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**Local Government Energy Program
Energy Audit Final Report**

**The Borough of Manasquan
Brielle Road Pump Station
Brielle Road
Manasquan, NJ 08736**

Project Number: LGEA81



TABLE OF CONTENTS

EXECUTIVE SUMMARY	3
INTRODUCTION	5
HISTORICAL ENERGY CONSUMPTION.....	6
EXISTING FACILITY AND SYSTEMS DESCRIPTION.....	9
RENEWABLE AND DISTRIBUTED ENERGY MEASURES.....	12
PROPOSED ENERGY CONSERVATION MEASURES	13
PROPOSED FURTHER RECOMMENDATIONS.....	14
APPENDIX A: EQUIPMENT LIST	16
APPENDIX B: LIGHTING STUDY	17
APPENDIX C: THIRD PARTY ENERGY SUPPLIERS	19
APPENDIX D: GLOSSARY AND METHOD OF CALCULATIONS	20
APPENDIX E: STATEMENT OF ENERGY PERFORMANCE FROM ENERGY STAR®.....	24
APPENDIX F: INCENTIVE PROGRAMS.....	25
APPENDIX G: ENERGY CONSERVATION MEASURES	27
APPENDIX H: METHOD OF ANALYSIS.....	28

EXECUTIVE SUMMARY

The Brielle Road Pump Station is an underground enclosure comprising a total operational area of approximately 25 square feet. The original pump station was built in the late 1980s and upgraded in 2008. The following table provides an overview of current energy usage in the building based on the analysis period of July 2009 through June 2010:

Table 1: State of Building-Energy Usage

	Electric Usage, kWh/yr	Current Annual Cost of Energy, \$	Site Energy Use Intensity, kBtu/sq ft yr	Joint Energy Consumption, MMBtu/yr
Current	7,682	\$1,667	1058.0	26
Proposed	7,670	\$1,662	1056.3	26
Savings	12	\$5*	1.7	0
% Savings	0.2%	0.3%	0.2%	0.2%

*Includes operation and maintenance savings

There may be energy procurement opportunities for the Brielle Road Pump Station to reduce annual electric utility costs, which are \$515 higher, when compared to the average estimated NJ commercial utility rates.

SWA has also entered energy information about the Brielle Road Pump Station in the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® Portfolio Manager Energy benchmarking system. The resulting Site Energy Use Intensity is 1058.0kBtu/sq ft yr, which is higher than the average building by 917%. However this is a specialized underground pump station and not a typical building.

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

Table 2: Energy Conservation Measure Recommendations

ECMs	First Year Savings (\$)	Simple Payback Period (years)	Initial Investment, \$	CO2 Savings, lbs/yr
0-5 Year	\$5	3.4	\$16	22
Total	\$5	3.4	\$16	22

Further Recommendations: Other recommendations to increase building efficiency pertaining to capital improvements and operations and maintenance are:

- Capital Improvements
 - Install premium motors when replacements are required - Select NEMA Premium motors when replacing motors that have reached the end of their useful operating lives. Installing Variable Frequency Drives (estimated at \$5,000) results in a greater than 15 year payback. These are small pumps which operate only a few hours a day and take turns in being lead and lag pumps.
 - Install nearby generator to back up pumps during a power outage with the next capital renovation.

- Operations and Maintenance
 - Continue to clean pumps on a regular basis to prevent clogging; Check pump seals.
 - 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/>.

The recommended ECMs and the list above are cost-effective energy efficiency measures and building upgrades that will reduce operating expenses for the Borough of Manasquan. Based on the requirements of the LGEA program, the Borough of Manasquan must commit to implementing some of these measures, and must submit paperwork to the Local Government Energy Audit program within one year of this report's approval to demonstrate that they have spent, net of other NJCEP incentives, at least 25% of the cost of the audit (per building). The minimum amount to be spent, net of other NJCEP incentives, is \$534.75 (or 25% of \$2,139).

Financial Incentives and Other Program Opportunities

The table below summarizes the recommended next steps that the Borough of Manasquan can take to achieve greater energy efficiency and reduce operating expenses.

Table 3: Next Steps for the Brielle Road Pump Station

Recommended ECMs	Incentive Program (Please refer to Appendix F for details)
Upgrade Lighting With (1) Efficient New CFL Lamps	Direct Install

There are various incentive programs that the Brielle Road Pump Station could apply to lower the installed ECM costs. SWA recommends the following programs, contingent upon available funding:

- **Direct Install 2010 Program:** Commercial buildings with peak electric demand below 200kW can receive up to 60% of installed cost of energy saving upgrades.
- **Smart Start:** Most of energy savings equipment and design measures have moderate incentives under this program.
- **Utility Sponsored Programs:** See available programs with JCP&L http://www.firstenergycorp.com/Residential_and_Business/Products_and_Services/index.html
- **Energy Efficiency and Conservation Block Grant Rebate Program:** Provides up to \$20,000 per local government toward energy saving measures; <http://njcleanenergy.com/EECBG>

Please refer to Appendix F for further details.

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, borough halls, police and library, 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 Brielle Road Pump Station at Brielle Road, Manasquan, NJ 08736. The process of the audit included a facility visit on September 2, 2010, benchmarking and energy bills analysis, assessment of existing conditions, energy modeling, energy conservation measures and other recommendations for improvements. The scope of work includes providing a summary of current building conditions, current operating costs, potential savings, and investment costs to achieve these savings. The facility description includes energy usage, occupancy profiles and current building systems along with a detailed inventory of building energy systems, recommendations for improvement and recommendations for energy purchasing and procurement strategies.

The goal of this Local Government Energy Audit is to provide sufficient information to the Borough of Manasquan to make decisions regarding the implementation of the most appropriate and most cost-effective energy conservation measures for the Brielle Road Pump Station.

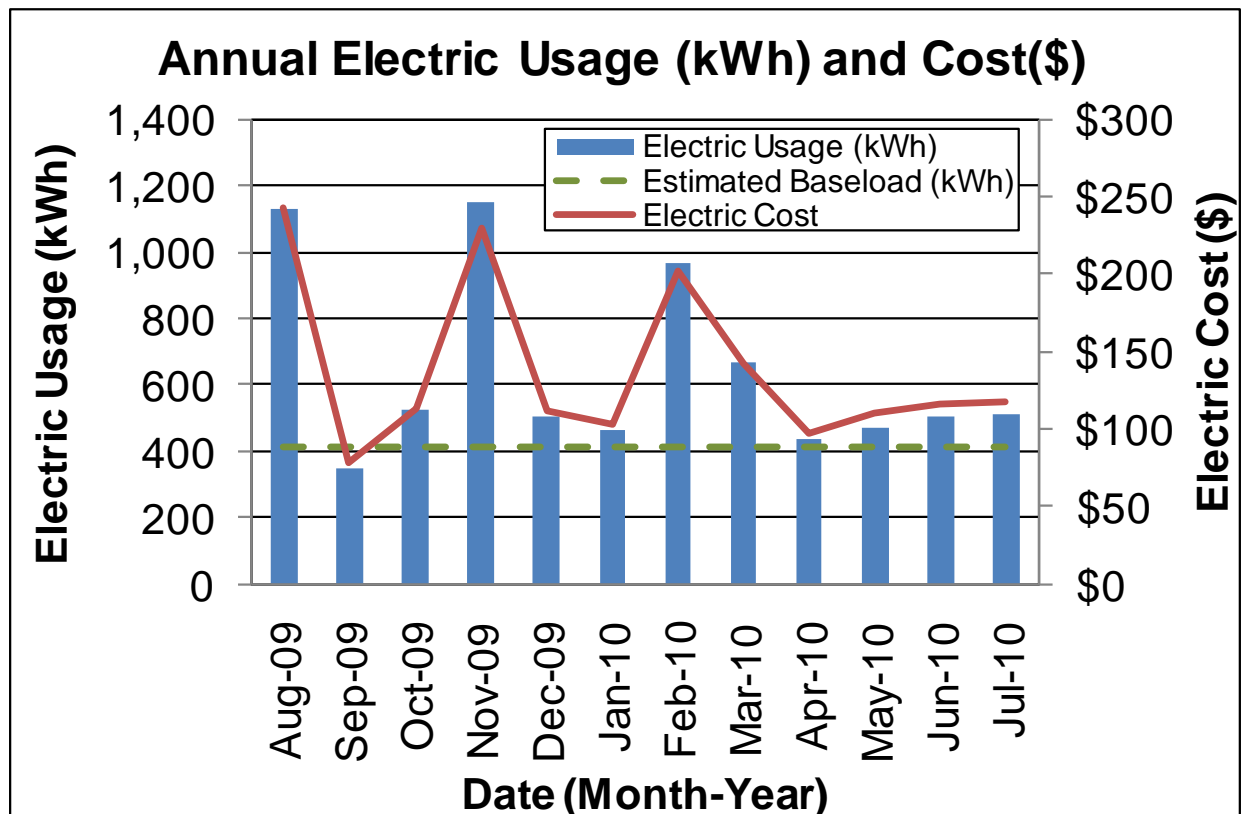
HISTORICAL ENERGY CONSUMPTION

Energy usage, load profile and cost analysis

SWA reviewed utility bills from November 2008 through July 2010 that were received from the utility companies supplying the Brielle Road Pump Station with electricity. A 12 month period of analysis from August 2009 through July 2010 was used for all calculations and for purposes of benchmarking the building.

Electricity - The Brielle Road Pump Station is currently served by one electric meter. The Brielle Road Pump Station currently buys electricity from JCP&L at **an average aggregated rate of \$0.217/kWh**. The Brielle Road Pump Station purchased **approximately 7,682 kWh, or \$1,667 worth of electricity**, in the previous year. The average monthly demand was 6.0 kW and the annual peak demand was 9.7 kW.

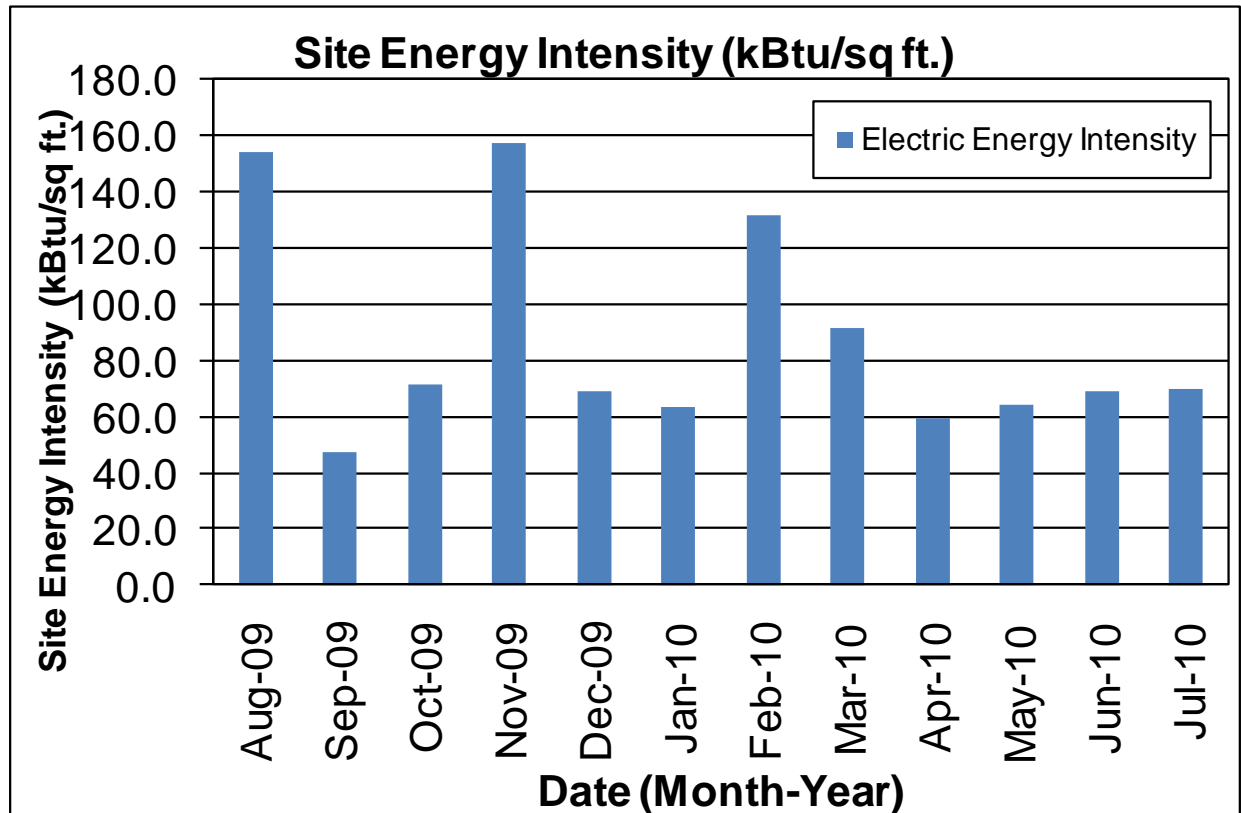
The chart below shows the monthly electric usage and costs. The dashed green line represents the approximate base-load or minimum electric usage required to operate the Brielle Road Pump Station.



Energy benchmarking

SWA has entered energy information about the Brielle Road Pump Station in the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® Portfolio Manager Energy benchmarking system. This Pump Station is categorized as an "Other" space type. Because it is an "Other" space type, it has not received a rating. The Site Energy Use Intensity is

1058.0kBtu/sq ft yr compared to the national average of a building consuming 104.0kBtu/sq ft yr. However this is a specialized underground pump station and not a typical building.



Per the LGEA program requirements, SWA has assisted the Borough of Manasquan to create an ENERGY STAR® Portfolio Manager account and share the Brielle Road Pump Station 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 Brielle Road Pump Station (user name of “manasquanboro” with a password of “manasquanboro”) and TRC Energy Services (user name of “TRC-LGEA”).

Tariff analysis

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

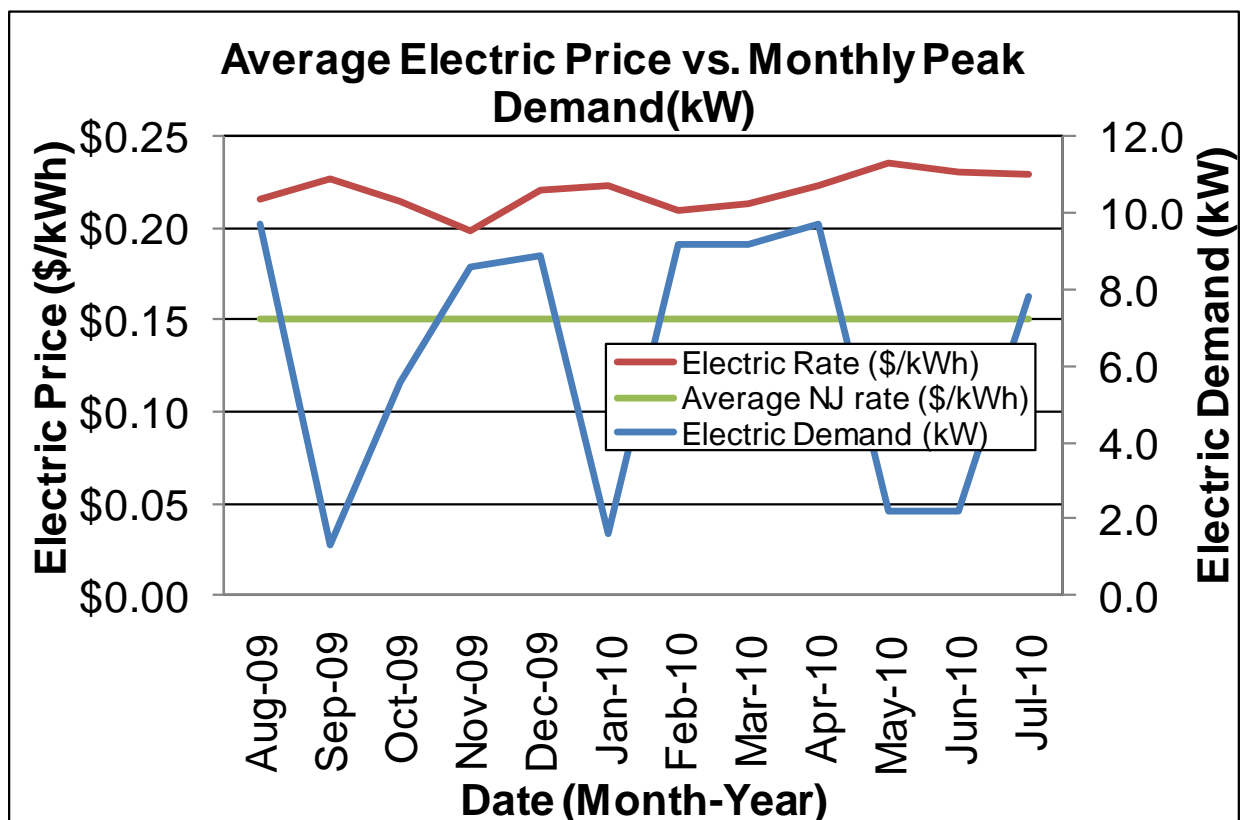
Tariff analysis is performed to determine if the rate that a building is contracted to pay with the electric utility provider is the best rate possible resulting in the lowest costs for the electric provision. Typically, electricity prices also increase during the cooling months when electricity is used for cooling.

The pump station is direct metered and currently purchases electricity at a general service rate for usage with an additional charge for electrical demand factored into each monthly bill. The general service rate for electric charges is market-rate based on usage and 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 is conducted using an average aggregated rate that is estimated based on the total cost divided by the total energy usage per utility per 12 month period. 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 Brielle Road Pump Station/Borough of Manasquan pays a rate of \$0.217/kWh. The Brielle Road Pump Station annual electric utility costs are \$515 higher, when compared to the average estimated NJ commercial utility rates. Electric bill analysis shows fluctuations up to 15% over the most recent 12 month period.



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

SWA recommends that the Borough of Mansquan 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 Brielle Road Pump Station. SWA was informed that as of several months ago, the Borough of Manasquan became part of the Sustainable Energy Meeting (SEM) consortium together with 250-300 other municipalities. Appendix C contains a complete list of third-party energy suppliers for the Brielle Road Pump Station 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 the visit from SWA on September 2, 2010, the following data was collected and analyzed.

Building Characteristics

The Brielle Road Pump Station facility is a sanitary sewer pump station. The original pump station was built in the late 1980s and upgraded in 2008. It houses duplex pumps underground in a sanitary sewer pump station located on Brielle Road in a concrete vault beneath the street and accessible through a manhole. The electric meter and control panel are located remotely in a steel enclosure on a grassy area near the edge of the street. Two submersible pumps are located in the wet well under the street man-way.

Pumping station under road manhole (left)

Control panel outside of road (middle)

Pump controls inside roadside panel (right)



Building Occupancy Profiles

The enclosure is unoccupied. The pumping station is checked daily (for about 15 minutes) implementing confined space procedures. The pump suction are cleaned every 3 weeks to prevent clogging.

Building Envelope

Exterior Walls

The concrete vault is located underground. There is no insulation (typically not required for these installations).

Roof

The underground pump enclosure is accessed via two manhole covers. A ladder provides access to the lower space where the pumps are immersed in the sewerage water..

Base

The vault enclosure and wet well is positioned on a below-grade concrete slab.

Building air-tightness

Overall the field auditors found the enclosure to be reasonably air-tight.

Mechanical Systems

The Brielle Road Pump Station is not provided with heating and cooling.

Two non clog sewerage submersible pumps working in a lead-lag fashion pump up sewerage to a main pipeline pumping station that feeds South Monmouth Regional Sewer Authority a few miles away.

A comprehensive Equipment List can be found in Appendix A.

Equipment

Two submersible non clog sewerage HOMA pumps, each a model AMX434-193mm impeller/5.5T/C 5.5 HP, 200 Volts, 17.02 Amps with a 85% efficiency motor, working in a lead-lag fashion pump up sewerage to a main pipeline that feeds a regional wastewater treatment plant a few miles away. The pumps were installed in 2008 and have 90% estimated remaining service lives.

Distribution Systems

The sewerage submersible pumps draw down their wet well to keep accumulation in check. The discharge is pumped into a main pipeline that feeds a regional wastewater treatment plant a few miles away.

Controls

The sewerage submersible pumps operate in a lead-lag fashion and are activated by the level in their wet well. The level in the wet well is sensed by an air bubbler system. When the level is high in the wet well, the lead pump is turned ON. If the lead pump cannot keep up with the pump-out the lag pump is turned ON. The pumps are turned OFF when a predetermined low level is reached.

Domestic Hot Water

There isn't a domestic hot water (DHW) heater installed at the Brielle Road Pump Station.

Electrical systems

Lighting

See attached lighting schedule in Appendix B for a complete inventory of lighting throughout the pump station 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 Brielle Road Pump Station currently contains one incandescent fixture.

Appliances and process

There aren't any appliances installed at the Brielle Road Pump Station.

Elevators

There isn't any elevator installed at the Brielle Road Pump Station.

Other electrical systems

There are not currently any significant energy-impacting electrical systems installed at the Brielle Road Pump Station.

RENEWABLE AND DISTRIBUTED ENERGY MEASURES

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

Existing systems

Currently, there isn't any renewable system installed at the Brielle Road Pump Station.

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 conditions, the Brielle Road Pump Station is not a good candidate for a Solar Panel installation. The application is too small and not a good fit.

Solar Thermal Collectors

Solar thermal collectors are not cost-effective for this pump station and would not be recommended due to no use of domestic hot water at the pump station to justify the expenditure.

Wind

The Brielle Road Pump Station is not a good candidate for a wind power generation due to unfavorable wind conditions in this area of New Jersey.

Geothermal

The Brielle Road Pump Station is not a good candidate for a geothermal installation since there isn't an HVAC system.

Combined Heat and Power

The Brielle Road Pump Station is not a good candidate for a 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 base-load 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 Recommended 0-5 Year Payback ECMs
1	Upgrade Lighting With Efficient (1) New CFL Lamps

ECM#1: Upgrade Lighting With Efficient (1) New CFL Lamps

During the field audit, SWA completed a building lighting inventory (see Appendix B). The existing lighting contains 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 when compared to incandescent, halogen and Metal Halide fixtures. CFL bulbs produce the same lumen output with less wattage than incandescent bulbs and last up to five times longer. The labor for the recommended installations is evaluated using prevailing electrical contractor wages. The building owner may decide to perform this work with in-house resources from the Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor.

Installation cost:

Estimated installed cost: \$16 (Includes \$12 of labor)
Source of cost estimate: RS Means

Economics:

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
16	none at this time	16	12	0	0	2	2	5	5	23	3.4	49	10	15	5	22

Assumptions: SWA calculated the savings for this measure using measurements taken during the field audit and using the billing analysis.

Rebates/financial incentives:

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

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 Brielle Road Pump Station:

- Install premium motors when replacements are required - Select NEMA Premium motors when replacing motors that have reached the end of their useful operating lives. Installing Variable Frequency Drives (estimated at \$5,000) results in a greater than 15 year payback. These are small pumps which operate only a few hours a day and take turns in being lead and lag pumps.
- Install nearby generator to back up pumps during a power outage with the next capital renovation.

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.

- Continue to clean pumps on a regular basis to prevent clogging; Check pump seals.
- 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/>.

The recommended ECMs and the list above are cost-effective energy efficiency measures and building upgrades that will reduce operating expenses for the Borough of Manasquan. Based on the requirements of the LGEA program, the Borough of Manasquan must commit to implementing some of these measures, and must submit paperwork to the Local Government Energy Audit program within one year of this report's approval to demonstrate that they have spent, net of other NJCEP incentives, at least 25% of the cost of the audit (per building). The minimum amount to be spent, net of other NJCEP incentives, is \$534.75 (or 25% of \$2,139).

APPENDIX A: EQUIPMENT LIST

Inventory

Building System	Description, % eff	Model # / Serial #	Fuel	Location	Space Served	Date Installed	Estimated Remaining Useful Life %
Pumps	(2) non clog submersible pumps (each pump operating avg 2.8 hrs/day)	HOMA AMX434-193mm impeller/5.5T/C 5.5 HP, 200 Volts, 17.02 Amps, 85% motor eff	Electric	Pump underground wet well	Pump underground wet well	2008	90

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	Ext	Control Panel	Ceiling Mounted	S	Inc	1	1	200	Sw	0.25	365	0	200	18	CFL	Ceiling Mounted	CFL	S	Sw	1	1	65	0	365	0	65	6	12	0	12
Totals:						1	1	200				0	200	18													12	0	12	
Rows Highlighted Yellow Indicate an Energy Conservation Measure is recommended for that space																														

Proposed Lighting Summary Table			
Total Surface Area (SF)		approximately 25	
Average Power Cost (\$/kWh)		0.2170	
Exterior Lighting		Existing	Proposed
Exterior Annual Consumption (kWh)		18	6
Exterior Power (watts)		200	65
Total Interior Lighting		Existing	Proposed
Annual Consumption (kWh)		0	0
Lighting Power (watts)		0	0
Lighting Power Density (watts/SF)		0.00	0.00
Estimated Cost of Fixture Replacement (\$)		16	
Estimated Cost of Controls Improvements (\$)		0	
Total Consumption Annual Cost Savings (\$)		5	

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 (De-lamping)
Ceiling Mounted	Wallpack	1'T12 U-Shaped	4'T5 U-Shaped	Fl.	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: THIRD PARTY ENERGY SUPPLIERS

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

JCP&L ELECTRICAL SERVICE TERRITORY Last Updated: 06/15/09		
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095 (800) 437-7872 www.hess.com	BOC Energy Services, Inc. 1135 Mountain Avenue Murray Hill, NJ 011374 (800) 247-2644 www.boc.com	Commerce Energy, Inc. 4400 Route 9 South, Suite 100 Freehold, NJ 07728 (800) 556-84113 www.commerceenergy.com
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446 (888) 635-0827 www.newenergy.com	Direct Energy Services, LLC 120 Wood Avenue Suite 611 Iselin, NJ 08830 (866) 547-2722 www.directenergy.com	FirstEnergy Solutions Corp. 300 Madison Avenue Morristown, NJ 0113113 (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	Integritys Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830 (877) 763-9977 www.integritysenergy.com	Strategic Energy, LLC 55 Madison Avenue, Suite 400 Morristown, NJ 011360 (888) 925-9115, www.sel.com
Liberty Power Holdings, LLC Park 80 West, Plaza II, Suite 200 Saddle Brook, NJ 07663 (866) 769-31139 www.libertypowercorp.com	Pepco Energy Services, Inc. 112 Main St. Lebanon, NJ 08833 (800) ENERGY-9 (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 The Mac-Cali Building 581 Main Street, 8 th Floor Woodbridge, NJ 07095 (877) 273-6772 www.semprasolutions.com	South Jersey Energy Company One South Jersey Plaza Route 54 Folsom, NJ 08037 (800) 800-756-3749 www.southjerseyenergy.com	Suez Energy Resources NA, Inc. 333 Thornall Street 6th Floor Edison, NJ 08837 (888) 644-1014 www.suezenergyresources.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 080113 (856) 273-9995 www.ugienergyservices.com	American Powernet Management, LP 437 North Grove St. Berlin, NJ 08009 (800) 437-7872 www.hess.com	ConEdison Solutions Cherry Tree, Corporate Center 1135 State Highway 38 Cherry Hill, NJ 08002 (888) 665-0955 www.conedsolutions.com

APPENDIX D: 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 measures (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 expressed as 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:

	A	B	C	D	E	F	G	H	I
1									
2									
3									
4					Year	Cash Flow			
5					0	\$ (5,000.00)			Investment Cost
6					1	\$ 850.00			
7					2	\$ 850.00			
8					3	\$ 850.00			
9					4	\$ 850.00			
10					5	\$ 850.00			
11					6	\$ 850.00			
12					7	\$ 850.00			
13					8	\$ 850.00			
14					9	\$ 850.00			
15					10	\$ 850.00			
16					IRR	11.03%			
17					NPV	\$2,250.67			

ECM Lifetime: 10 years (rows 5-14)

Cash Flow: Annual Energy Cost Savings + Annual Maintenance Savings (\$850.00 per year)

Formula:
 =IRR(F4:F14)
 =NPV(0.03,F5:F14)+F4

Solar PV ECM Calculation

There are several components to the calculation:

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

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

ECM and Equipment Lifetimes

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

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

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

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

New Jersey Clean Energy Program Commercial & Industrial Lifetimes

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

APPENDIX E: STATEMENT OF ENERGY PERFORMANCE FROM ENERGY STAR®

OMB No. 2060-0347



STATEMENT OF ENERGY PERFORMANCE Borough of Manasquan - Brielle Road Pump Station

Building ID: 2444445
For 12-month Period Ending: July 31, 2010¹
Date SEP becomes ineligible: N/A

Date SEP Generated: September 20, 2010

Facility
Borough of Manasquan - Brielle Road
Pump Station
Brielle Road Pump Station
Manasquan, NJ 08736

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1990
Gross Floor Area (ft²): 25

Energy Performance Rating² (1-100): N/A

Site Energy Use Summary³

Electricity - Grid Purchase (kBtu)	26,438
Natural Gas - (kBtu) ⁴	0
Total Energy (kBtu)	26,438

Energy Intensity⁵

Site (kBtu/ft²/yr)	1058
Source (kBtu/ft²/yr)	3532

Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO ₂ e/year)	4
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Electric Distribution Utility

FirstEnergy - Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	104
National Average Source EUI	213
% Difference from National Average Source EUI	1558%
Building Type	Other

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.

Meets Industry Standards⁶ for Indoor Environmental Conditions:

Ventilation for Acceptable Indoor Air Quality	N/A
Acceptable Thermal Environmental Conditions	N/A
Adequate Illumination	N/A

Certifying Professional
N/A

Notes:

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

The government estimates the average time needed to fill out this form is 5 hours (includes the time for entering energy data, Licensed Professional facility inspection, and notarizing the SEP) and we homes suggestions for reducing this time and effort. Send comments (including OMB control number) to the Director, Collection Strategies Division, U.S. EPA (2622), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460.

EPA Form 5900-16

APPENDIX F: INCENTIVE PROGRAMS

New Jersey Clean Energy Pay for Performance

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

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

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

Direct Install 2010 Program*

Direct Install is a division of the New Jersey Clean Energy Programs' 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 200 kW** within 12 months of applying
- Must be located in New Jersey
- Must be served by one of the state's public, regulated or natural gas companies
 - Electric: Atlantic City Electric, Jersey Central Power & Light, Orange Rockland Electric, PSE&G
 - Natural Gas: Elizabethtown Gas, New Jersey Natural Gas, PSE&G, PSE&G

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

Smart Start

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

There are a number of improvement options for commercial, industrial, institutional,

government, and agricultural projects throughout New Jersey. Alternatives are designed to enhance quality while building in energy efficiency to save money. Project categories included in this program are New Construction and Additions, Renovations, Remodeling and Equipment Replacement.

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

Renewable Energy Incentive Program*

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

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

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

Utility Sponsored Programs

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

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 G: 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
0-5 Year Payback	1	(1) New CFL Fixture	16	none at this time	16	12	0.0	0	1.7	2	5	5	23	3.4	49%	10%	15	6	22

APPENDIX H: METHOD OF ANALYSIS

Assumptions and tools

Energy modeling tool: Established/standard industry assumptions, E-Quest
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.