ENERGY AUDIT – FINAL REPORT

BRICK TOWNSHIP M.U.A.

WASTEWATER PUMPING STATIONS
BRICK, NJ 08724

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I. EXECUTIVE SUMMARY

This report presents the findings of the energy audit conducted for:

Brick Township Municipal Utilities Authority
Wastewater Pumping Stations
Brick, NJ 08724

Municipal Contact Person: Jay Delaney, Project Manager

This audit is performed in connection with the New Jersey Clean Energy - Local Government Energy Audit Program. The energy audit is conducted to promote the mission of the office of Clean Energy, which is to use innovation and technology to solve energy and environmental problems in a way that improves the State's economy. This can be achieved through the wiser and more efficient use of energy.

This report will include the energy audit for the Riverside Drive, Drum Point Road, and Bay Harbor Boulevard sewer pumping stations.

The annual energy costs at each of the facilities are as follows:

Riverside Drive Waste Water Pumping Station:

Electricity	$30,861.66
Diesel Fuel	$1,777.25
Total	$32,638.81

Bay Harbor Boulevard Waste Water Pumping Station:

Electricity	$15,520.86
Diesel Fuel	$615.31
Total	$16,136.17

Drum Point Road Waste Water Pumping Station:

Electricity	$16,136.82
Diesel Fuel	$1,146.72
Total	$17,283.54

The potential annual energy cost savings for each energy conservation measure (ECM) are shown below in Table 1. Be aware that the ECM's are not additive because of the interrelation of some of the measures. This audit is consistent with an ASHRAE level 2 audit. The cost and savings for each measure is ± 20%. The evaluations are based on engineering estimations and industry standard calculation methods. More detailed analyses would require engineering simulation models, hard equipment specifications, and contractor bid pricing.

Table 1A
Energy Conservation Measures (ECM's)

ENERGY CONSERVATION MEASURES (ECM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST[A]**	**ANNUAL SAVINGS[B]**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
Riverside Drive Pump Station					
ECM #1A	Lighting Upgrade - General	$3,080	$87	35.4	-57.6%
ECM #2A	Lighting Controls	$573	$59	9.7	54.5%
ECM #3A	Pump and Motor System Upgrade[C]	$33,185	$6,798	4.9	309.7%
Drum Point Road Pump Station					
ECM #1B	Lighting Upgrade - General	$2,860	$87	32.9	-54.4%
ECM #2B	Lighting Controls	$573	$56	10.2	46.6%
ECM #3B	Pump and Motor System Upgrade[C]	$50,000	$650	76.9	-74.0%
Bay Harbor Boulevard Pump Station					
ECM #1C	Lighting Upgrade - General	$3,190	$46	69.3	-78.4%
ECM #2C	Lighting Controls	$573	$54	10.6	41.4%
ECM #3C	Pump and Motor System Upgrade[C]	$60,000	$790	75.9	-73.7%

Notes: A. Cost takes into consideration applicable NJ Smart Start™ incentives and maintenance savings.
B. Savings takes into consideration applicable maintenance savings.
C. Cost based upon 20 year remaining life.

The estimated demand and energy savings for each facilities ECM's are shown below in Table 2. The information in this table corresponds to the ECM's in Table 1.

Table 2
Estimated Energy Savings

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	FUEL OIL (BTU)
Riverside Drive Pump Station				
ECM #1A	Lighting Upgrade - General	0.0	150	0
ECM #2A	Lighting Controls	0.0	366	0
ECM #3A	Pump and Motor System Upgrade©	12.2	42,594	0
Drum Point Road Pump Station				
ECM #1B	Lighting Upgrade - General	0.0	143	0
ECM #2B	Lighting Controls	0.0	330	0
ECM #3B	Pump and Motor System Upgrade©	1.6	3,968	0
Bay Harbor Boulevard Pump Station				
ECM #1C	Lighting Upgrade - General	0.0	158	0
ECM #2C	Lighting Controls	0.0	335	0
ECM #3C	Pump and Motor System Upgrade©	1.7	4,820	0

Notes: Elec. Demand Savings are calculated for peak month only. Elec. consumption savings are totaled annually.

Concord Engineering Group (CEG) recommends proceeding with the implementation of all ECM's that provide a calculated simple payback at or under ten (10) years. The following Energy Conservation Measures are recommended for the facility:

- **ECM #2:** Lighting Controls (All buildings)
- **ECM #3:** Pump and Motor System Upgrades at the Riverside Pump Station

Although ECMs #1 do not provide a payback less than ten (10) years, it is recommended to proceed with the installation of the ECM on an as needed basis and as worn out equipment is replaced.

In addition to the ECMs, there are maintenance and operational measures that can provide energy savings and provide immediate benefits. The ECMs listed above represent investments that can be made to the facility which are justified by the savings seen overtime. However, the maintenance items and small operational improvements below are typically achievable with on site staff or maintenance contractors and in turn have the potential to provide operational savings compared to the costs associated. The following are recommendations which should be considered a priority in achieving an energy efficient building:

1. Maintain all weather stripping on entrance doors.

2. Clean all light fixtures to maximize light output.

3. Provide more frequent air filter changes to decrease overall system power usage and maintain better IAQ.

4. Reactivate the motorized air louvers at all three pump stations as an additional feature of the HVAC system upgrade. Install louver control based upon a signal from the generator controller and also high temperature in the MCC room.

5. The HVAC equipment projects for the three pumping stations appear to be eligible for the New Jersey Clean Energy Program "Direct Install" incentive.

   Direct install is expected to launch in November 2009.

   Direct install is designed as a turn-key equipment replacement program to reduce energy costs of smaller, nonresidential facilities. Customers installing eligible equipment replacement measures under the program will receive financial incentives of up to 80% of installed costs.

   Non-residential facilities with peak electric demands not exceeding 200 kW will be eligible for Direct Install. Equipment categories eligible for incentives include: lighting, HVAC, natural gas, refrigeration, and food service. Specific equipment eligible in these categories must be listed on the program's eligible measure lists and also qualify based on the cost-effectiveness of energy savings versus cost as determined by the energy assessment.

6. Retro-commissioning - In addition to the recommendations above, implementing Retro-Commissioning would be beneficial for this facility. Retro-Commissioning is a means to verify your current equipment is operating at its designed efficiency and overall performance. Retro-Commissioning provides valuable insight into systems or components not performing correctly or efficiently. The commissioning process defines the original system design parameters and recommends revisions to the current system operating characteristics.

II. INTRODUCTION

This comprehensive energy audit covers the Brick Township MUA's three wastewater pumping stations. They include Riverside Drive, Drum Point Road, and Bay Harbor Boulevard pump stations. Each pump station has a footprint of 4,652 square feet, each having the same layout on each of the three floors. The stations differ in elevations and installed major process equipment. The Pumping Stations include a wet well, a dry well, super structure and a generator.

Electrical and diesel fuel utility information is collected and analyzed for one full year's energy use of all three buildings separately. The utility information allows for analysis of the buildings' operational characteristics, estimated savings potential, and baseline usage/cost to monitor the effectiveness of implemented measures. Computer spreadsheets are used to graph utility information (see Figures 1 to 3 for electricity usage profiles).

The Energy Use Index (EUI) is established for each building. Energy Use Index (EUI) is expressed in British Thermal Units/square foot/year (BTU/ft^2/yr), which is used to compare energy consumption to similar building types or to track consumption from year to year in the same building. The EUI is calculated by converting the annual consumption of all energy sources to BTUs and dividing it by the area (gross square footage) of the building. Blueprints (where available) are utilized to verify the gross area of the facility. The EUI is a good indicator of the relative potential for energy savings. However when considering a pump station, EUI may not be a good representative. In a pump station all major equipment items must be considered separately. Energy saving measures which are specific to the industry must be considered In addition to simply looking at the EUI. In general, a low EUI indicates less potential for energy savings, while a high EUI indicates poor building performance therefore a high potential for energy savings.

Existing building architectural and engineering drawings (where available) are utilized for additional background information. The building envelope, lighting systems, HVAC equipment, process equipment and controls information gathered from building drawings allow for a more accurate and detailed review of the building. The information is compared to the energy usage profiles developed from utility data. Through the review of the architectural and engineering drawings a building profile can be defined that documents building age, type, usage, major energy consuming equipment or systems, etc.

The preliminary audit information is gathered in preparation for the site survey. The site survey provides critical information in deciphering where energy is spent and opportunities exist within a facility. The entire site is surveyed to inventory the following to gain an understanding of how each facility operates:

- Building envelope (roof, windows, etc.)
- Heating, ventilation, and air conditioning equipment (HVAC)
- Lighting systems and controls
- Facility-specific equipment

The building site visit is performed to survey all major building components and systems. The site visit includes detailed inspection of energy consuming components. Summary of building occupancy schedules, operating and maintenance practices, and energy management programs provided by the building manager are collected along with the system and components to determine a more accurate impact on energy consumption.

III. METHOD OF ANALYSIS

General

Post site visit work includes evaluation of the information gathered, researching possible conservation opportunities, organizing the audit into a comprehensive report, and making recommendations on HVAC, lighting, process equipment and building envelope improvements. Data collected is processed using energy engineering calculations to anticipate energy usage for each of the proposed energy conservation measures (ECMs). The actual building's energy usage is entered directly from the utility bills provided by the owner. The anticipated energy usage is compared to the historical data to determine energy savings for the proposed ECMs.

It is pertinent to note, that the savings noted in this report are not additive. The savings for each recommendation is calculated as standalone energy conservation measures. Implementation of more than one ECM may in some cases affect the savings of each ECM. The savings may in some cases be relatively higher if an individual ECM is implemented in lieu of multiple recommended ECMs. For example implementing reduced operating schedules for inefficient lighting will result in a greater relative savings. Implementing reduced operating schedules for newly installed efficient lighting will result in a lower relative savings, because there is less energy to be saved. If multiple ECM's are recommended to be implemented, the combined savings is calculated and identified appropriately.

ECMs are determined by identifying the building's unique properties and deciphering the most beneficial energy saving measures available that meet the specific needs of the facility. The building construction type, function, operational schedule, existing conditions, and foreseen future plans are critical in the evaluation and final recommendations. Energy savings are calculated base on industry standard methods and engineering estimations. Energy consumption is calculated based on manufacturer's cataloged information when new equipment is proposed.

Specific Process Equipment Energy Method of Analysis:

Dramatic increases in energy prices have made the water and wastewater industry aware of the significance of energy costs. Energy plays an important role in decisions that pertain to equipment replacement, design and operation of water and wastewater treatment plants and their associated pump stations.

An energy audit is an inspection, survey and analysis of energy flows in a process or system with the objective of understanding the energy dynamics of the system and study. The energy audit is conducted to seek opportunities to reduce the amount of energy input into the system without negatively affecting the output. It is a survey of major areas of energy usage in treatment plants and pump stations followed by a cost effectiveness analysis of methods that can be used to reduce energy usage.

The greatest energy consumers in water and wastewater treatment facilities and pump stations are the motors that drive pumping equipment. Overall wire-to-water efficiency of a pump is calculated by the following equation:

Where:

H: differential head across the pump, ft.
Q: flow rate, gpm
Hp: horse power

$$Wire\ to\ Water\ Efficiency\ (e) = \frac{H \times Q}{hp \times 3{,}960}$$

The wire-to-water efficiency can also be calculated as follows:

e = pump eff. x drive eff. x motor eff.

To minimize energy consumption, overall efficiency must be maximized. Therefore each of the efficiency components of the above efficiency equation must be examined and maximized.

The overall wire-to-water efficiency formula reveals that the efficiency of the pump can be maximized by operating the pump at design flows and total dynamic head that coincides with the pumps most efficient operation range. In other words, pumps with highest flow per kWh should be operated where there is more than one pump available. It should be noted that pump wear can have a significant effect on pump performance.

The next element in the overall efficiency equation is electric motor. Two approaches are used to improve efficiency in existing systems:

- use of more efficient motors
- operation of motors at or near the nameplate rating

Motors can be loosely categorized as premium efficiency motors and standard motors. Premium efficiency motors generally cost more than comparable standard efficiency motors. These motors offer exceptional value if they are operated more than 50% of the time.

The last major element affecting overall efficiency is the drive. The constant speed drive with simple on-off control is the most efficient overall drive unit when it is operated at or near the most efficient point on the pump curve. However, most pumping applications require more flexibility in pump output. One of the most efficient methods of varying the pump output is using variable speed drives and one of the most efficient variable speed drives is a variable frequency drive.

There are number of other factors that may be considered in an energy audit in addition to equipment selection. They are as follows:

- power factor
- demand
- time of use

The demand and time-of-use factors can be defined for each specific process application.

It is worthwhile to add a few comments regarding a low power factor at the Authority's facilities and the resultant inefficient operation of the facilities. A review of the Authority's Jersey Central Power and Light (JCP&L) electric bills reveals the Authority is billed for kW used and not kva used. This type of billing is typical of power companies in New Jersey. However, if the ratio of kW/kva (power factor) drops below 0.85 JCP&L may impose penalties upon the Authority unless corrective action is taken. The energy efficiency improvement methods described above, i.e. premium motors, operating equipment in an efficient range, variable frequency drives, will all serve to raise the ratio closer to 1.0. A quick method to improve the power factor is to add capacitor banks to lower the total reactive kva.

The New Jersey Board of Public Utilities (BPU) regulates the fee structure of JCP&L and the other New Jersey power companies. BPU allows power factor management by penalties and not by incentives. In the absence of incentives the least cost approach for the Authority is to monitor any change in regulations by the BPU and to install power factor correction devices should JCP&L give a warning to the Authority.

Cost savings are calculated based on the actual historical energy costs for the facility. Installation costs include labor and equipment to estimate the full up-front investment required to implement a change. Costs are derived from Means Cost Data, industry publications, and local contractors and equipment suppliers. The NJ Smart Start Building® program incentives savings (where applicable) are included for the appropriate ECM's and subtracted from the installed cost. Maintenance savings are calculated where applicable and added to the energy savings for each ECM. The costs and savings are applied and a simple payback and simple return on investment (ROI) is calculated. The simple payback is based on the years that it takes for the savings to pay back the net installation cost (Net Installation divided by Net Savings.) A simple return on investment is calculated as the percentage of the net installation cost that is saved in one year (Net Savings divided by Net Installation.)

The costs and savings are applied and a simple payback, simple lifetime savings, and simple return on investment are calculated. See below for calculation methods:

ECM Calculation Equations:

$$Simple\ Payback = \left(\frac{Net\ Cost}{Yearly\ Savings} \right)$$

$$Simple\ Lifetime\ Savings = \left(Yearly\ Savings \times ECM\ Lifetime \right)$$

$$Simple\ Lifetime\ ROI = \frac{(Simple\ Lifetime\ Savings - Net\ Cost)}{Net\ Cost}$$

$$Lifetime\ Ma\,\mathrm{int}\,enance\ Savings = \left(Yearly\ Ma\,\mathrm{int}\,enance\ Savings \times ECM\ Lifetime \right)$$

$$Internal\ Rate\ of\ \mathrm{Re}\,turn = \sum_{n=0}^{N} \left(\frac{Cash\ Flow\ of\ Period}{(1 + IRR)^n} \right)$$

$$Net\ \mathrm{Pr}\,esent\ Value = \sum_{n=0}^{N} \left(\frac{Cash\ Flow\ of\ Period}{(1 + DR)^n} \right)$$

Net Present Value calculations are based on Interest Rate of 3%.

A simple life-time calculation is shown for each ECM. The life-time for each ECM is estimated based on the typical life of the equipment being replaced or altered. The energy savings is extrapolated throughout the life-time of the ECM. The total energy savings is calculated as the total life-time multiplied by the yearly savings.

An effective method to take all of the factors into account is to periodically run equipment performance tests. For motors and pumps new equipment is typically tested during the startup to determine compliance with procurement specifications. Subsequent testing can be compared to establish efficiency trends of motor and pump combinations. Small pumps and motors typically receive very little testing whereas larger pieces of equipment receive increased levels of attention.

For situations where test results are available a reasonably reliable increased cost of energy can be calculated for a loss of efficiency.

For situations where test results are not available the energy audit engineer must estimate loss of efficiency based upon other equipment factors, data that may be available, maintenance records and personal experiences. Confirmation performance testing may be conducted during a subsequent design phase.

Confirmation performance testing can also be useful as a retro commissioning procedure. In retro commissioning the original design efficiencies or equipment startup performance test results are compared to efficiencies calculated from test results of current conditions. A third

consideration is the potential for improved efficiencies by upgrading mechanical equipment and motors to models with enhanced efficiencies over original new equipment. The table below presents the efficiencies to be included in the analysis.

Retro-Commissioning Analysis			
Type	**Original Installation Efficiencies**	**Current Equipment Efficiencies**	**Upgrade Equipment Efficiencies**
Pump Capacity	USGPM	USGPM	USGPM
TDH	Feet	Feet	Feet
Water HP	Q*H/3960	Q*H/3960	Q*H/3960
Pump Efficiency	Range	Range	Range
Motor Efficiency	Manufacturer	Manufacturer	Manufacturer
Drive Efficiency	Manufacturer	Manufacturer	Manufacturer
Transformer Efficiency	Manufacturer	Manufacturer	Manufacturer
Switchgear Efficiency	Manufacturer	Manufacturer	Manufacturer

IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

The electric usage profiles (below) represents the actual electrical usage for each of the pump stations. Jersey Central Power and Light (JCP&L) provides electricity to these facilities under two of their General Service Secondary Space Heating Service 3 Phase rate schedules JC_G53_03F and JC_G53_01F. The "03F" rate applies to the Riverside Pump Station and the "01F" rate to the other two stations. The electric utility measures consumption in kilowatt-hours (kWh) and maximum demand in kilowatts (kW). One kWh usage is equivalent to 1,000 watts running for one hour. One kW of electric demand is equivalent to 1,000 watts running at any given time. The basic usage charges are shown as supply service and delivery charges along with several non-utility generation charges. Rates used in this report reflect the historical data received for the facilities.

The pump stations use no natural gas. The standby power generators use diesel fuel.

The overall cost for utilities is calculated by dividing the total cost by the total usage. Based on the utility history, the average cost for utilities at these facilities is as follows:

Facility	**Description**	**Cost**
Riverside Dr. Pump Station	Electricity	15.96 ¢ / kWh
	Diesel Fuel	$1,777.25 / Yr
Bay Harbor Blvd. Pump Station	Electricity	16.39 ¢ / kWh
	Diesel Fuel	$615.31 / Yr
Drum Point Rd. Pump Station	Electricity	16.37 ¢ / kWh
	Diesel Fuel	$1,146.72 / Yr

Table 3A
Electricity Billing Data
Riverside Dr. Pump Station

Utility Provider: PSE&G 3 Phase Rate Structure (Meter #)			
MONTH OF USE	**CONSUMPTION KWH**	**DEMAND**	**TOTAL BILL**
Mar 08	22,800	63.2	$3,284.32
Apr 08	13,600	46.8	$1,927.51
May 08	14,200	36.0	$2,422.27
Jun 08	12,200	33.0	$2,181.90
Jul 08	12,800	32.2	$2,272.43
Aug 08	10,600	31.8	$1,883.44
Sep 08	11,600	26.6	$1,748.62
Oct 08	14,600	35.2	$2,222.14
Nov 08	18,000	49.2	$2,845.05
Dec 09	22,000	47.6	$3,490.48
Jan 09	22,200	64.0	$3,637.57
Feb 09	18,800	40.6	$2,945.93
Totals	**193,400**	**64.0 Max**	**$30,861.66**
	AVERAGE DEMAND	**44 KW average**	
	AVERAGE RATE	**15.96¢/kWh**	

Figure 1A
Riverside Dr. Pump Station

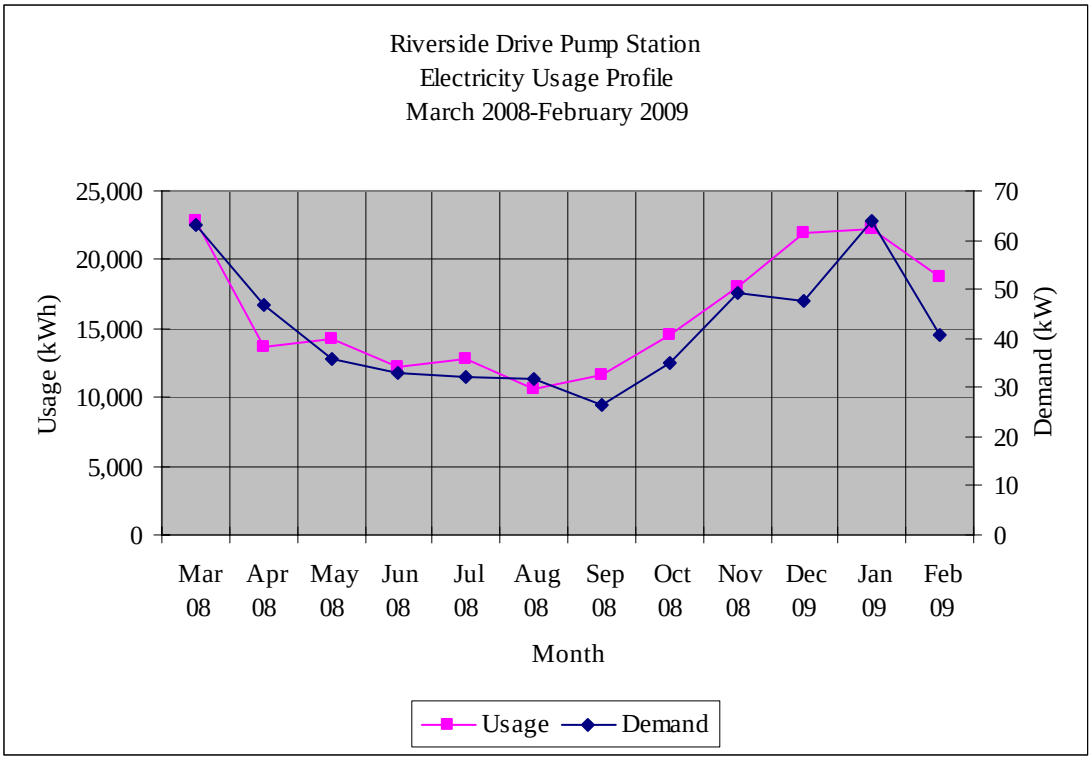


Table 3B
Electricity Billing Data
Bay Harbor Blvd. Pump Station

Utility Provider: PSE&G 3 Phase Rate Structure (Meter #)			
MONTH OF USE	**CONSUMPTION KWH**	**DEMAND**	**TOTAL BILL**
Mar 08	8,000	33.8	$1,227.20
Apr 08	8,000	23.4	$1,159.91
May 08	4,320	17.7	$789.52
Jun 08	6,720	31.7	$1,295.37
Jul 08	5,440	21.7	$1,008.37
Aug 08	4,800	21.7	$889.03
Sep 08	5,440	21.7	$872.36
Oct 08	7,840	23.2	$1,221.10
Nov 08	9,920	27.4	$1,577.32
Dec 09	11,200	27.8	$1,800.23
Jan 09	13,280	29.6	$2,119.54
Feb 09	9,760	26.1	$1,560.91
Totals	**94,720**	**33.8 Max**	**$15,520.86**
	AVERAGE DEMAND	**26 KW average**	
	AVERAGE RATE	**16.39¢/kWh**	

Figure 1B
Bay Harbor Blvd. Pump Station

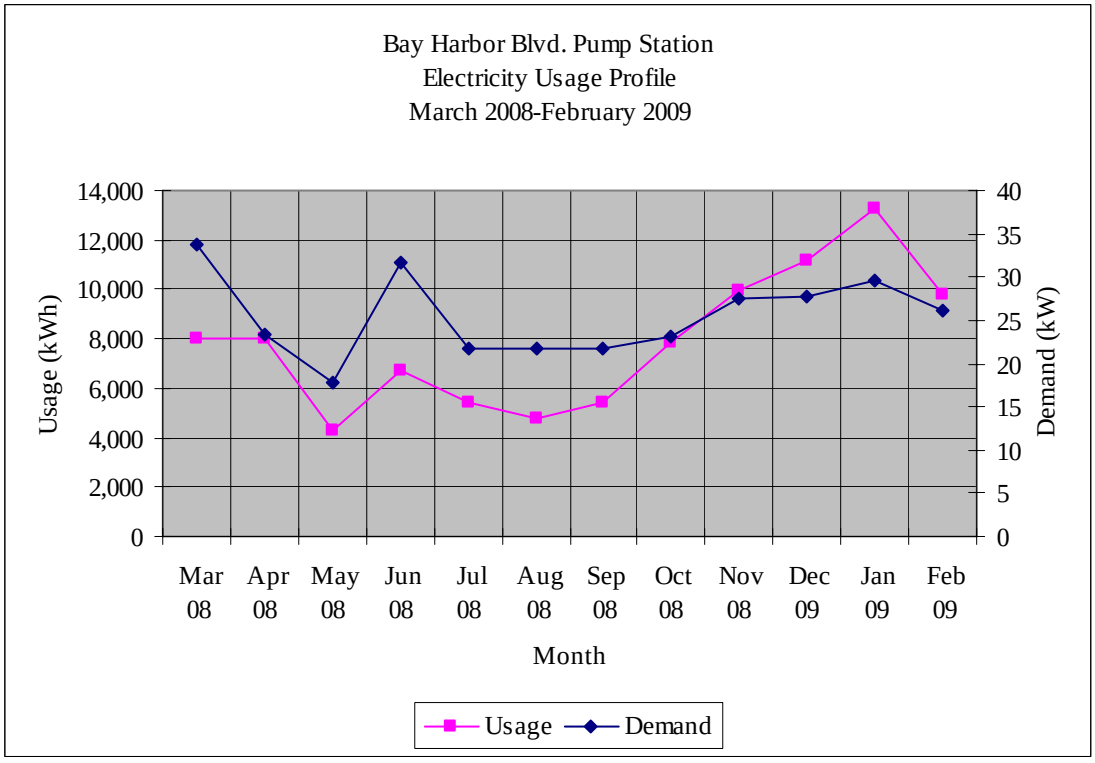
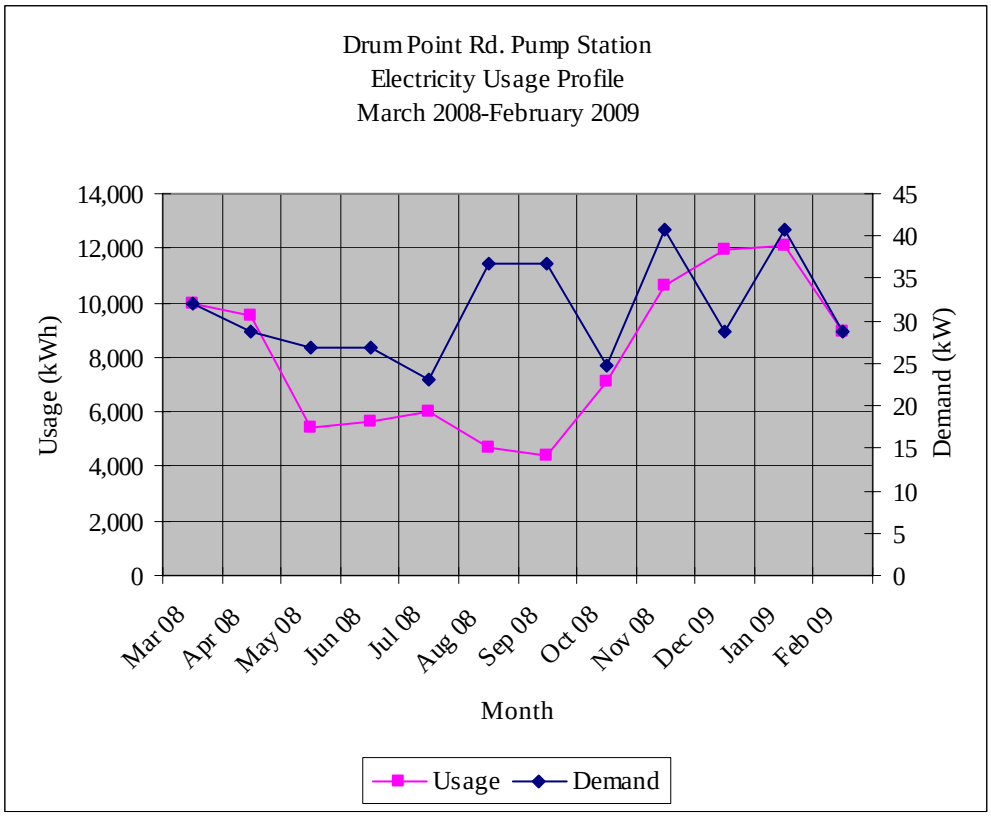


Table 3C
Electricity Billing Data
Drum Point Dr. Pump Station

Utility Provider: PSE&G 3 Phase Rate Structure (Meter #)			
MONTH OF USE	**CONSUMPTION KWH**	**DEMAND**	**TOTAL BILL**
Mar 08	10,000	32	$1,467.38
Apr 08	9,520	28.8	$1,386.58
May 08	5,440	26.8	$980.84
Jun 08	5,680	26.8	$1,062.91
Jul 08	6,000	23.2	$1,121.08
Aug 08	4,720	36.8	$998.80
Sep 08	4,400	36.8	$835.53
Oct 08	7,120	24.8	$1,132.05
Nov 08	10,640	40.8	$1,754.94
Dec 09	11,920	28.8	$1,909.98
Jan 09	12,080	40.8	$2,017.72
Feb 09	8,960	28.8	$1,469.01
Totals	**96,480**	**40.8 Max**	**$16,136.82**
	AVERAGE DEMAND	**32 KW average**	
	AVERAGE RATE	**16.73¢/kWh**	

Figure 1C
Drum Point Dr. Pump Station



B. Energy Use Index (EUI)

Energy Use Index (EUI) is a measure of a building's annual energy utilization per square foot of building. This calculation is completed by converting all utility usage consumed by a building for one year, to British Thermal Units (BTU) and dividing this number by the building square footage. EUI is a good measure of a building's energy use and is utilized regularly for comparison of energy performance for similar building types. The Oak Ridge National Laboratory (ORNL) Buildings Technology Center under a contract with the U.S. Department of Energy maintains a Benchmarking Building Energy Performance Program. The ORNL website determines how a building's energy use compares with similar facilities throughout the U.S. and in a specific region or state.

Source use differs from site usage when comparing a building's energy consumption with the national average. Site energy use is the energy consumed by the building at the building site only. Source energy use includes the site energy use as well as all of the losses to create and distribute the energy to the building. Source energy represents the total amount of raw fuel that is required to operate the building. It incorporates all transmission, delivery, and production losses, which allows for a complete assessment of energy efficiency in a building. The type of utility purchased has a substantial impact on the source energy use of a building. The EPA has determined that source energy is the most comparable unit for evaluation purposes and overall global impact. Both the site and source EUI ratings for the building are provided to understand and compare the differences in energy use.

The site and source EUI for this facility is calculated as follows:

$$Building\ Site\ EUI = \frac{(Electric\ Usage\ in\ kBtu + Gas\ Usage\ in\ kBtu)}{Building\ Square\ Footage}$$

$$Building\ Source\ EUI = \frac{(Electric\ Usage\ in\ kBtu\ X\ SS\ Ratio + Gas\ Usage\ in\ kBtu\ X\ SS\ Ratio)}{Building\ Square\ Footage}$$

Table 4A
Riverside Dr. Pumping Station Building EUI Calculations

ENERGY TYPE	BUILDING USE			SITE ENERGY	SITE-SOURCE	SOURCE ENERGY
	kWh	Therms	Gallons	kBtu	RATIO	kBtu
ELECTRIC	193,400			646,149	3.340	2,158,139
FUEL OIL			544.00	75,126	1.010	75,878
TOTAL				721,276		2,234,017
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA	4,652		SQUARE FEET			
BUILDING SITE EUI	*148.66*		kBtu/SF/YR			
BUILDING SOURCE EUI	*460.43*		kBtu/SF/YR			

Table 4B
Bay Harbor Blvd. Pumping Station Building EUI Calculations

ENERGY TYPE	BUILDING USE			SITE ENERGY	SITE-SOURCE	SOURCE ENERGY
	kWh	Therms	Gallons	kBtu	RATIO	kBtu
ELECTRIC	94,720			316,460	3.340	1,056,975
FUEL OIL			188.34	26,010	1.010	26,270
TOTAL				342,469		1,083,245
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA	4,652		SQUARE FEET			
BUILDING SITE EUI	*73.62*		kBtu/SF/YR			
BUILDING SOURCE EUI	*232.86*		kBtu/SF/YR			

Table 4C
Drum Point Rd. Pumping Station Building EUI Calculations

ENERGY TYPE	BUILDING USE			SITE ENERGY	SITE-SOURCE	SOURCE ENERGY
	kWh	Therms	Gallons	kBtu	RATIO	kBtu
ELECTRIC	96,480			322,340	3.340	1,076,615
FUEL OIL			351.00	48,473	1.010	48,958
TOTAL				370,813		1,125,572
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA	4,652		SQUARE FEET			
BUILDING SITE EUI	*79.71*		kBtu/SF/YR			
BUILDING SOURCE EUI	*241.95*		kBtu/SF/YR			

C. EPA Energy Benchmarking System

The United States Environmental Protection Agency (EPA) in an effort to promote energy management has created a system for benchmarking energy use amongst various end users. The benchmarking tool utilized for this analysis is entitled Portfolio Manager. The Portfolio Manager tool allows tracking and assessment of energy consumption via the template forms located on the ENERGY STAR website (www.energystar.gov). The importance of benchmarking for local government municipalities is becoming more important as utility costs continue to increase and emphasis is being placed on carbon reduction, greenhouse gas emissions and other environmental impacts.

Based on information gathered from the ENERGY STAR website, Government agencies spend more than $10 billion a year on energy to provide public services and meet constituent needs. Furthermore, energy use in commercial buildings and industrial facilities is responsible for more than 50 percent of U.S. carbon dioxide emissions. It is vital that local government municipalities assess facility energy usage, benchmark energy usage utilizing Portfolio Manager, set priorities and goals to lessen energy usage and move forward with priorities and goals.

In accordance with the Local Government Energy Audit Program, CEG has created an ENERGY STAR account for the municipality to access and monitoring the facility's yearly energy usage as it compares to facilities of similar type. The login page for the account can be accessed at the following web address; the username and password are also listed below:

https://www.energystar.gov/istar/pmpam/index.cfm?fuseaction=login.login

User Name: Brick TMUA
Password: lgeaceg2009

Security Question: What city were you born in?
Security Answer: Brick

The utility bills and other information gathered during the energy audit process are entered into the Portfolio Manager. The following is a summary of the results for the facility:

Table 5
ENERGY STAR Performance Rating

FACILITY DESCRIPTION	ENERGY PERFORMANCE RATING	NATIONAL AVERAGE
Wastewater Pumping Stations	N/A	N/A

Statement of Energy Performance Appendix for the detailed energy summary is not applicable.

V. FACILITY DESCRIPTION

The Brick Township MUA has numerous small wastewater pumping stations and three significant wastewater pumping stations. Only the three (3) significant stations are included in this Energy Audit Study. The largest pumping station is the Riverside Drive Pumping Station which houses three (3) 50 hp, motor driven centrifugal pumps. The two smaller pumping stations, the Bay Harbor and the Drum Point Pumping Stations, each house three (3) 15 hp, dry pit submersible pumps. All three stations were constructed in the early 1970's using the same design concept of a 4,562 square feet cast in place concrete structure consisting of a wet well, a dry well, an intermediate level equipment floor and a masonry super structure.

Riverside Drive Pumping Station

The Riverside Drive Pumping Station is situated in the center of a 1/5 acre lot inside a fenced enclosure measuring approximately 90 feet x 90 feet. The main function of the pumping station is to receive wastewater flows into a wet well and to house three waste water pumps to convey the wastewater to regional treatment facilities. The station layout consists of a cast in place concrete structure with a common wall separating a wet well and dry well. The wet well is fitted with process equipment to grind large items in the waste stream and a wet well mixer to keep the waste stream solids in suspension. The horsepower of the motors on these units is 3 hp or less. The dry well has two levels, a pump level and an intermediate level. The intermediate level formerly housed ancillary equipment including a pump seal water system, an air compressor for a bubbler control system and storage space. Remaining process equipment on the intermediate level has been deactivated having been replaced by alternate energy savings technologies including electronic level controller and backflow prevention outfitted potable water to a recently upgraded seal water system. The dry well level houses three centrifugal pumps with suction piping to the wet well, discharge piping to a manifold and force main discharge line, and associated valves and gauges.

A 30 feet square building or superstructure sits over the dry well and is the only large above ground structure on the pumping station site. The super structure houses the pump motors, which are connected by a drive shaft that extends approximately 30 feet vertically through the intermediate level to the centrifugal pumps. The superstructure also houses the motor, control center, variable frequency drives, a flow controller, controls for the wet well equipment, a diesel driven standby 210 kW generator, an automatic power transfer switch, an elevator and a restroom.

The heating and ventilating systems are in the process of being replaced and are currently not operable.

The superstructure is constructed of brick masonry walls, with metal doors and ventilation louvers, and a flat concrete plank roof. The roofing is a built up roof believed to be over rigid insulation.

HVAC Systems

The superstructure has inoperable unit heaters. The heaters are being replaced as described below under the section “Exhaust Systems”.

Exhaust System

The wet well has fresh air ventilator duct work as required by the New Jersey Department of Environmental Protection (NJDEP). The motor driven components have been removed.

The dry well has fresh air ventilator duct work in compliance with confined space entry requirements and NJDEP rules and regulations. The motor drive components have been removed.

The generator has an exhaust through the roof and a ducted air outlet louver for the radiator.

The motor operated air inlet louver has been disconnected and has been placed in an open position.

A CY2009 construction project is in progress to upgrade the HVAC and exhaust systems. A roof unit is to be installed to provide heating and cooling in the superstructure and dry well. It is understood that the motorized louvers will be refurbished to interlock with the generator and the thermostat in the superstructure. The wet well mechanical equipment is being replaced as a component of the project.

Domestic Hot Water

A 30 gallon electric hot water tank is located on the intermediate floor level.

Lighting

Typical lighting in the superstructure and dry well is fluorescent tube drop fixtures with T-12 lamps and magnetic ballasts. The wet well is lit with incandescent lamps. The exterior of the building is lit with incandescent flood lights.

Bay Harbor Boulevard Pump Station

The Bay Harbor Boulevard Pumping Station is situated in the center of a 1/3 acre lot inside a fenced enclosure measuring approximately 140 feet x 100 feet. The main function of the pumping station is to receive wastewater flows into a wet well and to house three (3) waste water pumps to convey the wastewater to regional treatment facilities. The station layout consists of a cast in place concrete structure with a common wall separating the wet well and the dry well. The wet well is fitted with process equipment to grind large items in the waste stream and a wet well mixer to keep the waste stream solids in suspension. The horsepower of the meters on these units is 5 hp or less. The dry well has two levels, a pump level and an intermediate level. The intermediate level formerly housed ancillary equipment including a pump seal water system, an air compressor for a bubbler control system and storage space. The remaining process equipment on the intermediate level has been deactivated having been replaced by alternate energy savings technologies including an electronic level controller. The dry well level houses three (3) Flygt brand dry pit submersible pumps with suction piping to the wet well, discharge piping to a manifold and force main discharge line, and associated valves and gauges.

A 30 feet square building or superstructure sits over the dry well and is the only large above ground structure on the pumping station site. The super structure formerly housed the pump motors, which were connected by a drive shaft that extended approximately 30 feet vertically through the intermediate level to the centrifugal pumps. The inefficient wound rotor motors and drive shafts have been removed and the floor penetration sealed. The superstructure now only houses the motor control center, across the line motor starters, a flow controller, controls for the wet well equipment, a diesel driven standby 105 KW generator, an automatic power transfer switch, an elevator and restroom.

The heating and ventilating systems are in the process of being replaced and are currently not operable.

The superstructure is constructed of brick masonry walls, with metal doors and ventilation louvers, and a flat concrete plank roof. The roofing is a built up roof believed to be over rigid insulation.

HVAC Systems

The superstructure has inoperable unit heaters. The heaters are being replaced as described below under the section “Exhaust Systems”.

Exhaust System

The wet well has fresh air ventilator duct work as required by the New Jersey Department of Environmental Protection (NJDEP). The motor driven components have been removed.

The dry well has fresh air ventilator duct work in compliance with confined space entry requirements and NJDEP rules and regulations. The motor drive components have been removed.

The generator has an exhaust through the roof and a ducted air outlet louver for the radiator.

The motor operated air inlet louver has been disconnected and has been placed in an open position.

A CY2009 construction project is in progress to upgrade the HVAC and exhaust systems. A roof unit is to be installed to provide heating and cooling in the superstructure and dry well. It is understood that the motorized louvers will be refurbished to interlock with the generator and the thermostat in the superstructure. The wet well mechanical equipment is being replaced as a component of the project.

Domestic Hot Water

30 gallon electric hot water heater is located on the intermediate level.

Lighting

Typical lighting in the superstructure and dry well is fluorescent tube drop fixtures with T-12 lamps and magnetic ballasts. The wet well is lit with incandescent lamps. The exterior of the buildings are lit with incandescent flood lights.

Drum Point Road Pumping Station

The Drum Point Road Pumping Station is situated in the center of a 1/3 acre lot inside a fenced enclosure measuring approximately 130 feet x 110 feet. The main function of the pumping station is to receive wastewater flows into a wet well and to house three waste water pumps to convey the wastewater to regional treatment facilities. The station layout consists of a cast in place concrete structure with a common wall separating the wet well and the dry well. The wet well is fitted with process equipment to grind large items in the waste stream and a wet well mixer to keep the waste stream solids in suspension. The horsepower of the motors on these units is 5 hp or less. The dry well has two levels, a pump level and an intermediate level. The intermediate level formerly housed ancillary equipment including a pump seal water system, an air compressor for a bubbler control system and storage space. Remaining process equipment on the intermediate level has been deactivated having been replaced by alternate energy savings technologies including an electronic level controller. The dry well level houses three Flygt brand dry pit submersible pumps with suction: piping to the wet well, discharge piping to a manifold and force main discharge line, and associated valves and gauges.

A 30 feet square building or superstructure sits over the dry well and is the only large above ground structure on the pumping station site. The super structure formerly housed the pump motors, which were connected by a drive shaft that extended approximately 30 feet vertically through the intermediate level to the centrifugal pumps. The inefficient wound rotor motors and drive shafts have been removed and the floor penetration sealed. The superstructure now only houses the motor control center, a single variable frequency drive set to run at only one speed, a flow controller, controls for the wet well equipment, a diesel driven standby 105 KW generator, an automatic power transfer switch, an elevator and restroom.

The heating and ventilating systems are in the process of being replaced and are currently not operable.

The superstructure is constructed of brick masonry walls, with metal doors and ventilation louvers, and a flat concrete plank roof. The roofing is a built up roof believed to be over rigid insulation.

HVAC Systems

The superstructure has inoperable unit heaters. The heaters are being replaced as described below under the section “Exhaust Systems”.

Exhaust System

The wet well has fresh air ventilator duct work as required by the New Jersey Department of Environmental Protection (NJDEP). The motor driven components have been removed.

The dry well has fresh air ventilator duct work in compliance with confined space entry requirements and NJDEP rules and regulations. The motor drive components have been removed.

The generator has an exhaust through the roof and a ducted air outlet louver for the radiator.

The motor operated air inlet louver has been disconnected and has been placed in the open position.

A CY2009 construction project is in progress to upgrade the HVAC and exhaust systems. A roof unit is to be installed to provide heating and cooling in the superstructure and dry well. It is understood that the motorized louvers will be refurbished to interlock with the generator and the thermostat in the superstructure. The wet well mechanical equipment is being replaced as a component of the project.

Domestic Hot Water

30 gallon electric hot water heater is located on the intermediate level.

Lighting

Typical lighting in the superstructure and dry well is fluorescent tube drop fixtures with T-12 lamps and magnetic ballasts. The wet well is lit with incandescent lamps. The exterior of the buildings are lit with incandescent flood lights.

VI. MAJOR EQUIPMENT LIST

The equipment list describes the major energy consuming equipment, which through energy conservation measures could yield substantial energy savings. The list shows the major equipment in the facility and all pertinent information utilized in energy savings calculations. An approximate age was assigned to the equipment in some cases if a manufactures date was not shown on the equipment's nameplate. The ASHRAE service life for the equipment along with the remaining useful life is also shown in the **Major Equipment List Appendix**.

National studies show that by far the largest consumers of energy at water and wastewater facilities are pumping equipment. The handbook of Public Water Systems by Robert William and Gordon Culp, Van Nostrand Reinhold, 1986 presents data that justifies that pumping accounts for about 80% of the electric consumption at water treatment facilities. The energy consumption by electric motor driven pumps at pumping stations is probably closer to 95% of all electric power used at the pumping station.

Refer to the **Major Equipment List Appendix** for this facility.

VII. ENERGY CONSERVATION MEASURES

ECM #1: Lighting Upgrade

Description:

The lighting in the pumping station buildings is primarily made up of fluorescent fixtures with T-12 lamps and magnetic ballasts.

This ECM includes replacement of the existing fixtures containing T12 lamps and magnetic ballasts with fixtures containing T8 lamps and electronic ballasts. The new energy efficient, T8 fixtures will provide adequate lighting and will save the owner on electrical costs due to the better performance of the lamp and ballasts. This ECM will also provide maintenance savings through the reduced number of lamps replaced per year. The expected lamp life of a T8 lamp is approximately 30,000 burn-hours, in comparison to the existing T12 lamps which is approximately 20,000 burn-hours. The facility will need 33% less lamps replaced per year.

This ECM also includes replacement of all incandescent fixtures to compact fluorescent fixtures. The energy usage of an incandescent compared to a compact fluorescent is approximately 3 to 4 times greater. In addition to the energy savings, compact fluorescent fixtures burn-hours are 8 to 15 times longer than incandescent fixtures ranging from 6,000 to 15,000 burn-hours compared to incandescent fixtures ranging from 750 to 1000 burn-hours.

Energy Savings Calculations:

The **Investment Grade Lighting Audit Appendix** outlines the proposed retrofits, costs, savings, and payback periods.

NJ Smart Start® Program Incentives are calculated as follows:

From the **Smart Start Incentive Appendix**, the replacement of a T-12 fixture to a T-5 or T-8 fixture warrants the following incentive: T-5 or T-8 (1-2 lamp) = $10 per fixture; T-5 or T-8 (3-4 lamp) = $20 per fixture.

$$\text{Smart Start®}\ Incentive = \left(\#\ of\ 1-2\ lamp\ \ fixtures \times\ \$10\right) + \left(\#\ of\ 3-4\ lamp\ \ fixtures \times\ \$20\right)$$

Riverside Dr. Pump Station

$$\text{Smart Start®}\ \textit{Incentive} = (28 \times\ \$10) + (0 \times\ \$20) = \underline{\$280}$$

Replacement and Maintenance Savings are calculated as follows:

$$\textit{Savings} = (\textit{reduction in lamps replaced per year}) \times (\textit{replacment \$ per lamp} + \textit{Labor \$ per lamp})$$

$$\textit{Savings} = (9\ \textit{lamps per year}) \times (\$2.00 + \$5.00) = \$63$$

Energy Savings Summary:

ECM #1A - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$3,360
NJ Smart Start Equipment Incentive ($):	$280
Net Installation Cost ($):	$3,080
Maintenance Savings ($/Yr):	$63
Energy Savings ($/Yr):	$24
Total Yearly Savings ($/Yr):	$87
Estimated ECM Lifetime (Yr):	15
Simple Payback	35.4
Simple Lifetime ROI	-57.6%
Simple Lifetime Maintenance Savings	$945
Simple Lifetime Savings	$1,305
Internal Rate of Return (IRR)	-9%
Net Present Value (NPV)	($2,041.40)

Drum Point Rd. Pump Station

$$\text{Smart Start®}\ Incentive = (26 \times \ \$10) + (0 \times \ \$20) = \underline{\$260}$$

Replacement and Maintenance Savings are calculated as follows:

$$Savings = (reduction\ in\ lamps\ replaced\ \ per\ \ year) \times (replacment\ \$\ \ per\ lamp + Labor\ \$\ \ per\ lamp)$$

$$Savings = (9\ lamps\ \ per\ \ year) \times (\$2.00 + \$5.00) = \$63$$

Energy Savings Summary:

ECM #1B - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$3,120
NJ Smart Start Equipment Incentive ($):	$260
Net Installation Cost ($):	$2,860
Maintenance Savings ($/Yr):	$63
Energy Savings ($/Yr):	$24
Total Yearly Savings ($/Yr):	$87
Estimated ECM Lifetime (Yr):	15
Simple Payback	32.9
Simple Lifetime ROI	-54.4%
Simple Lifetime Maintenance Savings	$945
Simple Lifetime Savings	$1,305
Internal Rate of Return (IRR)	-9%
Net Present Value (NPV)	($1,821.40)

Bay Harbor Blvd. Pump Station

$$\text{Smart Start®}\ \textit{Incentive} = (29 \times \$10) + (0 \times \$20) = \underline{\$290}$$

Replacement and Maintenance Savings are calculated as follows:

$$\textit{Savings} = (\textit{reduction in lamps replaced per year}) \times (\textit{replacment \$ per lamp} + \textit{Labor \$ per lamp})$$

$$\textit{Savings} = (10\ \textit{lamps per year}) \times (\$2.00 + \$5.00) = \$70$$

Energy Savings Summary:

ECM #1C - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$3,480
NJ Smart Start Equipment Incentive ($):	$290
Net Installation Cost ($):	$3,190
Maintenance Savings ($/Yr):	$20
Energy Savings ($/Yr):	$26
Total Yearly Savings ($/Yr):	$46
Estimated ECM Lifetime (Yr):	15
Simple Payback	69.3
Simple Lifetime ROI	-78.4%
Simple Lifetime Maintenance Savings	$300
Simple Lifetime Savings	$690
Internal Rate of Return (IRR)	-15%
Net Present Value (NPV)	($2,640.85)

ECM #2: Lighting Controls

Description:

Authority policy requires all lights to be off when the building is unoccupied; however, in some areas the lighting may be left on unnecessarily. In many cases the lights are left on because of the inconvenience to manually switch lights off when a room is left or on when a pump station is first occupied. This is possible in lower floor rooms that are occupied for only short periods and only a few times per day. In some instances lights are left on due to the misconception that it is better to keep the lights on rather to continuously switch lights on and off. Although increased switching reduces lamp life, the energy savings outweigh the lamp replacement costs. The payback timeframe for when to turn the lights off is approximately 2 minutes. If the lights are off for a least a two minute interval, then it pays to shut them off.

Lighting controls come in many forms. Sometimes an additional switch is adequate to provide reduced lighting levels when full light output is not needed. Occupancy sensors detect motion and will switch the lights on when the room is occupied. Occupancy sensors can either be mounted in place of a current wall switch, or on the ceiling to cover large areas. Photocell control senses light levels and turn off or reduce lights when there is adequate daylight. Photocells are mostly used outside, but are becoming more popular in energy-efficient interior lighting designs as well.

ASHRAE Standard 90.1-2004, Appendix G is a reference standard for modeling building efficiency. The standard estimates that lighting controls provide a 10% reduction in lighting power usage for daytime occupancies in buildings over 5,000 SF, and 15% reduction in buildings under 5,000 SF. This ECM includes occupancy sensors in the pump room, generator building, and wet well and drywell as well as a dual technology motion and photocell daylight sensor controlling the exterior lighting.

The ECM includes replacement of standard wall switches with sensor wall switches for individual areas and photocell sensors for the exterior lighting. See the **Investment Grade Lighting Audit Appendix** for details.

The **Investment Grade Lighting Audit Appendix** of this report includes the summary of lighting controls implemented in this ECM and outlines the proposed controls, costs, savings, and payback periods. The calculations adjust the lighting power usage by 15% for all areas that include occupancy sensor lighting controls and 20% for areas that include photocell daylight sensors.

Riverside Dr. Pump Station

Light Energy = 347 kWh/Yr. occupancy sensor controlled lighting, and
= 1,577 kWh/Yr. daylight sensor controlled lighting

Energy Savings Calculations:

Energy Savings = 15% x 347 kWh + 20% x 1,571 kWh = 455 kWh
Savings = Energy Savings (kWh) x Ave Elec Cost ($/kWh)
Savings = 366 kWh x $0.16/kWh = $59

Installation cost per occupancy sensor (Basis: Sensorswitch or equivalent) is $110/unit including material and labor. Installation cost per daylight sensor with dual motion sensor technology is $238/unit

Installation Cost =$110 x 4 motion sensors + $238 x 1 Daylight Sensors = $678

From the **NJ Smart Start Appendix**, the installation of a lighting control device warrants the following incentive: occupancy = $20 per fixture, daylight = $25 per fixture.

Smart Start® Incentive = (# of wall mount devices x $20) = (4 x $20) = $80
Smart Start® Incentive = (# of day light devices x $25) = (1 x $25) = $25
Smart Start® *Incentive* = $105 *Total*

Energy Savings Summary:

ECM #2A - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$678
NJ Smart Start Equipment Incentive ($):	$105
Net Installation Cost ($):	$573
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$59
Total Yearly Savings ($/Yr):	$59
Estimated ECM Lifetime (Yr):	15
Simple Payback	9.7
Simple Lifetime ROI	54.5%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$885
Internal Rate of Return (IRR)	6%
Net Present Value (NPV)	$131.34

*ECM#2 Calculations DO NOT include lighting changes implemented in ECM #1. If ECM #1 and #2 are implemented together the savings will be relatively lower than shown above.

Drum Point Rd. Pump Station

Light Energy = 332 kWh/Yr. occupancy sensor controlled lighting, and
= 1,401 kWh/Yr. daylight sensor controlled lighting

Energy Savings Calculations:

Energy Savings = 15% x 332 kWh + 20% x 1,401 kWh = 409 kWh

Savings = Energy Savings (kWh) x Ave Elec Cost ($/kWh)
Savings = 330 kWh x $0.17/kWh = $56

Installation cost per occupancy sensor (Basis: Sensorswitch or equivalent) is $110/unit including material and labor. Installation cost per daylight sensor with dual motion sensor technology is $238/unit

Installation Cost =$110 x 4 motion sensors + $238 x 1 Daylight Sensors = $678

From the **NJ Smart Start Appendix**, the installation of a lighting control device warrants the following incentive: occupancy = $20 per fixture, daylight = $25 per fixture.

Smart Start® Incentive = (# of wall mount devices x $20) = (4 x $20) = $80
Smart Start® Incentive = (# of day light devices x $25) = (1 x $25) = $25
Smart Start® *Incentive* = $105 *Total*

Energy Savings Summary:

ECM #2B - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$678
NJ Smart Start Equipment Incentive ($):	$105
Net Installation Cost ($):	$573
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$56
Total Yearly Savings ($/Yr):	$56
Estimated ECM Lifetime (Yr):	15
Simple Payback	10.2
Simple Lifetime ROI	46.6%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$840
Internal Rate of Return (IRR)	5%
Net Present Value (NPV)	$95.52

*ECM#2 Calculations DO NOT include lighting changes implemented in ECM #1. If ECM #1 and #2 are implemented together the savings will be relatively lower than shown above.

Bay Harbor Blvd. Pump Station

Light Energy = 364 kWh/Yr. occupancy sensor controlled lighting, and
= 1,401 kWh/Yr. daylight sensor controlled lighting

Energy Savings Calculations:
Energy Savings = 15% x 364 kWh + 20% x 1,401 kWh = 335 kWh
Savings = Energy Savings (kWh) x Ave Elec Cost ($/kWh)
Savings = 335 kWh x $0.16/kWh = $54

Installation cost per occupancy sensor (Basis: Sensorswitch or equivalent) is $110/unit including material and labor. Installation cost per daylight sensor with dual motion sensor technology is $238/unit

Installation Cost =$110 x 4 motion sensors + $238 x 1 Daylight Sensors = $678

From the **NJ Smart Start Appendix**, the installation of a lighting control device warrants the following incentive: occupancy = $20 per fixture, daylight = $25 per fixture.

Smart Start® Incentive = (# of wall mount devices x $20) = (4 x $20) = $80
Smart Start® Incentive = (# of day light devices x $25) = (1 x $25) = $25
Smart Start® *Incentive* = $105 *Total*

Energy Savings Summary:

ECM #2C - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$678
NJ Smart Start Equipment Incentive ($):	$105
Net Installation Cost ($):	$573
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$54
Total Yearly Savings ($/Yr):	$54
Estimated ECM Lifetime (Yr):	15
Simple Payback	10.6
Simple Lifetime ROI	41.4%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$810
Internal Rate of Return (IRR)	5%
Net Present Value (NPV)	$71.65

*ECM#2 Calculations DO NOT include lighting changes implemented in ECM #1. If ECM #1 and #2 are implemented together the savings will be relatively lower than shown above.

ECM #3: Pump and Motor System Upgrade

Description:

Riverside Dr. Pump Station

The pump station was designed and built in 1974 as a cast-in-place concrete substructure and a masonry superstructure with a masonry roof. The substructure is divided into two compartments, a wet well and a dry well. The wet well is fitted with a bypass bar screen and Franklin Miller grinding equipment. The dry well contains three ITT-Allis Chalmers vertically mounted centrifugal pumps Model NSW200 Frame F7-D3 – 8x8x14.

The dry well also houses the pumps suction piping to the wet well, discharge piping to a manifold and force main discharge line, and associated valves and gauges. The pumps have seal water piping that is controlled from pumps and a water reservoir on the intermediate level.

A 30 feet square building or superstructure sits over the dry well and is the only large above ground structure on the pumping station site. The super structure houses the pump motors, which are connected by a drive shaft that extends approximately 30 feet vertically through the intermediate level to the centrifugal pumps. The superstructure also houses the motor, control center, variable frequency drives, a flow controller, controls for the wet well equipment, a diesel driven standby 210 kW generator, an automatic power transfer switch and restroom.

ECM #3A includes removal of the three ITT-AC pumps, the drive shafts and the seal water system. The existing dry well, suction piping and discharge piping is to be used for the placement of three 50 hp Flygt brand high efficiency motor dry pit submersible pumps. The existing Eaton-Cutler Hammer SVX 9000 general purpose variable frequency drives are to be retained. The transducer flow controller is to be retained. The ECM does include structural modifications to retrofit the Flygt pumps and pipe fittings for adapting to the existing pipe arrangements.

We have considered the addition of a magnetic flow meter to the discharge force main at a convenient location inside the pump station. The meter will be useful for analysis of pump performance and efficiency and collection system performance.

Energy Savings Calculations:

The **Major Equipment List Appendix** outlines the proposed retrofits, costs, and savings.

NJ Smart® program incentives are calculated as follows:

From the **Smart Start® Incentive Appendix**, the use of new pumps with premium motors over 25 hp warrants an incentive of $0.16 per kWh saved provided at least 25,000 kWh are saved each year.

Smart Start® Incentive = 42,594 kWh x $0.16/kWh = $6,815

Operations and maintenance savings are estimated to be nominal.

Total O&M savings = $0

Energy Savings Summary:

ECM #3A - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$40,000
NJ Smart Start Equipment Incentive ($):	$6,815
Net Installation Cost ($):	$33,185
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$6,798
Total Yearly Savings ($/Yr):	$6,798
Estimated ECM Lifetime (Yr):	20
Simple Payback	4.9
Simple Lifetime ROI	309.7%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$135,960
Internal Rate of Return (IRR)	20%
Net Present Value (NPV)	$67,952.07

Note: ECM#3A Calculations are based upon a pumping system replacement with implementation of premium motor submersible pumps, VFDs, grinder equipment and a replacement magnetic flow meter together as one project.

Drum Point Dr. Pump Station

The pump station was designed and built in 1974 as a cast-in-place concrete substructure and a masonry superstructure with a masonry roof. The substructure is divided into two compartments wet well and dry well. The wet well is fitted with a bypass bar screen and Franklin Miller grinding equipment. The dry well contains three ITT-Flygt Brand Model 3153 dry pit submersible pumps.

The superstructure houses the motor control center, a single variable frequency drive set to run at only one speed, a flow controller, controls for the wet well equipment, a diesel driven standby 105 kW generator, an automatic power transfer switch, an elevator and restroom.

ECM #3B provides a variable frequency drives for all three pumps by setting up the existing VFD with flow matching operation and installing two new VFD's. The flow matching controller is to be made operational. A magnetic flow meter is included in ECM #3B by addition to the discharge force main at a convenient location inside the pump station. The meter will be useful for trend analysis of pump performance and efficiency, and collection system performance.

Energy Savings Calculations:

The **Major Equipment List Appendix** outlines the proposed retrofits, costs, and savings.

NJ Smart® program incentives are calculated as follows:

From the **Smart Start® Incentive Appendix**, the use of variable frequency drives for the new pumps greater than 200 hp and premium motors over 25 hp warrants an incentive of $0.16 per kWh saved provided at least 25,000 kWh are saved each year.

Smart Start® Incentive	Savings = 3,968 kWh
	Not Eligible <25,000 kWh

Operations and maintenance savings are calculated as follows:

Total O&M savings = $0

Energy Savings Summary:

ECM #3B - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$50,000
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$50,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$650
Total Yearly Savings ($/Yr):	$650
Estimated ECM Lifetime (Yr):	20
Simple Payback	76.9
Simple Lifetime ROI	-74.0%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	$13,000
Internal Rate of Return (IRR)	-10%
Net Present Value (NPV)	($40,329.64)

Note: ECM#3B Calculations are based upon a pumping system replacement with implementation of premium motor submersible pumps, VFDs, grinder equipment and a replacement magnetic flow meter together as one project.

Bay Harbor Blvd. Pump Station

The pump station was designed and built in 1974 as a cast-in-place concrete substructure and a masonry superstructure with a masonry roof. The substructure is divided into two compartments, a wet well and a dry well. The wet well is fitted with a bypass bar screen with Franklin Miller grinding equipment. The dry well contains three ITT Flygt Brand Model 3153 dry pit submersible pumps.

The superstructure houses the motor control center, across the line motor starters, a flow controller, controls for the wet well equipment, a diesel driven standby 105 KW generator, an automatic power transfer switch, an elevator and restroom.

ECM #3C provides three (3) variable frequency drives, one for each of the three pumps. A flow matching controller would also be provided. A magnetic flow meter is included in ECM #3C by addition to the discharge force main at a convenient location inside the pump station. The meter will be useful for trend analysis of pump performance and efficiency, and collection system performance.

Energy Savings Calculations:

The **Major Equipment List Appendix** outlines the proposed retrofits, costs, and savings.

NJ Smart® program incentives are calculated as follows:

From the **Smart Start® Building Incentives Appendix**, the installation of variable frequency drives for the new pumps greater than 200 hp and premium motors over 25 hp warrants an incentive of $0.16 per kWh saved provided at least 25,000 kWh are saved each year.

Smart Start® Incentive	Savings = 4,820 kWh Not Eligible <25,000 kWh

Operations and maintenance savings are estimated to be nominal.

Total O&M savings = $0

Energy Savings Summary:

ECM #3C - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$60,000
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$60,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$790
Total Yearly Savings ($/Yr):	$790
Estimated ECM Lifetime (Yr):	20
Simple Payback	75.9
Simple Lifetime ROI	-73.7%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$15,800
Internal Rate of Return (IRR)	-10%
Net Present Value (NPV)	($48,246.79)

Note: ECM#3C Calculations are based upon a pumping system replacement with implementation of premium motor submersible pumps, VFDs, grinder equipment and a replacement magnetic flow meter together as one project.

VIII. RENEWABLE/DISTRIBUTED ENERGY MEASURES

Globally, renewable energy has become a priority affecting international and domestic energy policy. The State of New Jersey has taken a proactive approach, and has recently adopted in its Energy Master Plan a goal of 30% renewable energy by 2020. To help reach this goal New Jersey crated the Office of Clean Energy under the direction of the Board of Public Utilities and instituted a Renewable Energy Incentive Program to provide additional funding to private and public entities for installing qualified renewable technologies. A renewable energy source can greatly reduce a building's operation expenses while producing clean environmentally friendly energy. CEG has assessed the feasibility of installing renewable energy technologies for Brick Township MUA.

Solar energy produces clean energy and reduces a building's carbon footprint. This is accomplished via photovoltaic panels which will be mounted on all south and southwestern facades of the building. Flat roof, as well as sloped areas can be utilized; flat areas will have the panels turned to an optimum solar absorbing angle. The state of NJ has instituted a program in which one Solar Renewable Energy Certificate (SREC) is given to the Owner for every 1000 kWh of generation. SREC's can be sold anytime on the market at their current market value. The value of the credit varies upon the current need of the power companies. The average value per credit is around $350, this value was used in our financial calculations. This equates to $0.35 per kWh generated.

CEG has reviewed the available area at the Brick Township MUA Sewer Pump Stations and has concluded that there is not an application for solar energy at this facility due to the lack of adequate area to locate PV panels. In addition to the solar PV screening, CEG has also reviewed the applicability of wind energy. Wind energy production is another option available through the Renewable Energy Incentive Program. Wind turbines of various types can be utilized to produce clean energy on a per building basis. Cash incentives are available per kWh of electric usage. Based on CEG's review of the applicability of wind energy for the facility, it was determined that the average wind speed is not adequate, and the kilowatt demand for the building is below the threshold (200 kW) for purchase of a commercial wind turbine. Therefore, wind energy is not a viable option to implement.

IX. ENERGY PURCHASING AND PROCUREMENT STRATEGY

Load Profile:

Load Profile analyses were performed to determine the seasonal energy usage of the pump station facilities. Irregularities in the load profile will indicate potential problems within the particular facility. Consequently based on the profile a recommendation will be made to remedy the irregularity in energy usage. For this report, the facilities' energy consumption data were gathered in table format and plotted in graph forms to create the load profiles. Refer to The Electric Usage Profiles included within this report to reference the respective electricity usage load profiles.

Electricity

- Riverside Drive Pump Station

The electric usage profile demonstrates a typical season load profile for a pumping station that may be experiencing extraneous flow issues. Peak month electric consumption is 41% above average and minimum month consumption is 34% below average. The high and low consumptions are suggestive of a system with extraneous flows that may be excessive, a flat load profile will allow for more competitive energy prices when shopping for alternative suppliers. Extraneous flows are increasing electric costs. It is estimated that annual electricity charges could be reduced by as much as $10,000 at the Riverside Drive Pump Station alone if the Township were to implement an aggressive infiltration and inflow reduction program.

- Bay Harbor Boulevard Pump Station

The electric usage profile demonstrates a typical season load profile for a pumping station that may be experiencing extraneous flow issues. Peak month electric consumption is 68% above average and minimum month consumption is 45% below average. The high and low consumptions are suggestive of a system with extraneous flows that may be excessive, a flat load profile will allow for more competitive energy prices when shopping for alternative suppliers. Extraneous flows are increasing electric costs. It is estimated that annual electricity charges could be reduced by as much as $6,500 at the Bay Harbor Boulevard Pump Station alone if the Township were to implement an aggressive infiltration and inflow reduction program.

- Drum Point Road Pump Station

The electric usage profile demonstrates a typical season load profile for a pumping station that may be experiencing extraneous flow issues. Peak month electric consumption is 50% above average and minimum month consumption is 45% below average. The high and low consumptions are suggestive of a system with extraneous flows that may be excessive, a flat load profile will allow for more competitive energy prices when shopping for alternative suppliers. Extraneous flows are increasing electric costs. It is estimated that annual electricity charges could be reduced by as much as $7,000 at the Drum Point Road Pump Station alone if the Township were to implement an aggressive infiltration and inflow reduction program.

Tariff Analysis:

Electricity

The Brick Township wastewater pump stations receive electrical service from Jersey Central Power and Light (JCP&L) under two General Services Secondary Space Heating Service 3 Phase rate schedule – JC_G53_03F and JC_G53_01F. The facilities' rate is based in part on a three phase service at secondary voltages. The "O3F" rate applies to the Riverside Drive Pump Station and the "O1F" rate to the other two stations. For electric supply (generation), the customer will use the utilities Basic Generation Service (BGS) or a Third Party Supplier (TPS). This facility uses Basic Generation service from the utility. Therefore, they will pay according to the BGS default service for BGS generator capacity and non-utility generation charges. The JCP&L delivery service includes the following charges: service charge, demand charge, societal benefits, and system control charge.

Recommendations:

CEG recommends a global approach that will be consistent with all pumping station facilities within the BTMUA service area. The primary area for potential improvement is seen in the electric costs. The average price per kWh (kilowatt hour) for all buildings based on 1-year historical average price is about $0.16/kWh (this is the average "price to compare" if the client intends to shop for energy). Energy commodities are among the most volatile of all commodities, however at this point and time, energy is extremely competitive. The BTMUA could see improvement in its energy costs if it were to take advantage of these current market prices quickly, before they increase. Based on annual historical consumption (July 2008 through June 2009) and current electric rates, the BTMUA could see an improvement in its electric costs of up to 20% annually. (Note: Savings were calculated using Average Annual Consumption and a variance to a Fixed Average One-Year commodity contract). CEG recommends aggregating the entire BTMUA electric load to gain the most optimal energy costs. CEG recommends advisement for alternative sourcing and supply of energy on a "managed approach". CEG notes this is already being done at the water treatment plant.

CEG also recommends that the Authority schedule a meeting with the current utility providers to review their utility charges and current tariff structures for electricity. This meeting would provide insight regarding alternative procurement options that are currently available. Through its meeting with the Local distribution Company (LDC), the BTMUA can learn more about the competitive supply process. BTMUA can acquire a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at www.nj.gov/pbu. BTMUA should consider using a billing-auditing service to further analyze the utility invoices, manage the data and use the information for ongoing demand-side management projects. Furthermore, special attention should be given to credit mechanisms, imbalances, balancing charges and commodity charges when meeting with the utility representative. The Township should ask the utility representative about alternative billing options, such as consolidated billing when utilizing the service of a Third Party Supplier.

X. INSTALLATION FUNDING OPTIONS

CEG has reviewed various funding options for the facility owner to utilize in subsidizing the costs for installing the energy conservation measures noted within this report. Below are a few alternative funding methods:

i. *Energy Savings Improvement Program (ESIP)* – Public Law 2009, Chapter 4 authorizes government entities to make energy related improvements to their facilities and par for the costs using the value of energy savings that result from the improvements. The "Energy Savings Improvement Program (ESIP)" law provides a flexible approach that can allow all government agencies in New Jersey to improve and reduce energy usage with minimal expenditure of new financial resources.

ii. *Municipal Bonds* – Municipal bonds are a bond issued by a city or other local government, or their agencies. Potential issuers of municipal bonds include cities, counties, redevelopment agencies, school districts, publicly owned airports and seaports, and any other governmental entity (or group of governments) below the state level. Municipal bonds may be general obligations of the issuer or secured by specified revenues. Interest income received by holders of municipal bonds is often exempt from the federal income tax and from the income tax of the state in which they are issued, although municipal bonds issued for certain purposes may not be tax exempt.

iii. *Power Purchase Agreement* – Public Law 2008, Chapter 3 authorizes contractor up to fifteen (15) years for contracts commonly known as "power purchase agreements." These are programs where the contracting unit (Owner) procures a contract for, in most cases, a third party to install, maintain, and own a renewable energy system. These renewable energy systems are typically solar panels, windmills or other systems that create renewable energy. In exchange for the third party's work of installing, maintaining and owning the renewable energy system, the contracting unit (Owner) agrees to purchase the power generated by the renewable energy system from the third party at agreed upon energy rates.

iv. *New Jersey Environmental Infrastructure Trust* – The New Jersey Environmental Infrastructure Trust (NJEIT) works in conjunction with the New Jersey Department of Environmental Protection (NJDEP) to identify "clean water" projects and to establish an annual "priority list" for the disbursement of low interest and no interest 20 year loans. The NJEIT also administers the American Recovery and Reinvestment Act of 2009 (ARRA or "Stimulus Program"). Project funded in FY 2009 are eligible for a 25% market rate loan (currently 4.0-4.5%) and a 75% 0% interest rate loan. Project receiving a high priority are also eligible for a 50% loan forgiveness up to $5 million. Competition for the 50% forgiveness is severe; however, a 75/25 loan is a very attractive means for financing a project with an effective interest rate of only

slightly more than 1%. Also renewable energy projects are given favorable consideration and often receive funding set asides.

CEG recommends the Owner review the use of the above-listed funding options in addition to utilizing their standard method of financing for facilities upgrades in order to fund the proposed energy conservation measures.

XI. ADDITIONAL RECOMMENDATIONS

The following recommendations include no cost/low cost measures, Operation & Maintenance (O&M) items, and water conservation measures with attractive paybacks. These measures are not eligible for the Smart Start Buildings incentives from the office of Clean Energy but save energy none the less.

A. Maintain all weather stripping on windows and doors.

B. Clean all light fixtures to maximize light output.

C. Provide more frequent air filter changes to decrease overall system power usage and maintain better IAQ.

D. Reactive the motorized air louvers at all three pump stations as an additional feature of the HVAC system upgrade. Install louver control based upon a signal from the generator controller and also high temperature in the MCC room.

E. The HVAC equipment projects for the three pumping stations appear to be eligible for the New Jersey Clean Energy Program "Direct Install" incentive.

Direct install is expected to launch in November 2009.

Direct install is designed as a turn-key equipment replacement program to reduce energy costs of smaller, nonresidential facilities. Customers installing eligible equipment replacement measures under the program will receive financial incentives of up to 80% of installed costs.

Non-residential facilities with peak electric demands not exceeding 200 kW will be eligible for Direct Install. Equipment categories eligible for incentives include: lighting, HVAC, natural gas, refrigeration, and food service. Specific equipment eligible in these categories must be listed on the program's eligible measure lists and also qualify based on the cost-effectiveness of energy savings versus cost as determined by the energy assessment.

F. Retro-Commissioning - In addition to the recommendations above, implementing Retro-Commissioning would be beneficial for this facility. Retro-Commissioning is a means to verify your current equipment is operating at its designed mechanical efficiency range, hydraulic flow capacity, designed motor efficiency and overall performance. Retro-Commissioning provides valuable insight into systems or components not performing correctly or efficiently. The commissioning process defines the original system design parameters and recommends revisions to the current system operating characteristics.

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Brick Township Municipal Utilities Authority

ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY

ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Saving * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
Riverside Drive Pump Station															
ECM #1A	Lighting Upgrade - General	$1,910	$1,450	$280	$3,080	$24	$63	$87	15	$1,305	$945	-57.6%	35.4	-9.21%	($2,041.40)
ECM #2A	Lighting Controls	$269	$409	$105	$573	$59	$0	$59	15	$885	$0	54.5%	9.7	6.00%	$131.34
ECM #3A	Pump and Motor System Upgrade©	$20,000	$20,000	$6,815	$33,185	$6,798	$0	$6,798	20	$135,960	$0	309.7%	4.9	19.95%	$67,952.07
Drum Point Road Pump Station															
ECM #1B	Lighting Upgrade - General	$1,820	$1,300	$260	$2,860	$24	$63	$87	15	$1,305	$945	-54.4%	32.9	-8.51%	($1,821.40)
ECM #2B	Lighting Controls	$269	$409	$105	$573	$56	$0	$56	15	$840	$0	46.6%	10.2	5.21%	$95.52
ECM #3B	Pump and Motor System Upgrade©	$25,000	$25,000	$0	$50,000	$650	$0	$650	20	$13,000	$0	-74.0%	76.9	-10.41%	($40,329.64)
Bay Harbor Boulevard Pump Station															
ECM #1C	Lighting Upgrade - General	$2,030	$1,450	$290	$3,190	$26	$20	$46	15	$690	$300	-78.4%	69.3	-14.97%	($2,640.85)
ECM #2C	Lighting Controls	$269	$409	$105	$573	$54	$0	$54	15	$810	$0	41.4%	10.6	4.68%	$71.65
ECM #3C	Pump and Motor System Upgrade©	$30,000	$30,000	$0	$60,000	$790	$0	$790	20	$15,800	$0	-73.7%	75.9	-10.32%	($48,246.79)

Notes: 1) The variable Cn in the formulas for Internal Rate of Return and Net Present Value stands for the cash flow during each period.
2) The variable DR in the NPV equation stands for Discount Rate
3) For NPV and IRR calculations: From n=0 to N periods where N is the *lifetime of ECM* and Cn is the *cash flow during each period* .

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SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives as of January, 2009:

Electric Chillers

Water-Cooled Chillers	$12 - $170 per ton
Air-Cooled Chillers	$8 - $52 per ton

Gas Cooling

Gas Absorption Chillers	$185 - $400 per ton
Gas Engine-Driven Chillers	Calculated through custom measure path)

Desiccant Systems

$1.00 per cfm – gas or electric

Electric Unitary HVAC

Unitary AC and Split Systems	$73 - $93 per ton
Air-to-Air Heat Pumps	$73 - $92 per ton
Water-Source Heat Pumps	$81 per ton
Packaged Terminal AC & HP	$65 per ton
Central DX AC Systems	$40- $72 per ton
Dual Enthalpy Economizer Controls	$250

Ground Source Heat Pumps

Closed Loop & Open Loop	$370 per ton

Gas Heating

Gas Fired Boilers < 300 MBH	$300 per unit
Gas Fired Boilers ≥ 300 - 1500 MBH	$1.75 per MBH
Gas Fired Boilers ≥1500 - ≤ 4000 MBH	$1.00 per MBH
Gas Fired Boilers > 4000 MBH	(Calculated through Custom Measure Path)
Gas Furnaces	$300 - $400 per unit

Variable Frequency Drives

Variable Air Volume	$65 - $155 per hp
Chilled-Water Pumps	$60 per hp
Compressors	$5,250 to $12,500 per drive

Natural Gas Water Heating

Gas Water Heaters ≤ 50 gallons	$50 per unit
Gas-Fired Water Heaters >50 gallons	$1.00 - $2.00 per MBH
Gas-Fired Booster Water Heaters	$17 - $35 per MBH

Premium Motors

Three-Phase Motors	$45 - $700 per motor

Prescriptive Lighting

T-5 and T-8 Lamps w/Electronic Ballast in Existing Facilities	$10 - $30 per fixture, (depending on quantity)
Hard-Wired Compact Fluorescent	$25 - $30 per fixture
Metal Halide w/Pulse Start	$25 per fixture
LED Exit Signs	$10 - $20 per fixture
T-5 and T-8 High Bay Fixtures	$16 - $284 per fixture

Lighting Controls – Occupancy Sensors

Wall Mounted	$20 per control
Remote Mounted	$35 per control
Daylight Dimmers	$25 per fixture
Occupancy Controlled hi-low Fluorescent Controls	$25 per fixture controlled

Lighting Controls – HID or Fluorescent Hi-Bay Controls

Occupancy hi-low	$75 per fixture controlled
Daylight Dimming	$75 per fixture controlled

Other Equipment Incentives

Performance Lighting	$1.00 per watt per SF below program incentive threshold, currently 5% more energy efficient than ASHRAE 90.1-2004 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive

Portfolio Manager "Statement of Energy Performance"

Not applicable at this time. A Portfolio Manager for wastewater pumping stations has not been developed at the time of this audit's preparation.

MAJOR EQUIPMENT LIST

Concord Engineering Group

Brick Township MUA Riverside Drive Waste Water Pumping Station

Large Motors >25HP												Proposed Equipment					Savings	
Service	**Location**	**Manufacturer**	**Type**	**Model Number**	**Serial Number**	**Rated Horsepower (hp)**	**Speed (rpm)**	**Annual Power Consumption (kWh/year)**	**Approx. Age**	**Remaing Life**	**Annual Operation (hours)**	**Retro-Unit Description**	**Horsepower**	**Unit Cost Installed**	**Remaining Life/ Service Life**	**Unit Cost for ECM Analysis**	**kWh Savings**	**Yearly $ Savings**
Sewage Pumps	Dry well	ITT	8x8x14 Type NSWV	200		50		193400	31	0	3300	Flygt Premium motor 50hp dry pit submersible pump	50	13334	0.00	0	14198.0	$2,143.90
Sewage Pumps	Dry Well	ITT	8x8x14 Type NSWV	200		50		193400	31	0	3300	Flygt Premium motor 50hp dry pit submersible pump	50	13333	0.00	0	14198.0	$2,143.90
Sewage Pumps	Dry Well	ITT	8x8x14 Type NSWV	200		50		193400	31	0	3300	Flygt Premium motor 50hp dry pit submersible pump	50	13333	0.00	0	14198.0	$2,143.90
Grinder		Franklin Miller				3						no change	3			0	0	0
Variable Frequency Drive with bypass	Superstructure	Eaton-Cutler Hammer	frequency variable	SVX9000							3300	no change	50		20	0	0	0
Variable Frequency Drive with bypass	Superstructure	Eaton-Cutler Hammer	frequency variable	SVX9000							3300	no change	50		20	0	0	0
Variable Frequency Drive with bypass	Superstructure	Eaton-Cutler Hammer	frequency variable	SVX9000					10	10	3300	no change	50		20	0	0	0
Emergency Generator		Caterpillar	210 kW															

MAJOR EQUIPMENT LIST

Concord Energy Group

Brick Township MUA Drum Point Road Wastewater Pumping Station

Large Motors >25HP												Proposed Equipment					Savings	
Service	Location	Manufacturer	Type	Model Number	Serial Number	Rated Horsepower (hp)	Speed (rpm)	Annual Power Consumption (kWh/year)	Approx. Age	Remaing Life	Annual Operation (hours)	Retro-Unit Description	Horsepower	Unit Cost Installed	Remaining Life/ Service Life	Unit Cost for ECM Analysis	kWh Savings	Yearly $ Savings
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible	3153		15	1700	28920	2	20	4117	no change						
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible			15	1700	28920	2	20	4117	no change						
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible			15	1700	28920	2	20	4117	no change						
VFD Pump #1	Super-Structure	Mitsubishi	frequency			15	53 Hz	-----	2	20	2000	Install variable capability and flow matcher	15	10000	20	10000	1322	217
VFD Pump #2	Super-Structure	none										Eaton-Cutler Hammer SVX9000	15	20000	20	20000	1323	217
VFD Pump #3	Super-Structure	none										Eaton-Cutler Hammer SVX9000	15	20000	20	20000	1323	217
Grinder	Wet Well	JWC				5												
Emergency Generator		Onan/Cummins	105 kW															

MAJOR EQUIPMENT LIST

Concord Energy Group

Brick Township MUA Bay Harbor Boulevard Wastewater Pumping Station

Large Motors >25HP												Proposed Equipment					Savings	
Service	**Location**	**Manufacturer**	**Type**	**Model Number**	**Serial Number**	**Rated Horsepower (hp)**	**Speed (rpm)**	**Annual Power Consumption (kWh/year)**	**Approx. Age**	**Remaing Life**	**Annual Operation (hours)**	**Retro-Unit Description**	**Horsepower**	**Unit Cost Installed**	**Remaining Life/ Service Life**	**Unit Cost for ECM Analysis**	**kWh Savings**	**Yearly $ Savings**
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible	3153		15	1700	28920	2	20	4117	no change						
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible			15	1700	28920	2	20	4117	no change						
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible			15	1700	28920	2	20	4117	no change						
VFD Pump #1	Super-Structure	none										Eaton-Cutler Hammer SVX9000	15	20000	20	20000	1607	263
VFD Pump #2	Super-Structure	none										Eaton-Cutler Hammer SVX9000	15	20000	20	20000	1607	263
VFD Pump #3	Super-Structure	none										Eaton-Cutler Hammer SVX9000	15	20000	20	20000	1607	263
Grinder	Wet Well	Franklin Miller				5										0		
Emergency Generator		Onan/Cummins	105 kW															

INVESTMENT GRADE LIGHTING AUDIT

CONCORD ENERGY SERVICES

Riverside Drive Pump Station

CEG Job #: PBM00500.01
Project: Brick Energy Audit
Address: Riverside Drive PS
City: Brick Twp.
Building SF: 4,652

DATE: 12/24/2009
KWH COST: $0.16

ECM # 1: Lighting Upgrade

EXISTING LIGHTING										PROPOSED LIGHTING								SAVINGS			
Line No.	Fixture Location	No. Fixts	No of Lamps	Fixture Type	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (Installed)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Payback
1	Exterior of Building	9		Flood Lamps			0.00	0	$0.00	9	No Change		0.00	0	0		$0.00	0.00	0	0	0.00
2	Interior - 1st Floor	7	2	4' Flourescent Fixtures, 2- T12 bulbs	300	80	0.56	168	$26.81	7	4' Flourescent Fixtures, 2- T8 bulbs	55	0.39	115.5	$18.43	$120.00	$840.00	0.18	52.5	$8.38	100.25
3	Interior - 1st Floor restroom	6	2	4' Flourescent Fixtures, 2- T12 bulbs	150	80	0.48	72	$11.49	6	4' Flourescent Fixtures, 2- T8 bulbs	55	0.33	49.5	$7.90	$120.00	$720.00	0.15	22.5	$3.59	200.50
4	Interior - Middle Floor	7	2	4' Flourescent Fixtures, 2- T12 bulbs	200	80	0.56	112	$17.88	7	4' Flourescent Fixtures, 2- T8 bulbs	55	0.39	77	$12.29	$120.00	$840.00	0.18	35	$5.59	150.38
5	Interior - Bottom Floor	8	2	4' Flourescent Fixtures, 2- T12 bulbs	200	80	0.64	128	$20.43	8	4' Flourescent Fixtures, 2- T8 bulbs	55	0.44	88	$14.04	$120.00	$960.00	0.20	40	$6.38	150.38
	Totals	37					2.24	480	$76.61	37			1.54	330	$52.67		$3,360.00	0.70	150	$23.94	140.35

INVESTMENT GRADE LIGHTING AUDIT

CONCORD ENERGY SERVICES

Bay Harbor Boulevard Waste Water Pump Station

CEG Job #: PBM00500.01
Project: Brick Energy Audit
Address: Bay Harbor P.S
City: Brick Twp.
Building SF: 4,652

DATE: 12/24/2009
KWH COST: $0.16

ECM # 1: Lighting Upgrade

EXISTING LIGHTING											PROPOSED LIGHTING							SAVINGS			
Line No.		Fixture Location	No. eFixts	Fixture eType	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. rFixts	Retro-Unit rDescription	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (Installed)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Payback
1		Exterior of Building	8	Flood Lamps			0.00	0	$0.00	8			0.00	0	0		$0.00	0.00	0	0	0.00
2		Interior - 1st Floor	8	4' Fluorescent Fixtures, 2- T12 bulbs	300	80	0.64	192	$31.47	8	4' Fluorescent Fixtures, 2- T8 bulbs	55	0.44	132	$21.63	$120.00	$960.00	0.20	60	$9.83	97.62
3		Interior - 1st Floor restroom	6	4' Fluorescent Fixtures, 2- T12 bulbs	150	80	0.48	72	$11.80	6	4' Fluorescent Fixtures, 2- T8 bulbs	55	0.33	49.5	$8.11	$120.00	$720.00	0.15	22.5	$3.69	195.24
4		Interior - Middle Floor	7	4' Fluorescent Fixtures, 2- T12 bulbs	200	80	0.56	112	$18.36	7	4' Fluorescent Fixtures, 2- T8 bulbs	55	0.39	77	$12.62	$120.00	$840.00	0.18	35	$5.74	146.43
5		Interior - Bottom Floor	8	4' Fluorescent Fixtures, 2- T12 bulbs	200	80	0.64	128	$20.98	8	4' Fluorescent Fixtures, 2- T8 bulbs	55	0.44	88	$14.42	$120.00	$960.00	0.20	40	$6.56	146.43
		Totals	37				2.32	504	$82.61	37			1.60	346.5	$56.79		$3,480.00	0.73	157.5	$25.81	134.81

INVESTMENT GRADE LIGHTING AUDIT

CONCORD ENERGY SERVICES

CEG Job #: PBM00500.01
Project: Brick Energy Audit
Address: Drum Point P.S.
City: Brick Twp.
Building SF: 4,652

Drum Point Road Waste Water Pump Station

DATE: 12/24/2009
KWH COST: $0.17

ECM # 1: Lighting Upgrade

EXISTING LIGHTING									PROPOSED LIGHTING								SAVINGS			
Line No.	Fixture Location	No. Fixts	Fixture Type	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (Installed)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Payback
1	Exterior of Building	8	Flood Lamps			0.00	0	$0.00	8	No Change		0.00	0	0		$0.00	0.00	0	0	0.00
2	Interior - 1st Floor	7	4' Fluorescent Fixtures, 2-T12 bulbs	300	80	0.56	168	$28.11	7	4' Fluorescent Fixtures, 2- T8 bulbs	55	0.39	115.5	$19.32	$120.00	$840.00	0.18	52.5	8.78325	95.64
3	Interior - 1st Floor restroom	4	4' Fluorescent Fixtures, 2-T12 bulbs	150	80	0.32	48	$8.03	4	4' Fluorescent Fixtures, 2- T8 bulbs	55	0.22	33	$5.52	$120.00	$480.00	0.10	15	2.5095	191.27
4	Interior - Middle Floor	7	4' Fluorescent Fixtures, 2-T12 bulbs	200	80	0.56	112	$18.74	7	4' Fluorescent Fixtures, 2- T8 bulbs	55	0.39	77	$12.88	$120.00	$840.00	0.18	35	5.8555	143.45
5	Interior - Bottom Floor	8	4' Fluorescent Fixtures, 2-T12 bulbs	200	80	0.64	128	$21.41	8	4' Fluorescent Fixtures, 2- T8 bulbs	55	0.44	88	$14.72	$120.00	$960.00	0.20	40	6.692	143.45
	Totals	34				2.08	456	$76.29	34			1.43	313.5	$52.45		$3,120.00	0.65	142.5	$23.84	130.87

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Brick Township Municipal Utilities Authority

ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY

ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Saving * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
Riverside Drive Pump Station															
ECM #1A	Lighting Upgrade - General	$1,910	$1,450	$280	$3,080	$24	$63	$87	15	$1,305	$945	-57.6%	35.4	-9.21%	($2,041.40)
ECM #2A	Lighting Controls	$269	$409	$105	$573	$59	$0	$59	15	$885	$0	54.5%	9.7	6.00%	$131.34
ECM #3A	Pump and Motor System Upgrade©	$20,000	$20,000	$6,815	$33,185	$6,798	$0	$6,798	20	$135,960	$0	309.7%	4.9	19.95%	$67,952.07
Drum Point Road Pump Station															
ECM #1B	Lighting Upgrade - General	$1,820	$1,300	$260	$2,860	$24	$63	$87	15	$1,305	$945	-54.4%	32.9	-8.51%	($1,821.40)
ECM #2B	Lighting Controls	$269	$409	$105	$573	$56	$0	$56	15	$840	$0	46.6%	10.2	5.21%	$95.52
ECM #3B	Pump and Motor System Upgrade©	$25,000	$25,000	$0	$50,000	$650	$0	$650	20	$13,000	$0	-74.0%	76.9	-10.41%	($40,329.64)
Bay Harbor Boulevard Pump Station															
ECM #1C	Lighting Upgrade - General	$2,030	$1,450	$290	$3,190	$26	$20	$46	15	$690	$300	-78.4%	69.3	-14.97%	($2,640.85)
ECM #2C	Lighting Controls	$269	$409	$105	$573	$54	$0	$54	15	$810	$0	41.4%	10.6	4.68%	$71.65
ECM #3C	Pump and Motor System Upgrade©	$30,000	$30,000	$0	$60,000	$790	$0	$790	20	$15,800	$0	-73.7%	75.9	-10.32%	($48,246.79)

Notes: 1) The variable Cn in the formulas for Internal Rate of Return and Net Present Value stands for the cash flow during each period.
2) The variable DR in the NPV equation stands for Discount Rate
3) For NPV and IRR calculations: From n=0 to N periods where N is the *lifetime of ECM* and Cn is the *cash flow during each period* .

MAJOR EQUIPMENT LIST

Concord Engineering Group

Brick Township MUA Riverside Drive Waste Water Pumping Station

Large Motors >25HP												Proposed Equipment					Savings	
Service	**Location**	**Manufacturer**	**Type**	**Model Number**	**Serial Number**	**Rated Horsepower (hp)**	**Speed (rpm)**	**Annual Power Consumption (kWh/year)**	**Approx. Age**	**Remaing Life**	**Annual Operation (hours)**	**Retro-Unit Description**	**Horsepower**	**Unit Cost Installed**	**Remaining Life/ Service Life**	**Unit Cost for ECM Analysis**	**kWh Savings**	**Yearly $ Savings**
Sewage Pumps	Dry well	ITT	8x8x14 Type NSWV	200		50		193400	31	0	3300	Flygt Premium motor 50hp dry pit submersible pump	50	13334	0.00	0	14198.0	$2,143.90
Sewage Pumps	Dry Well	ITT	8x8x14 Type NSWV	200		50		193400	31	0	3300	Flygt Premium motor 50hp dry pit submersible pump	50	13333	0.00	0	14198.0	$2,143.90
Sewage Pumps	Dry Well	ITT	8x8x14 Type NSWV	200		50		193400	31	0	3300	Flygt Premium motor 50hp dry pit submersible pump	50	13333	0.00	0	14198.0	$2,143.90
Grinder		Franklin Miller				3						no change	3			0	0	0
Variable Frequency Drive with bypass	Superstructure	Eaton-Cutler Hammer	frequency variable	SVX9000							3300	no change	50		20	0	0	0
Variable Frequency Drive with bypass	Superstructure	Eaton-Cutler Hammer	frequency variable	SVX9000							3300	no change	50		20	0	0	0
Variable Frequency Drive with bypass	Superstructure	Eaton-Cutler Hammer	frequency variable	SVX9000					10	10	3300	no change	50		20	0	0	0
Emergency Generator		Caterpillar	210 kW															

MAJOR EQUIPMENT LIST

Concord Energy Group

Brick Township MUA Drum Point Road Wastewater Pumping Station

Large Motors >25HP												Proposed Equipment					Savings	
Service	Location	Manufacturer	Type	Model Number	Serial Number	Rated Horsepower (hp)	Speed (rpm)	Annual Power Consumption (kWh/year)	Approx. Age	Remaing Life	Annual Operation (hours)	Retro-Unit Description	Horsepower	Unit Cost Installed	Remaining Life/ Service Life	Unit Cost for ECM Analysis	kWh Savings	Yearly $ Savings
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible	3153		15	1700	28920	2	20	4117	no change						
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible			15	1700	28920	2	20	4117	no change						
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible			15	1700	28920	2	20	4117	no change						
VFD Pump #1	Super-Structure	Mitsubishi	frequency			15	53 Hz	-----	2	20	2000	Install variable capability and flow matcher	15	10000	20	10000	1322	217
VFD Pump #2	Super-Structure	none										Eaton-Cutler Hammer SVX9000	15	20000	20	20000	1323	217
VFD Pump #3	Super-Structure	none										Eaton-Cutler Hammer SVX9000	15	20000	20	20000	1323	217
Grinder	Wet Well	JWC				5												
Emergency Generator		Onan/Cummins	105 kW															

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Brick Township Municipal Utilities Authority

ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY

ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Saving * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
Riverside Drive Pump Station															
ECM #1A	Lighting Upgrade - General	$1,910	$1,450	$280	$3,080	$24	$63	$87	15	$1,305	$945	-57.6%	35.4	-9.21%	($2,041.40)
ECM #2A	Lighting Controls	$269	$409	$105	$573	$59	$0	$59	15	$885	$0	54.5%	9.7	6.00%	$131.34
ECM #3A	Pump and Motor System Upgrade©	$20,000	$20,000	$6,815	$33,185	$6,798	$0	$6,798	20	$135,960	$0	309.7%	4.9	19.95%	$67,952.07
Drum Point Road Pump Station															
ECM #1B	Lighting Upgrade - General	$1,820	$1,300	$260	$2,860	$24	$63	$87	15	$1,305	$945	-54.4%	32.9	-8.51%	($1,821.40)
ECM #2B	Lighting Controls	$269	$409	$105	$573	$56	$0	$56	15	$840	$0	46.6%	10.2	5.21%	$95.52
ECM #3B	Pump and Motor System Upgrade©	$25,000	$25,000	$0	$50,000	$650	$0	$650	20	$13,000	$0	-74.0%	76.9	-10.41%	($40,329.64)
Bay Harbor Boulevard Pump Station															
ECM #1C	Lighting Upgrade - General	$2,030	$1,450	$290	$3,190	$26	$20	$46	15	$690	$300	-78.4%	69.3	-14.97%	($2,640.85)
ECM #2C	Lighting Controls	$269	$409	$105	$573	$54	$0	$54	15	$810	$0	41.4%	10.6	4.68%	$71.65
ECM #3C	Pump and Motor System Upgrade©	$30,000	$30,000	$0	$60,000	$790	$0	$790	20	$15,800	$0	-73.7%	75.9	-10.32%	($48,246.79)

Notes: 1) The variable Cn in the formulas for Internal Rate of Return and Net Present Value stands for the cash flow during each period.
2) The variable DR in the NPV equation stands for Discount Rate
3) For NPV and IRR calculations: From n=0 to N periods where N is the *lifetime of ECM* and Cn is the *cash flow during each period* .

MAJOR EQUIPMENT LIST

Concord Engineering Group

Brick Township MUA Riverside Drive Waste Water Pumping Station

Large Motors >25HP												Proposed Equipment					Savings	
Service	**Location**	**Manufacturer**	**Type**	**Model Number**	**Serial Number**	**Rated Horsepower (hp)**	**Speed (rpm)**	**Annual Power Consumption (kWh/year)**	**Approx. Age**	**Remaing Life**	**Annual Operation (hours)**	**Retro-Unit Description**	**Horsepower**	**Unit Cost Installed**	**Remaining Life/ Service Life**	**Unit Cost for ECM Analysis**	**kWh Savings**	**Yearly $ Savings**
Sewage Pumps	Dry well	ITT	8x8x14 Type NSWV	200		50		193400	31	0	3300	Flygt Premium motor 50hp dry pit submersible pump	50	13334	0.00	0	14198.0	$2,143.90
Sewage Pumps	Dry Well	ITT	8x8x14 Type NSWV	200		50		193400	31	0	3300	Flygt Premium motor 50hp dry pit submersible pump	50	13333	0.00	0	14198.0	$2,143.90
Sewage Pumps	Dry Well	ITT	8x8x14 Type NSWV	200		50		193400	31	0	3300	Flygt Premium motor 50hp dry pit submersible pump	50	13333	0.00	0	14198.0	$2,143.90
Grinder		Franklin Miller				3						no change	3			0	0	0
Variable Frequency Drive with bypass	Superstructure	Eaton-Cutler Hammer	frequency variable	SVX9000							3300	no change	50		20	0	0	0
Variable Frequency Drive with bypass	Superstructure	Eaton-Cutler Hammer	frequency variable	SVX9000							3300	no change	50		20	0	0	0
Variable Frequency Drive with bypass	Superstructure	Eaton-Cutler Hammer	frequency variable	SVX9000					10	10	3300	no change	50		20	0	0	0
Emergency Generator		Caterpillar	210 kW															

MAJOR EQUIPMENT LIST

Concord Energy Group

Brick Township MUA Drum Point Road Wastewater Pumping Station

Large Motors >25HP												Proposed Equipment					Savings	
Service	Location	Manufacturer	Type	Model Number	Serial Number	Rated Horsepower (hp)	Speed (rpm)	Annual Power Consumption (kWh/year)	Approx. Age	Remaing Life	Annual Operation (hours)	Retro-Unit Description	Horsepower	Unit Cost Installed	Remaining Life/ Service Life	Unit Cost for ECM Analysis	kWh Savings	Yearly $ Savings
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible	3153		15	1700	28920	2	20	4117	no change						
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible			15	1700	28920	2	20	4117	no change						
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible			15	1700	28920	2	20	4117	no change						
VFD Pump #1	Super-Structure	Mitsubishi	frequency			15	53 Hz	-----	2	20	2000	Install variable capability and flow matcher	15	10000	20	10000	1322	217
VFD Pump #2	Super-Structure	none										Eaton-Cutler Hammer SVX9000	15	20000	20	20000	1323	217
VFD Pump #3	Super-Structure	none										Eaton-Cutler Hammer SVX9000	15	20000	20	20000	1323	217
Grinder	Wet Well	JWC				5												
Emergency Generator		Onan/Cummins	105 kW															

MAJOR EQUIPMENT LIST

Concord Energy Group

Brick Township MUA Bay Harbor Boulevard Wastewater Pumping Station

Large Motors >25HP												Proposed Equipment					Savings	
Service	**Location**	**Manufacturer**	**Type**	**Model Number**	**Serial Number**	**Rated Horsepower (hp)**	**Speed (rpm)**	**Annual Power Consumption (kWh/year)**	**Approx. Age**	**Remaing Life**	**Annual Operation (hours)**	**Retro-Unit Description**	**Horsepower**	**Unit Cost Installed**	**Remaining Life/ Service Life**	**Unit Cost for ECM Analysis**	**kWh Savings**	**Yearly $ Savings**
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible	3153		15	1700	28920	2	20	4117	no change						
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible			15	1700	28920	2	20	4117	no change						
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible			15	1700	28920	2	20	4117	no change						
VFD Pump #1	Super-Structure	none										Eaton-Cutler Hammer SVX9000	15	20000	20	20000	1607	263
VFD Pump #2	Super-Structure	none										Eaton-Cutler Hammer SVX9000	15	20000	20	20000	1607	263
VFD Pump #3	Super-Structure	none										Eaton-Cutler Hammer SVX9000	15	20000	20	20000	1607	263
Grinder	Wet Well	Franklin Miller				5										0		
Emergency Generator		Onan/Cummins	105 kW															

INVESTMENT GRADE LIGHTING AUDIT

CONCORD ENERGY SERVICES

Riverside Drive Pump Station

CEG Job #: PBM00500.01
Project: Brick Energy Audit
Address: Riverside Drive PS
City: Brick Twp.
Building SF: 4,652

DATE: 12/24/2009
KWH COST: $0.16

ECM # 1: Lighting Upgrade

EXISTING LIGHTING										PROPOSED LIGHTING								SAVINGS			
Line No.	Fixture Location	No. Fixts	No of Lamps	Fixture Type	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (Installed)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Payback
1	Exterior of Building	9		Flood Lamps			0.00	0	$0.00	9	No Change		0.00	0	0		$0.00	0.00	0	0	0.00
2	Interior - 1st Floor	7	2	4' Flourescent Fixtures, 2- T12 bulbs	300	80	0.56	168	$26.81	7	4' Flourescent Fixtures, 2- T8 bulbs	55	0.39	115.5	$18.43	$120.00	$840.00	0.18	52.5	$8.38	100.25
3	Interior - 1st Floor restroom	6	2	4' Flourescent Fixtures, 2- T12 bulbs	150	80	0.48	72	$11.49	6	4' Flourescent Fixtures, 2- T8 bulbs	55	0.33	49.5	$7.90	$120.00	$720.00	0.15	22.5	$3.59	200.50
4	Interior - Middle Floor	7	2	4' Flourescent Fixtures, 2- T12 bulbs	200	80	0.56	112	$17.88	7	4' Flourescent Fixtures, 2- T8 bulbs	55	0.39	77	$12.29	$120.00	$840.00	0.18	35	$5.59	150.38
5	Interior - Bottom Floor	8	2	4' Flourescent Fixtures, 2- T12 bulbs	200	80	0.64	128	$20.43	8	4' Flourescent Fixtures, 2- T8 bulbs	55	0.44	88	$14.04	$120.00	$960.00	0.20	40	$6.38	150.38
	Totals	37					2.24	480	$76.61	37			1.54	330	$52.67		$3,360.00	0.70	150	$23.94	140.35

INVESTMENT GRADE LIGHTING AUDIT

CONCORD ENERGY SERVICES

Bay Harbor Boulevard Waste Water Pump Station

CEG Job #: PBM00500.01
Project: Brick Energy Audit
Address: Bay Harbor P.S
City: Brick Twp.
Building SF: 4,652

DATE: 12/24/2009
KWH COST: $0.16

ECM # 1: Lighting Upgrade

EXISTING LIGHTING											PROPOSED LIGHTING							SAVINGS			
Line No.		Fixture Location	No. eFixts	Fixture eType	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. rFixts	Retro-Unit rDescription	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (Installed)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Payback
1		Exterior of Building	8	Flood Lamps			0.00	0	$0.00	8			0.00	0	0		$0.00	0.00	0	0	0.00
2		Interior - 1st Floor	8	4' Fluorescent Fixtures, 2- T12 bulbs	300	80	0.64	192	$31.47	8	4' Fluorescent Fixtures, 2- T8 bulbs	55	0.44	132	$21.63	$120.00	$960.00	0.20	60	$9.83	97.62
3		Interior - 1st Floor restroom	6	4' Fluorescent Fixtures, 2- T12 bulbs	150	80	0.48	72	$11.80	6	4' Fluorescent Fixtures, 2- T8 bulbs	55	0.33	49.5	$8.11	$120.00	$720.00	0.15	22.5	$3.69	195.24
4		Interior - Middle Floor	7	4' Fluorescent Fixtures, 2- T12 bulbs	200	80	0.56	112	$18.36	7	4' Fluorescent Fixtures, 2- T8 bulbs	55	0.39	77	$12.62	$120.00	$840.00	0.18	35	$5.74	146.43
5		Interior - Bottom Floor	8	4' Fluorescent Fixtures, 2- T12 bulbs	200	80	0.64	128	$20.98	8	4' Fluorescent Fixtures, 2- T8 bulbs	55	0.44	88	$14.42	$120.00	$960.00	0.20	40	$6.56	146.43
		Totals	37				2.32	504	$82.61	37			1.60	346.5	$56.79		$3,480.00	0.73	157.5	$25.81	134.81

INVESTMENT GRADE LIGHTING AUDIT

CONCORD ENERGY SERVICES

CEG Job #: PBM00500.01
Project: Brick Energy Audit
Address: Drum Point P.S.
City: Brick Twp.
Building SF: 4,652

Drum Point Road Waste Water Pump Station

DATE: 12/24/2009
KWH COST: $0.17

ECM # 1: Lighting Upgrade

EXISTING LIGHTING									PROPOSED LIGHTING								SAVINGS			
Line No.	Fixture Location	No. Fixts	Fixture Type	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (Installed)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Payback
1	Exterior of Building	8	Flood Lamps			0.00	0	$0.00	8	No Change		0.00	0	0		$0.00	0.00	0	0	0.00
2	Interior - 1st Floor	7	4' Fluorescent Fixtures, 2-T12 bulbs	300	80	0.56	168	$28.11	7	4' Fluorescent Fixtures, 2- T8 bulbs	55	0.39	115.5	$19.32	$120.00	$840.00	0.18	52.5	8.78325	95.64
3	Interior - 1st Floor restroom	4	4' Fluorescent Fixtures, 2-T12 bulbs	150	80	0.32	48	$8.03	4	4' Fluorescent Fixtures, 2- T8 bulbs	55	0.22	33	$5.52	$120.00	$480.00	0.10	15	2.5095	191.27
4	Interior - Middle Floor	7	4' Fluorescent Fixtures, 2-T12 bulbs	200	80	0.56	112	$18.74	7	4' Fluorescent Fixtures, 2- T8 bulbs	55	0.39	77	$12.88	$120.00	$840.00	0.18	35	5.8555	143.45
5	Interior - Bottom Floor	8	4' Fluorescent Fixtures, 2-T12 bulbs	200	80	0.64	128	$21.41	8	4' Fluorescent Fixtures, 2- T8 bulbs	55	0.44	88	$14.72	$120.00	$960.00	0.20	40	6.692	143.45
	Totals	34				2.08	456	$76.29	34			1.43	313.5	$52.45		$3,120.00	0.65	142.5	$23.84	130.87

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Brick Township Municipal Utilities Authority

ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY

ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Saving * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
Riverside Drive Pump Station															
ECM #1A	Lighting Upgrade - General	$1,910	$1,450	$280	$3,080	$24	$63	$87	15	$1,305	$945	-57.6%	35.4	-9.21%	($2,041.40)
ECM #2A	Lighting Controls	$269	$409	$105	$573	$59	$0	$59	15	$885	$0	54.5%	9.7	6.00%	$131.34
ECM #3A	Pump and Motor System Upgrade©	$20,000	$20,000	$6,815	$33,185	$6,798	$0	$6,798	20	$135,960	$0	309.7%	4.9	19.95%	$67,952.07
Drum Point Road Pump Station															
ECM #1B	Lighting Upgrade - General	$1,820	$1,300	$260	$2,860	$24	$63	$87	15	$1,305	$945	-54.4%	32.9	-8.51%	($1,821.40)
ECM #2B	Lighting Controls	$269	$409	$105	$573	$56	$0	$56	15	$840	$0	46.6%	10.2	5.21%	$95.52
ECM #3B	Pump and Motor System Upgrade©	$25,000	$25,000	$0	$50,000	$650	$0	$650	20	$13,000	$0	-74.0%	76.9	-10.41%	($40,329.64)
Bay Harbor Boulevard Pump Station															
ECM #1C	Lighting Upgrade - General	$2,030	$1,450	$290	$3,190	$26	$20	$46	15	$690	$300	-78.4%	69.3	-14.97%	($2,640.85)
ECM #2C	Lighting Controls	$269	$409	$105	$573	$54	$0	$54	15	$810	$0	41.4%	10.6	4.68%	$71.65
ECM #3C	Pump and Motor System Upgrade©	$30,000	$30,000	$0	$60,000	$790	$0	$790	20	$15,800	$0	-73.7%	75.9	-10.32%	($48,246.79)

Notes: 1) The variable Cn in the formulas for Internal Rate of Return and Net Present Value stands for the cash flow during each period.
2) The variable DR in the NPV equation stands for Discount Rate
3) For NPV and IRR calculations: From n=0 to N periods where N is the *lifetime of ECM* and Cn is the *cash flow during each period* .

MAJOR EQUIPMENT LIST

Concord Energy Group

Brick Township MUA Drum Point Road Wastewater Pumping Station

Large Motors >25HP												Proposed Equipment					Savings	
Service	Location	Manufacturer	Type	Model Number	Serial Number	Rated Horsepower (hp)	Speed (rpm)	Annual Power Consumption (kWh/year)	Approx. Age	Remaing Life	Annual Operation (hours)	Retro-Unit Description	Horsepower	Unit Cost Installed	Remaining Life/ Service Life	Unit Cost for ECM Analysis	kWh Savings	Yearly $ Savings
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible	3153		15	1700	28920	2	20	4117	no change						
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible			15	1700	28920	2	20	4117	no change						
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible			15	1700	28920	2	20	4117	no change						
VFD Pump #1	Super-Structure	Mitsubishi	frequency			15	53 Hz	-----	2	20	2000	Install variable capability and flow matcher	15	10000	20	10000	1322	217
VFD Pump #2	Super-Structure	none										Eaton-Cutler Hammer SVX9000	15	20000	20	20000	1323	217
VFD Pump #3	Super-Structure	none										Eaton-Cutler Hammer SVX9000	15	20000	20	20000	1323	217
Grinder	Wet Well	JWC				5												
Emergency Generator		Onan/Cummins	105 kW															

MAJOR EQUIPMENT LIST

Concord Energy Group

Brick Township MUA Bay Harbor Boulevard Wastewater Pumping Station

Large Motors >25HP												Proposed Equipment					Savings	
Service	**Location**	**Manufacturer**	**Type**	**Model Number**	**Serial Number**	**Rated Horsepower (hp)**	**Speed (rpm)**	**Annual Power Consumption (kWh/year)**	**Approx. Age**	**Remaing Life**	**Annual Operation (hours)**	**Retro-Unit Description**	**Horsepower**	**Unit Cost Installed**	**Remaining Life/ Service Life**	**Unit Cost for ECM Analysis**	**kWh Savings**	**Yearly $ Savings**
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible	3153		15	1700	28920	2	20	4117	no change						
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible			15	1700	28920	2	20	4117	no change						
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible			15	1700	28920	2	20	4117	no change						
VFD Pump #1	Super-Structure	none										Eaton-Cutler Hammer SVX9000	15	20000	20	20000	1607	263
VFD Pump #2	Super-Structure	none										Eaton-Cutler Hammer SVX9000	15	20000	20	20000	1607	263
VFD Pump #3	Super-Structure	none										Eaton-Cutler Hammer SVX9000	15	20000	20	20000	1607	263
Grinder	Wet Well	Franklin Miller				5										0		
Emergency Generator		Onan/Cummins	105 kW															

MAJOR EQUIPMENT LIST

Concord Energy Group

Brick Township MUA Bay Harbor Boulevard Wastewater Pumping Station

Large Motors >25HP												Proposed Equipment					Savings	
Service	**Location**	**Manufacturer**	**Type**	**Model Number**	**Serial Number**	**Rated Horsepower (hp)**	**Speed (rpm)**	**Annual Power Consumption (kWh/year)**	**Approx. Age**	**Remaing Life**	**Annual Operation (hours)**	**Retro-Unit Description**	**Horsepower**	**Unit Cost Installed**	**Remaining Life/ Service Life**	**Unit Cost for ECM Analysis**	**kWh Savings**	**Yearly $ Savings**
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible	3153		15	1700	28920	2	20	4117	no change						
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible			15	1700	28920	2	20	4117	no change						
Sewage Pumps	Dry Well	ITT Flygt	dry pit submersible			15	1700	28920	2	20	4117	no change						
VFD Pump #1	Super-Structure	none										Eaton-Cutler Hammer SVX9000	15	20000	20	20000	1607	263
VFD Pump #2	Super-Structure	none										Eaton-Cutler Hammer SVX9000	15	20000	20	20000	1607	263
VFD Pump #3	Super-Structure	none										Eaton-Cutler Hammer SVX9000	15	20000	20	20000	1607	263
Grinder	Wet Well	Franklin Miller				5										0		
Emergency Generator		Onan/Cummins	105 kW															

INVESTMENT GRADE LIGHTING AUDIT

CONCORD ENERGY SERVICES

Riverside Drive Pump Station

CEG Job #: PBM00500.01
Project: Brick Energy Audit
Address: Riverside Drive PS
City: Brick Twp.
Building SF: 4,652

DATE: 12/24/2009
KWH COST: $0.16

ECM # 1: Lighting Upgrade

EXISTING LIGHTING										PROPOSED LIGHTING								SAVINGS			
Line No.	Fixture Location	No. Fixts	No of Lamps	Fixture Type	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (Installed)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Payback
1	Exterior of Building	9		Flood Lamps			0.00	0	$0.00	9	No Change		0.00	0	0		$0.00	0.00	0	0	0.00
2	Interior - 1st Floor	7	2	4' Flourescent Fixtures, 2- T12 bulbs	300	80	0.56	168	$26.81	7	4' Flourescent Fixtures, 2- T8 bulbs	55	0.39	115.5	$18.43	$120.00	$840.00	0.18	52.5	$8.38	100.25
3	Interior - 1st Floor restroom	6	2	4' Flourescent Fixtures, 2- T12 bulbs	150	80	0.48	72	$11.49	6	4' Flourescent Fixtures, 2- T8 bulbs	55	0.33	49.5	$7.90	$120.00	$720.00	0.15	22.5	$3.59	200.50
4	Interior - Middle Floor	7	2	4' Flourescent Fixtures, 2- T12 bulbs	200	80	0.56	112	$17.88	7	4' Flourescent Fixtures, 2- T8 bulbs	55	0.39	77	$12.29	$120.00	$840.00	0.18	35	$5.59	150.38
5	Interior - Bottom Floor	8	2	4' Flourescent Fixtures, 2- T12 bulbs	200	80	0.64	128	$20.43	8	4' Flourescent Fixtures, 2- T8 bulbs	55	0.44	88	$14.04	$120.00	$960.00	0.20	40	$6.38	150.38
	Totals	37					2.24	480	$76.61	37			1.54	330	$52.67		$3,360.00	0.70	150	$23.94	140.35

INVESTMENT GRADE LIGHTING AUDIT

CONCORD ENERGY SERVICES

CEG Job #: PBM00500.01
Project: Brick Energy Audit
Address: Drum Point P.S.
City: Brick Twp.
Building SF: 4,652

Drum Point Road Waste Water Pump Station

DATE: 12/24/2009
KWH COST: $0.17

ECM # 1: Lighting Upgrade

EXISTING LIGHTING									PROPOSED LIGHTING								SAVINGS			
Line No.	Fixture Location	No. Fixts	Fixture Type	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (Installed)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Payback
1	Exterior of Building	8	Flood Lamps			0.00	0	$0.00	8	No Change		0.00	0	0		$0.00	0.00	0	0	0.00
2	Interior - 1st Floor	7	4' Fluorescent Fixtures, 2-T12 bulbs	300	80	0.56	168	$28.11	7	4' Fluorescent Fixtures, 2- T8 bulbs	55	0.39	115.5	$19.32	$120.00	$840.00	0.18	52.5	8.78325	95.64
3	Interior - 1st Floor restroom	4	4' Fluorescent Fixtures, 2-T12 bulbs	150	80	0.32	48	$8.03	4	4' Fluorescent Fixtures, 2- T8 bulbs	55	0.22	33	$5.52	$120.00	$480.00	0.10	15	2.5095	191.27
4	Interior - Middle Floor	7	4' Fluorescent Fixtures, 2-T12 bulbs	200	80	0.56	112	$18.74	7	4' Fluorescent Fixtures, 2- T8 bulbs	55	0.39	77	$12.88	$120.00	$840.00	0.18	35	5.8555	143.45
5	Interior - Bottom Floor	8	4' Fluorescent Fixtures, 2-T12 bulbs	200	80	0.64	128	$21.41	8	4' Fluorescent Fixtures, 2- T8 bulbs	55	0.44	88	$14.72	$120.00	$960.00	0.20	40	6.692	143.45
	Totals	34				2.08	456	$76.29	34			1.43	313.5	$52.45		$3,120.00	0.65	142.5	$23.84	130.87

INVESTMENT GRADE LIGHTING AUDIT

CONCORD ENERGY SERVICES

Riverside Drive Pump Station

CEG Job #: PBM00500.01
Project: Brick Energy Audit
Address: Riverside Drive PS
City: Brick Twp.
Building SF: 4,652

DATE: 12/24/2009
KWH COST: $0.16

ECM # 2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING								SAVINGS			
Line No.	Fixture Location	No. Fixts	No of Lamps	Fixture Type	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Reduction %	Yearly $ Cost	Unit Cost (Installed)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Payback
1	Exterior of Building	9		Flood Lamps	1460	150	1.35	1971	$314.57	9	Photocell	120	1.08	1576.8	20%	251.657	$238.00	$238.00	0.27	394.2	62.91432	3.78
2	Interior - 1st Floor	7	2	4' Flourescent Fixtures, 2- T12 bulbs	300	68	0.48	142.8	$22.79	7	Dual technology occupancy sensor	57.8	0.40	121.38	15%	$19.37	$110.00	$110.00	0.07	21.42	$3.42	32.18
3	Interior - 1st Floor restroom	6	2	4' Flourescent Fixtures, 2- T12 bulbs	150	68	0.41	61.2	$9.77	6	Dual technology occupancy sensor	57.8	0.35	52.02	15%	$8.30	$110.00	$110.00	0.06	9.18	$1.47	75.08
4	Interior - Middle Floor	7	2	4' Flourescent Fixtures, 2- T12 bulbs	200	68	0.48	95.2	$15.19	7	Dual technology occupancy sensor	57.8	0.40	80.92	15%	$12.91	$110.00	$110.00	0.07	14.28	$2.28	48.26
5	Interior - Bottom Floor	8	2	4' Flourescent Fixtures, 2- T12 bulbs	200	68	0.54	108.8	$17.36	8	Dual technology occupancy sensor	57.8	0.46	92.48	15%	$14.76	$110.00	$110.00	0.08	16.32	$2.60	42.23
	Totals	37					3.25	2379	$379.69	37			2.70	1923.6		$307.01		$678.00	0.56	455.4	$72.68	9.33

INVESTMENT GRADE LIGHTING AUDIT

CONCORD ENERGY SERVICES

Riverside Drive Pump Station

CEG Job #: PBM00500.01
Project: Brick Energy Audit
Address: Riverside Drive PS
City: Brick Twp.
Building SF: 4,652

DATE: 12/24/2009
KWH COST: $0.16

ECM # 2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING								SAVINGS			
Line No.	Fixture Location	No. Fixts	No of Lamps	Fixture Type	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Reduction %	Yearly $ Cost	Unit Cost (Installed)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Payback
1	Exterior of Building	9		Flood Lamps	1460	150	1.35	1971	$314.57	9	Photocell	120	1.08	1576.8	20%	251.657	$238.00	$238.00	0.27	394.2	62.91432	3.78
2	Interior - 1st Floor	7	2	4' Flourescent Fixtures, 2- T12 bulbs	300	68	0.48	142.8	$22.79	7	Dual technology occupancy sensor	57.8	0.40	121.38	15%	$19.37	$110.00	$110.00	0.07	21.42	$3.42	32.18
3	Interior - 1st Floor restroom	6	2	4' Flourescent Fixtures, 2- T12 bulbs	150	68	0.41	61.2	$9.77	6	Dual technology occupancy sensor	57.8	0.35	52.02	15%	$8.30	$110.00	$110.00	0.06	9.18	$1.47	75.08
4	Interior - Middle Floor	7	2	4' Flourescent Fixtures, 2- T12 bulbs	200	68	0.48	95.2	$15.19	7	Dual technology occupancy sensor	57.8	0.40	80.92	15%	$12.91	$110.00	$110.00	0.07	14.28	$2.28	48.26
5	Interior - Bottom Floor	8	2	4' Flourescent Fixtures, 2- T12 bulbs	200	68	0.54	108.8	$17.36	8	Dual technology occupancy sensor	57.8	0.46	92.48	15%	$14.76	$110.00	$110.00	0.08	16.32	$2.60	42.23
	Totals	37					3.25	2379	$379.69	37			2.70	1923.6		$307.01		$678.00	0.56	455.4	$72.68	9.33

INVESTMENT GRADE LIGHTING AUDIT

CONCORD ENERGY SERVICES

Drum Point Pump Station

CEG Job #: PBM00500.01
Project: Brick Energy Audit
Address: Drum Point P.S.
City: Brick Twp.
Building SF: 4,652

DATE: 12/24/2009
KWH COST: $0.17

ECM # 2: Lighting Controls

EXISTING LIGHTING									PROPOSED LIGHTING									SAVINGS			
Line No.	Fixture Location	No. Fixts	Fixture Type	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Reduction %	Unit Cost (Installed)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Payback
1	Exterior of Building	8	Flood Lamps	1460	150	1.20	1752	$293.11	8	Photocell	120	0.96	1401.6	234.488	20%	$238.00	$238.00	0.24	350.4	58.62192	4.06
2	Interior - 1st Floor	7	4' Flourescent Fixtures, 2- T12 bulbs	300	68	0.48	142.8	$23.89	7	Dual technology occupancy sensor	57.8	0.40	121.38	$20.31	15%	$110.00	$110.00	0.07	21.42	3.583566	30.70
3	Interior - 1st Floor restroom	4	4' Flourescent Fixtures, 2- T12 bulbs	150	68	0.27	40.8	$6.83	4	Dual technology occupancy sensor	57.8	0.23	34.68	$5.80	15%	$110.00	$110.00	0.04	6.12	1.023876	107.43
4	Interior - Middle Floor	7	4' Flourescent Fixtures, 2- T12 bulbs	200	68	0.48	95.2	$15.93	7	Dual technology occupancy sensor	57.8	0.40	80.92	$13.54	15%	$110.00	$110.00	0.07	14.28	2.389044	46.04
5	Interior - Bottom Floor	8	4' Flourescent Fixtures, 2- T12 bulbs	200	68	0.54	108.8	$18.20	8	Dual technology occupancy sensor	57.8	0.46	92.48	$15.47	15%	$110.00	$110.00	0.08	16.32	2.730336	40.29
	Totals	34				2.97	2139.6	$357.96	34			2.46	1731.1	$289.61			$678.00	0.51	408.54	$68.35	9.92

INVESTMENT GRADE LIGHTING AUDIT

CONCORD ENERGY SERVICES

Bay Harbor Pump Station

CEG Job #: PBM00500.01
Project: Brick Energy Audit
Address: Bay Harbor P.S
City: Brick Twp.
Building SF: 4,652

DATE: 12/24/2009
KWH COST: $0.16

ECM # 2: Lighting Controls

EXISTING LIGHTING											PROPOSED LIGHTING								SAVINGS			
Line No.		Fixture Location	No. Fixts	Fixture Type	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Reduction %	Unit Cost (Installed)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Payback
1		Exterior of Building	8	Flood Lamps	1460	150	1.20	1752	$287.15	8	Photocell	120	0.96	1401.6	229.72224	20%	$238.00	$238.00	0.24	350.4	57.4306	4.14
2		Interior - 1st Floor	8	4' Flourescent Fixtures, 2- T12 bulbs	300	68	0.54	163.2	$26.75	8	Dual technology occupancy sensor	57.8	0.46	138.72	$22.74	15%	$110.00	$110.00	0.08	24.48	$4.01	27.42
3		Interior - 1st Floor restroom	6	4' Flourescent Fixtures, 2- T12 bulbs	150	68	0.41	61.2	$10.03	6	Dual technology occupancy sensor	57.8	0.35	52.02	$8.53	15%	$110.00	$110.00	0.06	9.18	$1.50	73.11
4		Interior - Middle Floor	7	4' Flourescent Fixtures, 2- T12 bulbs	200	68	0.48	95.2	$15.60	7	Dual technology occupancy sensor	57.8	0.40	80.92	$13.26	15%	$110.00	$110.00	0.07	14.28	$2.34	47.00
5		Interior - Bottom Floor	8	4' Flourescent Fixtures, 2- T12 bulbs	200	68	0.54	108.8	$17.83	8	Dual technology occupancy sensor	57.8	0.46	92.48	$15.16	15%	$110.00	$110.00	0.08	16.32	$2.67	41.12
		Totals	37				3.17	2180.4	$357.37	37			2.64	1765.74	$289.40			$678.00	0.54	414.66	$67.96	9.98