounted	CFL	S	Sw	1	2	13	8	365	0	26	76	0	0	0
109	Bsmt	Bathroom Men	Recessed	E	4'T8 U-Shaped	1	2	32	Sw	4	365	10	74	108	N/A	Recessed	4'T8 U-Shaped	E	Sw	1	2	32	4	365	10	74	108	0	0	0
110	Bsmt	Bathroom Men	Wall Mounted	M	2'T12	1	2	20	Sw	4	365	12	52	76	T8	Wall Mounted	2'T8	E	Sw	1	2	17	4	365	4	38	55	20	0	20
111	Bsmt	Bathroom Women	Recessed	E	4'T8 U-Shaped	1	2	32	Sw	4	365	10	74	108	N/A	Recessed	4'T8 U-Shaped	E	Sw	1	2	32	4	365	10	74	108	0	0	0
112	Bsmt	Bathroom Women	Wall Mounted	M	2'T12	1	2	20	Sw	4	365	12	52	76	T8	Wall Mounted	2'T8	E	Sw	1	2	17	4	365	4	38	55	20	0	20
113	Bsmt	Garage	Recessed Parabolic	E	4'T8	12	2	32	Sw	8	365	10	888	2,593	N/A	Recessed Parabolic	4'T8	E	Sw	12	2	32	8	365	10	888	2593	0	0	0
114	Bsmt	Garage	Wall Mounted	S	CFL	6	2	23	Sw	8	365	0	276	806	N/A	Wall Mounted	CFL	S	Sw	6	2	23	8	365	0	276	806	0	0	0
115	Bsmt	Garage	Exit Sign	S	LED	2	1	5	N	24	365	1	11	96	N/A	Exit Sign	LED	S	N	2	1	5	24	365	1	11	96	0	0	0
116	Ext	Garage	Ceiling Mounted	S	Inc	2	1	60	N	8	365	0	120	350	CFL	Ceiling Mounted	CFL	S	N	2	1	20	8	365	0	40	117	234	0	234
117	Ext	Exterior	Flood	E	HPS	2	1	250	T	12	365	50	600	2,628	PSMH	Flood	PSMH	E	T	2	1	150	12	365	30	360	1577	1051	0	1051
118	Ext	Exterior	Wall Mounted	E	Hal	6	1	75	T	12	365	17	549	2,405	CFL	Wall Mounted	CFL	E	T	6	1	25	12	365	0	150	657	1748	0	1748
119	Ext	Exterior	Wall Mounted	S	Inc	1	1	60	Sw	12	365	0	60	263	CFL	Wall Mounted	CFL	S	Sw	1	1	20	12	365	0	20	88	175	0	175
120	Ext	Exterior	Wall Mounted	E	HPS	5	1	150	T	12	365	30	900	3,942	PSMH	Wall Mounted	PSMH	E	T	5	1	100	12	365	20	600	2628	1314	0	1314
121	Ext	Exterior	Wall Mounted	E	MH	1	1	150	T	12	365	42	192	841	PSMH	Wall Mounted	PSMH	E	T	1	1	100	12	365	20	120	526	315	0	315
Totals:						470	222	4,857				1,156	34,418	92,794						470	222	3,485			750	29,724	71,037	15,896	5,861	21,757

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

Proposed Lighting Summary Table			
Total Gross Floor Area (SF)	28,000		
Average Power Cost ($/kWh)	0.1590		
Exterior Lighting	**Existing**	**Proposed**	**Savings**
Exterior Annual Consumption (kWh)	10,429	5,592	**4,837**
Exterior Power (watts)	2,421	1,290	**1,131**
Total Interior Lighting	**Existing**	**Proposed**	**Savings**
Annual Consumption (kWh)	82,365	65,445	**16,920**
Lighting Power (watts)	31,997	28,434	**3,564**
Lighting Power Density (watts/SF)	1.14	1.02	**0.13**
Estimated Cost of Fixture Replacement ($)	8,905		
Estimated Cost of Controls Improvements ($)	4,400		
Total Consumption Cost Savings ($)	**3,919**		

Legend							
Fixture Type		**Lamp Type**			**Control Type**	**Ballast Type**	**Retrofit Category**
Ceiling Suspended	Recessed	CFL	3'T12	8'T5	Autom. Timer (T)	S (Self)	N/A (None)
Exit Sign	Sconce	Inc	3'T12 U-Shaped	8'T5 U-Shaped	Bi-Level (BL)	E (Electronic)	T8 (Install new T8)
High Bay	Spotlight	LED	3'T5	8'T8	Contact (Ct)	M (Magnetic)	T5 (Install new T5)
Parabolic Ceiling Mounted	Track	HPS	3'T5 U-Shaped	8'T8 U-Shaped	Daylight & Motion (M)		CFL (Install new CFL)
Parabolic Ceiling Suspended	Vanity	MH	3'T8	Circline - T5	Daylight & Switch (DLSw)		LEDex (Install new LED Exit)
Pendant	Wall Mounted	MV	3'T8 U-Shaped	Circline - T8	Daylight Sensor (DL)		LED (Install new LED)
Recessed Parabolic	Wall Suspended	1'T12	4'T5	Circline - T12	Delay Switch (DSw)		D (Delamping)
Ceiling Mounted	Wallpack	1'T12 U-Shaped	4'T5 U-Shaped	FI.	Dimmer (D)		C (Controls Only)
Chandelier		1'T5	6'T12	Hal	Motion Sensor (MS)		PSMH (Install new Pulse-Start Metal Halide)
Equipment / Fume Hood		1'T5 U-Shaped	6'T12 U-Shaped	Induction	Motion& Switch (MSw)		
Flood		1'T8	6'T5	Infrared	None (N)		
Landscape		1'T8 U-Shaped	6'T5 U-Shaped	LPS	Occupancy Sensor (OS)		
Low Bay		2'T12 U-Shaped	6'T8	Mixed Vapor	Occupancy Sensor - CM (OSCM)		
Parabolic Wall Mounted		2'T5	6'T8 U-Shaped	Neon	Photocell (PC)		
Pole Mounted		2'T5 U-Shaped	8'T12	Quartz Halogen	Switch (Sw)		
Pole Mounted Off Building		2'T8 U-Shaped	8'T12 U-Shaped				

APPENDIX C: UPCOMING EQUIPMENT PHASEOUTS

LIGHTING:

- As of **July 1, 2010** magnetic ballasts most commonly used for the operation of T12 lamps will no longer be produced for commercial and industrial applications.

- As of **January 1, 2012** 100 watt incandescent bulbs will be phased out in accordance with the Energy Independence and Security Act of 2007.

- Starting **July 2012** many non energy saver model T12 lamps will be phased out of production.

- As of **January 1, 2013** 75 watt incandescent bulbs will be phased out in accordance with the Energy Independence and Security Act of 2007.

- As of **January 1, 2014** 60 and 40 watt incandescent bulbs will be phased out in accordance with the Energy Independence and Security Act of 2007.

- Energy Independence and Security Act of 2007 incandescent lamp phase-out exclusions:
  1. Appliance lamp (e.g. refrigerator or oven light)
  2. Black light lamp
  3. Bug lamp
  4. Colored lamp
  5. Infrared lamp
  6. Left-hand thread lamp
  7. Marine lamp
  8. Marine signal service lamp
  9. Mine service lamp
  10. Plant light lamp
  11. Reflector lamp
  12. Rough service lamp
  13. Shatter-resistant lamp (including a shatter-proof lamp and a shatter-protected lamp)
  14. Sign service lamp
  15. Silver bowl lamp
  16. Showcase lamp
  17. 3-way incandescent lamp
  18. Traffic signal lamp
  19. Vibration service lamp
  20. Globe shaped “G” lamp (as defined in ANSI C78.20-2003 and C79.1-2002 with a diameter of 5 inches or more
  21. T shape lamp (as defined in ANSI C78.20-2003 and C79.1-2002) and that uses not more than 40 watts or has a length of more than 10 inches
  22. A B, BA, CA, F, G16-1/2, G-25, G30, S, or M-14 lamp (as defined in ANSI C79.1-2002 and ANSI C78.20-2003) of 40 watts or less
  23. Candelabra incandescent and other lights not having a medium Edison screw base.

- When installing compact fluorescent lamps (CFLs), be advised that they contain a very small amount of mercury sealed within the glass tubing and EPA guidelines concerning

cleanup and safe disposal of compact fluorescent light bulbs should be followed. Additionally, all lamps to be disposed should be recycled in accordance with EPA guidelines through state or local government collection or exchange programs instead.

HCFC (Hydrochlorofluorocarbons):

- As of **January 1, 2010,** no production and no importing of R-142b and R-22, except for use in equipment manufactured before January 1, 2010, in accordance with adherence to the Montreal Protocol.

- As of **January 1, 2015,** No production and no importing of any HCFCs, except for use as refrigerants in equipment manufactured before January 1, 2010.

- As of **January 1, 2020** No production and no importing of R-142b and R-22.

APPENDIX D: THIRD PARTY ENERGY SUPPLIERS

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

Third Party Electric Suppliers for PSEG Service Territory	Telephone & Web Site
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
American Powernet Management, LP 437 North Grove St. Berlin, NJ 08009	(877) 977-2636 www.americanpowernet.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
ConEdison Solutions 535 State Highway 38 Cherry Hill, NJ 08002	(888) 665-0955 www.conedsolutions.com
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 www.newenergy.com
Credit Suisse, (USA) Inc. 700 College Road East Princeton, NJ 08450	(212) 538-3124 www.creditsuisse.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
Metro Energy Group, LLC 14 Washington Place Hackensack, NJ 07601	(888) 536-3876 www.metroenergy.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
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
Strategic Energy, LLC 55 Madison Avenue, Suite 400 Morristown, NJ 07960	(888) 925-9115 www.sel.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 PSEG 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
Dominion Retail, Inc. 395 Highway 170, Suite 125 Lakewood, NJ 08701	(866) 275-4240 www.retail.dom.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
Great Eastern Energy 116 Village Riva, Suite 200 Princeton, NJ 08540	(888) 651-4121 www.greateastern.com

Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
Hudson Energy Services, LLC 545 Route 17 South Ridgewood, NJ 07450	(877) 483-7669 www.hudsonenergyservices.com
Intelligent Energy 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	(800) 724-1880 www.intelligentenergy.org
Keil & Sons 1 Bergen Blvd. Fairview, NJ 07002	(877) 797-8786 www.systrumenergy.com
Metro Energy Group, LLC 14 Washington Place Hackensack, NJ 07601	(888) 536-3876 www.metroenergy.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
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
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
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
Stuyvesant Energy LLC 10 West Ivy Lane, Suite 4 Englewood, NJ 07631	(800) 646-6457 www.stuyfuel.com
Woodruff Energy 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 www.woodruffenergy.com

APPENDIX E: GLOSSARY AND METHOD OF CALCULATIONS

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.

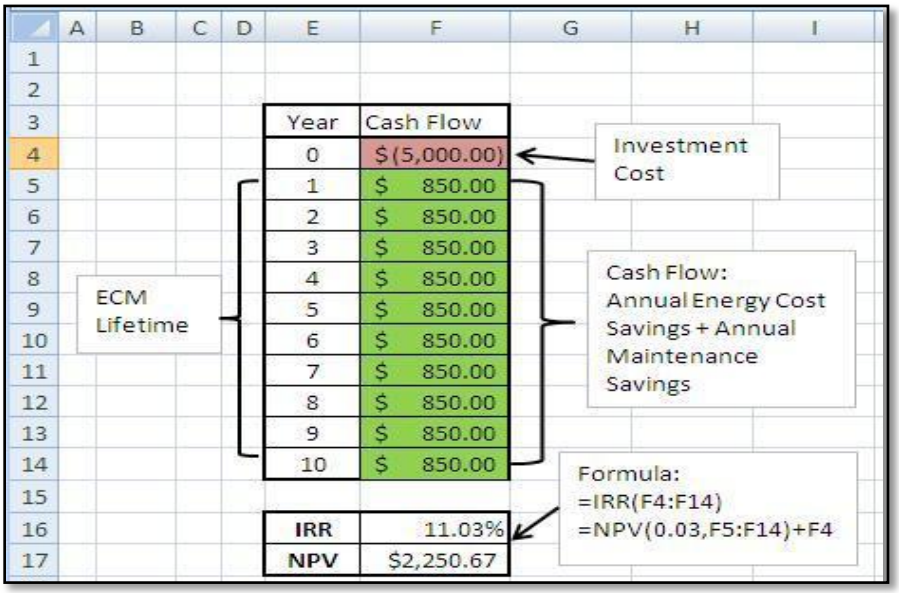
Calculation References

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 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 Equipment Life Span

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 F: STATEMENT OF ENERGY PERFORMANCE FROM ENERGY STAR®

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Township of Bloomfield Municipal Building

Building ID: 2844484
For 12-month Period Ending: June 30, 2011[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: September 21, 2011

Facility	Facility Owner	Primary Contact for this Facility
Township of Bloomfield Municipal Building 1 Municipal Plaza Bloomfield, NJ 07003	N/A	N/A

Year Built: 1900
Gross Floor Area (ft²): 28,000

Energy Performance Rating[2] (1-100) 43

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	1,380,453
Natural Gas (kBtu)[4]	751,252
Total Energy (kBtu)	2,131,705

Energy Intensity[4]	
Site (kBtu/ft²/yr)	76
Source (kBtu/ft²/yr)	193

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	235

Electric Distribution Utility
Public Service Electric & Gas Co

National Average Comparison	
National Average Site EUI	71
National Average Source EUI	181
% Difference from National Average Source EUI	7%
Building Type	Office

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[5] 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. Values represent energy intensity, annualized to a 12-month period.
5. 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 G: 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 2011 Program*

Direct Install is a division of the New Jersey Clean Energy Programs' 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 60%** 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 100 kW** within 12 months of applying (the 100 kW peak demand threshold has been waived for local government entities who receive and utilize their Energy Efficiency and Conservation Block Grant in conjunction with Direct Install)
- Must be located in New Jersey
- Must be served by one of the state's public, regulated or natural gas companies

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.

Energy Provider Incentives

- **PSEG** - Provides funding for site-specific uses of emerging technology. The incentives are determined on a case by case basis.

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 **t**hat may be available.

Energy Efficiency and Conservation Block Grant Rebate Program

The Energy Efficiency and Conservation Block Grant (EECBG) Rebate Program provides supplemental funding up to $20,000 for eligible New Jersey local government entities to lower the cost of installing energy conservation measures. Funding for the EECBG Rebate Program is provided through the American Recovery and Reinvestment Act (ARRA).

For the most up to date information on how to participate in this program, go to: http://njcleanenergy.com/EECBG.

Other 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/.

*Subject to availability. Incentive program timelines might not be sufficient to meet the 25% in 12 months spending requirement outlined in the LGEA program.

APPENDIX H: ENERGY CONSERVATION MEASURES

ECM #	ECM description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
1	Install (48) new CFL fixtures to be installed with incentives	514	0	514	11,335	2	0	1.4	84	1,886	5	9,431	0.3	1,736	347	367	7,825	20,295
2	Install (22) new occupancy sensors to be installed with incentives	880	80	800	1,095	0	0	0.1	0	170	15	2,550	4.7	219	15	20	1,163	1,961
3	Install (25) New T8 Fixtures With Incentives	3,116	250	2,866	1,881	0	0	0.2	125	424	15	6,360	6.8	122	8	12	2,057	3,368
4	Replace existing 4 ton Carrier Weathmaker packaged rooftop heat pump with an Energy Star® certified unit	9,667	368	9,299	8,356	0	0	1.0	0	1,328	15	19,920	7.0	114	8	11	6,131	14,962
5	Replace (9) old refrigerators with compact ENERGY STAR® refrigerators and two (2) old refrigerators with 18 cu ft Energy Star models	2,535	none at this time	2,535	1,465	0	0	0.2	100	333	15	4,992	7.6	97	6	10	1,338	2,623
6	Install (8) new PSMH fixtures with incentives	5,725	200	5,525	2,681	1	0	0.3	251	677	15	10,161	8.2	84	6	9	2,370	4,800
7	Replace existing Sanyo DX split system with an Energy Star® certified unit	2,818	92	2,726	1,918	0	0	0.2	0	305	15	4,573	8.9	68	5	7	835	3,435
8	Replace existing Trane condenser with an Energy Star® certified unit	7,560	460	5,308	2,905	0	0	0.4	105	567	15	8,499	9.4	60	4	7	1,317	5,201
	Total	**32,814**	**1,450**	**29,572**	**31,636**	**4**	**0**	**3.8**	**665**	**5,690**	**---**	**66,486**	**5.2**	**---**	**---**	**---**	**23,038**	**56,645**

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 I: METHOD OF ANALYSIS

Assumptions and tools

Energy modeling tool:	Established/standard industry assumptions
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.