Bordentown Sewerage Authority
New Jersey

Final Energy Audit Report

September 2010

CDM

Contents

Section 4 Energy Conservation and Retrofit Measures (ECRM)

Appendices

Executive Summary

As part of an initiative to reduce energy cost and consumption, the Bordentown Sewerage Authority (BSA) has secured the services of Camp Dresser and McKee (CDM) to perform an energy audit at their wastewater treatment plant and remote pumping stations which are owned and operated by BSA in an effort to develop comprehensive Energy Conservation and Retrofit Measures (ECRMs).

CDM's energy audit team visited the facilities on April 15th 2010. As a result of the site visits and evaluation of the historical energy usage of the facilities, CDM was successful in identifying opportunities for energy savings measures.

CDM has also evaluated the potential for renewable energy technologies to be implemented at BSA's wastewater treatment plant facility to offset the electrical energy usage. Specifically, the use of solar electric photovoltaic panels, combined heat and power co-generation systems, ground source heat pumps and wind turbines were investigated.

In addition to identifying ECRMs and the potential for on-site energy generation, an alternate third party supplier was contacted in an effort to identify further energy cost savings available for BSA. This is discussed further in Section 5. Additionally, there is potential for BSA to make money by participation in a Demand Response Program, as discussed in Section 5.2.

Not all ECRMs identified as a result of the energy audit are recommended. ECRMs must be economically feasible to be recommended for implementation. The feasibility of each ECRM was measured through a simple payback analysis. The simple payback period was determined after establishing Engineer's Opinion of Probable Construction Cost estimates, O&M estimates, projected annual energy savings estimates, and the potential value of New Jersey Clean Energy rebates, or Renewable Energy Credits, if applicable. Generally, ECRMs with a payback period of 20 years or less are recommended, unless other factors such as wastewater system operational issues need to be factored into the decision process.

Historical Energy Usage

The following table, Table ES-1, summarizes the historical energy usage at each of facility, for the average from January 2009 through January 2010, as presented in Section 3. These values can serve as a benchmarking tool, along with the building profile that has been established through the EPA's Portfolio Manager Program for the wastewater treatment plant facility, to quantify the reduction in electrical energy and natural gas usage following the implementation of the recommended ECRMs.

Table ES-1: Summary of Annual Energy Usage & Cost						
	Electrical Energy Use (kWH)	Peak Summer Demand (kW)	Peak Winter Demand (kW)	Fuel Use for Entire Building (therms)	Cost for Electric Service	Cost for Fuel
Wastewater Treatment Plant Facility	2,303,602	336	437	5,704	$274,062	$6,699
Bossert Pump Station	28,219	14	33	-	$4,791	-
Lauren Run Pump Station	46,773	26	14	-	$7,508	$4,467
Mile Hollow Pump Station	95,945	48	32	-	$15,964	-
Park Street Pump Station	52,735	45	12	-	$9,948	-

Wastewater Process Improvements ECRMs

The following table, Table ES-2, presents the recommended ECRM identified

Table ES-2 Ranking of Energy Savings Measures for Wastewater Process Improvements					
Overall Ranking (Based on Simple Payback)	Site	Total Cost	Anticipated Annual Energy Savings	Annual Fiscal Savings[1]	Simple Payback (Years)
1	**Sludge Holding Tank Mixing System**	$144,000	336,864 kWh	$38,854	3.7

1. Annual Fiscal Savings accounts for maintenance costs.

Building Lighting and HVAC System ECRMs

The following table, Table ES-3, presents the ranking of recommended ECRMs identified for the building lighting and HVAC systems based on the simple payback analysis.

Additional ECRMs associated were identified and evaluated, as discussed in Sections 2 and 4; but, were not recommended due to longer payback periods. This table includes the Engineer's Opinion of Probable Construction Cost, projected annual energy cost savings, projected annual energy usage savings, and total simple payback period for each recommended ECRM. The ECRMs are ranked based on payback period.

Table ES-3[1] Ranking of Energy Savings Measures for Building Lighting and HVAC Systems					
Overall Ranking (Based on Simple Payback)	**Site**	**Total Cost**	**Anticipated Annual Energy Savings**	**Annual Fiscal Savings[3]**	**Simple Payback (Years)**
1	**Laurel Run Pump Station Building – Exterior Lighting**	$77.6	225.1 kWh	$150.7	**0.5**
2	**Mile Hollow Pump Station (Dog Pound) – Exterior Lighting**	$35.9	6,552.5 kWh	$57.5	**0.6**
3	**Bossert Pump Station Building – Exterior Lighting**	$143.8	1,092.8 kWh	$228.9	**0.6**
4	**Mile Hollow Pump Station (Main Building) – Exterior Lighting**	$107.8	255.64 kWh	$172.6	**0.6**
5	**Site & Roadway Lighting**	$6,060.5	1,293.6 kWh	$784.5	**7.7**
6	**Park Street No.1 Pump Station Building – Interior Lighting**	$422.8	2,710.4 kWh	$41.4	**10.2**
7	**Administration Building – Interior Lighting**	$25,775.4	14,990.4 kWh	$2,044	**12.6**
8	**Solids Processing Building – Interior Lighting**	$18,322.1	1,243.7 kWh	$1,368.5	**13.4**
9	**Pump Station 2 Building – Interior Lighting**	$2,565.3	1,810.5 kWh	$186.7	**13.7**
10	**Solids Holding Building – Interior Lighting**	$5,545.3	724.2 kWh	$397.2	**14.0**
11	**Chlorine & Sulfur Dioxide Building – Interior Lighting**	$3,776.4	1,558.6 kWh	$260.1	**14.5**
12	**Pump Station 1 Building – Interior Lighting**	$1,598.1	10,061.7 kWh	$104.0	**15.4**

1. 'Total Cost' takes into account any applicable rebates.
2. Savings assume all building heat provided by natural gas, at current natural gas aggregate rate per therm
3. 'Annual Fiscal Savings' takes into account maintenance costs.

Motor Upgrades and VFD Addition ECRMs

Section 4.4 of the report provides for an economic evaluation of upgrading all motors over 20 HP to premium efficiency, and adding VFDs to pumps that are currently utilizing other forms of starters.

Table ES-4 includes a simple payback analysis for the upgrade of motors, and addition of VFDs.

Table ES-4 Ranking of Energy Savings Measures for Motor Upgrades and VFDs					
Overall Ranking (Based on Simple Payback)	**Site**	**Total Cost[1]**	**Anticipated Annual Energy Savings**	**Annual Fiscal Savings[2]**	**Simple Payback (Years)**
1	**Oxidation Ditch – Motor & VFD Upgrades**	$194,083.50	447,623.1 kWh	$73,992.10	**2.6**
2	**All Combined Motors– Motor & VFD Upgrades**	$293,126.94	547,088.0 kWh	$85,964.31	**3.4**
3	**Grit & Bar Screen Building – Motor Upgrades**	$1,660.75	2,802.0 kWh	$331.47	**5.0**
4	**Solids Processing Building – Motor & VFD Upgrades**	$64,493.63	89,313.4 kWh	$10,824.12	**6.0**

1. 'Total Cost' takes into account any applicable rebates.
2. 'Annual Fiscal Savings' takes into account maintenance costs.

Renewable Energy ECRMs

Solar Energy

Section 4.5 of the report provides for an economic evaluation of a PV solar system that was evaluated to be installed at Bordentown Sewerage Authority facilities. The evaluation covered the economic feasibility of BSA installing a solar energy system under a typical construction contract and to assume full responsibility of the operation of such a system.

Based on a simple payback model, summarized in Table ES-5, it would benefit BSA to further investigate the installation of a solar energy system at the Black Creek Wastewater facility, Mile Hollow Pump Station, Laurel Run Pump Station, and Bossert Pump Station. This is primarily based on the initial upfront capital investment required for a solar energy system installation and the combined 18.5 year payback period. This payback period may justify installing the solar energy system. Other options such as Power Purchase Agreements are potentially available as well to help finance the project. Solar technology is constantly changing and will most likely continue to lower in price.

Two major factors influencing the project financial evaluation is the variance of the prevailing energy market conditions and Solar Renewable Energy Credit (SREC) rates, with the largest impact to the payback model being the SREC credit pricing. For the payback model, conservative estimates of the SREC's market value over a 15 year period were assumed, as discussed in Section 4.5.

Table ES-5 includes a simple payback analysis for the installation of a solar energy system at BSA. Refer to Appendix E for a more detailed solar financing spreadsheet.

Table ES-5: Simple Payback Analysis for Solar Energy System	
Parameter	**Solar**
Engineer's Opinion of Probable Cost	$7,091,450
1st Year Production	729,805 kWh
Annual Electric Savings	$86,335.9
Annual Estimated SREC Revenue	$308,708.0
Project Simple Payback	**18.0 Years**

Recommended ECRMs

Table ES-6 summarizes the Total Engineer's Opinion of Probable Construction Cost, annual energy savings, projected annual energy and O&M cost savings and the payback period based on the implementation of all of the above recommended ECRMs.

Table ES-6: Recommended ECRM's[1]			
Total Engineer's Opinion of Probable Construction Cost	**Projected Annual Energy Savings (kWH or therms)**	**Projected Annual Fiscal Savings**	**Simple Payback Period (years)**
$761,796	373,383 kWh	$215,762	3.5

1. Does not include energy savings associated with Solar Energy System or Wind Power Generation. Includes motor and VFD upgrades for "All Combined Motors" from Table ES-4.

Section 1
Introduction

1.1 General

As part of an initiative to reduce energy cost and consumption, the Bordentown Sewerage Authority (BSA) has secured the services of Camp Dresser and McKee (CDM) to perform an energy audit for their wastewater treatment plant and remote pumping stations in an effort to develop comprehensive energy conservation initiatives.

The performance of an Energy Audit requires a coordinated phased approach to identify, evaluate and recommend energy conservation and retrofit measures (ECRM). The various phases conducted under this Energy Audit included the following:

- Gather preliminary data on all facilities;
- Facility inspection;
- Identify and evaluate potential ECRMs and evaluate renewable/distributed energy measures;
- Develop the energy audit report.

Figure 1-1 is a schematic representation of the phases utilized by CDM to prepare the Energy Audit Report.

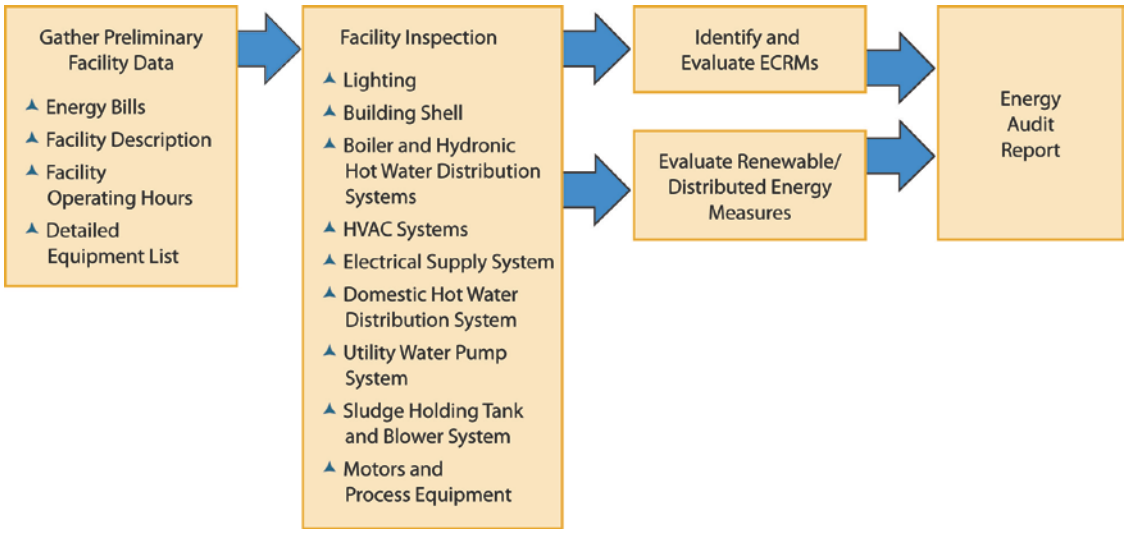


Figure 1-1: Energy Audit Phases

1.2 Background

The Bordentown Sewerage Authority (BSA) owns and operates a 3.0 MGD wastewater treatment facility located in Bordentown, New Jersey named the Black's Creek Wastewater Treatment Facility. The collection system consists of 60 miles of sewer pipes and thirteen (13) remote pump stations. At the present time, the Black's Creek Wastewater Treatment Facility treats approximately 1.8- 2.0 million gallons per day.

The wastewater treatment plant utilizes the Activated Sludge process to provide primary and secondary treatment for the removal of BOD_5 and suspended solids in the wastewater flow. Primary treatment consists of influent pumping, grit, and screening removal, and primary clarification. Secondary treatment consists of aeration (oxidation ditches), final sedimentation, and chlorine disinfection. Treated wastewater is ultimately discharged into Black's Creek. Primary sludge is conveyed to one of the two sludge storage tanks where it is combined with waste activated sludge. The combined sludge is mixed with air prior to being conveyed to the belt filter presses located in the Sludge/Chemical Building where sludge cake is produced at a concentration of 14%-15% solids and hauled to Burlington County Composting Facility.

1.3 Purpose and Scope

The objective of the energy audit is to identify energy conservation and retrofit measures to reduce energy usage and to develop an economic basis to financially validate the planning and implementation of identified energy conservation and retrofit measures.

Significant energy savings may be available with retrofits to the buildings' envelopes, heating and cooling systems and lighting systems. It should be noted that the magnitude of energy savings available is not only dependent on the type of treatment process and delivery systems in use, but also on the age and condition of the equipment and the capital available to implement major changes. Therefore, with the growing demands for electricity and the increased cost for this electricity, feasible alternatives for reducing energy consumption and operating costs must be evaluated for each wastewater treatment plant on a case-by-case basis.

The purpose of this energy audit is to identify the various critical processes within the wastewater treatment plant facility and remote pumping stations that have been included in the Request for Proposal, namely Bossert, Laurel Run, Mile Hollow and Park Street pump stations that are major consumers of electrical energy and are clear candidates for energy savings measures. In addition, potential energy producing systems such as combined heat and power co-generation, solar electric, ground source heat pumps, and wind energy systems to be located at the wastewater treatment plant were also evaluated. A discussion on these technologies is included in Section 4 Energy Conservation and Retrofit Measures (ECRM).

The existing process systems that have been identified for possible energy savings retrofits include the following:

Wastewater Treatment Plant

- Sludge Holding Tanks
- Building HVAC Systems;
- Building Lighting Systems; and
- Motor Upgrades.

In addition to identifying ECRMs and the potential for on-site energy generation, alternative third party suppliers were contacted in an effort to identify further cost savings available for the Authority, by switching service providers. This is discussed further in Section 5.

Section 2
Facility Description

2.1 Wastewater Treatment Facility

The Bordentown Sewerage Authority (BSA) owns and operates a wastewater collection system and a 3.0 MGD wastewater treatment facility known as Black's Creek Wastewater Treatment Plant located in Bordentown, New Jersey. The system consists of 60 miles of sewer pipe and thirteen (13) remote pump stations. BSA receives and treats wastewater from Bordentown City and Bordentown Township.

The plant operates under NJPDES Permit No.NJ0024678 and is rated at an annual average flow of 3.0 MGD. Treated effluent from the wastewater treatment facility discharges by gravity through about 75 feet of pipe to Black's Creek about 1 mile upstream of the Delaware River.

The existing treatment plant utilizes an Activated Sludge Treatment Process. The primary settling tanks serve as treatment units for the reduction of BOD_5 and solids from the raw wastewater prior to the wastewater entering the oxidation ditches.. Air is introduced during secondary treatment in the aeration tanks located downstream of the primary clarifiers. Secondary treatment also consists of two (2) final clarifiers.

2.1.1 Influent Pump Station

Upon entering Black's Creek Treatment Plant, wastewater from the Authority's collection system is lifted through an influent internal screw pump station at an elevation high enough to allow the wastewater flow to be conveyed by gravity through the entire treatment process. There are three (3) internal screw pumps each driven by a 30HP constant speed motor. Typically, one internal screw pump is in operation to convey average daily flow and a second pump is placed into operation to conveyed both peak and wet weather flows. Pump operation is controlled via a bubbler control system.

2.1.2 Grit Building

The grit building comprises of a mechanical bar screen, comminutor, and grit removal system. Wastewater flow is conveyed to the bar screen where screening material is removed and manually collected and dumped. The comminutor that is located downstream from the mechanical bar screen grinds solid material that may have passed through the mechanical bar screens. Following the comminutor is the grit removal system. The grit system includes an aerated grit chamber with two (2) 7.5 Hp blowers located outdoors adjacent to the Grit Building.

2.1.3 Primary Clarifiers

From the Grit Building, wastewater flows by gravity to a splitter box and is distributed evenly to two (2) primary clarifiers. The splitter box contains a waterfall to provide dissolved oxygen and minimize odors.

Primary effluent is conveyed through Pump Station No. 2 by two (2) 5Hp screw pumps. Effluent from the pump station travels into another splitter box (also with a waterfall) before reaching the oxidation ditches..

Soda ash is added to the primary effluent for alkalinity control.

2.1.4 Oxidation Ditches

The first stage of the secondary treatment process occurs within the oxidation ditches. There are two (2) oxidation ditches, both located outdoors. Each is equipped with twelve (12) 25Hp blowers.

Effluent from the oxidation ditches travels through another splitter box and into the final clarifiers.

2.1.5 Final Clarifiers

Effluent from the oxidation ditches is conveyed by gravity to a splitter box. From this box, flow is directed to two (2) final clarifier tanks.

Effluent from the final clarifiers is conveyed by gravity to the chlorine contact tanks for disinfection.

2.1.6 Disinfection

Sodium Hypochlorite is added to the effluent flow at the head of the chlorine contact tanks. Sulfur dioxide is then added for dechlorination. The plant effluent discharges about 75 feet behind the facility property into Black's Creek, about one mile upstream of the Delaware River.

2.1.7 Solids Handling

2.1.7.1 Sludge Pumps

Sludge from the primary settling tanks is pumped by two (2) 10 Hp sludge pumps to the sludge holding tanks. The sludge pumps are located in Pump Station No. 2 along with the screw pumps described above.

Return Activated Sludge (RAS) is pumped back to the oxidation ditches, while Waste Activated Sludge (WAS) is conveyed to the sludge holding tanks. There are three (3) 20Hp RAS sludge pumps. Typically, one pump is running. All three are on VFDs. There are two (2) WAS pumps. These two pumps run on a timer for a few minutes per hour. The RAS and WAS pumps are located in the Solids Processing Building B-3.

2.1.7.2 Sludge Holding Tanks

There are two (2) sludge holding tanks with one tank typically in operation. The tanks were originally designed as anaerobic digesters, but converted into aerobic sludge holding tanks during later construction at the facility. Aeration is usually provided to the tanks by one (1) 60Hp centrifugal blower. However, there are three (3) 50Hp rotary blowers that are used as needed during certain times of the year.

2.1.7.3 Belt Filter Press and Sludge Disposal

Two (2) pumps convey sludge from the holding tanks to the belt filter press. A polymer is added at the press before the sludge is picked up for disposal.

2.2 Remote Pump Stations

Four remote pump stations within the Bordentown Sewerage Authority's system were evaluated under the energy audit, the Mile Hollow Pump Station, Laurel Run Pump Station, Park Street No. 1 Pump Station, and the Bossert Pump Station. The Mile Hollow Pump Station has three (3) pumps each having a 60HP motor, the Laurel Run Pump Station has two (2) pumps each having a 20 HP motor, the Park Street Number 1 Pump Station has two (2) pumps each having a 25 HP motor, and the Bossert Pump Station has two (2) pumps each having a 15 HP motor.

2.3 Administration BuildingB-1

2.3.1 Description of Building Envelope

The energy audit included an evaluation of the building's envelope (exterior shell) to determine the components' effective R-values to be utilized in the building model and to locate and fix any thermal weaknesses that may be present. The components of a building envelope include the exterior walls, foundation and roof. The construction and material, age and general condition of these components, including exterior windows and doors, impact the building's energy use.

The Administration Building's walls consist of brick and mortar façade with finished interior. The existing roofing system consists of fiberglass shingles over pitched roof decks with 8" batt insulation above the 5/8" drywall attic ceiling. We were not able to access the roof at the time of the audit, but it appeared to be in good condition.

The windows throughout the building are insulating double pane windows. The majority of the doors are of steel and glass construction. The windows and exterior doors were sealed well with no signs of infiltration.

Our inspection has revealed that the building envelope is in good condition and is currently providing a high level of insulation. As such, any modifications to the insulation system would not prove to be cost effective, from an energy savings stand-point.

2.3.2 Description of Building HVAC

The Administration Building office area is heated by four (4) ceiling recessed 160 MBH gas fired furnace units. Conditioned air is distributed throughout the office by use of ductwork. There are two Fisher Scientific lab hood duct heaters. The garage is heated by eight (8) 96 MBH Reznor gas fired unit heaters and ventilated by exhaust fans and motorized louvers. Cooling is provided to the office by means of three (3) condensers and a heat pump located outside the building. They each have a cooling capacity of approximately 5 tons.

2.3.3 Description of Building Lighting

The Administration Building's existing lighting system consists of 1X2 (2 lamp), 1X4 (2 lamp), 2X2 (2 lamp), 2x4 (2 lamp) T12 standard efficiency linear fluorescent fixtures with magnetic ballasts, and incandescent fixtures. Existing exterior lighting consists of high pressure sodium fixtures. Refer to Section 4 for a more detailed description.

The site and roadway existing lighting system consists of pole mounted high pressure sodium fixtures. Refer to Section 4 for a more detailed description.

2.4 Grit and Bar Screen Building B-2

2.4.1 Description of Building Envelope

The Grit and Bar Screen Building's second floor walls consist of brick and mortar façade with concrete masonry (CMU) back up blocks. The first floor wall façade consists of concrete. The existing roofing system of the building consists of EPDM roofing with rigid insulation over flat roof decks. At the time of the audit, the roof was in good condition with no signs of interior leakage from the roof.

The windows throughout the building are insulating double pane windows. The exterior doors are FRP doors. FRP doors are recommended on an energy efficiency level, as the doors are made out of a high strength, light weight material with energy saving insulation and good sealing ability, as the doors will not expand or contract with changing climate. The windows and exterior doors were sealed well with no signs of infiltration.

Our inspection has revealed that the building envelope is in good condition and is currently providing a high level of insulation. As such, any modifications to the insulation system would not prove to be cost effective, from an energy savings stand-point.

2.4.2 Description of Building HVAC

The Grit and Bar Screen Building is heated by eight (8) Markel explosion proof electric unit heaters. Three (3) 10 kW electric unit heaters serve the grit building, three (3) 12.5 kW heaters serve the screen room, and two (2) 10 kW heaters serve the basement. Exhaust fans and motor operated wall louvers provide proper ventilation to each of the spaces.

2.4.3 Description of Building Lighting

The Grit and Bar Screen Building's existing lighting system consists of explosion-proof high pressure sodium fixtures. Existing exterior lighting consists of high pressure sodium fixtures, and 1X4 (2 lamp) T12 standard efficiency linear fluorescent fixtures with magnetic ballasts. Refer to Section 4 for a more detailed description.

2.5 Solids Processing Building B-3

2.5.1 Description of Building Envelope

The Solids Processing Building walls are composite cavity walls consisting of brick and mortar facade, and CMU back-up blocks. The existing roofing system of the building consists of ballasted EPDM roofing with rigid insulation over flat concrete roof decks. There were no signs of interior leakage from the roof. The exterior doors are sealed with no signs of significant infiltration.

The windows throughout the building are insulating double pane windows. The exterior doors are FRP doors and as indicated in Section 2.4.1, are recommended on an energy efficiency level. The windows and exterior doors were sealed well with no signs of infiltration.

Our inspection has revealed that the building envelopes are in good condition and are currently providing a high level of insulation.

2.5.2 Description of Building HVAC

The Solids Processing Building is heated by a combination of electric and gas fired unit heaters. Eight (8) Reznor gas fired unit heaters serve the ground level. Three (3) 5 kW Brasch electric unit heaters provide heat for the electric room and stairwell. Four (4) Reznor roof mounted gas fired make-up air units provide heat to the first floor. Make-up air is distributed to the ground floor through ductwork that runs along the inside perimeter of the building. At the time of the audit, the plant staff indicated that these units consume a high volume of gas that subsequently they have not been mainly operated after the first year of installation. A combination of 7.5 kW and 5kW Brasch electric unit heaters provide heat to the basement. A roof mounted supply fan and motorized louvers supply air to the basement and roof mounted exhaust fans exhaust air from the basement and ground floor.

2.5.3 Description of Building Lighting

The Solids Processing Building's existing lighting system consists of 1x4 (2 lamp) T12 standard efficiency linear fluorescent fixtures with magnetic ballasts. Existing exterior lighting consists of high pressure sodium wall pack fixtures. Refer to Section 4 for a more detailed description.

2.6 Solids Holding Building EB-1

2.6.1 Description of Building Envelope

The Solids Handling Building walls are composite cavity walls consisting of a brick and mortar facade, and CMU back-up blocks. CDM did not have access to the roof at the time of the audit and therefore are unable to report on the roof's condition.

The windows throughout the building are insulating double pane windows. The exterior doors are FRP doors and as indicated in Section 2.4.1, are recommended on an energy efficiency level.The windows and exterior doors were sealed well with no signs of infiltration.

Our inspection has revealed that the building envelope is in good condition and is currently providing a moderate level of insulation.

2.6.2 Description of Building HVAC

The Solids Holding Building is heated by a combination of natural gas and electric unit heaters. Two (2) Reznor 96 MBH gas fired unit heaters provide heat to the top floor. Five (5) Brasch electric unit heaters provide heat to the first floor. The basement is heated by two (2) 7.5 kW Brasch electric unit heaters. Exhaust fans and motor operated wall louvers provide ventilation to the building.

2.6.3 Description of Building Lighting

The Solids Holding Building's existing lighting system consists of 1X4 (2 lamp) T12 standard efficiency linear fluorescent fixtures with magnetic ballasts. Existing exterior lighting consists of high pressure sodium fixtures. Refer to Section 4 for a more detailed description.

2.7 Pump Station 1 Building PS-1

2.7.1 Description of Building Envelope

The Pump Station 1 building walls and roof consist of concrete. There were no signs of interior leakage from the roof.

The door at Pump Station 1 was an FRP door and was sealed with no signs of significant infiltration.

Our inspection has revealed that the building envelope is in good condition and is currently providing a moderate level of insulation.

2.7.2 Description of Building HVAC

The Pump Station 1 Building electrical room is heated by a5 kW Brasch electric unit heater. The pump utility room has two 5kW Brash electric unit heaters providing heat to the space. An exhaust fan and motor operated wall louver are located in each of the two rooms to provide ventilation.

2.7.3 Description of Building Lighting

The Pump Station 1 Building's existing lighting system consists of 1X4 (2 lamp) T12 standard efficiency linear fluorescent fixtures with magnetic ballasts. Existing exterior fixtures consist of high pressure sodium fixtures. Refer to Section 4 for a more detailed description.

2.8 Pump Station 2 Building PS-2

2.8.1 Description of Building Envelope

The Pump Station 2 Building's walls are composite walls consisting of brick and mortar façade, and CMU back up blocks. The existing roofing system of the building consists of ballasted EPDM roofing with rigid insulation over flat roof decks. There were no signs of interior leakage from the roof.

The windows are double pane windows. The exterior doors are FRP doors and as indicated in Section 2.4.1, are recommended on an energy efficiency level. The windows and exterior doors were sealed well with no signs of infiltration.

Our inspection has revealed that the building envelope is in good condition and is currently providing a high level of insulation.

2.8.2 Description of Building HVAC

The Pump Station 2 Building is heated by Brasch electric unit heaters. A 7.5 kW electric unit heater heats the top floor of the stairwell. A 5 kW electric unit heater heats the electrical room of the first floor. Three (3) 5kW electric unit heaters provide heat to the basement. Exhaust fans and motor operated wall louvers provide ventilation to the building.

2.8.3 Description of Building Lighting

The Pump Station 2 Building's existing lighting system consists of 1X4 (2 lamp) T12 linear fluorescent fixtures with magnetic ballasts. Existing exterior fixtures consist of high pressure sodium fixtures. Refer to Section 4 for a more detailed description.

2.9 Chlorine and Sulfur Dioxide Building B-4

2.9.1 Description of Building Envelope

The Chlorine and Sulfur Dioxide building walls are composite walls consisting of brick and mortar façade, and CMU back up blocks. The existing roofing system consists of ballasted EPDM roofing with rigid insulation over flat concrete roof decks. There were no signs of interior leakage from the roof.

The windows are double pane windows. The exterior doors are FRP doors and as indicated in Section 2.4.1, are recommended on an energy efficiency levelThe windows and exterior doors were sealed well with no signs of infiltration.

Our inspection has revealed that the building envelope is in good condition and is currently providing a high level of insulation.

2.9.2 Description of Building HVAC

The Chlorine and Sulfur Dioxide building is heated by a combination of eight (8) 5 and 7.5 kW Brasch electric unit heaters. Exhaust fans and motor operated wall louvers provide ventilation for the building..

2.9.3 Description of Building Lighting

The Chlorine and Sulfur Dioxide Building's existing lighting system consists of 1X4 (2 lamp) T12 linear fluorescent fixtures with magnetic ballasts. Existing exterior fixtures consist of high pressure sodium fixtures. Refer to Section 4 for a more detailed description.

2.10 Mile Hollow Pump Station

The Mile Hollow Pump Station consists of two buildings; the Main Building and the Dog Pound.

2.10.1.A Description of Main Building Envelope

The Main Building's walls consist of brick and mortar. CDM did not have access to the roof at the time of the audit.

The windows are double pane windows. The exterior doors are constructed of steel.

2.10.1.B Description of Dog Pound Building Envelope

The walls of the Dog Pound building consist of concrete masonry (CMU) blocks. The roofing system consists of asphalt shingles over pitched roof decks. The door for the entrance is constructed of steel.

Roof deck deterioration

The wood roof deck is old and shows significant signs of deterioration. The roof should be evaluated and determined if it is in need of repair or replacement.

2.10.2.A Description of Main Building HVAC

Heating in the Main Building is provided by five (5) 45 MBH Dayton natural ?gas fired unit heaters. Ventilation is provided by exhaust fans and wall louvers.

2.10.2.B Description of Dog Pound Building HVAC

Heating is provided to the Dog Pound building by a recently installed American Standard 60 MBH natural gas fired furnace.

2.10.3.A Description of Main Building Lighting

The Main Building's existing lighting system consists of 1X4 (2 lamp) T12 linear fluorescent fixtures with magnetic ballasts, and incandescent fixtures. Existing exterior lighting consists of incandescent fixtures. Refer to Section 4 for a more detailed description.

2.10.3.B Description of Dog Pound Building Lighting

The Dog Pound's existing lighting system consists of 1X4 (1 lamp) T12 linear fluorescent fixtures with magnetic ballasts. Existing exterior lighting consists of incandescent fixtures. Refer to Section 4 for a more detailed description.

2.11 Laurel Run Pump Station

2.11.1 Description of Building Envelope

The walls of the Laurel Run Pump Station consist of concrete masonry (CMU) blocks. The roofing system consists of asphalt shingles over pitched roof decks.

The windows throughout the Laurel Run Pump Station are single pane. The exterior doors are of wood construction and as indicated in Section 2.4.1, are recommended on an energy efficiency level.

Replacement of the single pane windows throughout the building with insulating double pane, low e glass is highly recommended. Thermal transmittance and solar heat gain are the most important energy considerations for windows. Air leakage as well as the window's optical characteristics, frame material and type of glass assembly also enter into window selection.

In the northeast, the U-factor of the window is the most important criterion. The U-factor is the measure of the heat transfer through the window assembly. The lower the U-factor, the lower the resulting heat flow across the window. A U-factor of 0.4 is typically suggested for cold climates, but the lower the better to minimize heat transmission and window condensation. Single glass windows typically have a U-factor around 1.1.

Energy efficient windows use three strategies to improve the R value (reciprocal of the U-value); multiple panes, gas fillings between the panes and special coatings. The best strategy from an energy standpoint is to include two or more of these parameters.

The low-e, or low emissivity coatings are metallic glass coatings to resist the flow of radiant heat. Low-e coatings in colder climates are applied on the interior surface of the inside pane. Gases like carbon dioxide and argon have a higher R-value than air and are sometimes utilized to fill the space between the two glass panes. These are fairly high tech windows and the gases weigh more than air.

While replacement of the windows with new high-performance, double pane, low-E, air tight window models will be better energy efficiency performers, the cost of window replacement is rarely justified by energy savings alone. Due to the small quantity and surface area of the windows and the reasons stated above, this recommendation has not been evaluated further.

2.11.2 Description of Building HVAC

Heating is provided to the building by a fuel oil heater. Heated air is distributed throughout the building by the means of ductwork. Exhaust fans and wall louvers provide ventilation for the building.

2.11.3 Description of Building Lighting

The Laurel Run Pump Station's existing lighting system consists of 1x4 (4 lamp) T8 standard efficiency linear fluorescent fixtures with electronic ballasts, 1X4 (4 lamp) T12 linear fluorescent fixtures with magnetic ballasts, and incandescent fixtures. Existing exterior lighting consists of one fixture with no lamp(s) present, it is assumed to be an incandescent fixture. Refer to Section 4 for a more detailed description.

2.12 Park Street No. 1 Pump Station

2.12.1 Description of Building Envelope

The Park Street No. 1 Pump Station top floor walls consist of brick and mortar. The roofing system consists of asphalt shingles over pitched roof decks.

There are no windows at this pump station and the doors are constructed of steel.

2.12.2 Description of Building HVAC

Heating is provided to the pump level of the building by means of an explosion proof 5 kW Ruffneck electric unit heater. There is a gas fired generator that is located on the first floor of the pump station. It is run for short periods of time each month.

2.12.3 Description of Building Lighting

The Park Street No. 1 Pump Station's existing lighting system consists of 1x4 (2 lamp) T8 standard efficiency linear fluorescent fixtures with electronic ballasts, 1X4 (2 lamp) T12 linear fluorescent fixtures with magnetic ballasts, and incandescent fixtures. Existing exterior lighting consists of high pressure sodium wall packs. Refer to Section 4 for a more detailed description.

2.13 Bossert Pump Station

2.13.1 Description of Building Envelope

The Bossert Pump Station walls consist of brick and mortar. The roofing system consists of asphalt shingles over pitched roof decks.

Our inspection has revealed that the building envelope is in good condition and is currently providing a high level of insulation.

2.13.2 Description of Building HVAC

Heating is provided to the building by three (3) 5kW Dayton electric unit heaters. The building is ventilated by means of an exhaust fan and a motorized wall louver.

2.13.3 Description of Building Lighting

The Bossert Pump Station's existing lighting system consists of 1X4 (2 lamp) T12 linear fluorescent fixtures with magnetic ballasts, and incandescent fixtures. Existing exterior lighting consists of incandescent fixtures. Refer to Section 4 for a more detailed description.

Section 3
Baseline Energy Use

3.1 Utility Data Analysis

The first step in the energy audit process is the compilation and quantification of the facility's current and historical energy usage and associated utility costs. It is important to establish the existing patterns of electric and gas usage in order to be able to identify areas in which energy consumption can be reduced.

For this study, the monthly gas and electric bills per facility were analyzed and unit costs of energy were obtained. The unit cost of energy, as determined from the information provided by the Authority, was utilized in determining the feasibility of switching from one energy source to another or reducing the demand on that particular source of energy to create annual cost savings for the Bordentown Sewerage Authority.

3.1.1 Electric Charges

It is important to understand how the utility companies charge for the service. The majority of the energy consumed is electric, as a result of both indoor and outdoor lighting systems, pumping systems, and wastewater treatment processes and equipment. Electricity is charged by three basic components: electrical consumption (kWH), electrical demand (kW) and power factor (kVAR) (reactive power). The cost for electrical consumption is similar to the cost for fuel oil, the monthly consumption appears on the utility bill as kWH consumed per month with a cost figure associated with it. The service connections are either billed on a flat rate or time of day rates per kWH.

Electrical demand can be as much as 50 percent or more of the electric bill. The maximum demand (kW value) during the billing period is multiplied by the demand cost factor and the result is added to the electric bill. It is often possible to decrease the electric bill by 15 – 25 percent by reducing the demand, while still using the same amount of energy.

The power factor (reactive power) is the power required to energize electric and magnetic fields that result in the production of real power. Power factor is important because transmission and distribution systems must be designed and built to manage the need for real power as well as the reactive power component (the total power). If the power factor is low, then the total power required can be greater than 50 percent or more than the real power alone. The power factor charge is a penalty for having a low power factor.

The other parts of the electric bill are the supply charges, delivery charges, system benefits, transmission revenue adjustments, state and municipality tariff surcharges and sales taxes, which cannot be avoided.

PSE&G is the distributor of electric energy for the Bordentown Sewerage Authority's main wastewater treatment facility, and Hess the supplier. PSE&G is the current supplier and distributor of electric energy for the Bordentown Sewerage Authority's pump stations.

3.1.2 Natural Gas Charges

PSE&G is the current supplier and distributor of natural gas for the Authority's wastewater treatment plant. The pump station facilities do not require the use of natural gas. The Authority is charged for the cost of the natural gas, a delivery charge and a customer charge, which covers gas administration charges.

3.2 Facility Results

3.2.1 Wastewater Treatment Facility

Electric power for the Wastewater Treatment Facility is fed from one General Secondary Service three phase line from PSE&G. Figure 3.2-1 illustrates the average monthly total energy consumption from January 2009 through January 2010. For example, for the month of October, the bar graph represents average energy consumption for October 2009. This same graphical representation approach has been carried through for all months and is typical for all graphs presented in this Section. Electrical usage has been averaged by month for the above referenced time period to portray a more encompassing monthly usage trend.

From this graph, it can be determined that the average annual baseline electrical consumption for the wastewater treatment plant is approximately 192,000 kWH / month.

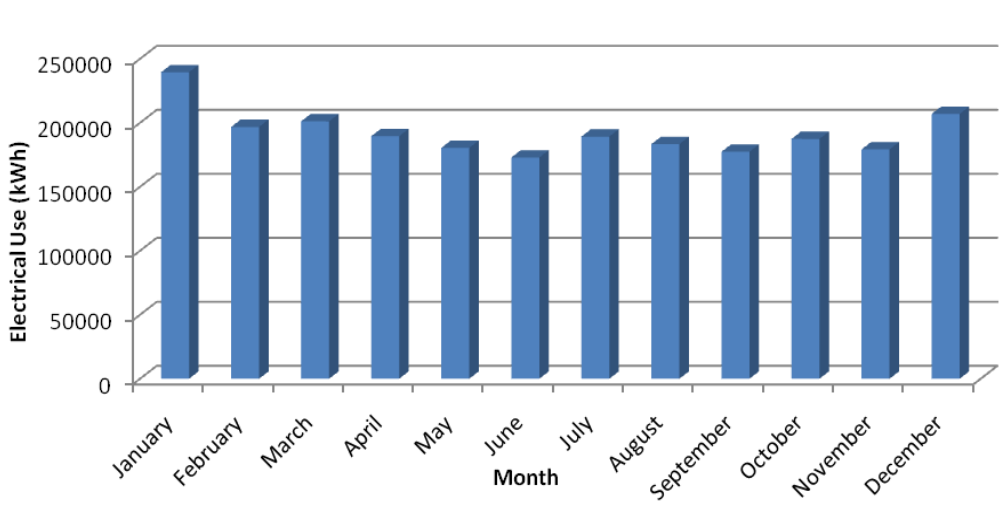


Figure 3.2-1: Wastewater Treatment Plant Electrical Usage

The most recent tariff rates available at the time of this audit for the wastewater treatment plant facility's electrical service can be found on the electrical bills provided by PSE&G and are as follows:

		Acct #: 62-659-951-54
Service Charge:		$385.44
Distribution Charges:	Annual Demand	$1.620304045/kW
	On-Peak kWh	$0.005101021/kWh
	Off-Peak kWh	$0.005100959/kWh
Societal Benefits Charge:		$0.007441017/kWh
Securitization Transition Charge:		$0.012068020/kWh

Figure 3.2-2 illustrates the average monthly demand load for the wastewater treatment plant facility from January 2009 through January 2010.

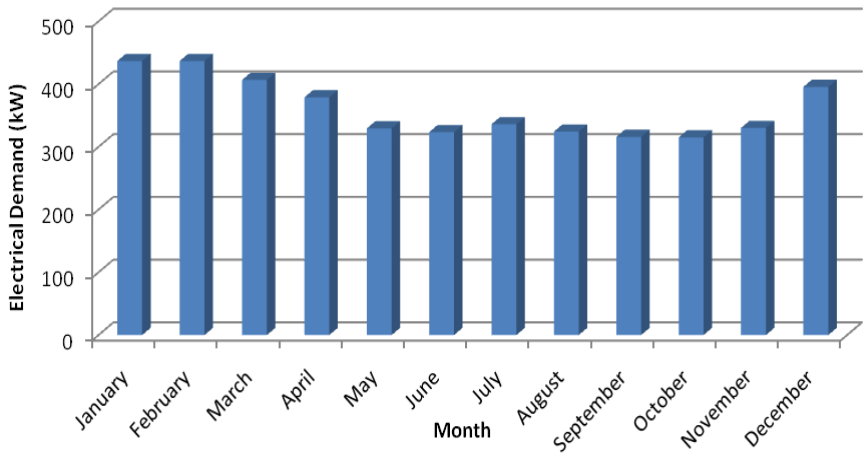


Figure 3.2-2: Wastewater Treatment Plant Maximum Monthly Demand

Refer to Table 3.3-1, in Section 3.3 for the average electrical aggregate cost. These tariffs are subject to change quite frequently. Refer to Appendix A for a complete Historical Data Analysis.

The gas usage for the Wastewater Treatment Plant is metered at one location. The monthly total gas consumption from January 2009 through January 2010 at the plant is illustrated in Figure 3.2-3.

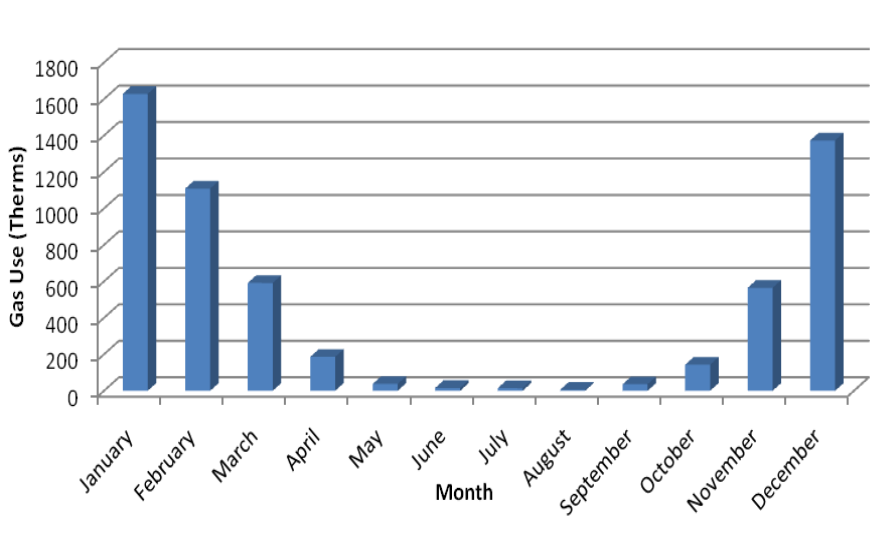


Figure 3.2-3: Wastewater Treatment Plant Total Gas Usage

For more on the wastewater treatment plant facility's gas usage, refer to Section 4.3.

3.2.2 Bossert Pump Station

Electric power for Bossert Pump Station is fed from one General Secondary Service three phase line from PSE&G. Figure 3.2-4 illustrates the average monthly total energy consumption from January 2009 through January 2010. From this graph, it can be determined that the average annual electrical consumption for the Bossert Pump Station is approximately 2,400 kWH / month.

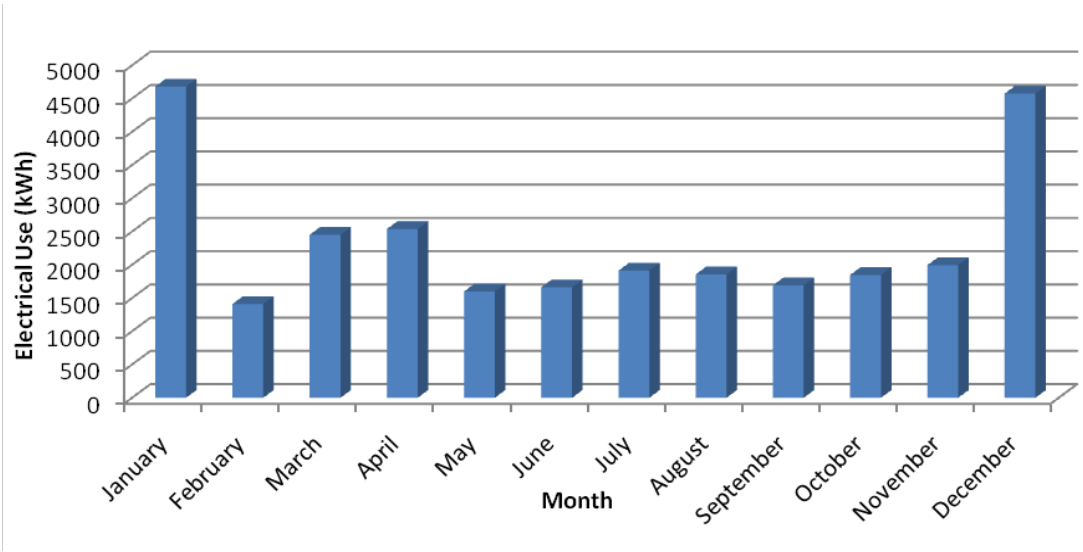


Figure 3.2-4: Bossert Pump Station Electrical Usage

The most recent tariff rates available at the time of this audit for the wastewater treatment plant facility's electrical service can be found on the electrical bills provided by PSE&G and are as follows:

	Acct #: 65-392-047-01
Service Charge:	$4.39
Distribution Charges:	$4.033333333/kW
	$0.009088235/kWh
Societal Benefits Charge:	$0.007568627/kWH
Securitization Transition Charge:	$0.012068627/kWH

Figure 3.2-5 illustrates the monthly demand load for the Bossert Pump Station from January 2009 through January 2010.

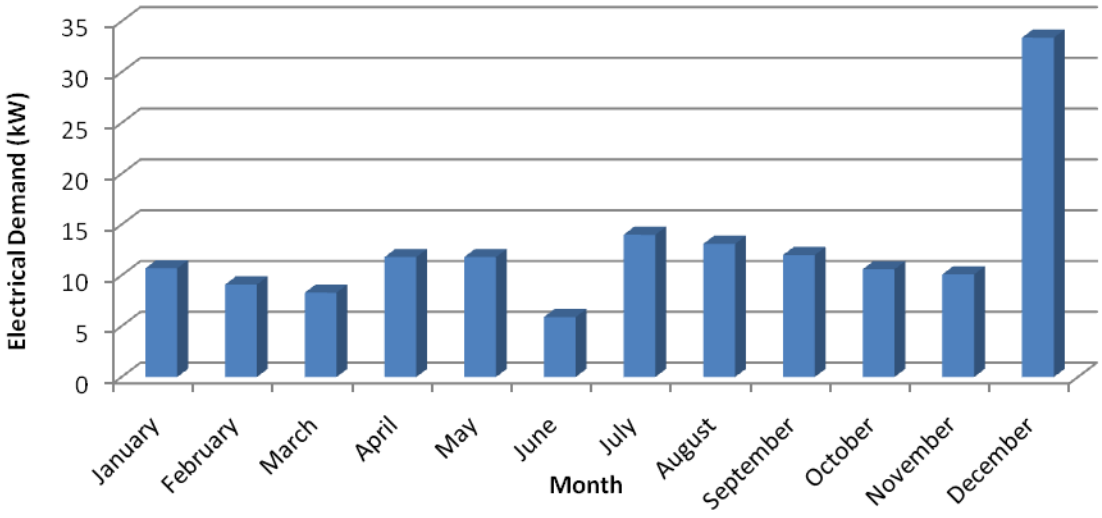


Figure 3.2-5: Bossert Pump Station Maximum Monthly Demand

Refer to Table 3.3-1, in Section 3.3, for average electrical aggregate cost. These tariffs are subject to change quite frequently. Refer to Appendix A for a complete Historical Data Analysis.

There is no natural gas use at the Bossert Pump Station.

3.2.3 Laurel Run Pump Station

Electric power for the Lauren Run Pump Station is fed from one General Secondary Service three phase line from PSE&G. Figure 3.2-6 illustrates the average monthly total energy consumption from January 2009 through January 2010. From this graph, it can be determined that the average annual baseline electrical consumption for the Laurel Run Pump Station is approximately 3,900 kWH / month.

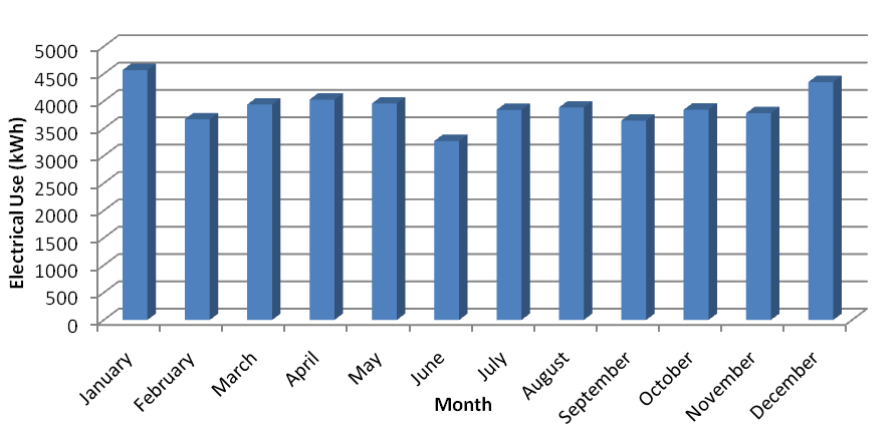


Figure 3.2-6: Laurel Run Pump Station Electrical Usage

The most recent tariff rates available at the time of this audit for the wastewater treatment plant facility's electrical service can be found on the electrical bills provided by PSE&G and are as follows:

	Acct #: 65-177-963-04
Service Charge:	$4.39
Distribution Charge:	$0.009088235/kWH
	$1.033653846/kW
Societal Benefits Charge:	$0.007568015/kWH
Securitization Transition Charge:	$0.012060015/kWH

Figure 3.2-7 illustrates the monthly demand load for the Laurel Run Pump Station from January 2009 through January 2010

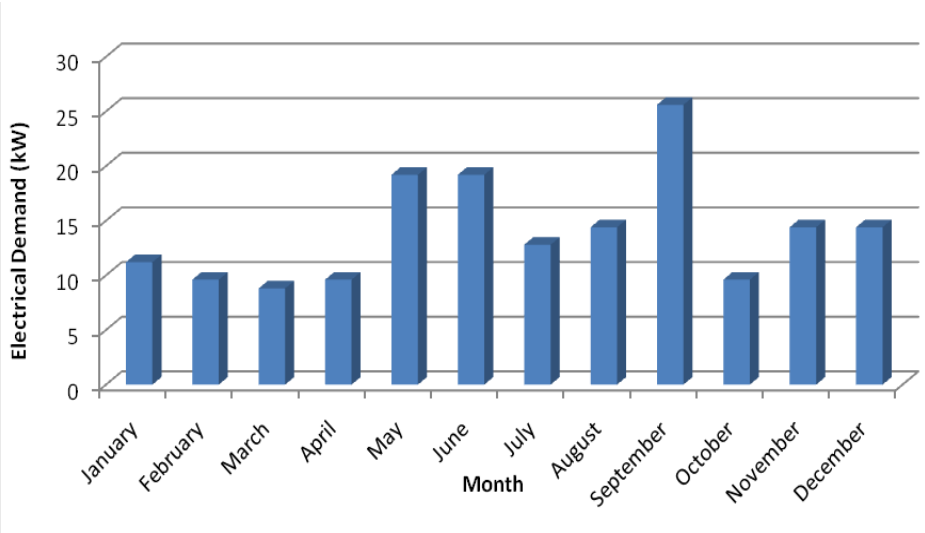


Figure 3.2-7: Laurel Run Pump Station Maximum Monthly Demand

Refer to Table 3.3-1, in Section 3.3, for average electrical aggregate cost. These tariffs are subject to change quite frequently. Refer to Appendix A for a complete Historical Data Analysis.

There is oil used at the Laurel Run Pump Station. Due to the minimal use of oil, the usage was not plotted.

3.2.4 Mile Hollow Pump Station

Electric power for the Mile Hollow Pump Station is fed from one General Secondary Service three phase line from PSE&G. Figure 3.2-8 illustrates the average monthly total energy consumption from January 2009 through January 2010. From this graph, it can be determined that the average annual baseline electrical consumption for the Mile Hollow Pump Station is approximately 8,000 kWH / month.

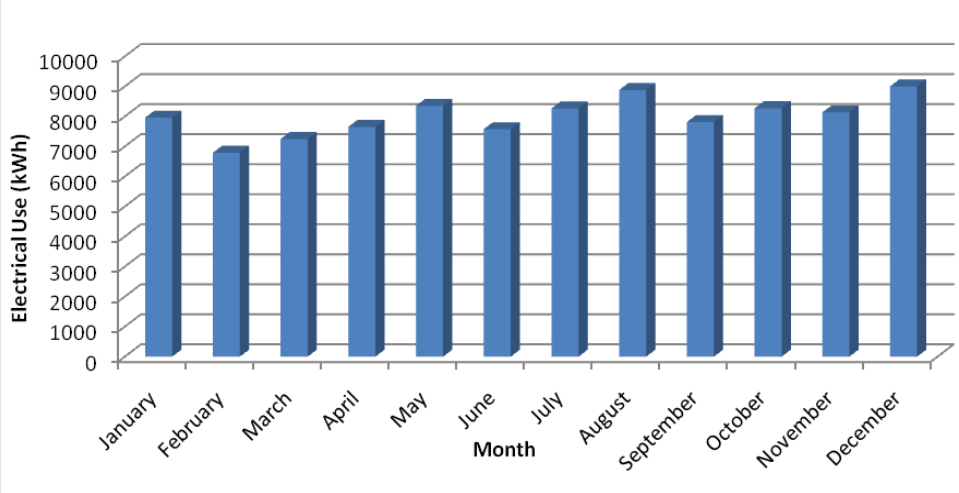


Figure 3.2-8: Mile Hollow Pump Station Electrical Usage

The most recent tariff rates available at the time of this audit for the wastewater treatment plant facility's electrical service can be found on the electrical bills provided by PSE&G and are as follows:

	Acct #: 65-076-886-08
Service Charge:	$4.39
Distribution Charge:	$0.009088997/kWH
	$4.033666667/kW
Societal Benefits Charge:	$0.007567961/kWH
Securitization Transition Charge:	$0.012067961/kWH

Figure 3.2-9 illustrates the monthly demand load for the Mile Hollow Pump Station from January 2009 through January 2010.

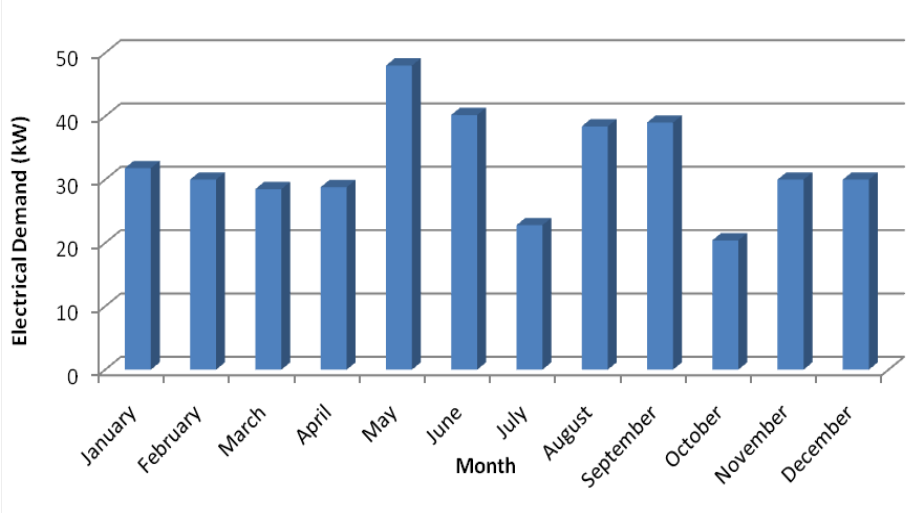


Figure 3.2-9: Mile Hollow Pump Station Maximum Monthly Demand

Refer to Table 3.3-1, in Section 3.3, for average electrical aggregate cost. These tariffs are subject to change quite frequently. Refer to Appendix A for a complete Historical Data Analysis.

The gas usage for the Mile Hollow Pump Station is metered at one location. The monthly total gas consumption from September 2008 through January 2010 at the pump station is illustrated in Figure 3.2-10.

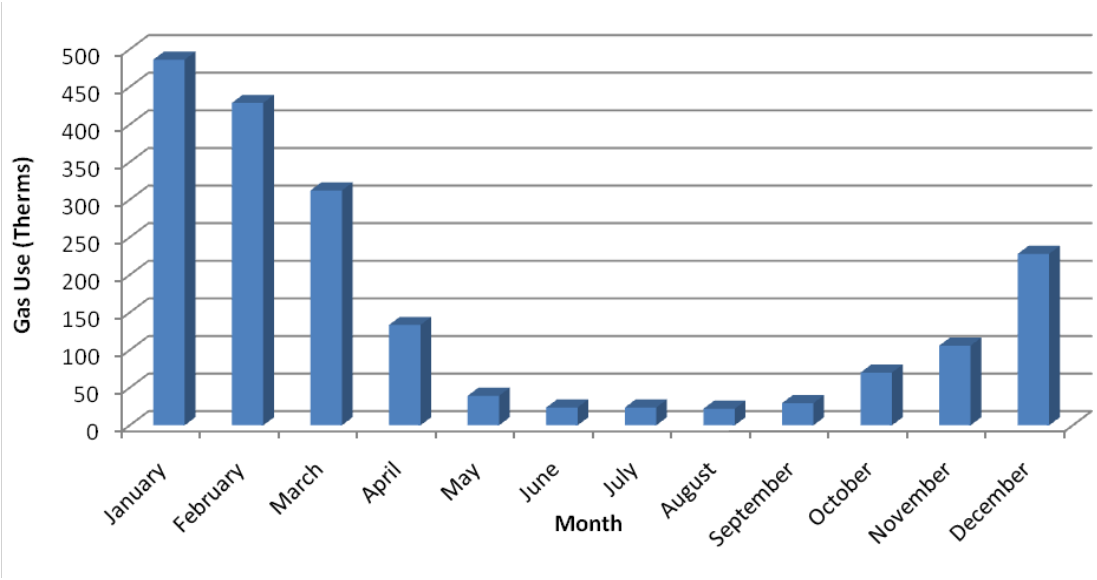


Figure 3.2-10: Mile Hollow Pump Station Total Gas Usage

For more on the pump station's gas usage, refer to Section 4.3.

3.2.5 Park Street No.1 Pump Station

Electric power for the Park Street No. 1 Pump Station is fed from one General Secondary Service three phase line from PSE&G. Figure 3.2-11 illustrates the average monthly total energy consumption from January 2009 through January 2010. From this graph, it can be determined that the average annual baseline electrical consumption for the Park Street No. 1 Pump Station is approximately 4,400 kWH / month.

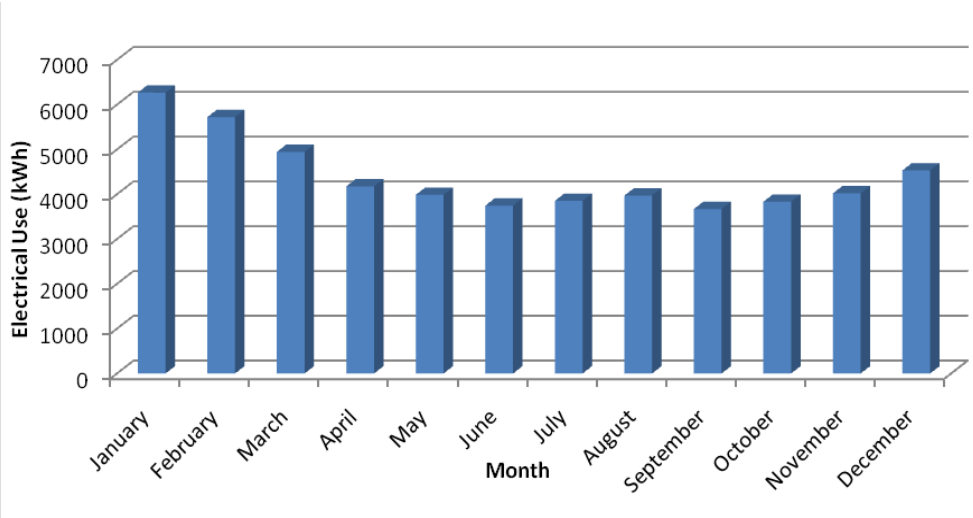


Figure 3.2-11: Park Street No. 1 Pump Station Electrical Usage

The most recent tariff rates available at the time of this audit for the wastewater treatment plant facility's electrical service can be found on the electrical bills provided by PSE&G and are as follows:

	Acct #: 65-470-787-01
Service Charge:	$4.39
Distribution Charge:	$0.009089522/kWH
	$4.033663366/kW
Societal Benefits Charge:	$0.007568667/kWH
Securitization Transition Charge:	$0.012068498/kWH

Figure 3.2-12 illustrates the monthly demand load for the Park Street No. 1 Pump Station from January 2009 through January 2010.

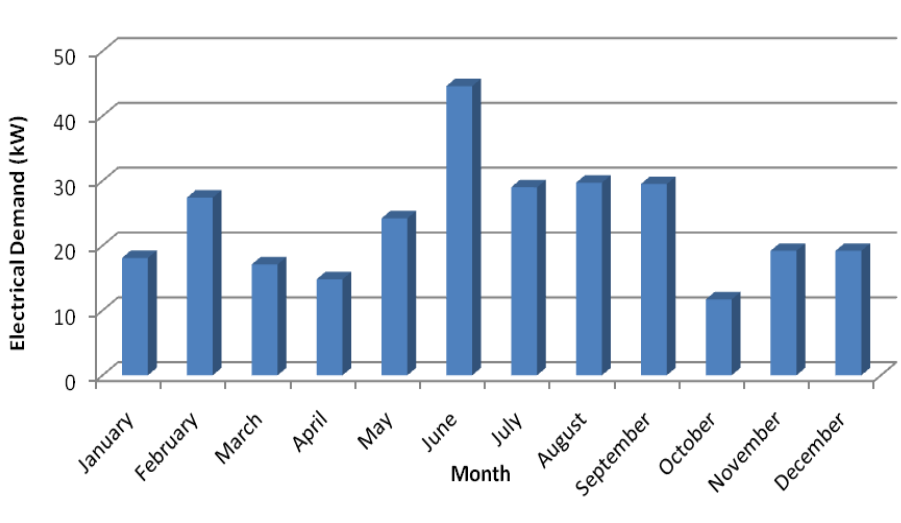


Figure 3.2-12: Park Street No. 1 Pump Station Maximum Monthly Demand

Refer to Table 3.3-1, in Section 3.3, for average electrical aggregate cost. These tariffs are subject to change quite frequently. Refer to Appendix A for a complete Historical Data Analysis.

The gas usage for the Park Street No.1 Pump Station is metered at one location and is supplied for the backup generator present at the pump station. The monthly total gas consumption from September 2008 through January 2010 at the pump station is illustrated in Figure 3.2-13.

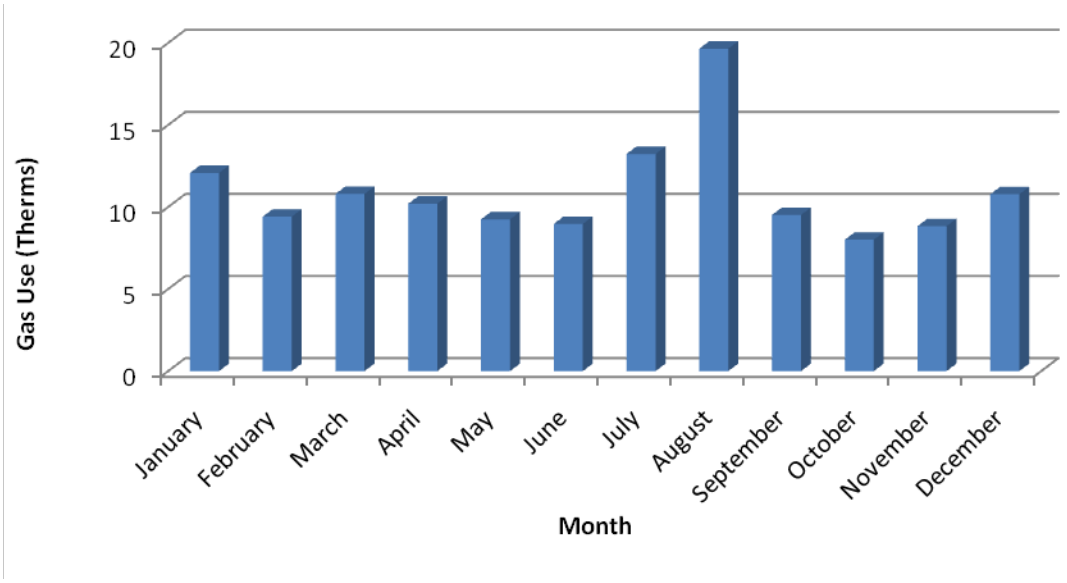


Figure 3.2-13: Park Street No.1 Pump Station Total Gas Usage

For more on the pump station's gas usage, refer to Section 4.3.

3.3 Aggregate Costs

For the purposes of computing energy savings for all identified energy conservation and retrofit measures, aggregate unit costs for electrical energy and fuel, in terms of cost/kWH and cost/therm, were determined for each service location and utilized in the simple payback analyses discussed in subsequent sections. The aggregate unit cost accounts for all distribution and supply charges for each location. Table 3.3-1 and Table 3.3-2 summarize the aggregate costs for electrical energy consumption and therms utilized, respectively.

Table 3.3-1: Electrical Aggregate Unit Costs

Service Location	Aggregate $ / kW-hr
Wastewater Treatment Facility	$0.1183
Bossert Pump Station	$0.1638
Laurel Run Pump Station	$0.1579
Mile Hollow Pump Station	$0.1653
Park Street #1 Pump Station	$0.1868

Table 3.3-2: Natural Gas Aggregate Unit Costs

Service Location	Aggregate $ / therm
Wastewater Treatment Facility	$1.1963
Mile Hollow Pump Station	$1.2113
Park Street #1 Pump Station	$2.0365

3.4 Portfolio Manager

3.4.1 Portfolio Manager Overview

Portfolio Manager is an interactive energy management tool that allows the Bordentown Sewerage Authority to track and assess energy consumption at the WWTP in a secure online environment. Portfolio Manager can help the Bordentown Sewerage Authority set investment priorities, verify efficiency improvements, and receive EPA recognition for superior energy performance.

3.4.2 Energy Performance Rating

For many facilities, you can rate their energy performance on a scale of 1–100 relative to similar facilities nationwide. Your facility is *not* compared to the other facilities entered into Portfolio Manager to determine your ENERGY STAR rating. Instead, statistically representative models are used to compare your facility against similar facilities from a national survey conducted by the Department of Energy's Energy Information Administration. This national survey, known as the Commercial Building Energy Consumption Survey (CBECS), is conducted every four years, and gathers data on building characteristics and energy use from thousands of facilities across the United States. Your facility's peer group of comparison is those facilities in the CBECS survey that have similar facility and operating characteristics. A rating of 50 indicates that the facility, from an energy consumption standpoint, performs better than 50% of all similar facilities nationwide, while a rating of 75 indicates that the facility performs better than 75% of all similar facilities nationwide.

The wastewater treatment plant facility is eligible to receive a rating, yet is not eligible for an Energy Star label.

3.4.3 Portfolio Manager Account Information

A Portfolio Manager account has been established for the Bordentown Sewerage Authority, which includes a profile for the wastewater treatment plant facility and the four (4) pump stations. Information entered into this Portfolio Manager Facility

profile, including electrical energy consumption and natural gas consumption has been used to establish a performance baseline.

It is recommended that the information be updated to track the buildings' energy usage. At the time of the audit the wastewater treatment plant facility received a rating of 32.

Appendix B contains a Portfolio Manager Reference sheet.

The following website link, username and password shall be used to access the Portfolio Manager account and building profiles that has been established for the Authority:

https://www.energystar.gov/istar/pmpam/

USERNAME: BordentownWWTP

PASSWORD: EnergyStar

Section 4
Energy Conservation and Retrofit Measures (ECRM)

The following is a summary of how Annual Return on Investment (AROI), Internal Rate of Return (IRR), and Net Present Value (NPV) will be broken down in the cost analysis for all ECRMs recommended in this report.

Included in the simplified payback analysis summary table is the 'Annual Return on Investment' (AROI) values. This value is a performance measure used to evaluate the efficiency of an investment and is calculated using the following equation:

$$AROI = \frac{AECS + OCS}{NET\ ECM\ Cost} - \frac{1}{Lifetime}$$

Where OCS = Operating Cost Savings, and AECS = Annual Energy Cost Savings.

Also included in the table are net present values for each option. The NPV calculates the present value of an investment's future cash flows based on the time value of money, which is accounted for by a discount rate (DR) (assume bond rate of 3%). NPV is calculated using the following equation:

$$NPV = \sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$$

Where C_n=Annual cash flow, and N = number of years.

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

$$IRR \rightarrow 0 = \sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$$

Where C_n=Annual cash flow, and N = number of years.

The lifetime energy savings represents the cumulative energy savings over the assumed life of the ECRM.

4.1 Wastewater Treatment Facility

CDM has evaluated the current operation of the sludge holding tanks and has identified potential ECRMs to enhance the current process.

4.1.1 Sludge Holding Tanks – New Blowers

The facility has two sludge holding tanks that are 35 feet in diameter with a maximum sludge depth of 19 feet. Typically, only one tank is in operation. The tanks are equipped with coarse bubble diffusers that receive air from the blower system. There is one centrifugal blower and three positive displacement blowers that serve the sludge holding tanks. The facility currently aims to keep the dissolved oxygen (DO) concentration at 2.0 mg/l to limit the odors that are emitted from the sludge holding tanks. Table 4-1 presents the existing blower design information.

Table 4-1: Existing Blower Information

	Existing Blowers
Number of Units	4
Motor Horsepower	1 at 60 hp (Centrifugal) 3 at 50 hp (Positive Displacement)
Motor Power Factor	0.86

The facility staff has indicated that the 60 hp centrifugal blower operates 24 hours/day for the entire year. Staff has also indicated that the three 50 hp positive displacement blowers operate 24 hours/day for about three months out of the year. Table 4-2 presents the current sludge holding tank electrical energy usage and cost associated with the operation of the blower system for one sludge holding tank. The data presented in this table will be utilized as the baseline energy usage.

Table 4-2: Existing Blower Power Draw and Costs

	Centrifugal Blower	Positive Displacement Blowers
Number of Units	1	3
Power Draw	60 hp	50 hp
Operating Hours per Year, total	8,760	2,160 (1)
Annual Energy Usage, kWh/yr	375,400	244,900
Operating Cost per Year	$44,400	$29,000

Note 1: The operating hours of 2,160 represents the average operating time between the three 50 hp blowers. See Section 4.4.2 for recorded operating time for each blower.

As presented in Table 3.3-1, the aggregate cost for electric energy is $0.1183 per kWh. CDM analyzed the design conditions as well as the existing operating conditions of the sludge holding tank aeration system in efforts to identify potential energy savings measures to include blower replacement.

In order to properly size a new blower system, it has been calculated that 700 cfm of air is required to achieve adequate mixing in the sludge holding tank and approximately 500 cfm of air is required to achieve a dissolved oxygen concentration of 2 mg/L. Since only one sludge holding tank is in operation, the financial analysis, simple payback and energy saving computations will include the upgrade of the aeration system for only one tank only.

4.1.1.1 Alternative 1: Positive Displacement Blowers

New positive displacement blowers could be provided. Manufacturers such as Aerzen or Gardner Denver can provide one duty and one standby blower to meet the conditions of the facility. It is estimated that the average required power would be approximately 76 hp having an annual energy cost of approximately $58,900 and an annual energy consumption of 504,600 kWh/year resulting in an annual energy savings (based on current conditions) of $14,500 and energy consumption of 115,700 kWh/year.

4.1.1.3 Alternative 2: Positive Displacement Blowers with Variable Frequency Drives

New positive displacement blowers with variable speed drives (VFDs) could be provided. The incorporation of variable frequency drives provides the energy savings flexibility to reduce the air flow during those periods of the year where maintaining a dissolved oxygen concentration of 2 mg/L is not critical. Manufacturers such as Aerzen or Gardner Denver can provide one duty and one standby blower to meet the conditions of the facility. It is estimated that the average required power would be approximately 65 hp having an annual energy cost of approximately $50,200 and an annual energy consumption of 430,500 kWh/year resulting in an annual energy savings (based on current conditions) of $23,200 and energy consumption of 189,800 kWh/year.

Table 4-3 presents preliminary costs, savings and a simple payback period for each of the blower alternatives. Engineer's Opinion of Probable Construction Cost computations are included in Appendix H.

Table 4-3: Blower Alternatives Probable Cost Summary

	Alt. 1 – New Positive Displacement Blowers	Alt. 2 – New Positive Displacement Blowers and VFDs
Installation Cost	$159,000	$186,000
Annual Energy Savings	$14,500	$23,200
Annual O&M Cost	$6,000	$6,000
Simple Payback Period, years	18.7	10.8
Lifetime, years	20	20
Internal Rate of Return (IRR)	6.6%	10.9%
Net Present Value (NPV)	$57,000	$159,000

4.1.2 Sludge Holding Tank – Mixing System

Another option to provide mixing for the existing sludge holding tank system is the installation of a jet mixing/ aeration system. The jet aeration system is a submerged aeration system which produces fine gas bubbles and enhances mixing between the gas and liquid phases. The fine bubble and intimate contacting results in increased absorption efficiency and less operating horsepower over conventional aeration mixing systems. Mixing System, Inc. is a typical manufacturer that can provide such a system. The system consists of an external pump which circulates sludge through a jet eddy mixer and an external blower which circulates air also to the jet eddy mixer.

The proposed system for each sludge holding tank consists of one (1) twelve jet eddy mixer/aerator, one external circulation pump and one external blower. A design summary for each sludge holding tank is shown in Table 4-5.

Table 4-5: Jet Mixing Aeration System Design Summary

Number of Sludge Holding Tanks	1
Tank Diameter	35 feet
Water Depth	7 to 19 feet
Tank Volume	137,000 gallons
Design Dissolved Oxygen Concentration	2mg/l
Solids Concentration	1%
Jet mixers/aerators per tank	1
Jets per mixer/aerator	12
Blower Flow	500 SCFM
Blower Bhp/hp	27/30
Pump Flow	2400 gpm
Pump Bhp/hp	18/20
Mixing Intensity	328 Bhp/MG
Turnover Time	10 minutes

The average required power to operate one tank would be approximately 45Hp (1 blower at 27Hp, 1 pump at 18Hp), which equates to an annual energy cost of approximately $34,826 and an annual energy consumption of 294,388 kWh/year. Based upon the baseline energy usage and cost presented in Table 4-2, the installation of a jet mixing/aeration system will result in an annual energy cost savings of $39,854 and energy consumption of 336,864kWh/year.

Refer to Appendix N for information pertaining to the jet mixing/aeration system.

Table 4-6: Jet Mixing Aeration System Probable Cost Summary

	New System
Installation Cost	$144,000
Annual Energy Savings	$39,854
Annual O&M Cost	$1,000
Simple Payback Period, years	3.7
Lifetime, years	20
Internal Rate of Return (IRR)	27.5%
Net Present Value (NPV)	$448,927

The above cost summary provides for the simple payback and financial analysis for retrofitting one sludge holding tank which reflects the normal operational mode of the sludge holding tank system.

Based upon the simple payback periods, internal rates of return and net present values presented in Tables 4-3 and 4-6, it is recommended that a jet mixer/aerator system, such as one manufactured by Mixing Systems Inc., be installed in order to achieve energy savings associated with the sludge holding tank aeration system.

4.2 Building Lighting Systems

The goal of this section is to present any lighting energy conservation measures that may also be cost beneficial. It should be noted that replacing current bulbs with more energy-efficient equivalents will have a small effect on the building heating and cooling loads. The building cooling load will see a small decrease from an upgrade to more efficient bulbs and the heating load will see a small increase, as the more energy efficient bulbs give off less heat.

Two options are offered for most buildings. The first option will be for upgrading existing interior lighting, if applicable. The second option will be for upgrading existing exterior lighting, if applicable. A total cost for upgrading both options at the same time will be presented. Retrofitting of existing fluorescent fixtures includes

upgrading both ballasts and lamps for the fixture. Refer to Appendix D for more information.

The strategies included in this section focus on maximizing energy savings and maintaining or exceeding existing lighting levels, while also maintaining the existing look of each fixture; therefore, proposed lamp styles remain consistent with existing lamp styles.

For the Bordentown Sewerage Authority, it was noted that there were no interior occupancy sensors installed. Installing occupancy sensors will typically increase energy savings; however, if the space is not occupied often in the first place, there will be little savings by installing occupancy sensors. However, certain areas of the Bordentown Sewerage Authority plant could benefit from installation of occupancy sensors. Therefore, occupancy sensor installation has been recommended in this report. Refer to Appendix D for occupancy sensor locations and quantities.

Please note that the Engineer's Estimate of Probable Construction Costs presented herein are estimates based on historic data compiled from similar installations and engineering opinions. Additional engineering will be required for each measure identified in this report and final scope of work and budget cost estimates will need to be confirmed prior to the coordination of project financing or the issuance of a Request for Proposal.

4.2.1 Administration Building B-1

It is recommended that the existing interior lighting system at the Administration Building be upgraded to high efficiency standards to reduce power consumption. In general, the recommended lighting upgrade, as presented in Appendix D, involves replacing existing inefficient bulbs, and installing new energy-efficient luminaires to the existing interior lighting system. Options for improving the interior and exterior lighting for the Administration Building are listed in Table 4.2-1.

Table 4.2-1
Administration Building B-1 Lighting System Improvements

Interior Lighting	High Performance T8 Retrofit of T12 Fixtures, Incandescent to CFL
Exterior Lighting	Induction Retrofit of Building Mounted Fixtures, Incandescent to CFL

The annual energy savings for these options are as follows:

Interior Lighting: 4.5kW, 13,308.5 kWh and $1,574.4
Exterior Lighting: 0.4kW, 1,681.9 kWh and $199.0

The following table, Table 4.2-2, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the Administration Building. Based upon the simple payback analysis presented in Table 4.2.2, it is recommended that interior lighting improvements be implemented.

Table 4.2-2
Administration Building B-1 Lighting System Improvements***

	Interior Lighting	Exterior Lighting	Total
Engineer's Opinion of Probable Cost	$27,895.4	$6,796.5	$34,691.9
New Jersey SmartStart Rebate	-$2,120*	-$0****	-$2,120*
Total Cost	$25,775.4	$6,796.5	$32,571.9.0
Annual Energy Savings	$1,574.4	$199.0	$1,773.4
Annual Maintenance Cost Savings (AMCS)	$469.6	$73.8	$543.4
Simple Payback	**12.6 years**	**24.9 years**	**14.1 years**
Annual Return on Investment (AROI)	1.26%	-2.65%	0.45%
Lifetime Energy Savings (15 years)**	$29,282.1	$3,701.2	$32,983.3
Internal Rate of Return (IRR)	4.91%	-3.25%	3.46%
Net Present Value (NPV)	$3,991.59	-$2,823.68	$1,167.91

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs. Total lifetime savings does not equal sum of combined savings.
***See Appendix H & I for ECRM Financial Analyses
****No incentives are available for the type of retrofit being recommended.

It should be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled "Proposed Operational Hours Without Sensors" in Appendix D.

4.2.2 Grit and Bar Screen Building B-2

It is not recommended to upgrade either the existing interior or exterior lighting at the Grit and Bar Screen Building. Payback calculations yielded a simple payback of 75.9 years for the interior lighting, and 28 years for the exterior lighting. The options that were presented for improving the interior and exterior lighting for the Grit and Bar Screen Building are listed in Table 4.2-3.

Table 4.2-3
Grit and Bar Screen Building B-2 Lighting System Improvements

Interior Lighting	High Performance T8 Retrofit of T12 Fixtures
Exterior Lighting	Induction Retrofit of Building Mounted Fixtures, High Performance T8 Retrofit of T12 Fixtures

The annual energy savings for these options are as follows:

Interior Lighting: 0.7kW, 1,600.6 kWh and $189.3
Exterior Lighting: 0.3kW, 1,292.1 kWh and $152.9

The following table, Table 4.2-4, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the Grit and Bar Screen Building.

Table 4.2-4
Grit and Bar Screen Building B-2 Lighting System Improvements***

	Interior Lighting	Exterior Lighting	Total
Engineer's Opinion of Probable Cost	$15,369.8	$4,758.1	$20,127.9
New Jersey SmartStart Rebate	-$144*	-$0****	-$144*
Total Cost	$15,225.8	$4,758.1	$19,983.9
Annual Energy Savings	$189.3	$152.9	$342.2
Annual Maintenance Cost Savings (AMCS)	$11.3	$17.1	$28.4

Table 4.2-4 Grit and Bar Screen Building B-2 Lighting System Improvements***			
	Interior Lighting	Exterior Lighting	Total
Simple Payback	**75.9 years**	**28 years**	**53.9 years**
Annual Return on Investment (AROI)	-5.35%	-3.09%	-4.82%
Lifetime Energy Savings (15 years)**	$3,520.8	$2,843.8	$6,364.6
Internal Rate of Return (IRR)	-13.38%	-4.46%	-10.58%
Net Present Value (NPV)	-$12,304.44	-$2,282.37	-$14,595.55

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs. Total lifetime savings does not equal sum of combined savings.
***See Appendix H & I for ECRM Financial Analyses
****No incentives are available for the type of retrofit being recommended.

It should be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled "Proposed Operational Hours Without Sensors" in Appendix D.

4.2.3 Solids Processing Building B-3

It is recommended that the existing interior lighting system at the Solids Processing Building be upgraded to high efficiency standards to reduce power consumption. In general, the recommended lighting upgrade, as presented in Appendix D, involves replacing existing inefficient bulbs, and installing new energy-efficient luminaires to the existing interior lighting system. Options for improving the interior and exterior lighting for the Solids Processing Building are listed in Table 4.2-5.

Table 4.2-5 Solids Processing Building B-3 Lighting System Improvements	
Interior Lighting	High Performance T8 Retrofit of T12 Fixtures
Exterior Lighting	Induction Retrofit of Exterior Fixtures

The annual energy savings for these options are as follows:

Interior Lighting: 3.3KW, 9,290.8 kWh and $1,099.1
Exterior Lighting: 0.2KW, 770.9 kWh and $91.2

The following table, Table 4.2-6, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the Solids Processing Building. Based upon the simple payback analysis presented in Table 4.2.6, it is recommended that interior lighting improvements be implemented.

Table 4.2-6
Solids Processing Building B-3 Lighting System Improvements***

	Interior Lighting	Exterior Lighting	Total
Engineer's Opinion of Probable Cost	$19,767.1	$5,945.5	$25,712.6
New Jersey SmartStart Rebate	-$1,445*	-$0****	-$1,445*
Total Cost	$18,322.1	$5,945.5	$24,267.6
Annual Energy Savings	$1,099.1	$91.2	$1,190.3
Annual Maintenance Cost Savings (AMCS)	$269.4	$2.9	$272.3
Simple Payback	**13.4 years**	**63.2 years**	**16.6 years**
Annual Return on Investment (AROI)	0.80%	-5.08%	-0.64%
Lifetime Energy Savings (15 years)**	$20,442.1	$1,696.2	$22,138.3
Internal Rate of Return (IRR)	4.10%	-11.89%	1.36%
Net Present Value (NPV)	$1,607.51	-$4,575.11	-$2,967.60

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs. Total lifetime savings does not equal sum of combined savings.
***See Appendix H & I for ECRM Financial Analyses
****No incentives are available for the type of retrofit being recommended.

It should be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled "Proposed Operational Hours without Sensors" and "Proposed Operational Hours with Sensors" in Appendix D.

4.2.4 Solids Holding Building EB-1

It is recommended that the existing interior lighting system at the Solids Holding Building be upgraded to high efficiency standards to reduce power consumption. In general, the recommended lighting upgrade, as presented in Appendix D, involves replacing existing inefficient bulbs, and installing new energy-efficient luminaires to the existing interior lighting system. Options for improving the interior and exterior lighting for the Solids Holding Building is listed in Table 4.2-7.

Table 4.2-7
Solids Holding Building EB-1 Lighting System Improvements

Interior Lighting	High Performance T8 Retrofit of T12 Fixtures
Exterior Lighting	Induction Retrofit of Exterior Fixtures

The annual energy savings for these options are as follows:

Interior Lighting: 0.9KW, 2,710.4 kWh and $320.6
Exterior Lighting: 0.1KW, 578.2 kWh and $68.4

The following table, Table 4.2-8, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the Solids Holding Building. Based upon the simple payback analysis presented in Table 4.2.8, it is recommended that interior lighting improvements be implemented.

Table 4.2-8
Solids Holding Building EB-1 Lighting System Improvements***

	Interior Lighting	Exterior Lighting	Total
Engineer's Opinion of Probable Cost	$6,030.3	$4,459.1	$10,489.4
New Jersey SmartStart Rebate	-$485*	-$0****	-$485*
Total Cost	$5,545.3	$4,459.1	$10,004.4
Annual Energy Savings	$320.6	$68.4	$389.0

Annual Maintenance Cost Savings (AMCS)	$76.5	$2.2	$78.7
Simple Payback	**14.0 years**	**63.2 years**	**21.4 years**
Annual Return on Investment (AROI)	0.50%	-5.08%	-1.99%
Lifetime Energy Savings (15 years)**	$5,962.8	$1,272.2	$7,235.0
Internal Rate of Return (IRR)	3.55%	-11.89%	-1.59%
Net Present Value (NPV)	$239.17	-$3,430.94	-$3,191.78

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs. Total lifetime savings does not equal sum of combined savings.
***See Appendix H & I for ECRM Financial Analyses
****No incentives are available for the type of retrofit being recommended.

It should be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled "Proposed Operational Hours without Sensors" and "Proposed Operational Hours with Sensors" in Appendix D.

4.2.5 Pump Station No. 1 Building PS-1

It is recommended that the existing interior lighting system at Pump Station No. 1 Building be upgraded to high efficiency standards to reduce power consumption. In general, the recommended lighting upgrade, as presented in Appendix D, involves replacing existing inefficient bulbs, and installing new energy-efficient luminaires to the existing interior lighting system. Options for improving the interior and exterior lighting for the Pump Station No. 1 Building are listed in Table 4.2-9.

Table 4.2-9
Pump Station No. 1 Building PS-1 Lighting System Improvements

Interior Lighting	High Performance T8 Retrofit of T12 Fixtures
Exterior Lighting	Induction Retrofit of Exterior Fixtures

The annual energy savings for these options are as follows:

Interior Lighting: 0.2KW, 724.2 kWh and $85.7
Exterior Lighting: 0.1KW, 385.4 kWh and $45.6

The following table, Table 4.2-10, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the Pump Station No. 1 Building. Based upon the simple payback analysis presented in Table 4.2.10, it is recommended that interior lighting improvements be implemented.

Table 4.2-10
Pump Station 1 Building Lighting System Improvements***

	Interior Lighting	Exterior Lighting	Total
Engineer's Opinion of Probable Cost	$1,758.1	$2,972.8	$4,730.8
New Jersey SmartStart Rebate	-$160*	-$0****	-$160*
Total Cost	$1,598.1	$2,972.8	$4,570.8
Annual Energy Savings	$85.7	$45.6	$131.3
Annual Maintenance Cost Savings (AMCS)	$18.4	$1.5	$19.8
Simple Payback	**15.4 years**	**63.2 years**	**30.3 years**
Annual Return on Investment (AROI)	-0.16%	-5.08%	-3.36%
Lifetime Energy Savings (15 years)**	$1,593.9	$848.1	$2,442.0
Internal Rate of Return (IRR)	2.32%	-11.89%	-5.24%
Net Present Value (NPV)	-$83.54	-$2,286.88	-$2,370.31

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs. Total lifetime savings does not equal sum of combined savings.
***See Appendix H & I for ECRM Financial Analyses
****No incentives are available for the type of retrofit being recommended.

It should be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled "Proposed Operational Hours without Sensors" and "Proposed Operational Hours with Sensors" in Appendix D.

4.2.6 Pump Station No. 2 Building PS-2

It is recommended that the existing interior lighting system at the Pump Station No. 2 Building be upgraded to high efficiency standards to reduce power consumption. In

general, the recommended lighting upgrade, as presented in Appendix D, involves replacing existing inefficient bulbs, and installing new energy-efficient luminaires to the existing interior lighting system. Options for improving the interior and exterior lighting for the Pump Station No. 2 Building are listed in Table 4.2-11.

Table 4.2-11
Pump Station No. 2 Building PS-2 Lighting System Improvements

Interior Lighting	High Performance T8 Retrofit of T12 Fixtures
Exterior Lighting	Induction Retrofit of Exterior Fixtures

The annual energy savings for these options are as follows:

Interior Lighting: 0.4KW, 1,293.6 kWh and $153.0
Exterior Lighting: 0.1KW, 289.1 kWh and $34.2

The following table, Table 4.2-12, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the Pump Station 2 Building. Based upon the simple payback analysis presented in Table 4.2.12, it is recommended that interior lighting improvements be implemented.

Table 4.2-12
Pump Station No. 2 Building PS-2 Lighting System Improvements***

	Interior Lighting	Exterior Lighting	Total
Engineer's Opinion of Probable Cost	$2,800.3	$2,229.6	$5,029.8
New Jersey SmartStart Rebate	-$235*	-$0****	-$235*
Total Cost	$2,565.3	$2,229.6	$4,794.8
Annual Energy Savings	$153.0	$34.2	$187.2
Annual Maintenance Cost Savings	$33.7	$1.1	$34.8

(AMCS)			
Simple Payback	**13.7 years**	**63.2 years**	**21.6 years**
Annual Return on Investment (AROI)	0.61%	-5.08%	-2.04%
Lifetime Energy Savings (15 years)**	$2,845.6	$636.1	$3,481.7
Internal Rate of Return (IRR)	3.76%	-11.89%	-1.70%
Net Present Value (NPV)	$153.63	-$1,715.52	$1,561.79

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs. Total lifetime savings does not equal sum of combined savings.
***See Appendix H & I for ECRM Financial Analyses.
****No incentives are available for the type of retrofit being recommended.

It should be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled "Proposed Operational Hours without Sensors" and "Proposed Operational Hours with Sensors" in Appendix D.

4.2.7 Chlorine & Sulfur Dioxide Building B-4

It is recommended that the existing interior lighting system at the Chlorine & Sulfur Dioxide Building be upgraded to high efficiency standards to reduce power consumption. In general, the recommended lighting upgrade, as presented in Appendix D, involves replacing existing inefficient bulbs, and installing new energy-efficient luminaires to the existing interior lighting system. Options for improving the interior and exterior lighting for the Chlorine & Sulfur Dioxide Building are listed in Table 4.2-13.

Table 4.2-13
Chlorine & Sulfur Dioxide Building B-4 Lighting System Improvements

Interior Lighting	High Performance T8 Retrofit of T12 Fixtures
Exterior Lighting	Induction Retrofit of Exterior Fixtures

The annual energy savings for these options are as follows:

Interior Lighting: 0.6KW, 1,810.5 kWh and $214.2
Exterior Lighting: 0.3KW, 1,252.7 kWh and $148.2

The following table, Table 4.2-14, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the Chlorine & Sulfur Dioxide Building. Based upon the simple payback analysis presented in Table 4.2.14, it is recommended that interior lighting improvements be implemented.

Table 4.2-14
Chlorine & Sulfur Dioxide Building B-4 Lighting System Improvements***

	Interior Lighting	Exterior Lighting	Total
Engineer's Opinion of Probable Cost	$4,141.4	$9,661.4	$13,802.9
New Jersey SmartStart Rebate	-$365*	-$0****	-$365*
Total Cost	$3,776.4	$9,661.4	$13,437.9
Annual Energy Savings	$214.2	$148.2	$362.4
Annual Maintenance Cost Savings (AMCS)	$45.9	$4.7	$50.7
Simple Payback	**14.5 years**	**63.2 years**	**32.5 years**
Annual Return on Investment (AROI)	0.22%	-5.08%	-3.59%
Lifetime Energy Savings (15 years)**	$3,983.9	$2,756.4	$6,740.3
Internal Rate of Return (IRR)	3.04%	-11.89%	-5.96%
Net Present Value (NPV)	$11.46	-$7,434.70	-$7,423.34

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs. Total lifetime savings does not equal sum of combined savings.
***See Appendix H & I for ECRM Financial Analyses
****No incentives are available for the type of retrofit being recommended.

It should be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled "Proposed Operational Hours without Sensors" and "Proposed Operational Hours with Sensors" in Appendix D.

4.2.8 Mile Hollow Pump Station (Main Building)

It is recommended that the existing exterior lighting system at the Main Building of the Mile Hollow Pump Station be upgraded to high efficiency standards to reduce

power consumption. In general, the recommended lighting upgrade, as presented in Appendix D, involves replacing existing inefficient bulbs, and installing new energy-efficient luminaires to the existing exterior lighting system. Options for improving the interior and exterior lighting for the Main Building of the Mile Hollow Pump Station are listed in Table 4.2-15.

Table 4.2-15
Mile Hollow Pump Station (Main Building) Lighting System Improvements

Interior Lighting	High Performance T8 Retrofit of T12 Fixtures, Incandescent to CFL
Exterior Lighting	Incandescent to CFL

The annual energy savings for these options are as follows:

Interior Lighting: 1.2KW, 626.1 kWh and $103.5
Exterior Lighting: 0.1KW, 617.6 kWh and $102.1

The following table, Table 4.2-16, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the Main Building of the Mile Hollow Pump Station. Based upon the simple payback analysis presented in Table 4.2.16, it is recommended that exterior lighting improvements be implemented.

Table 4.2-16
Mile Hollow Pump Station (Main Building) Lighting System Improvements***

	Interior Lighting	Exterior Lighting	Total
Engineer's Opinion of Probable Cost	$6,325.0	$107.8	$6,432.8
New Jersey SmartStart Rebate	-$450*	-$0****	-$450*
Total Cost	$5,875	$107.8	$5,982.8
Annual Energy Savings	$103.5	$102.1	$205.6
Annual Maintenance Cost Savings (AMCS)	$138.9	$70.5	$209.4

Simple Payback	24.2 years	0.6 years	14.4 years
Annual Return on Investment (AROI)	-2.54%	153.44%	0.27%
Lifetime Energy Savings (15 years)**	$1,925.0	$1,899.0	$3,823.9
Internal Rate of Return (IRR)	-2.96%	163.11%	3.13%
Net Present Value (NPV)	-$2,344.90	$2,405.79	$60.89

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs. Total lifetime savings does not equal sum of combined savings.
***See Appendix H & I for ECRM Financial Analyses
****No incentives are available for the type of retrofit being recommended.

It should be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled "Proposed Operational Hours without Sensors" and "Proposed Operational Hours with Sensors" in Appendix D.

4.2.9 Mile Hollow Pump Station (Dog Pound Building)

It is recommended that the existing exterior lighting system at the Dog Pound Building of the Mile Hollow Pump Station be upgraded to high efficiency standards to reduce power consumption. In general, the recommended lighting upgrade, as presented in Appendix D, involves replacing existing inefficient bulbs, and installing new energy-efficient luminaires to the existing exterior lighting system. Options for improving the interior and exterior lighting for the Dog Pound Building of the Mile Hollow Pump Station are listed in Table 4.2-17.

Table 4.2-17
Mile Hollow Pump Station (Dog Pound Building) Lighting System Improvements

Interior Lighting	High Performance T8 Retrofit of T12 Fixtures
Exterior Lighting	Incandescent to CFL

The annual energy savings for these options are as follows:

Interior Lighting: 0.04KW, 19.2 kWh and $3.2
Exterior Lighting: 0.05KW, 205.9 kWh and $34.0

The following table, Table 4.2-18, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the Dog Pound Building of the Mile Hollow Pump. Based upon the simple payback analysis

presented in Table 4.2.18, it is recommended that exterior lighting improvements be implemented.

Table 4.2-18
Mile Hollow Pump Station (Dog Pound Building) Lighting System Improvements***

	Interior Lighting	Exterior Lighting	Total
Engineer's Opinion of Probable Cost	$301.9	$35.9	$337.8
New Jersey SmartStart Rebate	-$30*	-$0****	-$30*
Total Cost	$271.9	$35.9	$307.8
Annual Energy Savings	$3.2	$34.0	$37.2
Annual Maintenance Cost Savings (AMCS)	$2.2	$23.5	$25.7
Simple Payback	**50.7 years**	**0.6 years**	**4.9 years**
Annual Return on Investment (AROI)	-4.68%	153.50%	13.77%
Lifetime Energy Savings (15 years)**	$59.5	$632.4	$691.9
Internal Rate of Return (IRR)	-9.97%	163.17%	21.78%
Net Present Value (NPV)	-$193.26	$801.48	$608.22

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs. Total lifetime savings does not equal sum of combined savings.
***See Appendix H & I for ECRM Financial Analyses
****No incentives are available for the type of retrofit being recommended.

It should be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled "Proposed Operational Hours without Sensors" and "Proposed Operational Hours with Sensors" in Appendix D.

4.2.10 Laurel Run Pump Station Building

It is recommended that the existing exterior lighting system at the Laurel Run Pump Station Building be upgraded to high efficiency standards to reduce power consumption. In general, the recommended lighting upgrade, as presented in Appendix D, involves replacing existing inefficient bulbs, and installing new energy-

efficient luminaires to the existing exterior lighting system. Options for improving the interior and exterior lighting for the Laurel Run Pump Station Building are listed in Table 4.2-19.

Table 4.2-19
Laurel Run Pump Station Building Lighting System Improvements

Interior Lighting	High Performance T8 Retrofit of T12 Fixtures, Incandescent to CFL
Exterior Lighting	Incandescent to CFL

The annual energy savings for these options are as follows:

Interior Lighting: 1.7KW, 901.6 kWh and $142.4
Exterior Lighting: 0.2KW, 657.0 kWh and $103.7

The following table, Table 4.2-20, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the Laurel Run Pump Station Building. Based upon the simple payback analysis presented in Table 4.2.20, it is recommended that exterior lighting improvements be implemented.

Table 4.2-20
Laurel Run Pump Station Building Lighting System Improvements***

	Interior Lighting	Exterior Lighting	Total
Engineer's Opinion of Probable Cost	$7,233.5	$77.6	$7,311.1
New Jersey SmartStart Rebate	-$395*	-$0****	-$395*
Total Cost	$6,838.5	$77.6	$6,916.1
Annual Energy Savings	$142.4	$103.7	$246.1
Annual Maintenance Cost Savings (AMCS)	$157.2	$47.0	$204.2
Simple Payback	**22.8 years**	**0.5 years**	**15.4 years**

Annual Return on Investment (AROI)	-2.29%	187.66%	-0.16%
Lifetime Energy Savings (15 years)**	$2,648.5	$1,928.7	$4,577.2
Internal Rate of Return (IRR)	-2.31%	197.33%	2.32%
Net Present Value (NPV)	-$2,475.39	$2,118.52	-$358.33

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs. Total lifetime savings does not equal sum of combined savings.
***See Appendix H & I for ECRM Financial Analyses
****No incentives are available for the type of retrofit being recommended.

It should be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled "Proposed Operational Hours without Sensors" and "Proposed Operational Hours with Sensors" in Appendix D.

4.2.11 Park Street No.1 Pump Station Building

It is recommended that the existing interior lighting system at the Park Street No.1 Pump Station Building be upgraded to high efficiency standards to reduce power consumption. In general, the recommended lighting upgrade, as presented in Appendix D, involves replacing existing inefficient bulbs, and installing new energy-efficient luminaires to the existing interior lighting system. Options for improving the interior and exterior lighting for the Park Street No.1 Pump Station Building are listed in Table 4.2-21.

Table 4.2-21
Park Street No.1 Pump Station Building Lighting System Improvements

Interior Lighting	High Performance T8 Retrofit of T12 Fixtures, Incandescent to CFL
Exterior Lighting	Induction Retrofit of Exterior Fixtures

The annual energy savings for these options are as follows:

Interior Lighting: 0.1KW, 62.9 kWh and $11.8
Exterior Lighting: 0.04KW, 192.7 kWh and $36.0

The following table, Table 4.2-22, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the Park Street Pump Station Building. Based upon the simple payback analysis presented in Table 4.2.22, it is recommended that interior lighting improvements be implemented.

Table 4.2-22
Park Street No.1 Pump Station Building Lighting System Improvements***

	Interior Lighting	Exterior Lighting	Total
Engineer's Opinion of Probable Cost	$452.8	$1,489.4	$1,939.2
New Jersey SmartStart Rebate	-$30*	-$0****	-$30*
Total Cost	$422.8	$1,486.4	$1,909.2
Annual Energy Savings	$11.8	$36	$47.8
Annual Maintenance Cost Savings (AMCS)	$29.6	$0.7	$30.4
Simple Payback	**10.2 years**	**40.5 years**	**24.4 years**
Annual Return on Investment (AROI)	3.13%	-4.20%	-2.58%
Lifetime Energy Savings (15 years)**	$219.5	$669.6	$889.0
Internal Rate of Return (IRR)	7.95%	-8.03%	-3.05%
Net Present Value (NPV)	$180.11	-$951.93	-$771.82

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs. Total lifetime savings does not equal sum of combined savings.
***See Appendix H & I for ECRM Financial Analyses
****No incentives are available for the type of retrofit being recommended.

It should be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled "Proposed Operational Hours without Sensors" and "Proposed Operational Hours with Sensors" in Appendix D.

4.2.12 Bossert Pump Station Building

It is recommended that the existing exterior lighting system at the Bossert Pump Station Building be upgraded to high efficiency standards to reduce power consumption. In general, the recommended lighting upgrade, as presented in Appendix D, involves replacing existing inefficient bulbs, and installing new energy-efficient luminaires to the existing exterior lighting system. Options for improving the

interior and exterior lighting for the Bossert Pump Station Building are listed in Table 4.2-23.

Table 4.2-23
Bossert Pump Station Building Lighting System Improvements

Interior Lighting	High Performance T8 Retrofit of T12 Fixtures
Exterior Lighting	Incandescent to CFL

The annual energy savings for these options are as follows:

Interior Lighting: 0.5KW, 269.4 kWh and $44.1
Exterior Lighting: 0.2KW, 823.4 kWh and $134.9

The following table, Table 4.2-24, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the Bossert Pump Station Building. Based upon the simple payback analysis presented in Table 4.2.24, it is recommended that exterior lighting improvements be implemented.

Table 4.2-24
Bossert Pump Station Building Lighting System Improvements***

	Interior Lighting	Exterior Lighting	Total
Engineer's Opinion of Probable Cost	$2,918.1	$143.8	$3,061.9
New Jersey SmartStart Rebate	-$210*	-$0****	-$210*
Total Cost	$2,708.1	$143.8	$2,851.9
Annual Energy Savings	$44.1	$134.9	$179
Annual Maintenance Cost Savings (AMCS)	$42.9	$94.0	$136.9
Simple Payback	**31.1 years**	**0.6 years**	**9.0 years**

Annual Return on Investment (AROI)	-3.45%	152.51%	4.41%
Lifetime Energy Savings (15 years)**	$820.2	$2,509.0	$3,329.2
Internal Rate of Return (IRR)	-5.52%	162.18%	9.87%
Net Present Value (NPV)	-$1,441.11	$3,189.70	$1,748.59

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs. Total lifetime savings does not equal sum of combined savings.
***See Appendix H & I for ECRM Financial Analyses
****No incentives are available for the type of retrofit being recommended.

It should be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled "Proposed Operational Hours without Sensors" and "Proposed Operational Hours with Sensors" in Appendix D.

4.2.13 Site & Roadway Lighting

It is recommended that the existing site and roadway lighting system at the Bordentown Sewerage Authority be upgraded to high efficiency standards to reduce power consumption. In general, the recommended lighting upgrade, as presented in Appendix D, involves replacing existing inefficient bulbs, and installing new energy-efficient luminaires to the existing lighting systems. Options for improving the site and roadway lighting for the Bordentown Sewerage Authority are listed in Table 4.2-25.

Table 4.2-25
Site and Roadway Lighting System Improvements

Exterior Lighting	Induction Retrofit of Exterior Fixtures

The annual energy savings for these options are as follows:

Exterior Lighting: 1.5KW, 6,552.5 kWh and $775.2

The following table, Table 4.2-26, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the site and roadway lighting system at the Bordentown Sewerage Authority.

Table 4.2-26 Site and Roadway Lighting System Improvements***	
	Exterior Lighting
Engineer's Opinion of Probable Cost	$6,060.5
New Jersey SmartStart Rebate	-$0****
Total Cost	$6,060.5
Annual Energy Savings	$775.2
Annual Maintenance Cost Savings (AMCS)	$9.3
Simple Payback	**7.7 years**
Annual Return on Investment (AROI)	6.28%
Lifetime Energy Savings (15 years)**	$14,417.9
Internal Rate of Return (IRR)	12.50%
Net Present Value (NPV)	$5,364.26

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs. Total lifetime savings does not equal sum of combined savings.
***See Appendix H & I for ECRM Financial Analyses
****No incentives are available for the type of retrofit being recommended.

It should be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled "Proposed Operational Hours without Sensors" and "Proposed Operational Hours with Sensors" in Appendix D.

4.3 Building HVAC Systems

The goal of this section is to present any heating and cooling energy reduction and cost saving measures that may also be cost beneficial. Where possible, measures will be presented with a life-cycle cost analysis. This analysis displays a payback period based on weighing the capital cost of the measure against predicted annual fiscal savings.

Some buildings, with more complex HVAC systems, were modeled to more accurately predict energy usage savings from certain recommendations. Buildings modeled were done so using software called eQuest, a Department of Energy-

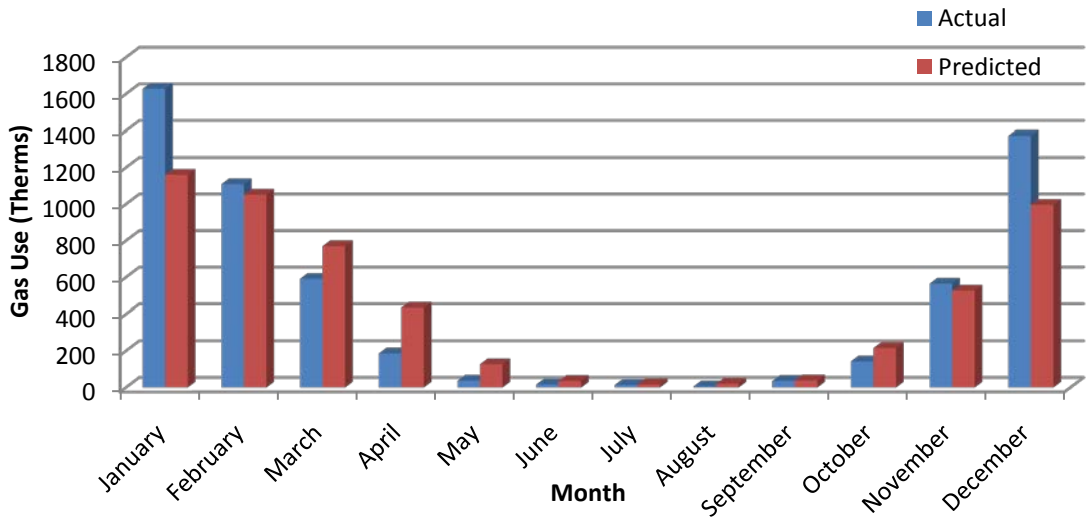
sponsored energy modeling program, to establish a baseline space heating and cooling energy usage. Climate data from Trenton, NJ was used for analyses. From this, the model may be calibrated, using historical utility bills, to predict the impact of theoretical energy savings measures. However, because the entire Wastewater Plant is on one electric bill, CDM was not able to accurately track electric heating requirements for each individual building at the wastewater plant. Therefore, only the three buildings that had gas heating were modeled because they could be more accurately calibrated to the actual gas usage of the plant.

Once annual energy savings from a particular measure have been predicted and the initial capital cost has been estimated, payback periods may be approximated. Equipment cost estimate calculations are provided in Appendix G. Building eQuest model run summaries for ECRMs may be found in Appendix C.

4.3.1 Wastewater Treatment Plant

As stated above, the entire Wastewater Treatment Facility is on one electric bill. Modeling all of the buildings and calibrating to the entire plant's electric bill would not be beneficial for estimated electrical usage or energy savings. However, there are three buildings that have gas heating. The three buildings that have gas heating are all billed on one account. The Administration Building B-1, Solids Processing Building B-3 , and the Solids Holding Building (EB-1) were modeled and calibrated to match the actual gas usage for the plant. To calibrate the models, CDM used natural gas bills from December, 2008 through January, 2010. Figure 4.3-1-1 below compares actual monthly gas usages, with those predicted by the eQuest models for the three buildings. The models combined are modeled within 6% of the actual usage.

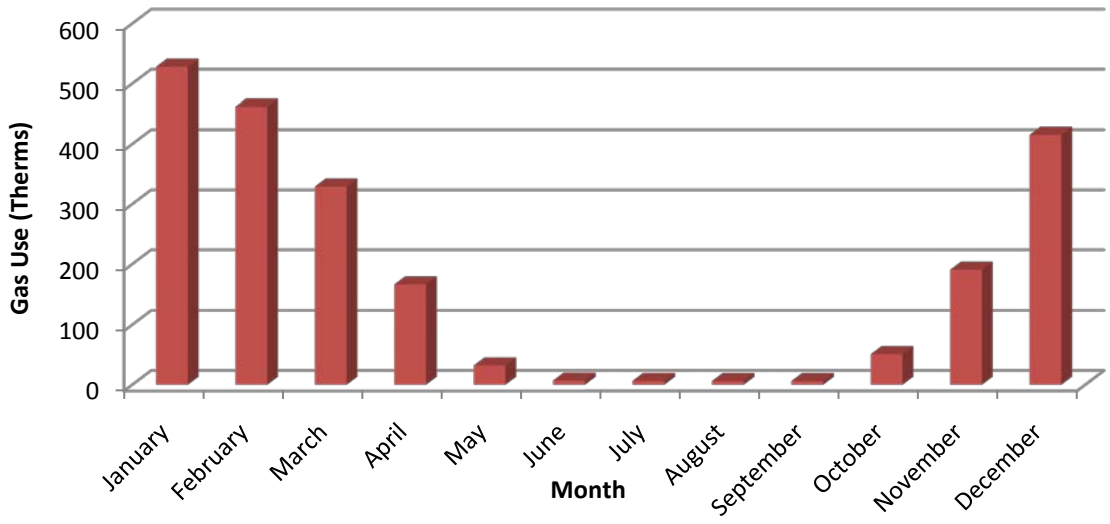
Figure 4.3-1-1: Wastewater Treatment Plant – Natural Gas Usage



4.3.2 Administration Building B-1

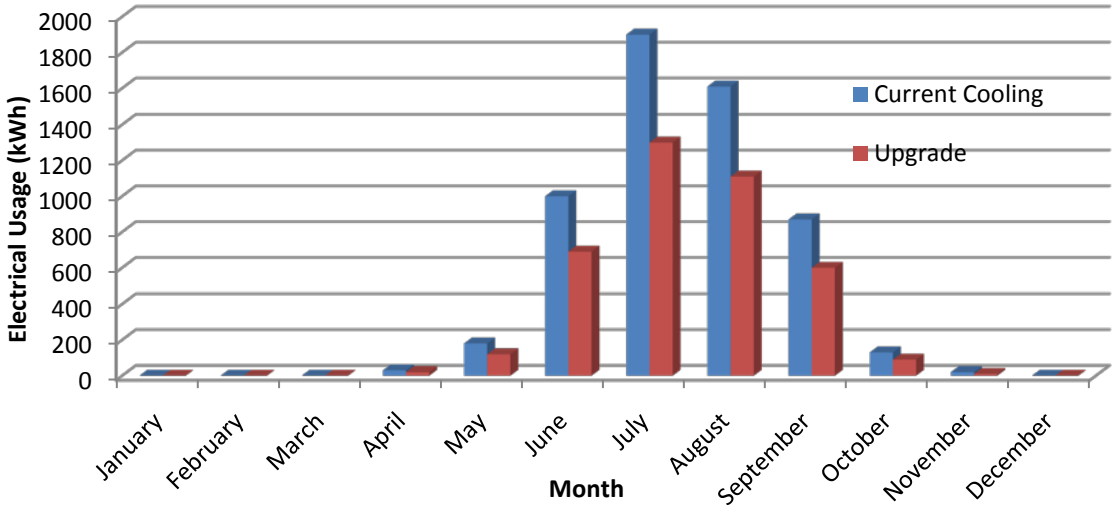
The Administration Building office area is heated by natural gas furnace units. The garage is heated by gas fired unit heaters. Air-cooled condensing units located outside work with evaporator (cooling) coils inside to provide cooling throughout the office area of the building. The building controls have night setback incorporated. Figure 4.3.2-1 below shows the natural gas usage for the Administration Building. The predicted usage is calibrated based on the summation of the three buildings to the single gas account. Therefore the predicted usage shown below is based on a model that is a fraction of the total calibrated usage.

Figure 4.3.2-1: Administration Building B-1 – Natural Gas Usage



The Carrier air-cooled condensing unit was manufactured in February of 1988 equipped with motor master fan speed control. The high efficiency air source heat pump was manufactured in March of 1988. Dates of manufacture were not found on the other two condensing units, but CDM assumes they were installed around the same time. All of the units are assumed to be beyond their ASHRAE useful life. It should be noted, that over time, efficiency declines and equipment degrades. Due to age of service and improvements in equipment efficiency, these units should be replaced. Figure 4.3.2-2 below shows the existing, and replacement cooling electrical usage next to each other for comparison.

Figure 4.3.2-2: Administration Building B-1 – Cooling Electrical Usage



Based on available data, the condensing units and heat pump seasonal energy efficiency ratio was found for the existing and replacement units. Replacement SEER ratios are based on the 2010 Carrier product catalog. Condensing unit 1 and 3 are assumed to have an SEER ratio of 10.15, and the replacement a 13.5 SEER ratio. Condensing unit 2 is assumed to have an SEER ratio of 9.75, and the replacement a 13.5 SEER ratio. The heat pump is assumed to have an SEER ratio of 10, and the replacement a 15 SEER ratio. Predicted fiscal savings from such an upgrade are identified in Table 4.3.2-1 below. The costs associated with each of the new units can be seen in Appendix H. Due to the entire plant being on a single electric bill, the Administration Building's electrical usage is not calibrated to actual usage. The savings and payback displayed below are based off a model of the Administration Building, and further investigation is warranted before proceeding.

Table 4.3.2-1: Administration Building B-1 Condensing Unit, and Heat Pump Replacement	
Predicted Annual Savings (kWh)	1,800
Total Annual Savings	$213
Initial Capital Cost of Upgrade	$16,944
Incentives**	$1,420
Cost of Upgrade	$15,524
Simple Payback	**72.9**

Table 4.3.2-1: Administration Building B-1 Condensing Unit, and Heat Pump Replacement	
Lifetime Energy Savings (15 years)*	$3,962
Annual Maintenance Cost Savings (AMCS)	$0
Annual Return on Investment (AROI)	(5.29%)
Internal Rate of Return (IRR)	(13.1%)
Net Present Value (NPV)	($12,422)

*Assumes 3% yearly inflation on electricity costs

**Incentives per New Jersey Clean Energy Program for Heat Pumps are $65 per ton. Split system incentives are granted on a case by case basis ranging from $73-$92 per ton. $73 per ton was used for this calculation.

Due to the long payback, CDM does not recommend this replacement. The Authority should make replacements of their condensing units and heat pump on an as needed basis.

Over several decades, ASHRAE has compiled data pertaining to service lives of most HVAC related equipment. From this, ASHRAE indicates a median service life (life until replacement) for HVAC related equipment that may be used as an estimate for the useful life of HVAC equipment currently in service. For example, ASHRAE indicates a window air conditioning unit has a median service life of 10 years. Therefore, if a window unit has been in service for more than 10 years, the owner may want to consider replacement. Not only will a replacement ensure minimal downtime between units (the unit is replaced before it ceases to function), but it will also maintain rated system efficiency, as efficiency tends to decrease with age.

All major equipment associated with the Administration Building noted during CDM's on site audit is listed in Table 4.3.2-2, along with ASHRAE-expected service lives. It should be noted that equipment that was not seen while on site and was observed on the provided drawings are included. Where equipment ages were not found on the equipment tags, they have been estimated based on the unit appearance, approximate renovation dates, or last manufacture date of the particular model. Additionally, in cases where a unit's manufacturer and/or model could not be determined due to an unreadable, faded, destroyed, or lost tag, manufacturer and model number information has been represented as "unknown".

Table 4.3.2-2 Administration Building B-1 HVAC Equipment Service Lives							
Description	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
Gas Fired Furnace Unit	Day Room	Utility Room, Superintendents Office, Day Room, Locker Rooms,	Carrier	160 MBH input unit	76%	Unknown	18
Gas Fired Furnace Unit	Laboratory	Laboratory, Lab Storage	Carrier	160 MBH input unit	76%	Unknown	18
Gas Fired Furnace Unit	File Room	Hallway, Lobby, Computer Room, Storage Room, File Room, Receptionist Office	Carrier	160 MBH input unit	76%	Unknown	18
Gas Fired Furnace Unit	Conference Room 2	Operators Office, Electric Room, Hallway, Assistant Directors Office, Conference Room 1 and 2	Carrier	160 MBH input unit	76%	Unknown	18
Electric Lab Hood Duct Heater	Laboratory	Laboratory	Fisher Scientific	20 kW	100%	Unknown	13
Electric Lab Hood Duct Heater	Laboratory	Laboratory	Fisher Scientific	15 kW	100%	Unknown	13

Table 4.3.2-2 Administration Building B-1 HVAC Equipment Service Lives							
Air-Cooled Condensing Unit	Outside	Utility Room, Superintendents Office, Day Room, Locker Rooms,	Carrier	38EH060630DL	9 SEER	22	15
Air-Cooled Condensing Unit	Outside	Laboratory, Lab Storage	Carrier	38HD0600621	10 SEER	~22	15
Air Source Heat Pump	Outside	Hallway, Lobby, Computer Room, Storage Room, File Room, Receptionist Office	Carrier	38QH060640	>9 SEER	22	15
Condensing Unit	Outside	Operators Office, Electric Room, Hallway, Assistant Directors Office, Conference Room 1 and 2	Carrier	38HD060C600	10 SEER	~22	15
Gas Fired Unit Heaters (x8)	Garage	Garage	Reznor	Unknown	80%	Unknown	13

CDM also created an inventory of observed domestic water heaters. This will identify any water heaters that are in need of replacement. Domestic water heaters observed to be in poor or aging condition would warrant replacement, as they are likely not operating at peak efficiency. This domestic water heater inventory may be seen as Table 4.3.2-3 below.

Table 4.3.2-3 Administration Building B-1 Domestic Water Heaters					
Location	Make	Storage Capacity (Gallons)	Type	Heating Capacity	Estimated Age (Years)
Laundry Room	State Industries	100	Gas	200 MBH	Unknown

4.3.3 Grit and Bar Screen Building B-2

The Grit and Bar Screen Building HVAC equipment consists of electric unit heaters, exhaust fans and motor operated louvers. The HVAC equipment at the Grit and Bar Screen Building appeared to be operating efficiently and based upon our site inspection appears to be in good operating order. Due to the equipment condition, CDM did not identify any HVAC-related energy savings recommendations for this building.

All major equipment noted during CDM's on site audit is listed in Table 4.3.3-1 below, along with estimated current ages and ASHRAE-expected service lives. It should be noted that equipment that was not seen while on site and was observed on the provided drawings are included.

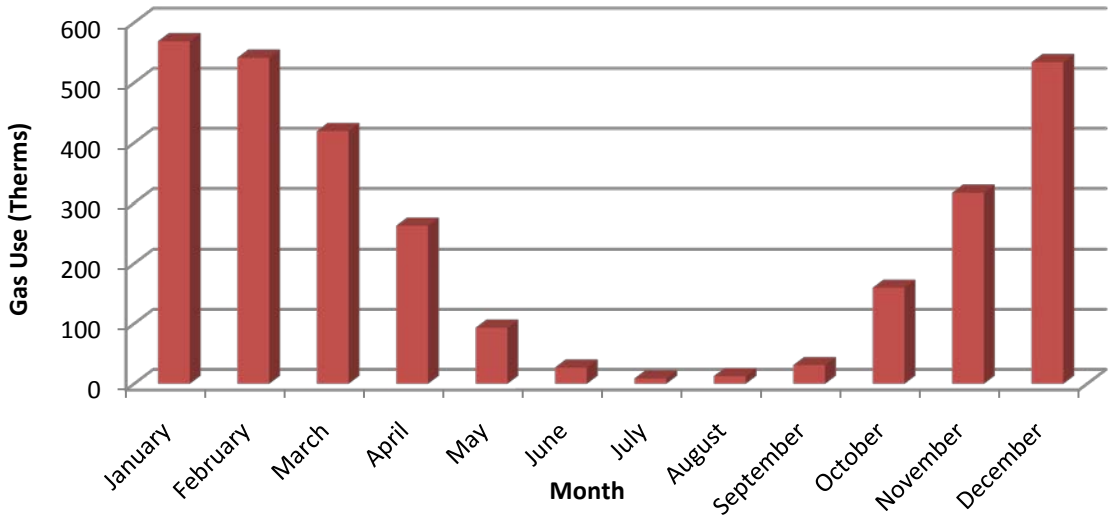
Table 4.3.3-1 Grit and Bar Screen Building B-2 HVAC Equipment Service Lives							
Description	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
Explosion Proof Electric Unit Heater (x3)	Grit Room	Grit Room	Markel	X1316-480360-10.0	100%	Unknown	13
Explosion Proof Electric Unit Heater (x3)	Screen Room	Screen Room	Markel	X1316-480360-10.0	100%	Unknown	13

Table 4.3.3-1 Grit and Bar Screen Building B-2 HVAC Equipment Service Lives							
Explosion Proof Electric Unit Heater (x2)	Lower Floor	Screen Room	Markel	10 kW	100%	Unknown	13

4.3.4 Solids Processing Building B-3

The Solids Processing Building office area is heated by natural gas fired unit heaters, make-up air units, and electric unit heaters. Make-up air units distribute outside air to the first floor through ductwork that is run along the inside perimeter of the building. Four large roof mounted exhaust fans remove air from the ground floor. Air is removed from the electrical room by an exhaust fan. A roof mounted supply fan and motorized louvers supply air to the basement and roof mounted exhaust fans remove air from the basement. Figure 4.3.4-1 below shows the natural gas usage for the Solids Processing Building. The predicted usage is calibrated based on the summation of the three buildings to the single gas account. Therefore the predicted usage shown below is based on a model that is a fraction of the total calibrated usage.

Figure 4.3.4-1: Solids Processing Building B-3 – Natural Gas Usage



As a potential ECRM, CDM evaluated the implementation of heat recovery ventilators (HRV) serving the first floor filter press room. The existing HVAC equipment drawing schedule that was supplied indicates that the four exhaust fans that exhaust air from the first floor are each rated at an air flow rate of 12,000 cfm. Heat recovery ventilators are plate type heat exchangers that capture the heat from the air that is

being exhausted from the interior space, and apply it to the colder air being brought into the space. In doing so, they offer an attractive savings in required heating energy.

CDM has used the building eQuest model to predict natural gas savings realized from installing four heat recovery ventilators for the first floor filter press room.

The addition of the HRVs adds resistance to building ventilation systems, forcing fans to work harder to sufficiently ventilate the area. Therefore, while an HRV installation will likely cause a reduction in natural gas heating energy usage, it will also result in an increased ventilation electrical load.

Figure 4.3.4-2 shows the predicted gas usage for implementation of four HRVs in the Solids Processing Building first floor filter press room. The exhaust fans are located relatively close to the make-up air units. Implementation of four HRVs allows for limited ductwork changes, due to the close proximity of the exhaust fans and make-up air units. Figure 4.3.4-3 shows the expected increase in ventilation load from this installation. HRVs are modeled with a sensible effectiveness of 60%.

Figure 4.3.4-2: Solids Processing Building B-3 – Heat Recovery Ventilator - Natural Gas Usage

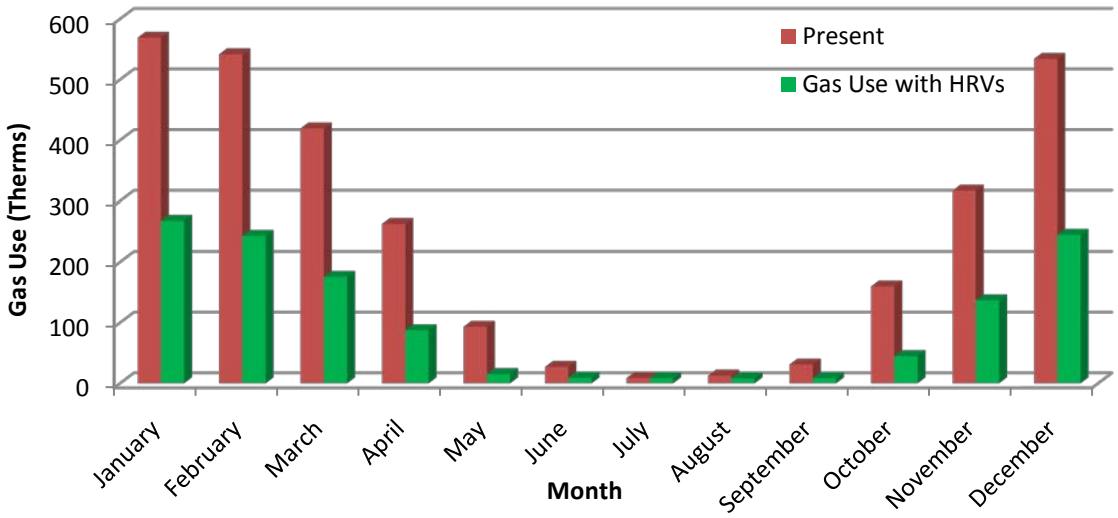
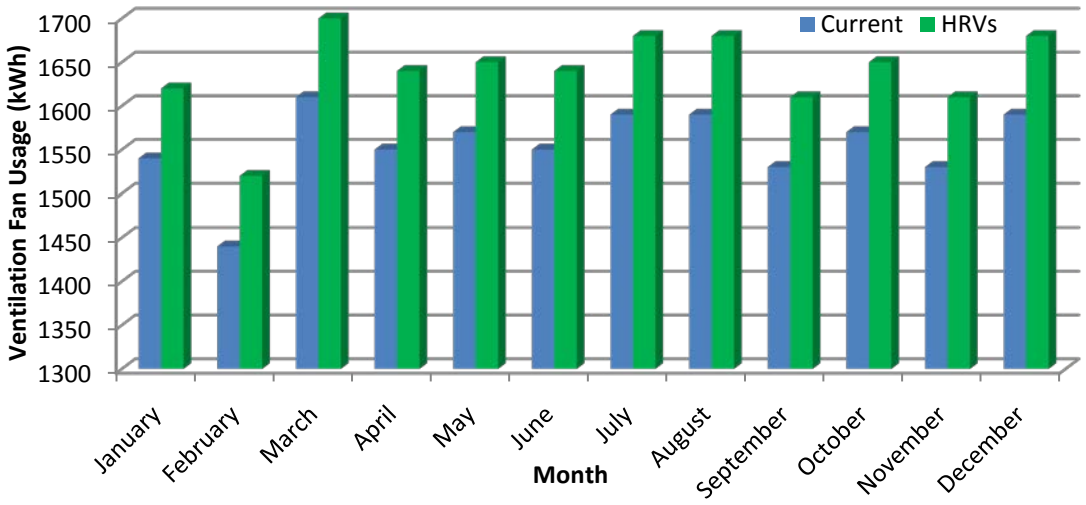


Figure 4.3.4-3: Solids Processing Building B-3 – Heat Recovery Ventilator – Ventilation Fan Usage



Predicted fiscal savings from adding four HRVs to the system serving the first floor filter press room are identified in Table 4.3.4-1 below. Lifetime savings calculations for all ECRM's may be found in Appendix I. CDM anticipates no maintenance savings resulting from implementing four HRVs for the filter press area.

Table 4.3.4-1: Solid's Processing Building B-3 HRVs Payback	
Predicted Annual Savings (Therms)	1,727
Natural Gas Annual Savings	$2,072
Predicted Annual Electricity Usage Increase (kWh)	(1,020)
Electricity Cost Savings	($121)
Total Savings	$1,951
Initial Capital Cost of Upgrade	$435,016
Incentives	$0
Cost of Upgrade	$435,016
Simple Payback	**69.2**
Lifetime Energy Savings (15 years)*	$33,581
Annual Maintenance Cost Savings (AMCS)	$0
Annual Return on Investment (AROI)	(6.22%)
Internal Rate of Return (IRR)	(21.13%)

Table 4.3.4-1: Solid's Processing Building B-3 HRVs Payback	
Net Present Value (NPV)	($406,603)

*Assumes 2% yearly inflation on natural gas costs, 3% inflation on electricity costs

The predicted usages are calibrated based on the summation of the three buildings to the single gas account. It's important to note that these estimates are based on building models, and further investigation is warranted before pursuing HRVs. CDM could not locate any incentives for implementing heat recovery ventilators. The payback is beyond 20 years, therefore this ECM is not recommended by CDM.

All major equipment noted during CDM's on site audit is listed in Table 4.3.4-2 below, along with estimated current ages and ASHRAE-expected service lives. It should be noted that equipment that was not seen while on site and was observed on the provided drawings are included.

Table 4.3.4-2 Solids Processing Building B-3 HVAC Equipment Service Lives

Description	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
Gas Fired Unit Heater (x6)	Upper Floor	Upper Floor	Reznor	95.6 MBH input	80%	Unknown	13
Gas Fired Unit Heater (x3)	Upper Floor	Upper Floor	Reznor	V3 Tcore	Unknown	Unknown	13
Electric Unit Heater	Stairwell	Stairwell	Brasch	5 kW	100%	Unknown	13
Electric Unit Heater (x2)	Control Room	Control Room	Brasch	5 kW	100%	Unknown	13
Electric Unit Heater (x4)	Basement	Basement	Brasch	7.5 kW	100%	Unknown	13

Table 4.3.4-2 Solids Processing Building B-3 HVAC Equipment Service Lives							
Electric Unit Heater (x8)	Basement	Basement	Brasch	5 kW	100%	Unknown	13
Makeup Air Unit 1	Roof	Northeast side of Upper Floor	Reznor	CRPV-PAK3-6-S2JE	Unknown	Unknown	15
Makeup Air Unit 2	Roof	East Corner of Upper Floor	Reznor	Unknown	Unknown	Unknown	15
Makeup Air Unit 3	Roof	Northwest side of Upper Floor	Reznor	Unknown	Unknown	Unknown	15
Makeup Air Unit 4	Roof	Southwest side of Upper Floor	Reznor	CRPV-PAK3-6-S2JE	Unknown	Unknown	15

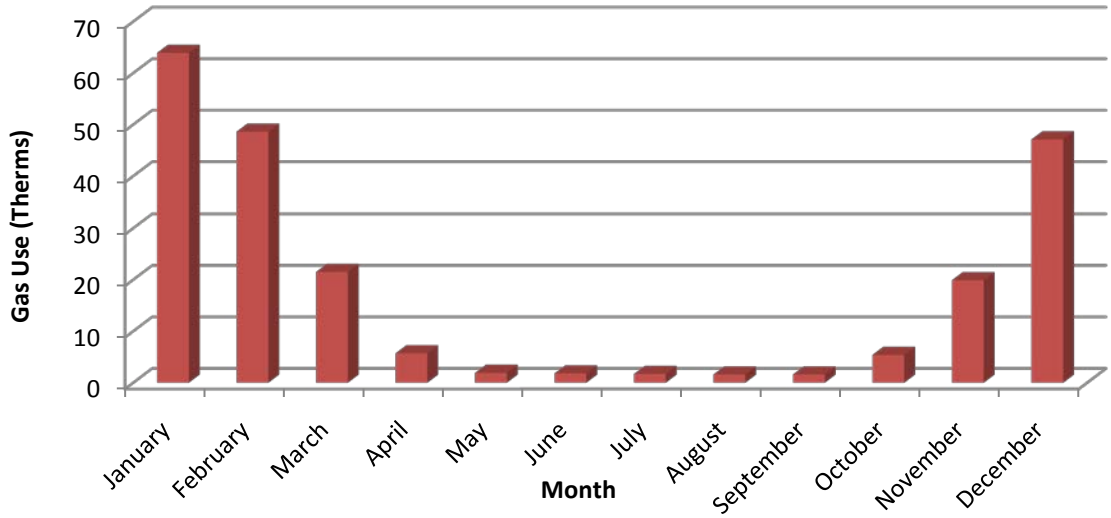
An inventory of observed compressors may be seen as Table 4.3.4-3 below.

Table 4.3.4-3 Solids Processing Building B-3 Compressors				
Location	Make	Receiver Capacity (Gallons)	Motor (HP)	Observed Condition
Basement	Ingersoll-Rand	Unknown	5	Good
Basement	Ingersoll-Rand	Unknown	5	Good
Basement	Ingersoll-Rand	Unknown	5	Good
Basement	Ingersoll-Rand	Unknown	5	Good

4.3.5 Solids Holding Building EB-1

The Solids Holding Building office area is heated by gas and electric unit heaters. There are two roof mounted exhaust fans and motor operated wall louvers that provide ventilation for the sludge conveyer room, and the first floor. A wall mounted exhaust fan and motor operated wall louvers provide ventilation to the basement. Figure 4.3.5-1 below shows the natural gas usage for the Solids Holding Building. The predicted usage is calibrated based on the summation of the three buildings to the single gas account. Therefore the predicted usage shown below is based on a model that is a fraction of the total calibrated usage.

Figure 4.3.5-1: Solids Holding Building EB-1 – Natural Gas Usage



The HVAC equipment at the Solids Holding Building appeared to be operating efficiently and based upon our site inspection appears to be in good operating order. Due to the equipment condition, CDM did not identify any HVAC-related energy savings recommendations for this building.

All major equipment noted during CDM's on site audit is listed in Table 4.3.5-1 below, along with estimated current ages and ASHRAE-expected service lives. It should be noted that equipment that was not seen while on site and was observed on the provided drawings are included.

Table 4.3.5-1 Solids Holding Building EB-1 HVAC Equipment Service Lives							
Description	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
Gas Fired Unit Heater (x2)	Sludge Conveyor Room	Sludge Conveyor Room	Reznor	95.6 MBH input	80%	Unknown	13
Electric Unit Heater (x3)	First Floor	First Floor	Brasch	BTUH-7.5-4803AD	100%	Unknown	13
Electric Unit Heater	Electric Room	Electric Room	Brasch	BTUH-5-4803AD	100%	21	13
Electric Unit Heater	Water Closet	Water Closet	Brasch	BTUH-5-4803AD	100%	Unknown	13
Electric Unit Heater (x2)	Basement	Basement	Brasch	7.5 kW	100%	Unknown	13

CDM also created an inventory of observed domestic water heaters. This will identify any water heaters that are in need of replacement. Domestic water heaters observed to be in poor or aging condition would warrant replacement, as they are likely not operating at peak efficiency. This domestic water heater inventory may be seen as Table 4.3.5-2 below.

Table 4.3.5-2 Solids Holding Building EB-1 Domestic Water Heaters						
Location	Make	Storage Capacity (Gallons)	Type	Heating Capacity	Date	Observed Condition
Water Closet	State Censible	Unknown	Electric	Unknown	Unknown	Water Closet

4.3.6 Pump Station No. 1 Building

The Pump Station No. 1 Building's HVAC systems consist of three electric unit heaters. The pump utility room is heated by two of the three Brasch 5 kW electric unit heaters. An exhaust fan and motor operated louver provide ventilation to both the pump utility room and electrical room. The HVAC equipment at the Pump Station No. 1 Building appeared to be operating efficiently and based upon our site inspection appears to be in good operating order. Due to the equipment condition, CDM did not identify any HVAC-related energy savings recommendations for this building.

All major equipment noted during CDM's on site audit is listed in Table 4.3.6-1 below, along with estimated current ages and ASHRAE-expected service lives. It should be noted that equipment that was not seen while on site and was observed on the provided drawings are included.

Table 4.3.6-1 Pump Station No. 1 Building HVAC Equipment Service Lives

Description	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
Electric Unit Heater (x2)	Pump Utility Room	Pump Utility Room	Brasch	BTUH-5-4803AD	100%	21	13
Electric Unit Heater	Electrical Room	Electrical Room	Brasch	BTUH-5-4803AD	100%	21	13

An inventory of observed compressors may be seen as Table 4.3.6-2 below.

Table 4.3.6-2 Pump Station No. 1 Building Compressors

Location	Make	Receiver Capacity (Gallons)	Motor (HP)	Observed Condition
Electrical Room	Gast	Unknown	1/6	Good

4.3.7 Pump Station No. 2 Building

The Pump Station No. 2 Building is heated by electric unit heaters. Exhaust ductwork is run throughout the basement that removes air from the space. The exhaust fan for the basement is mounted on a concrete slab outside. The HVAC equipment at the Pump Station No. 2 Building appeared to be operating efficiently and based upon our site inspection appears to be in good operating order. Due to the equipment condition, CDM did not identify any HVAC-related energy savings recommendations for this building.

All major equipment noted during CDM's on site audit is listed in Table 4.3.7-1 below, along with estimated current ages and ASHRAE-expected service lives. It should be noted that equipment that was not seen while on site and was observed on the provided drawings are included.

Table 4.3.7-1 Pump Station No. 2 Building HVAC Equipment Service Lives

Description	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
Electric Unit Heater	Stairwell	Stairwell	Brasch	BTUH-7.5-480-3AD	100%	21	13
Electric Unit Heater	Electrical Room	Electrical Room	Brasch	BTUH-5-4803AD	100%	21	13
Electric Unit Heater (x3)	Basement	Basement	Brasch	5 kW	100%	21	13

4.3.8 Chlorine and Sulfur Dioxide Building B-4

The Chlorine and Sulfur Dioxide Building is heated by electric unit heaters. Three roof exhaust fans, and a wall exhaust fan extract air from the four spaces. Three exhaust fans with separate ductwork runs through three of the spaces. The HVAC equipment at the Chlorine and Sulfur Dioxide Building appeared to be operating efficiently and based upon our site inspection appears to be in good operating order. Due to the equipment condition, CDM did not identify any HVAC-related energy savings recommendations for this building.

All major equipment noted during CDM's on site audit is listed in Table 4.3.8-1 below, along with estimated current ages and ASHRAE-expected service lives. It should be noted that equipment that was not seen while on site and was observed on the provided drawings are included.

Table 4.3.8-1 Chlorine and Sulfur Dioxide Building B-4 HVAC Equipment Service Lives

Description	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
Electric Unit Heater	Sulfur Dioxide Scale Room	Sulfur Dioxide Scale Room	Brasch	BTUH-7.5-4803-B-24-D-TDR	100%	Unknown	13
Electric Unit Heater (x2)	Sulfur Dioxide Scale Room	Sulfur Dioxide Scale Room	Brasch	BTUH-7.5-480-3-24-D-A	100%	Unknown	13
Electric Unit Heater (x2)	Sulfonator /Chlorinator Room	Sulfonator/Chlorinator Room	Brasch	5 kW	100%	Unknown	13
Electric Unit Heater (x2)	Chlorine Scale Room	Chlorine Scale Room	Brasch	BTUH-7.5-480-3-24-D-A	100%	Unknown	13
Electric Unit Heater	Electrical Room	Electrical Room	Brasch	BTUH-5-4803AD	100%	Unknown	13

4.3.9 Mile Hollow Pump Station (2 Buildings)

4.3.9.A Main Building

The Main Building is heated by gas fired unit heaters. Exhaust fans and wall louvers provide ventilation for the building. The HVAC equipment at the Main Building appeared to be operating efficiently and based upon our site inspection appears to be in good operating order. Due to the equipment condition and limited occupancy of

the building, CDM did not identify any HVAC-related energy savings recommendations for this building.

All major equipment noted during CDM's on site audit is listed in Table 4.3.9.-1 below, along with estimated current ages and ASHRAE-expected service lives. The basement did not have lighting at the time of the audit, so the unit heaters were assumed to be the same units as the first floor. It should be noted that only equipment that was observed at the time of the audit is included.

Table 4.3.9-1 Main Building HVAC Equipment Service Lives

Description	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
Gas Fired Unit Heater (x2)	First Floor	First Floor	Dayton	3E226C	81%	Unknown	13
Gas Fired Unit Heater	First Floor	First Floor	Unknown	Unknown	Unknown	Unknown	13
Gas Fired Unit Heater (x2)	Basement	Basement	Dayton	Unknown	81%	Unknown	13

CDM also created an inventory of observed domestic water heaters. This will identify any water heaters that are in need of replacement. Domestic water heaters observed to be in poor or aging condition would warrant replacement, as they are likely not operating at peak efficiency. This domestic water heater inventory may be seen as Table 4.3.9-2 below. It was reported at the time of the audit that this domestic water heater is not used.

Table 4.3.9-2 Main Building Domestic Water Heaters

Location	Make	Storage Capacity (Gallons)	Type	Heating Capacity	Estimated Age (Years)
Basement	A.O. Smith	Unknown	Unknown	Unknown	Unknown

4.3.9.B Dog Pound

The Dog Pound is heated by a gas fired furnace. It was reported at the time of the audit that the furnace was recently installed by the police department. The HVAC equipment at the Dog Pound appeared to be operating efficiently and based upon our site inspection appears to be in good operating order. Due to the equipment condition, CDM did not identify any HVAC-related energy savings recommendations for this building.

All major equipment noted during CDM's on site audit is listed in Table 4.3.9-3 below, along with estimated current ages and ASHRAE-expected service lives. It should be noted that only equipment that was observed at the time of the audit is included.

Table 4.3.9-3 Dog Pound HVAC Equipment Service Lives

Description	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
Gas Fired Furnace	Northeast Corner of Room	Pump Station	American Standard	Freedom 80	80 AFUE	New	18

4.3.10 Laurel Run Pump Station

The HVAC equipment at the Laurel Run Pump Station is heated by an oil furnace. The HVAC equipment at the Laurel Run Pump appeared to be operating efficiently and based upon our site inspection appears to be in good operating order. Due to the equipment condition, CDM did not identify any HVAC-related energy savings recommendations for this building.

All major equipment noted during CDM's on site audit is listed in Table 4.3.10-1 below, along with estimated current ages and ASHRAE-expected service lives. It should be noted that equipment that was not seen while on site and was observed on the provided drawings are included.

Table 4.3.10-1 Laurel Run Pump Station HVAC Equipment Service Lives							
Description	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
Oil Heater	Closet	Pump Station	Williamson	Unknown	Unknown	Unknown	18

CDM also created an inventory of observed domestic water heaters. This will identify any water heaters that are in need of replacement. Domestic water heaters observed to be in poor or aging condition would warrant replacement, as they are likely not operating at peak efficiency. This domestic water heater inventory may be seen as Table 4.3.10-2 below.

Table 4.3.10-2 Laurel Run Pump Station Domestic Water Heaters					
Location	Make	Storage Capacity (Gallons)	Type	Heating Capacity	Estimated Age (Years)
Bathroom	A.O. Smith	30	Electric	4,500 Watts	Unknown

4.3.11 Park Street No.1 Pump Station Building

The Park Street No.1 Pump Station Building is heated by explosion proof electric unit heaters. There is gas usage that is attributed to the gas generator being run for short periods each month. The HVAC equipment at the Park Street No.1 Pump Station Building appeared to be operating efficiently and based upon our site inspection appears to be in good operating order. Due to the equipment condition, CDM did not identify any HVAC-related energy savings recommendations for this building.

All major equipment noted during CDM's on site audit is listed in Table 4.3.11-1 below, along with estimated current ages and ASHRAE-expected service lives. It should be noted that equipment that was not seen while on site and was observed on the provided drawings are included.

Table 4.3.11-1 Park Street No.1 Pump Station Building HVAC Equipment Service Lives							
Description	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
Explosion Proof Electric Unit Heater	Lower Level	Lower Level	Ruffneck	TX412	100%	7	13

4.3.12 Bossert Pump Station Building

The Bossert Pump Station Building is heated by electric unit heaters. A wall mounted exhaust fan provides ventilation for the building. The HVAC equipment at the Bossert Pump Station appeared to be operating efficiently and based upon our site inspection appears to be in good operating order. Due to the equipment condition, CDM did not identify any HVAC-related energy savings recommendations for this building.

All major equipment noted during CDM's on site audit is listed in Table 4.3.12-1 below, along with estimated current ages and ASHRAE-expected service lives. It should be noted that equipment that was not seen while on site and was observed on the provided drawings are included.

Table 4.3.12-1 Bossert Pump Station Building HVAC Equipment Service Lives							
Description	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
Electric Unit Heater (x2)	First Floor	First Floor	Dayton	2E659B	100%	Unknown	13
Electric Unit Heater	Basement	Basement	Dayton	2E639B	100%	21	13

4.4 Motor Upgrades and VFD Additions

The goal of this section is to present any energy conservation measures related to upgrading motors to premium efficiency models, and adding variable frequency drives (VFD) that may also be cost beneficial.

To model the expected energy savings from upgrading motors to premium efficiency models, and the addition of VFDs, MotorMaster+ 4.0 software was utilized. Additional installation and labor costs were modeled using CostWorks software.

Additional benefits when adding VFDs include removal of traditional motor starters, lower stress levels on the motor bearings and windings, and a decrease in stress and wear on the motor/pump.

Application of a VFD to a pump results in a cubic power reduction with speed, where a 1% reduction in pump speed, will result in a 4% reduction in energy usage required to drive the pump. For the pumps which we added VFDs at the Black's Creek Wastewater Treatment Plant, we assumed a 25% decrease in energy usage, which results in a 6.25% reduction in pump horsepower.

Please note that the Engineer's Estimate of Probable Construction Costs presented herein are estimates based on historic data compiled from similar installations and engineering opinions. Additional engineering will be required for each measure identified in this report and final scope of work and budget cost estimates will need to be confirmed prior to the coordination of project financing.

In addition, several of the motors surveyed had unreadable nameplate data. Therefore, CDM has assumed standard NEMA efficiencies for these motors for analysis. Refer to Appendix M for individual motor and VFD information.

4.4.1 Grit & Bar Screen Building B-2

It is recommended that the following existing motors at the Grit & Bar Screen Building be upgraded to high efficiency standards to create energy savings potential for the Authority. The following pieces of equipment are included in the analysis:

-Grit Blower #1 Motor (Runs 4380 hours per year)
-Grit Blower #2 Motor (Runs 4380 hours per year)

The combined annual energy savings for this option is as follows:

Motor Upgrades: 0.64kW, 2,801.94 kWh and $331.47

Refer to Appendix M for more information regarding motor annual energy savings.

The following Table, Table 4.4-1, summarizes a simple payback analysis assuming the implementation of all recommended motor upgrades for the Grit & Bar Screen Building. For more information about the upgrades and a complete breakdown of simple payback and savings per motor, refer to Appendix M.

Table 4.4-1
Grit & Bar Screen Building Motor Upgrades***

Engineer's Opinion of Probable Cost	$1,822.75
New Jersey SmartStart Rebate	-$162*
Total Cost	$1,660.75
Annual Energy Savings	$331.47
Simple Payback	**5.0 years**
Annual Return on Investment (AROI)	13.29%
Lifetime Energy Savings (15 years)**	$6,164.98
Internal Rate of Return (IRR)	21.23%
Net Present Value (NPV)	$3,166.48

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs
***See Appendices M for Upgrade Analyses, & H & I for ECRM Financial Analyses

It should also be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled "Yearly Runtime" in Appendix M.

4.4.2 Solids Processing Building B-3

It is recommended that the following existing motors at the Solids Processing Building be upgraded to high efficiency standards to create energy savings potential for the Authority. The following pieces of equipment are included in the analysis:

-Polymer Feed Pump #1 Motor (Runs 2190 hours per year)
-Polymer Feed Pump #2 Motor (Runs 2190 hours per year)
-Polymer Feed Pump #3 Motor (Runs 2190 hours per year)
-Belt Filter Press Polymer Transfer Pump Motor (Runs 2190 hours per year)

-Macerator Pump #1 Motor (Runs 2190 hours per year)
-Macerator Pump #2 Motor (Runs 2190 hours per year)
-Macerator Pump #3 Motor (Runs 2190 hours per year)
-Sludge Holding Tank Blower #1 50 hp Motor (Runs 2903 hours per year)(1)
-Sludge Holding Tank Blower #2 50 hp Motor (Runs 1087 hours per year)(1)
-Sludge Holding Tank Blower #3 50 hp Motor (Runs 2596 hours per year)(1)
-Secondary Scum Pump #1 Motor (Runs 182 hours per year)
-Secondary Scum Pump #2 Motor (Runs 182 hours per year)
-Return Activated Sludge Pump #1 Motor (Runs 2883 hours per year)
-Return Activated Sludge Pump #2 Motor (Runs 2797 hours per year)
-Return Activated Sludge Pump #3 Motor (Runs 2308 hours per year)

Note 1: The Sludge Holding Tank Blowers are further discussed under Section 4.1.1 Sludge Holding Tanks. At a minimum, if new blowers or jet mixing/aeration system are not implemented, then it is recommended that the motors for the existing Sludge Holding Tank Blowers be replaced.

Additionally, the Utility Water Pump system is in continuous operation which conveys plant effluent water for seal water, spray water, wash water for the belt filter press system, makeup water, hydrant system and dilution water for the chemical feed systems. Typically, one pump is continuously operated at full speed regardless of the system water demand. The below table demonstrates the energy savings should these motors be equipped with variable frequency drives and upgraded to high efficiency standards that would enable the pumps to reduce energy consumption during periods of low system demand. Please note that the Utility Water Booster Pumps are already high efficiency and do not need to be upgraded.

Utility Water Pump System:
-Utility Water Pump #1 Motor (Runs 0 hours per year)
-Utility Water Pump #2 Motor (Runs 4226 hours per year)(New VFD)
-Utility Water Pump #3 Motor (Runs 4194 hours per year)(New VFD)
-Utility Water Booster Pump #1 Motor (Runs 4380 hours per year)(New VFD)
-Utility Water Booster Pump #2 Motor (Runs 4380 hours per year)(New VFD)

Utility Water Pump System Motor Upgrades and VFD Additions*	
Current Energy Consumption (kWh/Yr)	301,684.84
Current Cost Per Year	$35,689.32
Energy Consumption Savings with	80,662.35

Upgrades (kWh/Yr)	
Annual Energy Savings with Upgrades	$9,542.40

*See Appendix M for Upgrade Analyses

The combined annual energy savings at the Solids Processing Building is as follows:

Motor Upgrades: 24.90kW, 89,313.42 kWh and $10,824.12

Refer to Appendix M for more information regarding motor annual energy savings.

The following Table, Table 4.4-2, summarizes a simple payback analysis assuming the implementation of all recommended motor upgrades and VFD additions for the Solids Processing Building. For more information about the upgrades and a complete breakdown of simple payback and savings per motor, refer to Appendix M.

Table 4.4-2
Solids Processing Building B-3 Motor Upgrades and VFD Additions***

Engineer's Opinion of Probable Cost	$66,317.63
New Jersey SmartStart Rebate	-$1,824*
Total Cost	$64,493.63
Annual Energy Savings	$10,824.12
Simple Payback	**6.0 years**
Annual Return on Investment (AROI)	10.12%
Lifetime Energy Savings (15 years)**	$201,316.88
Internal Rate of Return (IRR)	17.44%
Net Present Value (NPV)	$93,139.19

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs
***See Appendices M for Upgrade Analyses, & H & I for ECRM Financial Analyses

It should be noted that this analysis does not include all motors in the Solids Processing Building. The following existing motors either are not in use or are already highly efficient with no VFD's required:

-Sludge Thickener Polymer Transfer Pump Motor
-Splitter Box 3 Transfer Pump Motor
-Liquid Loader Pump #1 Motor
-Liquid Loader Pump #2 Motor
-Waste Activated Sludge Pump #1 Motor
-Waste Activated Sludge Pump #2 Motor

Refer to Appendix M for more information regarding individual motor payback periods.

4.4.3 Solids Holding Building EB-1

It is not recommended to upgrade the existing blower motor at the Solids Holding Building to high efficiency. This is primarily based on the 16.9 year payback period. However, this option was included in the analysis for the purpose of illustrating pre-incentive costs. The NJBPU custom measure program could possibly provide additional incentives which would reduce the payback period. Refer to Appendix G for NJPBU custom measures incentives worksheets. Should the pre-incentive cost option be pursued, the following piece of equipment is included in the analysis:

-Sludge Holding Tank Blower 60 hp Motor (Runs 8760 hours per year)(1)

Note 1: The Sludge Holding Tank Blowers are further discussed under Section 4.1.1 Sludge Holding Tanks. At a minimum, if new blowers or jet mixing/aeration system are not implemented, then it is recommended that the motors for the existing Sludge Holding Tank Blowers be replaced.

The annual energy savings for this option is as follows:

Motor Upgrades: 0.25kW, 2,183.78 kWh and $258.34

The following Table, Table 4.4-3, summarizes a simple payback analysis assuming the implementation of all recommended motor upgrade for the Solids Holding Building. For more information about the upgrade and a complete breakdown of simple payback and savings per motor, refer to Appendix M.

Table 4.4-3
Solids Holding Building EB-1 Motor Upgrades***

Engineer's Opinion of Probable Cost	$4,592.81
New Jersey SmartStart Rebate	-$234*
Total Cost	$4,358.81

Annual Energy Savings	$258.34
Simple Payback	**16.9 years**
Annual Return on Investment (AROI)	-0.74%
Lifetime Energy Savings (15 years)**	$4,804.84
Internal Rate of Return (IRR)	1.16%
Net Present Value (NPV)	-$596.58

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs
***See Appendices M for Upgrade Analyses, & H & I for ECRM Financial Analyses

It should be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled "Yearly Runtime" in Appendix M. If custom measure incentives are not available for motor replacement in the Solids Holding Building, recommend replacing existing motors in the case of motor failure only.

4.4.4 Pump Station No. 1 Building PS-1

It is not recommended to upgrade the existing motors at the Pump Station No. 1 Building to high efficiency. This is primarily based on the 50.0 year payback period. However, this option was included in the analysis for the purpose of illustrating pre-incentive costs. The NJBPU custom measure program could possibly provide additional incentives which would reduce the payback period. Refer to Appendix G for NJPBU custom measures incentives worksheets. Should the pre-incentive cost option be pursued, the following piece of equipment is included in the analysis:

-Raw Sewage Screw Lift Pump #1 Motor (Runs 0 hours per year)
-Raw Sewage Screw Lift Pump #2 Motor (Runs 5665 hours per year)
-Raw Sewage Screw Lift Pump #3 Motor (Runs 3537 hours per year)

The combined annual energy savings for this option is as follows:

Motor Upgrades: 0.25kW, 1,169.09 kWh and $138.30

The following Table, Table 4.4-4, summarizes a simple payback analysis assuming the implementation of all recommended motor upgrade for the Pump Station No. 1 Building. For more information about the upgrade and a complete breakdown of simple payback and savings per motor, refer to Appendix M.

Table 4.4-4 Pump Station No. 1 Building PS-1 Motor Upgrades***	
Engineer's Opinion of Probable Cost	$7,180.31
New Jersey SmartStart Rebate	-$270*
Total Cost	$6,910.31
Annual Energy Savings	$138.30
Simple Payback	**50.0 years**
Annual Return on Investment (AROI)	-4.67%
Lifetime Energy Savings (15 years)**	$2,572.23
Internal Rate of Return (IRR)	-9.90%
Net Present Value (NPV)	-$4,896.23

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs
***See Appendices M for Upgrade Analyses, & H & I for ECRM Financial Analyses

It should be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled "Yearly Runtime" in Appendix M. If custom measure incentives are not available for motor replacement in the Pump Station 1Building, recommend replacing existing motors in the case of motor failure only.

4.4.5 Pump Station No. 2 Building PS-2

It is not recommended to upgrade the existing motors at the Pump Station No. 2 Building to high efficiency. This is primarily based on the 3,676.8 year payback period. However, this option was included in the analysis for the purpose of illustrating pre-incentive costs. The NJBPU custom measure program could possibly provide additional incentives which would reduce the payback period. Refer to Appendix G for NJPBU custom measures incentives worksheets. Should the pre-incentive cost option be pursued, the following piece of equipment is included in the analysis:

-Primary Sludge Pump #1 Motor (Runs 12 hours per year)
-Primary Sludge Pump #2 Motor (Runs 12 hours per year)

The combined annual energy savings for this option is as follows:

Motor Upgrades: 0.27kW, 3.25 kWh and $0.54

The following Table, Table 4.4-5, summarizes a simple payback analysis assuming the implementation of all recommended motor upgrade for the Pump Station No. 2 Building. For more information about the upgrade and a complete breakdown of simple payback and savings per motor, refer to Appendix M.

Table 4.4-5
Pump Station No. 2 PS-2 Motor Upgrades***

Engineer's Opinion of Probable Cost	$2,153.38
New Jersey SmartStart Rebate	-$180*
Total Cost	$1,973.38
Annual Energy Savings	$0.54
Simple Payback	**3,676.8 years**
Annual Return on Investment (AROI)	-6.64%
Lifetime Energy Savings (15 years)**	$10.04
Internal Rate of Return (IRR)	N/A
Net Present Value (NPV)	-$1,965.52

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs
***See Appendices M for Upgrade Analyses, & H & I for ECRM Financial Analyses

It should be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled "Yearly Runtime" in Appendix M. If custom measure incentives are not available for motor replacement in the Pump Station No. 2 Building, recommend replacing existing motors in the case of motor failure only.

It should be noted that this analysis does not include all motors in the Pump Station No. 2 Building. The following existing motors are already highly efficient with no VFD's required:

-Primary Scum Pump #1 Motor
-Primary Scum Pump #2 Motor

Refer to Appendix M for more information regarding individual motor payback periods.

4.4.6 Oxidation Ditch

The oxidation ditch system is the major consumer of energy at the Black's Creek wastewater treatment plant facility. Each ditch comprises of twelve disc aerators equipped with 25 Hp motors. Currently, disc aerators are manually operated to achieve the desired dissolved oxygen set points for the oxidation ditches. During periods of low flow or even during rain events where the strength of the wastewater and/or organic loading to the oxidation ditches is reduced, the disc aeration system cannot automatically control its operation to reduce the amount of aeration until an operator manually shuts down the disc aerators; thus creating an energy inefficient system operation.

A detailed process evaluation of the oxidation ditch system is not part of the scope of work for this energy audit report. The estimated energy savings provided in this section will demonstrate to the Authority that significant energy savings can be realized should variable frequency drives and an automated oxygen control system be implemented into the operational protocol of the oxidation ditch system. A detailed process analysis will be required to be performed on the oxidation ditch system to more accurately define potential energy savings, engineering cost opinions, and financial computations.

It is recommended that the following existing motors at the Oxidation Ditch be upgraded to high efficiency standards to create energy savings potential for the Authority. The motors in the Oxidation Ditch operate on a standby basis where an average of 10 motors, out of 24, run for 24 hours at any one time throughout the year. The calculated payback associated with upgrading only 10 of the most used motors is small enough to pay off replacement of all 24 motors. Therefore all 24 motors were considered in the analysis since standby conditions may require the operation of any combination of motors. The following pieces of equipment are included in the analysis:

-Oxidation Ditch #1-24 Motor (Run times vary per year)(New VFD)

The combined annual energy savings for this option is as follows:

Motor Upgrades: 51.10kW, 447,623.14 kWh and $73,992.10

Refer to Appendix M for more information regarding motor annual energy savings.

The following Table, Table 4.4-6, summarizes a simple payback analysis assuming the implementation of all recommended motor upgrades for the above referenced equipment. For more information about the upgrades and a complete breakdown of simple payback and savings per motor, refer to Appendix M.

Table 4.4-6
Oxidation Ditch Motor Upgrades and VFD Additions***

Engineer's Opinion of Probable Cost	$196,891.50
New Jersey SmartStart Rebate	-$2,808*
Total Cost	$194,083.50
Annual Energy Savings	$73,992.10
Simple Payback	**2.6 years**
Annual Return on Investment (AROI)	31.46%
Lifetime Energy Savings (15 years)**	$1,376,172.70
Internal Rate of Return (IRR)	40.77%
Net Present Value (NPV)	$883,471.35

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs
***See Appendices M for Upgrade Analyses, & H & I for ECRM Financial Analyses

It should be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled "Yearly Runtime" in Appendix M.

4.4.7 Mile Hollow Pump Station Building

It is not recommended to upgrade the existing motors at the Mile Hollow Pump Station Building to high efficiency. This is primarily based on the 47.3 year payback period. However, this option was included in the analysis for the purpose of illustrating pre-incentive costs. The NJBPU custom measure program could possibly provide additional incentives which would reduce the payback period. Refer to Appendix G for NJPBU custom measures incentives worksheets. Should the pre-incentive cost option be pursued, the following piece of equipment is included in the analysis:

-Pump #1 Motor (Runs 730 hours per year)
-Pump #2 Motor (Runs 730 hours per year)
-Pump #3 Motor (Runs 730 hours per year)

The combined annual energy savings for this option is as follows:

Motor Upgrades: 2.11kW, 1,543.34 kWh and $276.46

The following Table, Table 4.4-7, summarizes a simple payback analysis assuming the implementation of all recommended motor upgrade for the Mile Hollow Pump Station Building. For more information about the upgrade and a complete breakdown of simple payback and savings per motor, refer to Appendix M.

Table 4.4-7
Mile Hollow Pump Station Motor Upgrades***

Engineer's Opinion of Probable Cost	$13,778.44
New Jersey SmartStart Rebate	-$702*
Total Cost	$13,076.44
Annual Energy Savings	$276.46
Simple Payback	**47.3 years**
Annual Return on Investment (AROI)	-4.55%
Lifetime Energy Savings (15 years)**	$5,141.86
Internal Rate of Return (IRR)	-9.42%
Net Present Value (NPV)	-$9,050.32

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs
***See Appendices M for Upgrade Analyses, & H & I for ECRM Financial Analyses

It should be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled "Yearly Runtime" in Appendix M. If custom measure incentives are not available for motor replacement in the Mile Hollow Pump Station Building, recommend replacing existing motors in the case of motor failure only.

4.4.8 Laurel Run Pump Station Building

It is not recommended to upgrade the existing motors at the Laurel Run Pump Station Building to high efficiency because they are already high efficiency. The following existing motors are already highly efficient with no VFD's required:

-Pump #1 Motor (Runs 475 hours per year)
-Pump #2 Motor (Runs 1095 hours per year)

Refer to Appendix M for more information regarding individual motor information.

4.4.9 Park Street No.1 Pump Station Building

It is not recommended to upgrade the existing motors at the Park Street No.1 Pump Station Building to high efficiency. This is primarily based on the 32.5 year payback period. However, this option was included in the analysis for the purpose of illustrating pre-incentive costs. The NJBPU custom measure program could possibly provide additional incentives which would reduce the payback period. Refer to Appendix G for NJPBU custom measures incentives worksheets. Should the pre-incentive cost option be pursued, the following piece of equipment is included in the analysis:

-Pump #1 Motor (Runs 1460 hours per year)
-Pump #2 Motor (Runs 1460 hours per year)

The combined annual energy savings for this option is as follows:

Motor Upgrades: 0.52kW, 755.61 kWh and $123.77

The following Table, Table 4.4-8, summarizes a simple payback analysis assuming the implementation of all recommended motor upgrade for the Park Street No. 1 Pump Station Building. For more information about the upgrade and a complete breakdown of simple payback and savings per motor, refer to Appendix M.

Table 4.4-8
Park Street No.1 Pump Station Motor Upgrades***

Engineer's Opinion of Probable Cost	$4,260.75
New Jersey SmartStart Rebate	-$234*
Total Cost	$4,026.75

Annual Energy Savings	$123.77
Simple Payback	**32.5 years**
Annual Return on Investment (AROI)	-3.59%
Lifetime Energy Savings (15 years)**	$2,301.99
Internal Rate of Return (IRR)	-5.96%
Net Present Value (NPV)	-$2,224.27

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs
***See Appendices M for Upgrade Analyses, & H & I for ECRM Financial Analyses

It should be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled "Yearly Runtime" in Appendix M. If custom measure incentives are not available for motor replacement in the Park Street No.1 Pump Station Building, recommend replacing existing motors in the case of motor failure only.

4.4.10 Bossert Pump Station Building

It is recommended that the following existing motors at the Bossert Pump Station Building be upgraded to high efficiency standards to create energy savings potential for the Authority. The following pieces of equipment are included in the analysis:

-Pump #1 Motor (Runs 1581 hours per year)
-Pump #2 Motor (Runs 2020 hours per year)

The combined annual energy savings for this option is as follows:

Motor Upgrades: 0.94kW, 1,694.40 kWh and $277.54

The following Table, Table 4.4-9, summarizes a simple payback analysis assuming the implementation of all recommended motor upgrade for the Bossert Pump Station Building. For more information about the upgrade and a complete breakdown of simple payback and savings per motor, refer to Appendix M.

Table 4.4-9 Bossert Pump Building Motor Upgrades***	
Engineer's Opinion of Probable Cost	$2,751.38
New Jersey SmartStart Rebate	-$208*
Total Cost	$2,543.38
Annual Energy Savings	$277.54
Simple Payback	**9.2 years**
Annual Return on Investment (AROI)	4.25%
Lifetime Energy Savings (15 years)**	$5,161.94
Internal Rate of Return (IRR)	9.63%
Net Present Value (NPV)	$1,498.46

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs
***See Appendices M for Upgrade Analyses, & H & I for ECRM Financial Analyses

It should be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled "Yearly Runtime" in Appendix M. If custom measure incentives are not available for motor replacement in the Bossert Pump Station Building, recommend replacing existing motors in the case of motor failure only.

4.4.11 All Combined Motors

CDM has completed a full motor replacement analysis, in which replacing almost all motors described in this analysis is considered. Based on this analysis, it is recommended that most of the existing motors at the Bordentown Sewerage Authority could be upgraded to high efficiency standards to create energy savings potential for the Authority.

The annual energy savings for this option is as follows:

All Motor Upgrades: 80.98kW, 547,087.97 kWh and $86,222.65

Refer to Appendix M for more information regarding motor annual energy savings.

The following Table, Table 4.4-10, summarizes a simple payback analysis assuming the implementation of all recommended motor upgrades and VFD additions for the Authority. For more information about the upgrades and VFD additions and a complete breakdown of simple payback per motor, refer to Appendix M.

Table 4.4-10 All Combined Motor Upgrades and VFD Additions***	
Engineer's Opinion of Probable Cost	$299,748.94
New Jersey SmartStart Rebate	-$6,622*
Total Cost	$293,126.94
Annual Energy Savings	$85,964.31
Simple Payback	**3.41 years**
Annual Return on Investment (AROI)	22.66%
Lifetime Energy Savings (15 years)**	$1,598,842.80
Internal Rate of Return (IRR)	31.58%
Net Present Value (NPV)	$958,780.49

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix G.
**3% yearly inflation on electricity costs
***See Appendix M for ECRM Financial Analyses

It should be noted that the Annual Energy Savings assume the annual hours per year of operation as outlined under the columns entitled "Yearly Runtime" in Appendix M.

4.5 Alternative Energy Sources

4.5.1 Photovoltaic Solar Energy System Overview

Photovoltaic (PV) cells convert energy in sunlight directly into electrical energy through the use of silicon semi conductors, diodes and collection grids. Several PV cells are then linked together in a single frame of module to become a solar panel. PV cells are able to convert the energy from the sun into electricity. The angle of inclination of the PV cells, the amount of sunlight available, the orientation of the

panels, the amount of physical space available and the efficiency of the individual panels are all factors that affect the amount of electricity that is generated.

Based on the estimated cumulative total available land area, calculations determine that the installation of a photovoltaic (PV) solar energy ground system will be appropriate for the Black's Creek Wastewater Treatment Plant, Mile Hollow Pump Station, Laurel Run Pump Station, and Bossert Pump Station. Park Street No.1 Pump Station was not chosen because it does not have the land space required to install a sizeable solar array system on the ground. In addition, building roof was angled poorly thus impairing the installation of a solar array system.

As part of this energy audit, a preliminary engineering feasibility study of wastewater treatment plant and pump stations to support solar generation facilities was completed consisting of the following tasks:

a. Site Visit by our engineers;

b. Satellite Image Analysis and Conceptual design and layout of the photovoltaic system;

c. Design and construction cost estimates;

d. Determine a preliminary design for the size and energy production of the solar system.

The total unobstructed available area of land with southern exposure was evaluated. It is important to note the following:

1. The PV system sizing and kWh production was calculated assuming the installation of a crystalline module facing south direction (220 Degree Azimuth) and tilted approximately 20 degrees to allow better rain water shedding and snow melting. Please note that the kWh production as well as system size may differ significantly based on final panel tilt selected during the design phase.

2. Blended electric rates were used based on actual utility bills and were applied for the facility.

The following is a preliminary study on the feasibility of installing a PV solar system at the Bordentown Sewerage Authority's Plant and Pump Stations to generate a portion of the facilities electricity requirements. The system is designed to offset the electric purchased from the local utility and not as a backup or emergency source of power.

In order to determine the best location for the installation of the PV solar system, a satellite image analysis and site walk through of the facilities was performed on April 15th, 2010. Also, as part of our assessment, we investigated possible locations for electrical equipment that need to be installed such as combiner boxes, disconnect switches and DC to AC inverters. Consideration was also given to locations of interconnection between the solar system and the facilities electrical grid.

Roof mounted solar installation for various buildings within the wastewater treatment plant is not recommended. For solar installation on rooftops, considerable structural integrity is necessary. The best location for solar PV array would be the adjoining fields to the facilities; as the small area of the roofs would most likely need extra structural support, bringing the payback outside of 20 years. A study should be performed in order to determine if construction of a solar PV array on this land is feasible, based on land type, soil, etc.

4.5.1.1 Black's Creek Wastewater Treatment Plant

There is no amount of shading on the land that may have an impact to the design and layout of a solar PV array. The quality of land was not confirmed, and prior to installation of a solar array, site analysis should determine if the land is feasible for a PV solar system.

The Project Team conducted both a facility walk through and a satellite image analysis and based on the estimated available area calculations predict that a system rated at approximately 619.2 kW (dc) is feasible.

Electrical Service

The electrical service size of the Black's Creek Wastewater Treatment Plant is 3000 A, at 277/480V, 3-phase. The interconnection point for the PV system will require a modification or replacement of the existing service entrance equipment wherein the PV system feeder connections will have to be made after the main circuit breaker, and protective relaying will also have to be implemented. Preferably, the AC inverter should be installed in close proximity to the service entrance equipment, but in the case of the Black Creek Wastewater Treatment Plant, the main circuit breaker is in an exterior enclosed substation and there is little to no available space. The inverter should be installed outside on a concrete pad in a weather proof enclosure. AC wiring would run from the inverters into the connection point(s) at the service entrance equipment. Any connection points would have to meet NEC and local utility requirements. Further investigation and verification of existing electrical equipment would be required prior to implementation of a PV system.

4.5.1.2 Mile Hollow Pump Station

There is a minimal amount of shading on the land that may have an impact to the design and layout of a solar PV array. A shading analysis would need to be performed during the design phase of the project. The quality of land was not confirmed, and prior to installation of a solar array, site analysis should determine if the land is feasible for a PV solar system.

The Project Team conducted both a facility walk through and a satellite image analysis and based on the estimated available area calculations predict that a system rated at approximately 42.1 kW (dc) is feasible.

Electrical Service

The electrical service size of the Mile Hollow Pump Station is 400 A, at 480V, 3-phase. The interconnection point for the PV system will require a modification or replacement of the existing service entrance equipment wherein the PV system feeder connections will have to be made after the main circuit breaker, and protective relaying will also have to be implemented. Any connection points would have to meet NEC and local utility requirements. Further investigation and verification of existing electrical equipment would be required prior to implementation of a PV system.

4.5.1.3 Laurel Run Pump Station

There is a minimal amount of shading on the land that may have an impact to the design and layout of a solar PV array. A shading analysis would need to be performed during the design phase of the project. The quality of land was not confirmed, and prior to installation of a solar array, site analysis should determine if the land is feasible for a PV solar system.

The Project Team conducted both a facility walk through and a satellite image analysis and based on the estimated available area calculations predict that a system rated at approximately 40.0 kW (dc) is feasible.

Electrical Service

The electrical service size of the Laurel Run Pump Station is 200 A, at 480V, 3-phase. The interconnection point for the PV system will require a modification or replacement of the existing service entrance equipment wherein the PV system feeder connections will have to be made after the main circuit breaker, and protective relaying will also have to be implemented. Any connection points would have to meet NEC and local utility requirements. Further investigation and verification of existing electrical equipment would be required prior to implementation of a PV system.

4.5.1.4 Bossert Pump Station

There is a minimal amount of shading on the land that may have an impact to the design and layout of a solar PV array. A shading analysis would need to be performed during the design phase of the project. The quality of land was not confirmed, and prior to installation of a solar array, site analysis should determine if the land is feasible for a PV solar system.

The Project Team conducted both a facility walk through and a satellite image analysis and based on the estimated available area calculations predict that a system rated at approximately 24.0 kW (dc) is feasible.

Electrical Service

The electrical service size of the Bossert Pump Station is 175 A, at 240V, 3-phase. The interconnection point for the PV system will require a modification or replacement of the existing service entrance equipment wherein the PV system feeder connections will have to be made after the main circuit breaker, and protective relaying will also have to be implemented. Any connection points would have to meet NEC and local utility requirements. Further investigation and verification of existing electrical equipment would be required prior to implementation of a PV system.

4.5.1.5 Basis for Design and Calculations

Fixed Tilt System

The most common solar PV system is referred to as a ("fixed tilt") system typically mounted to a metal rack that can be fixed at a specific angle. There are also ("tracking systems") or movable along one or two axes to follow the position of the sun during the day. For a roof-mounted PV system, tracking systems are very rarely installed and are usually used for ground-mounted systems only, as they require more complex racks and higher maintenance costs. For the "fixed" system, the tilt is determined based on the following factors: geographical location, total targeted kWh production, seasonal electricity requirements and weather conditions such as wind. Ideally, the module tilt for Central to Eastern New Jersey should be 25-35 degrees with an azimuth as close as possible to 180 (south); however, our experience has shown that PV systems are typically installed at a tilt of 20 degrees or lower in order to avoid any issues with wind and to maximize total system size.

The type of PV panels and equipment used to mount the system shall be determined based on the wind conditions determined during the design phase of the project. In general, penetration/tie-down systems, non-penetrating ballasted type systems, or a combination of the two should be considered.

Calculation of PV System Yield

An industry accepted software package, PV Watts, was used to calculate projected annual electrical production of the crystalline silicon PV system in its first year, as summarized in Table 4.5-1. The system was design to provide maximum kWh production based on available land space. The assumptions we used in the calculations were as follows: average monthly electrical usage per month of each facility, average aggregate electrical rate of each facility, square feet of available land space, and a solar rating of 4.48 kWh/m^2 per day.

Table 4.5-1 PV Solar System Summary

Site	Est. Area (ft2)	kWh	Annual Energy Savings	Est. Annual SREC	Lifetime Energy Savings (25 Years)*	Annual Return On Investment (AROI)	Net Present Value (NPV)	Internal Rate of Return (IRR)
Wastewater Treatment Plant	61,924	729,805	$86,335.9	$308,708	$3,147,743.4	1.6%	-$1,457,333	0.6%
Mile Hollow Pump Station	4,207	49,582	$8,195.9	$20,973	$298,816.5	0.9%	-$162,219	-0.06%
Laurel Run Pump Station	4,000	47,000	$7,421.3	$19,881	$270,575.1	0.7%	-$169,593	-0.4%
Bossert Pump Station	2,400	28,285	$4,633.1	$11,965	$168,919.4	0.2%	-$147,206	-1.4%

*3% yearly inflation on electricity costs

Total Costs

It should be noted that construction costs are only estimates based on historic data compiled from similar installations, and engineering opinion. Additional engineering and analysis is required to confirm the condition of the land, the system type, sizing, costs and savings. For illustration purposes, a draft financial analysis pro forma is attached outlining all project costs and revenues, Refer to Appendix E.

Table 4.5-2 Solar PV Array Engineer's Opinion of Probable Cost

Engineer's Opinion of Probable Cost	**$8,659,738**

As stated above the engineer's opinion of probable costs are based on experience with the pricing of solar installations in New Jersey, and are intended to provide the Authority with a reasonable budget cost. A typical solar installation can vary in cost from $7.00 - $10.00 per watt depending on size, complexity of the system, labor rates, etc. Approximately 60-70% of that number is material costs while the balance is labor, engineering, etc. Like any installation, certain conditions can affect a price upward or downward. We have included a budget of $9/watt for the solar system installation with an additional estimated budget of $100,000 for potential electric service work.

Based on a simple payback model, summarized in Table 4.5-3, it would benefit the Bordentown Sewerage Authority to further investigate the installation of a solar energy system at the Black's Creek Wastewater Treatment Plant. This is primarily based on the initial upfront capital investment required for a solar energy system installation and the 18.0 year payback period. The simple payback for the other listed pump stations does not justify the installation of a solar energy system at those sites. This payback period may justify installing the solar energy system. Other options such as Power Purchase Agreements are potentially available as well to help finance the project. Solar technology is constantly changing and will most likely continue to lower in price. Two major factors influencing the project financial evaluation is the variance of the prevailing energy market conditions and Solar Renewable Energy Credit (SREC) rates, with the largest impact to the payback model being the SREC credit pricing.

Table 4.5-3 includes the total simple payback analysis for the installation of a solar energy system at the Bordentown Sewerage facilities. Refer to Appendix E for a more detailed solar financing spreadsheet.

Table 4.5-3: Simple Payback Analysis for Solar Energy System				
Building & Measure	**Engineer's Opinion of Probable Cost**	**Annual SREC Credit**	**Annual Fiscal Savings**	**Simple Payback (Years)**
Black's Creek Wastewater Treatment Plant – PV Solar System	$7,091,450	$308,708	$86,335.9	**18.0**
Mile Hollow Pump Station – PV Solar System	$598,288	$20,973	$8,195.9	**20.5**
Laurel Run Pump Station – PV Solar System	$575,000	$19,881	$7,421.3	**21.1**
Bossert Pump Station – PV Solar System	$395,000	$11,965	$4,633.1	**23.8**
Combined PV Solar System	$8,659,738	$361,527.0	$106,586.2	**18.5**

Refer to Section 7 for discussion on Solar Renewable Energy Certificates and other financing options for solar projects. The financial model in Appendix E provides an annual forecast illustration of project revenues and costs for 25 years.

4.5.2 Ground Source Heat Pump Systems

Ground source heat pumps utilize the relatively constant temperature of underground water sources to reject or supply heat to the interior space. Water is pumped through a loop that runs from the underground source to heat pumps at the building level. Depending on the time of year and building demand, these heat pumps use the ground source loop as a heat source or a heat sink.

Typically, ground source heat pump systems are most efficient when used in spaces that have similar heating and cooling loads, as the same loop and heat pumps are used for both cooling and heating. For wastewater treatment plant facilities, the heating and cooling loads are essentially unequal with most of the cooling in plant process areas achieved by ventilation of outdoor air to meet code requirements. Furthermore, as a water conservation measure, the cooling medium for a proposed ground source geothermal system will likely consist of treated plant effluent, which, although treated, will tend to foul heat transfer components as a result of inherent microbiological organisms present in the cooling media. Potential fouling of heat transfer components will result in increased maintenance efforts and system outage.

Ground source heat pump systems are often very costly to install due to the high cost of test boring and drilling wells. Due to this, the largely unbalanced heating and cooling demands at wastewater treatment plants, and the potential fouling of heat transfer components, CDM anticipates that installation of a ground source heat pump system would not prove cost-beneficial.

4.5.3 Wind Power Generation

On-site wind power generation typically utilizes a form of turbine, which is rotated with the flow of wind across it, this rotational force powers a generator, producing DC electricity. The DC electricity is then converted into AC electricity, which can be used for commercial power, or can be fed back into the power grid, reducing the overall electric demand. The size of the turbine is proportional to the amount of wind and concurrently the amount of energy it can produce. An ideal location for a wind turbine is 20 feet above any surrounding object within a 250 foot radius. In general this relates to a property size of one acre or more.

CDM has determined that it is feasible for the Bordentown Sewerage Authority to install a wind turbine energy system on grounds of the Black Creek Wastewater Treatment Plant. A wind turbine energy system would not be viable for the Park Street Pump Station as the area is not large enough to support a wind turbine, and is lined by trees, which will cause turbulence for the wind energy system. For the purpose of this feasibility analysis, CDM is recommending a 1-10KW wind turbine. Depending on area available, and funding, the Authority may choose to install more than 1 wind turbine on the premises.

Utilizing NASA's online wind mapping tool, it was determined that the local average wind speeds at the pump station ranged from 8.5mph to 12.4mph, or 3.8m/s to 5.5m/s. In general, around 9mph of average wind speed, as determined over the course of a year, is necessary to "fuel" the turbine. These values fall within the range of feasibility for installation of a new wind turbine system.

For the purposes of this feasibility analysis, CDM chose a 10KW Bergey wind turbine. This turbine size is used most often for small commercial applications. Power Curve data was determined through the use of the product specification sheets on vendor websites, and vendor provided tools. Actual turbine size, height, location, and manufacturer should be determined upon design of a wind turbine system.

The estimated wind speed data, associated wind probability distribution function (weibull value), turbulence losses, and other relevant data were then incorporated into Bergey's Wind Cad program to estimate the annual output for the wind turbine. Refer to Appendix J for Wind Cad Modeling.

In order to determine simple payback analysis of the proposed wind turbine, CDM used the vendor pricing information located on the Bergey Wind Turbine website (www.bergey.com), for more information on wind turbine cost estimation refer to Appendix H. By installing the proposed wind turbine, the Authority will offset between $726.2 and $2,061.6 per year in utility costs based on the minimum and maximum average local wind speeds. In addition, Renewable Energy Credits (REC's) are obtainable for renewable power and incentives are available through the Renewable Energy Incentive Program (REIP); refer to Section 7 for a more in depth explanation.

This simple payback calculation takes into account the incentive provided for wind turbines through the REIP program. For the first 16,000 kWh of production, the incentive is $3.20/kWh. For production between 16,000 kWh – 750,000 kWh the REIP program incentive is $0.50/kWh. CDM used this incentive as an upfront deduction from the Engineer's Opinion of Probable Cost. In addition, in order to benefit from the REIP incentive, the Authority must purchase a wind turbine on the approved NJ Clean Energy list. CDM chose the Bergey wind turbine for this analysis as it is approved by the NJ Clean Energy program and is the appropriate size for pump stations or smaller commercial installations. Refer to the NJ Clean Energy website for more information.

Table 4.5-4 includes a simple payback analysis for the installation of a wind turbine energy system on the Black's Creek Wastewater Treatment Plant grounds. Refer to Appendix K for a more detailed wind turbine financing spreadsheet, including utility cost avoidance and REC's.

Table 4.5-4: Simple Payback Analysis for Wind Turbine Energy System

Parameter	Wind Turbine (Minimum Site Wind Speed – 8.52 mph)	Wind Turbine (Maximum Site Wind Speed – 12.35 mph)	Wind Turbine (Average Site Wind Speed – 10.56 mph)
Engineer's Opinion of Probable Cost	$68,489.69	$68,489.69	$68,489.69
Renewable Energy Incentive Program**	-$18,371.00	-$52,150.00	-$34,301.00
Total Cost	$50,118.69	$16,339.69	$34,188.69
1st Year Production	5,741 kWh	16,297 kWh	10,719 kWh
Annual Estimated Electric Savings	$726.20	$2,061.60	$1,268.10
Annual Estimated REC Revenue	$144.00	$407.00	$268.00
Project Simple Payback	**57.6 Years**	**6.6 Years**	**22.3 Years**

Table 4.5-4: Simple Payback Analysis for Wind Turbine Energy System			
Parameter	**Wind Turbine (Minimum Site Wind Speed – 8.52 mph)**	**Wind Turbine (Maximum Site Wind Speed – 12.35 mph)**	**Wind Turbine (Average Site Wind Speed – 10.56 mph)**
Annual Return On Investment (AROI)	-2.3%	11.1%	0.5%
Lifetime Energy Savings (25 years)**	$26,476.72	$75,164.42	$46,233.99
Internal Rate of Return (IRR)	-3.8%	16.6%	2.8%
Net Present Value (NPV)	-$31,137	$37,544	-$758

*Refer to Appendix J for Wind Cad Modeling

**REIP incentive is calculated for only the first year and is applied as a deduction.

Based on the simple payback model, summarized in Table 4.5-4, it would not benefit the Authority to further investigate the installation of a wind energy system for the facilities. This is primarily based on the initial upfront capital investment required for a wind turbine energy system installation and the 22.3 year average wind speed payback period. Other options such as Power Purchase Agreements are potentially available as well to help finance the project. This technology is constantly changing and will most likely continue to lower in price.

It should be noted that CDM used only REC values, utility cost avoidance factors, and the REIP incentive in determining simple payback periods. As stated above, other incentives and financial programs such as Power Purchase Agreements are available to help finance this installation. For example, if a Power Purchase Agreement is completed, the private company financing the project would benefit from the 30% tax credit. Other incentives such as CREB's and first year usage incentives could be available to the Authority in lowering the payback period. Refer to *www.dsireusa.org* for an extensive listing of possible incentives for the New Jersey area.

It should also be noted that the wind turbine represented above is for feasibility purposes only. If the Authority decides to install a wind turbine, different mounting heights, turbine sizes, and manufacturers should be considered. In addition, permits may be required for installation according to local zoning laws. The FAA must also be notified in order to give clearance for the tower, and for installation of aviation safety lights if necessary.

4.5.4 Combined Heat and Power Cogeneration Technology

The feasibility study to implement combined heat and power cogeneration systems at the Authority's wastewater treatment plant was not conducted as the plant does not employ the anaerobic digestion process and therefore digester gas is not available as potential fuel. Furthermore, the natural gas service main serving the wastewater treatment plant cannot convey the required gas flow to support a reasonable sized cogeneration system in terms of electrical energy production without making extensive changes to the gas main and service requirements.

Section 5
Evaluation of Energy Purchasing and Procurement Strategies

5.1 Energy Deregulation

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law, the deregulation of the market, allowed all consumers to shop for their electric supplier. The intent was to create a competitive market for electrical energy supply. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party supplier. Energy deregulation in New Jersey increased the energy buyers' options by separating the function of electricity distribution from that of electricity supply.

Public Service Enterprise Group (PSE&G) is currently the supplier of electrical energy for BSA wastewater treatment facility, however PSE&G is both the generator and supplier for the BSA pump stations. Energy deregulation creates the opportunity to choose your electric generation supplier. The benefit of this is the ability to choose a supplier based on what is important to you, for example, lowest rate or how the electric generation supply is produced.

To sell electric generation service in New Jersey, electric power suppliers must be licensed by the New Jersey Board of Public Utilities (NJ BPU). They must also be registered with the local public utility (PSE&G) to sell electric service in that utility's service areas. The following suppliers are licensed with the NJ BPU and are registered to sell electric service in the PSE&G service territory:

- Amerada Hess Corp
- BOC Energy Services
- Con Edison Solutions, Inc.
- Constellation New Energy, Inc.
- Direct Energy, LLC.
- First Energy Solutions Corp.
- Glacial Energy
- Integrys Energy Service
- Liberty Power
- Pepco Energy Services, Inc.
- PP&L Energy Plus, LLC.
- Reliant Energy Solutions East, LLC.
- Sempra Energy Solutions
- South Jersey Energy
- Strategic Energy LLC
- Suez Energy Resources NA, Inc
- UGI Energy Services

5.1.1 Alternate Third Party Electrical Energy Supplier

In evaluating the potential for an alternative third party supplier, CDM contacted and requested a proposal for electrical service from Glacial Energy. The objective of which was to get an overall idea of whether or not switching electric energy suppliers is an avenue that should be pursued further to obtain electrical energy cost savings.

Glacial Energy has proposed a flat rate retail cost per kWh over the next 6 or 12 month period. The proposal is included in Appendix F.

The following table, Table 5.1-1, summarizes the annual cost savings available based on historical energy consumption and the proposed energy rate for a 12 month term. The retail rates used in this analysis represent the baseline generation rates from the two suppliers and do not include any applicable demand charges, societal benefits charges, transmission charges, energy charges, reconciliation charges, transitional assessment charges or system control charges that were included in the aggregate rates presented in Section 3. These baseline generation rates, are used for comparison purposes to identify any potential energy cost savings, as all other applicable charges cannot be avoided by switching suppliers. This summary table, which utilizes the historical electrical energy usage provided, confirms the information and available cost savings presented by Glacial Energy.

Table 5.1-1: Potential Energy Cost Savings with an Alternate Third Party Supplier – Glacial Energy

Account #'s	Average Annual Consumption (kWh)	Projected Annual Cost with Hess(@ $0.12226/kWh)	Proposed Annual Cost with Glacial Energy (@ $0.10864/kWh)	Potential Annual Savings ($)
65-392-047-01, 65-470-787-01, 65-177-963-04, 65-076-886-08	237,993	$29,097.00	$25,856.00	$3,241.00

As energy cost savings are available by switching to a third party supplier, such as Glacial Energy, this is a recommended energy cost savings measure. The estimated annual cost savings available by switching to Glacial Energy is an 11% savings. CDM recommends that BSA investigate this opportunity further and compare proposals from alternate third party suppliers to obtain the lowest electrical energy rates available.

5.2 Demand Response Program

Demand Response is a program through which a business can make money on reducing their electricity use when wholesale electricity prices are high or when

heavy demand causes instability on the electric grid, which can result in voltage fluctuations or grid failure. Demand Response is an energy management program that compensates the participant for reducing their energy consumption at critical times. Demand Response is a highly efficient and cost effective means of reducing the potential for electrical grid failure and price volatility and is one of the best solutions to the Mid-Atlantic region's current energy challenges.

The program provides at least 2 hours advance notice before curtailment is required. There is typically 1 event a year that lasts about 3 hours in the summer months, when demand for electricity is at its highest.

Participation in Demand Response is generally done through companies known as Curtailment Service Providers, or CSPs, who are members of PJM Interconnection. There is no cost to enroll in the program and participation is voluntary, for instance, you can choose when you want to participate. In most cases, there is no penalty for declining to reduce your electricity use when you're asked to do so. The event is managed remotely by notifying your staff of the curtailment request and then enacting curtailment through your Building Management System. CSPs will share in a percentage of your savings, which may differ among various CSPs, since there may be costs associated with the hardware and/or software required for participation, so it is recommended that a number of CSPs be contacted to review their offers.

Section 6
Ranking of Energy Conservation and Retrofit Measures (ECRM)

6.1 ECRMs

The main objective of this energy audit is to identify potential Energy Conservation and Retrofit Measures and to determine whether or not the identified ECRM's are economically feasible to warrant the cost for planning and implementation of each measure. Economic feasibility of each identified measure was evaluated through a simple payback analysis. The simple payback analysis consists of establishing the Engineer's Opinion of Probable Construction Cost estimates, O&M cost savings estimates, projected annual energy savings estimates and the potential value of New Jersey Clean Energy Rebates or Renewable Energy Credits, if applicable. The simple payback period is then determined as the amount of time (years) until the energy savings associated with each measure amounts to the capital investment cost.

As discussed in Section 3, aggregate unit costs for electrical energy delivery and usage and natural gas delivery and usage, which accounts for all demand and tariff charges at each complex, was determined and utilized in the simple payback analyses.

In general, ECRMs having a payback period of 20 years or less have been recommended and only those recommended ECRMs within Section 4 of the report have been ranked for possible implementation. The most attractive rankings are those with the lowest simple payback period.

Ranking of ECRMs has been broken down into the following categories:

- Sludge Holding Tank Mixing System
- Lighting Systems
- HVAC Systems
- Motor Upgrades & VFD Additions
- Solar

6.1.1 Sludge Holding Tank Mixing System

Several options to identify energy conservation measures for the sludge holding tank mixing system were evaluated. These options included replacing the existing blower system with new blowers only, new blowers equipped with variable frequency drives, and a new jet mixing aeration system. A detailed discussion on these options is presented in Section 4.1.1. As a result of the financial analysis including simple payback, it is recommended that a jet mixer/aerator system be installed in order to achieve energy savings associated with the sludge holding tank aeration system.

Table 6.1-1 Sludge Holding Tank Mixing System					
Complex	**Engineer's Opinion of Probable Cost**	**Incentives**	**Total Cost**	**Annual Fiscal Savings**	**Simple Payback (Years)**
Sludge Holding Tanks	$144,000	$0	$144,000	$39,854	**3.7**

6.1.2 Lighting Systems

Table 6.1-2 includes the recommended ECRMs to provide energy savings for all building lighting systems, which include the installation of energy-efficient luminaires and occupancy sensors. A detailed discussion on building lighting systems is presented in Section 4.2.

Table 6.1-2 Ranking of Energy Savings Measures Summary – Lighting System Retrofits					
Location/Measure	**Engineer's Opinion of Probable Cost**	**Incentives**	**Total Cost[1]**	**Annual Fiscal Savings[2]**	**Simple Payback (Years)**
Laurel Run Pump Station Building – Exterior Lighting	$77.6	$0	$77.6	$150.7	**0.5**
Mile Hollow Pump Station (Dog Pound) – Exterior Lighting	$35.9	$0	$35.9	$57.5	**0.6**
Bossert Pump Station Building – Exterior Lighting	$143.8	$0	$143.8	$228.9	**0.6**
Mile Hollow Pump Station (Main Building) – Exterior Lighting	$107.8	$0	$107.8	$172.6	**0.6**
Site & Roadway Lighting	$6,060.5	$0	$6,060.5	$784.5	**7.7**
Park Street No.1 Pump Station Building – Interior Lighting	$452.8	$30	$422.8	$41.4	**10.2**
Administration Building – Interior Lighting	$27,895.4	$2,120	$25,775.4	$2,044	**12.6**
Solids Processing Building – Interior Lighting	$19,767.1	$1,445	$18,322.1	$1,368.5	**13.4**
Pump Station 2 Building – Interior Lighting	$2,800.3	$235	$2,565.3	$186.7	**13.7**
Solids Holding Building – Interior Lighting	$6,030.3	$485	$5,545.3	$397.2	**14.0**
Chlorine & Sulfur Dioxide Building – Interior Lighting	$4,141.4	$365	$3,776.4	$260.1	**14.5**
Pump Station 1 Building – Interior Lighting	$1,758.1	$160	$1,598.1	$104.0	**15.4**

1. 'Total Cost' takes into account any applicable rebates.
2. 'Annual Fiscal Savings' takes into account maintenance costs savings.

6.1.3 HVAC Systems

A detailed discussion on building HVAC systems is presented in Section 4.3. The Administration Building ECRM has an estimated payback of 72.9 years. The Solids Processing Building ECRM has an estimated payback of 69.2 years. There were no HVAC ECRMs that had a simple payback of less than 20 years.

6.1.4 Motor Upgrades and VFD Additions

Table 6.1-3 includes the recommended ECRM to provide energy savings by upgrading motors to premium efficiency models, and adding VFDs. A detailed discussion on motor upgrades and VFD additions is presented in Section 4.4.

Table 6.1-3
Ranking of Energy Savings Measures Summary – Motor Upgrades and VFD Additions

Building & Measure	Engineer's Opinion of Probable Cost	Incentives	Total Cost	Annual Fiscal Savings	Simple Payback (Years)
Oxidation Ditch – Motor & VFD Upgrades	$196,891.50	$2,808	$194,083.50	$73,992.10	**2.6**
All Combined Motors– Motor & VFD Upgrades	$299,748.94	$6,622	$293,126.94	$85,964.31	**3.4**
Grit & Bar Screen Building – Motor Upgrades	$1,822.75	$162	$1,660.75	$331.47	**5.0**
Solids Processing Building – Motor & VFD Upgrades	$66,317.63	$1,824	$64,493.63	$10,824.12	**6.0**

6.1.5 Solar Energy

Implementation of a new solar energy system has been evaluated to determine the economic feasibility for furnishing and installing such systems for Bordentown Sewerage Authority. Based on the simple payback modeling performed, it would benefit the Authority to further investigate installing the solar energy system at the Black's Creek Wastewater Treatment Plant. This is primarily based on the initial upfront capital investment required for a solar energy system installation and the 18.0 year payback period.

Two major factors influencing the project financial evaluation is the variance of the prevailing energy market conditions and Solar Renewable Energy Credit (SREC) rates, with the largest impact to the payback model being the SREC credit pricing. For the payback model, conservative estimates of the SREC's market value over a 15 year period were assumed, as discussed in Section 4.5.

Table 6.1-4 includes a simple payback analysis for the installation of solar energy systems at Black's Creek Wastewater Treatment Plant. Refer to Appendix E for a more detailed solar financing spreadsheet.

Table 6.1-4 Ranking of Energy Savings Measures Summary – Solar Energy Systems	
Parameter	**Solar**
Engineer's Opinion of Probable Cost	$7,091,450
1st Year Production	729,805 kWh
Annual Electric Savings	$86,335.9
Annual Estimated SREC Revenue	$308,708.0
Project Simple Payback	**18.0 Years**

Section 7
Grants, Incentives and Funding Sources

7.1 Renewable Energy

7.1.1 Renewable Energy Certificates (NJ BPU)

As part of New Jersey's Renewable Portfolio Standards (RPS), electric suppliers are required to have an annually-increasing percentage of their retail sales generated by renewable energy. Electric suppliers fulfill this obligation by purchasing renewable energy certificates (RECs) from the owners of solar generating systems. One REC is created for every 1,000 kWh (1 MWh) of renewable electricity generated. Although solar systems generate electricity and SRECs in tandem, the two are independent commodities and sold separately. The RPS, and creation of RECs, is intended to provide additional revenue flow and financial support for renewable energy projects in New Jersey. Class I RECs, which include electricity generation from wind, wave, tidal, geothermal and sustainable biomass typically trade at around $25/MWh. RECs generated from solar electricity, or SRECs, trade at $550/MWh due to supplemental funding from NJ PBU. The supplemental funding will decrease over time to $350/MWh.

7.1.2 Clean Energy Solutions Capital Investment Loan/Grant (NJ EDA)

NJ EDA in cooperation with NJ DEP is offering interest-free loans and grants for energy efficiency, combined heat and power (CHP) and renewable energy projects with total project capital equipment costs of at least $1 million. The interest-free loans are available for up to $5 million, a portion of which may be issued as a grant. The most recent round was closed as of October 2009, but new CESCI program updates will be posted at www.njeda.com. For additional information, contactCESCI@njeda.com or call 866-534-7789.

7.1.3 Renewable Energy Incentive Program (NJ BPU)

The Renewable Energy Incentive Program (REIP) provides rebates for installing solar, wind, and sustainable biomass systems in Smart Growth regions. Rebates of $1.00 per watt are available for solar electricity projects up to 50 kW in capacity. Wind systems can receive rebates up to $3.20 per expected kWh produced. Sustainable biomass rebates start at $4.00 per watt installed with a maximum incentive amount of 30 percent of project costs. REIP will give out $53.25 million in rebates from 2009 - 2012. Project owners must complete the Pay for Performance Program, Direct Install or Local Municipal audit, or the rebate will be reduced by $0.10 per watt.

The REIP Funding Cycle 2, opened May 3, 2010, for solar installation incentives was recently closed. The budget is currently being reviewed and there is still expectation for Funding Cycle 3 to open in September. For further information on the status of this program, please visit: http://www.njcleanenergy.com/renewable-energy/home/home

7.1.4 Grid Connected Renewables Program (NJ BPU)

The New Jersey Grid Connected Renewables Program offers competitive incentives for wind and sustainable biomass electricity generation projects larger than 1 Megawatt (MW). Applications for the most recent round of funding, which totaled $6 million, were due January 8, 2010. Requests for Proposals (RFPs) for the next round will be posted at www.njcleanenergy.com and www.state.nj.us/bpu. A total of roughly $16 million is available for incentives under this program during 2010. Most of the incentives offered under this program will take the form of a payment for energy production ($/MWh) once the project is operating. Incentives range up to $58.49/MWh for publicly-owned wastewater biogas projects. Up to 10% of the incentive may be requested in the form of a lump grant to cover up-front costs such as financing fees, interconnection fees, project design, permitting, and construction costs.

7.1.5 Utility Financing Programs

All four Electric Distribution Companies (EDCs) in New Jersey have developed long term contracting or financing programs for the development of solar energy systems. In all of the programs, Solar Renewable Energy Credits (SRECs) generated by the solar energy systems will be sold at auction to energy suppliers who are required to purchase a certain quantity of SRECs to meet their Renewable Portfolio Standard requirements.

7.1.6 Renewable Energy Manufacturing Incentive (NJ BPU)

New Jersey's Renewable Energy Manufacturing Incentive (REMI) program provides rebates to purchase and install solar panels, inverters, and racking systems manufactured in New Jersey. Rebates for panels start at $0.25 per watt and rebates for racking systems and inverters start at $0.15 per watt for solar projects up to 500 kW in capacity. To be eligible for REMI, applicants must apply to either the Renewable Energy Incentive Program (REIP) or the SREC Registration Program (SRP).

7.1.7 PSE&G Solar Loan Program

Public Service Electric and Gas (PSE&G) of New Jersey will offer $143 million in loans to their customers for solar electric systems in 2009-2010. Their Solar Loan program will provide 15-year loans at an interest rate of 11.3092% to cover 40-60% of the cost of solar systems 500 kW in capacity or less. PSE&G customers may repay the loan through cash payments or by signing over their Solar Renewable Energy Certificates (SRECs) to PSE&G. Loan applications are scheduled to be accepted on a quarterly basis. For more information, call 973-430-8460.

7.1.8 Environmental Infrastructure Financing Program (NJ DEP)

The Environmental Infrastructure Financing Program (EIFP) provides low-interest loans for the planning, design and construction of a variety of water, wastewater and stormwater infrastructure projects. NJ DEP traditionally provides loans at 0% interest for approximately 20 years for up to one-half the allowable project costs. The remaining project costs are funded through 20-year loans at about the market rate or

less. Approximately $100 million-$200 million is available per year. In 2009, 20 percent of the projects funded were required to be "green infrastructure" projects, including energy efficiency and renewable energy projects. Applicants must submit a commitment letter in the beginning of October and an application in March annually. For more information, contact Stanley V. Cach, Jr. Assistant Director NJDEP-Municipal Finance and Construction Element at 609-292-8961 or stanley.cach@dep.state.nj.us.

7.1.9 Clean Renewable Energy Bonds (IRS)

CREBs are 0% interest bonds typically issued for up to approximately $3.0 million administered by the Internal Revenue Service (IRS). Last year, $2.2 billion in CREBs was allocated to municipal entities to fund 610 renewable energy projects, including anaerobic digestion. IRS has been allocating funding for CREBs annually since 2005. Last year, IRS solicited applications starting in April, which were due in August. The IRS is expected to receive additional funding for CREBs and release another round of solicitations in 2010.

7.1.10 Qualified Energy Conservation Bonds (IRS)

These IRS 0% interest bonds are very similar to CREBs except they are allocated based on state and county population. New Jersey was allocated $90 million as part of the ARRA stimulus fund. QECBs are typically distributed through municipal bond banks or state economic development agencies.

7.1.11 Global Climate Change Mitigation Incentive Fund (US EDA)

The Economic Development Agency (part of the U.S. Department of Commerce) administers the GCCMIF to public works projects that reduce greenhouse gas emissions and creates new jobs. In FY 2009, $15 million was allocated to the fund, and additional funding is expected to be allocated in FY 2010. Applications are due on a rolling basis. The program does not have a maximum grant amount but does limit the grant to 50 percent of the project cost.

7.1.12 Private Tax-Exempt Financing

Similar to traditional municipal bond financing, there are many private financial service companies that offer a myriad of options for tax-exempt financing of municipal projects. The providers of these services suggest that this capital can be offered at competitive rates in an expedited timeframe and with fewer complications when compared to traditional municipal financing methods. Though these factors would need to be compared on a case-by-case basis, the one distinct advantage to private financing on the current project would likely be the flexibility to structure payments to meet budget needs with consideration given to the terms and conditions of existing loan and/or bond agreements. For example, this mechanism could be used to limit the digestion project dept payments in the initial years when the current bond debt is the greatest and the operations savings of the project has yet to be fully realized. It should also be noted that, in many cases, the construction and long term

financing can be rolled into a single private financing agreement. Also, in some instances, equipment manufacturers have the ability to offer competitive financing terms (e.g. Siemens Financial Services Corporation), though financing from these sources is generally contingent upon a substantial portion of the project cost (~20% to 30%) being for their respective equipment.

7.1.13 Performance Based Contracts (ESCOs)

A second financing alternative for a project of this nature would be to enter into a Performance Based Contract with an Energy Services Company (ESCO). The premise of this type of contract is that it requires no initial municipal capital contributions in order to implement the project - instead relying on future operations cost savings and/or energy production, to fund the annual payments. Prior to entering into an agreement for the funding of the project, an ECSO would perform an energy audit and/or conceptual studies to confirm future energy cost savings or energy production inherent with the projects implementation and operation. The contract would then be formulated based on some measurable parameter(s) (sludge reduction, energy production, etc) which would be verified by measurement throughout the contract duration. The savings in energy costs or energy production would then be used to pay back the capital investment of the project over the contract time period (typically on the order of 10-years or less). The ESCO would guarantee the agreed upon energy savings or energy production. If the project does not meet energy savings or production commitments, the ESCO pays the owner the equivalent difference.

With this funding alternative, the ownership and operation of the facility would be maintained by the original owner. A performance contract may also include ESCO operation and maintenance of the energy-related facilities if that were deemed appropriate. Significant ESCO's with experience in this area include Siemens Building Technologies, Chevron and Johnson Controls. CDM has functioned in several roles on performance based contracts including being the owner's representative and, on different contracts, providing design-build services (as a subcontractor to the ECSO). We can provide additional experience-based information upon request.

7.1.14 Power Purchase Agreements (SPCs)

More commonly referred to as a Build-Own-Transfer (BOT) agreement in the Water/Wastewater industry, a Power Purchase Agreement (PPA) also delivers a project with no initial capital contribution by the original owner. In this model, a Special Purpose Company (SPC) created by a developer, would own the energy production facilities. Within the framework of a PPA, a SPC will typically lease property from the owners for construction and operation of the new facilities. The funding and construction of the new facilities would be performed by the SPC who would then own and operate the facilities for the duration of the contract (typically 20 to 30 years). Throughout that period of time, the original owner would purchase power from the SPC at a pre-negotiated rate which would take into account the initial capital cost, operation and maintenance of the constructed facility, ancillary benefits of the project and investor returns on investment. For renewable energy, financial

incentives may enable this financing approach to compete favorably with utility power tariffs. Incentives include state and local tax credits, renewable energy credits, and Federal energy production tax credits or energy investment tax credits. It is expected that a number of experienced companies and developers may be interested in a PPA for New Jersey municipal renewable energy projects.

7.2 Energy Efficiency

7.2.1 Introduction

New Jersey's Clean Energy Program (NJ CEP) promotes increased energy efficiency and the use of clean, renewable sources of energy including solar, wind, geothermal, and sustainable biomass. The results for New Jersey are a stronger economy, less pollution, lower costs, and reduced demand for electricity. NJCEP offers financial incentives, programs, and services for residential, commercial, and municipal customers.

NJCEP reduces the need to generate electricity and burn natural gas which eliminates the pollution that would have been caused by such electric generation or natural gas usage. The benefits of these programs continue for the life of the measures installed, which on average is about 15 years. Thus, the public receives substantial environmental and public health benefits from programs that also lower energy bills and benefit the economy.

7.2.2 New Jersey Smart Start Buildings Program (NJ BPU)

The New Jersey Smart Start Buildings Program offers rebate incentives for several qualifying equipment such as high efficient premium motors and lighting, and lighting controls.

Incentive information and incentive calculation worksheets are provided for the various new equipment installation identified in this report and are included in Appendix F.

7.2.3 Pay for Performance Program (NJ BPU)

Another program offered through the New Jersey Smart Start Program, is the Pay for Performance Program. Commercial, industrial and institutional buildings with an average annual peak demand over 200 kW are eligible for participation. In addition, local government agencies, which do not meet the 200 kW demand requirement and are not receiving Energy Efficiency and Conservation Block Grants are eligible.

Incentives are available for buildings that are able to present an Energy Reduction Plans that reduce the building's current energy consumption by 15% or more, in addition to incentives for installing the recommended measures and incentives for presenting the energy savings in a post-construction benchmarking report. No more than 50% of the total energy savings may be derived from lighting retrofits. In addition, the total energy savings of 15% may not come from the implementation of one energy savings measure.

7.2.4 Local Government Energy Audits (NJ BPU)

New Jersey's Clean Energy Program offers an incentives program that will subsidize the cost of an energy audit for local government entities. This audit identifies cost-justified energy efficiency measures for sites in the service territory of one of New Jersey's regulated electric and/or gas utilities.

The program provides guidance to eligible entities as they select buildings to be audited. Participants in the program then select one of the pre-qualified energy auditing firms that will produce a report to satisfy program requirements. The program will then subsidize 75% of the cost of the audit. The remaining 25% of the cost will be subsidized if the participant expends that sum of money implementing energy efficiency upgrades. All recommended measures are eligible for additional incentives available through the NJ SmartStart Buildings Program. However, these incentives will be subtracted from the cost of the installed measures.

Applications for this program are submitted for each individual building and will be considered on a building-by-building basis. Funds are awarded on a first-come, first-serve basis and case-by-case basis.

7.2.5 Free Energy Benchmarking

Industrial facilities are eligible for a free energy benchmarking assessment conducted by the NJ Board of Public Utilities. This benchmarking provides energy managers with a building energy performance assessment and valuable information on how to get an energy efficiency project started. The benchmarking process may involve comparing a facility's energy use to that of its peers (dependent upon availability of sufficient comparative data), or simply its own energy use year-to-year. If the building type fits either the EPA's ENERGY STAR® Portfolio Manager or EPA Energy Performance Indicator models, then its energy performance is compared to national data for similar buildings. The five major benchmarks used to analyze building performance include: electricity use, heating fuel use, weather-normalized heating fuel use, total cost, and total cost per resident, all of which are normalized for comparison by square footage and weather. If an ENERGY STAR benchmark is conducted, a detailed description of the building's specific score is included in the report.

The analysis included in each report is based on the information provided on a Building Data Request Form submitted by the owner/manager, which includes building, energy supplier, and other information. The building's utility bills are also used to assess its electricity and heating fuel consumption for the year(s) provided. The benchmarking report includes: a summary table of each building's energy use and cost information, assessment of the building's carbon footprint, recommended next steps, and information on other offerings available through New Jersey's Clean Energy Program. Please contact Joe Carlamere of New Jersey's Clean Energy Program at 732-855-2895 for additional information.

7.2.6 Clean Energy Solutions Capital Investment Loan/Grant (NJ EDA)

NJ EDA in cooperation with NJ DEP is offering interest-free loans and grants for energy efficiency, combined heat and power (CHP) and renewable energy projects with total project capital equipment costs of at least $1 million. The interest-free loans are available for up to $5 million, a portion of which may be issued as a grant. The most recent round was closed as of October 2009, but new CESCI program updates will be posted at www.njeda.com. For additional information, contactCESCI@njeda.com or call 866-534-7789.

7.2.7 Direct Install (NJ BPU)

Owners of existing small to mid-size commercial and industrial facilities with a peak electric demand that did not exceed 200 kW in any of the preceding 12 months are eligible to participate in Direct Install. Buildings must be located in New Jersey and served by one of the state's public, regulated electric or natural gas utility companies.

This program will cover up to 80% of the retro-fitting costs associated with the use of new energy efficient equipment. Lighting, HVAC, refrigeration, motors, natural gas systems, and variable frequency drives are covered under the Direct Install program.

7.2.8 Environmental Infrastructure Financing Program (NJ DEP)

The Environmental Infrastructure Financing Program (EIFP) provides low-interest loans for the planning, design and construction of a variety of water, wastewater and stormwater infrastructure projects. NJ DEP traditionally provides loans at 0% interest for approximately 20 years for up to one-half the allowable project costs. The remaining project costs are funded through 20-year loans at about the market rate or less. Approximately $100 million-$200 million is available per year. In 2009, 20 percent of the projects funded were required to be "green infrastructure" projects, including energy efficiency and renewable energy projects. Applicants must submit a commitment letter in the beginning of October and an application in March annually. For more information, contact Stanley V. Cach, Jr. Assistant Director NJDEP-Municipal Finance and Construction Element at 609-292-8961 or stanley.cach@dep.state.nj.us.

7.2.9 Global Climate Change Mitigation Incentive Fund (US EDA)

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7.2.10 Private Tax-Exempt Financing

Similar to traditional municipal bond financing, there are many private financial service companies that offer a myriad of options for tax-exempt financing of municipal projects. The providers of these services suggest that this capital can be offered at competitive rates in an expedited timeframe and with fewer complications when compared to traditional municipal financing methods. Though these factors would need to be compared on a case-by-case basis, the one distinct advantage to private financing on the current project would likely be the flexibility to structure payments to meet budget needs with consideration given to the terms and conditions of existing loan and/or bond agreements. It should also be noted that, in many cases, the construction and long term financing can be rolled into a single private financing agreement. Also, in some instances, equipment manufacturers have the ability to offer competitive financing terms (e.g. Siemens Financial Services Corporation), though financing from these sources is generally contingent upon a substantial portion of the project cost (~20% to 30%) being for their respective equipment.

7.2.11 Performance Based Contracts (ESCOs)

Another financing option would be to enter into a Performance Based Contract with an Energy Services Company (ESCO). The premise of this type of contract is that it requires no initial municipal capital contributions in order to implement the project - instead relying on future operations cost savings and/or energy production, to fund the annual payments. Prior to entering into an agreement for the funding of the project, an ECSO would perform an energy audit and/or conceptual studies to confirm future energy cost savings inherent with the projects implementation and operation. The contract would then be formulated based on some measurable parameter(s) (sludge reduction, energy production, etc) which would be verified by measurement throughout the contract duration. The savings in energy costs would then be used to pay back the capital investment of the project over the contract time period (typically on the order of 10-years or less). The ESCO would guarantee the agreed upon energy savings. If the project does not meet energy savings or production commitments, the ESCO pays the owner the equivalent difference.

With this funding alternative, the ownership and operation of the facility would be maintained by the original owner. A performance contract may also include ESCO operation and maintenance of the energy-related facilities if that were deemed appropriate. Significant ESCO's with experience in this area include Siemens Building Technologies, Chevron and Johnson Controls. CDM has functioned in several roles on performance based contracts including being the owner's representative and, on different contracts, providing design-build services (as a subcontractor to the ECSO). We can provide additional experience-based information upon request.

APPENDIX A

UTILITY BILL INFORMATION

Electric Bills for Plots - WWTP										
Comments	Month	Year	PSE&G Delivery Charges Act. # 62-659-951-54 Meter # 778018216	Hess Corporation Supply Charges Act # PE00000928056474471 6	Total Electric Charges	On Peak KWH	Off Peak KWH	Total KWH	Measured Demand	Cost Per kWh
	January	2007	$ -	$ -	$ -	-	-	-	-	-
	February	2007	$ -	$ -	$ -	-	-	-	-	-
	March	2007	$ -	$ -	$ -	-	-	-	-	-
	April	2007	$ -	$ -	$ -	-	-	-	-	-
	May	2007	$ -	$ -	$ -	-	-	-	-	-
	June	2007	$ -	$ -	$ -	-	-	-	-	-
	July	2007	$ -	$ -	$ -	-	-	-	-	-
	August	2007	$ -	$ -	$ -	-	-	-	-	-
	September	2007	$ -	$ -	$ -	-	-	-	-	-
	October	2007	$ -	$ -	$ -	-	-	-	-	-
	November	2007	$ -	$ -	$ -	-	-	-	-	-
	December	2007	$ -	$ -	$ -	-	-	-	-	-
	January	2008	$ -	$ -	$ -	-	-	-	-	-
	February	2008	$ -	$ -	$ -	-	-	-	-	-
	March	2008	$ -	$ -	$ -	-	-	-	-	-
	April	2008	$ -	$ -	$ -	-	-	-	-	-
	May	2008	$ -	$ -	$ -	-	-	-	-	-
	June	2008	$ -	$ -	$ -	-	-	-	-	-
	July	2008	$ -	$ -	$ -	-	-	-	-	-
	August	2008	$ -	$ -	$ -	-	-	-	-	-
	September	2008	$ -	$ -	$ -	-	-	-	-	-
	October	2008	$ -	$ -	$ -	-	-	-	-	-
	November	2008	$ -	$ -	$ -	-	-	-	-	-
	~~December~~	~~2008~~	~~$ 519.42~~	~~$ 6,995.98~~	~~$ 7,515.40~~	~~35,428~~	~~41,277~~	~~76705~~	-	~~$ 0.10~~
	January	2009	$ 3,998.49	$ 22,131.72	$ 26,130.21	106,504	132,986	239490	436.80	$ 0.11
	February	2009	$ 5,414.38	$ 17,564.35	$ 22,978.72	84,871	111,869	196740	436.80	$ 0.12
	March	2009	$ 5,446.69	$ 16,243.93	$ 21,690.62	86,671	114,475	201147	406.60	$ 0.11
	April	2009	$ 5,055.81	$ 14,852.94	$ 19,908.74	80,256	109,251	189507	378.8	$ 0.11
	May	2009	$ 5,947.18	$ 14,947.09	$ 20,894.27	77,424	102,970	180394	329.3	$ 0.12
	June	2009	$ 7,381.05	$ 15,507.92	$ 22,888.97	76,033	96,855	172887	323.4	$ 0.13
	July	2009	$ 8,044.75	$ 16,971.11	$ 25,015.86	81,443	107,756	189199	336.0	$ 0.13
	August	2009	$ 7,933.31	$ 16,447.34	$ 24,380.66	79,810	103,550	183359	324.2	$ 0.13
	September	2009	$ 6,755.23	$ 15,909.82	$ 22,665.05	75,355	102,012	177367	315.8	$ 0.13
	October	2009	$ 5,256.74	$ 16,809.90	$ 22,066.64	81,001	106,400	187401	315.0	$ 0.12
	November	2009	$ 5,017.98	$ 16,075.08	$ 21,093.06	76,116	103,093	179209	330.1	$ 0.12
	December	2009	$ 5,789.92	$ 18,559.08	$ 24,348.99	88,195	118,707	206902	395.6	$ 0.12

Month	Combined (KWH)	Demand (KW)
January	239490	437
February	196740	437
March	201147	407
April	189507	379
May	180394	329
June	172887	323
July	189199	336
August	183359	324
September	177367	316
October	187401	315
November	179209	330
December	206902	396
Total	**2303602**	**4328**

Gas Bills for Plots - WWTP							
Comments	Month	Year	PSE&G Delivery Charges Act. # 62-659-951-54 Meter # 778018216	PSE&G Supply Charges Ac. #	Total Gas Charges	Total Therms	Cost Per Therm
	January	2007	$ -	$ -	$ -	-	-
	February	2007	$ -	$ -	$ -	-	-
	March	2007	$ -	$ -	$ -	-	-
	April	2007	$ -	$ -	$ -	-	-
	May	2007	$ -	$ -	$ -	-	-
	June	2007	$ -	$ -	$ -	-	-
	July	2007	$ -	$ -	$ -	-	-
	August	2007	$ -	$ -	$ -	-	-
	September	2007	$ -	$ -	$ -	-	-
	October	2007	$ -	$ -	$ -	-	-
	November	2007	$ -	$ -	$ -	-	-
	December	2007	$ -	$ -	$ -	-	-
	January	2008	$ -	$ -	$ -	-	-
	February	2008	$ -	$ -	$ -	-	-
	March	2008	$ -	$ -	$ -	-	-
	April	2008	$ -	$ -	$ -	-	-
	May	2008	$ -	$ -	$ -	-	-
	June	2008	$ -	$ -	$ -	-	-
	July	2008	$ -	$ -	$ -	-	-
	August	2008	$ -	$ -	$ -	-	-
	September	2008	$ -	$ -	$ -	-	-
	October	2008	$ -	$ -	$ -	-	-
	November	2008	$ -	$ -	$ -	-	-
	~~December~~	~~2008~~	~~$ 233.13~~	~~$ 519.42~~	~~$ 752.55~~	~~565~~	~~$ 1.33~~
	January	2009	$ 672.15	$ 1,415.29	$ 2,087.45	1,628	$ 1.28
	February	2009	$ 459.76	$ 838.54	$ 1,298.31	1,109	$ 1.17
	March	2009	$ 232.94	$ 397.75	$ 630.69	591	$ 1.07
	April	2009	$ 66.72	$ 116.14	$ 182.87	186	$ 0.98
	May	2009	$ 21.49	$ 21.48	$ 42.97	37	$ 1.15
	June	2009	$ 14.41	$ 9.14	$ 23.55	16	$ 1.51
	July	2009	$ 14.57	$ 8.59	$ 23.17	14	$ 1.63
	August	2009	$ 12.16	$ 3.08	$ 15.24	6	$ 2.69
	September	2009	$ 20.91	$ 20.39	$ 41.30	36	$ 1.15
	October	2009	$ 61.62	$ 87.72	$ 149.34	143	$ 1.04
	November	2009	$ 239.37	$ 387.25	$ 626.62	565	$ 1.11
	December	2009	$ 569.33	$ 1,008.14	$ 1,577.47	1,373	$ 1.15

Month	Combined (Therms)
January	1628
February	1109
March	591
April	186
May	37
June	16
July	14
August	6
September	36
October	143
November	565
December	1373
Total	**5704**

Electric Bills for Plots - Bossert Pump Station										
Comments	Month	Year	PSE&G Delivery Charges Ac # 65-392-047-01 Meter # 256002058	Supply Charges Act. #	Total Electric Charges	On Peak KWH	Off Peak KWH	Total KWH	Measured Demand	Cost Per kWh
	January	2007	$ -	$ -	$ -	-	-	-	-	-
	February	2007	$ -	$ -	$ -	-	-	-	-	-
	March	2007	$ -	$ -	$ -	-	-	-	-	-
	April	2007	$ -	$ -	$ -	-	-	-	-	-
	May	2007	$ -	$ -	$ -	-	-	-	-	-
	June	2007	$ -	$ -	$ -	-	-	-	-	-
	July	2007	$ -	$ -	$ -	-	-	-	-	-
	August	2007	$ -	$ -	$ -	-	-	-	-	-
	September	2007	$ -	$ -	$ -	-	-	-	-	-
	October	2007	$ -	$ -	$ -	-	-	-	-	-
	November	2007	$ -	$ -	$ -	-	-	-	-	-
	December	2007	$ -	$ -	$ -	-	-	-	-	-
	January	2008	$ -	$ -	$ -	-	-	-	-	-
	February	2008	$ -	$ -	$ -	-	-	-	-	-
	March	2008	$ -	$ -	$ -	-	-	-	-	-
	April	2008	$ -	$ -	$ -	-	-	-	-	-
	May	2008	$ -	$ -	$ -	-	-	-	-	-
	June	2008	$ -	$ -	$ -	-	-	-	-	-
	July	2008	$ -	$ -	$ -	-	-	-	-	-
	August	2008	$ -	$ -	$ -	-	-	-	-	-
	September	2008	$ -	$ -	$ -	-	-	-	-	-
	October	2008	$ -	$ -	$ -	-	-	-	-	-
	November	2008	$ -	$ -	$ -	-	-	-	-	-
	~~December~~	~~2008~~	~~$ 156.49~~	~~$ 350.13~~	~~$ 506.62~~	~~-~~	~~-~~	~~3800~~	~~17.80~~	~~$ 0.13~~
	January	2009	$ 180.95	$ 450.39	$ 631.34	-	-	4681	10.70	$ 0.13
	February	2009	$ 59.92	$ 151.13	$ 211.04	-	-	1410	9.10	$ 0.15
	March	2009	$ 105.51	$ 263.06	$ 368.56	-	-	2451	8.30	$ 0.15
	April	2009	$ 104.69	$ 268.63	$ 373.32	-	-	2538	11.80	$ 0.15
	May	2009	$ 113.13	$ 181.11	$ 294.24	-	-	1599	11.80	$ 0.18
	June	2009	$ 117.14	$ 220.72	$ 337.87	-	-	1662	5.90	$ 0.20
	July	2009	$ 207.13	$ 266.58	$ 473.71	-	-	1913	14.00	$ 0.25
	August	2009	$ 209.90	$ 254.30	$ 464.20	-	-	1856	13.10	$ 0.25
	September	2009	$ 124.06	$ 228.97	$ 353.03	-	-	1691	12.00	$ 0.21
	October	2009	$ 100.04	$ 224.63	$ 324.68	-	-	1848	10.60	$ 0.18
	November	2009	$ 94.80	$ 224.45	$ 319.24	-	-	1995	10.10	$ 0.16
	December	2009	$ 183.76	$ 455.55	$ 639.31	-	-	4576	33.4	$ 0.14

Month	Combined (KWH)	Demand (KW)
January	4681	11
February	1410	9
March	2451	8
April	2538	12
May	1599	12
June	1662	6
July	1913	14
August	1856	13
September	1691	12
October	1848	11
November	1995	10
December	4576	33
Total	**28219**	**151**

Electric Bills for Plots - Laurel Run PS										
Comments	Month	Year	PSE&G Delivery Charges Act # 65-177-963-04 Meter # 728000239	Supply Charges Act #	Total Electric Charges	On Peak KWH	Off Peak KWH	Total KWH	Measured Demand	Cost Per kWh
	January	2007	$ -	$ -	$ -	-	-	-	-	-
	February	2007	$ -	$ -	$ -	-	-	-	-	-
	March	2007	$ -	$ -	$ -	-	-	-	-	-
	April	2007	$ -	$ -	$ -	-	-	-	-	-
	May	2007	$ -	$ -	$ -	-	-	-	-	-
	June	2007	$ -	$ -	$ -	-	-	-	-	-
	July	2007	$ -	$ -	$ -	-	-	-	-	-
	August	2007	$ -	$ -	$ -	-	-	-	-	-
	September	2007	$ -	$ -	$ -	-	-	-	-	-
	October	2007	$ -	$ -	$ -	-	-	-	-	-
	November	2007	$ -	$ -	$ -	-	-	-	-	-
	December	2007	$ -	$ -	$ -	-	-	-	-	-
	January	2008	$ -	$ -	$ -	-	-	-	-	-
	February	2008	$ -	$ -	$ -	-	-	-	-	-
	March	2008	$ -	$ -	$ -	-	-	-	-	-
	April	2008	$ -	$ -	$ -	-	-	-	-	-
	May	2008	$ -	$ -	$ -	-	-	-	-	-
	June	2008	$ -	$ -	$ -	-	-	-	-	-
	July	2008	$ -	$ -	$ -	-	-	-	-	-
	August	2008	$ -	$ -	$ -	-	-	-	-	-
	September	2008	$ -	$ -	$ -	-	-	-	-	-
	October	2008	$ -	$ -	$ -	-	-	-	-	-
	November	2008	$ -	$ -	$ -	-	-	-	-	-
	~~December~~	~~2008~~	~~$ 59.40~~	~~$ 155.79~~	~~$ 215.19~~	~~-~~	~~-~~	~~1569~~	~~-~~	~~$ 0.14~~
	January	2009	$ 171.40	$ 464.80	$ 636.20	-	-	4568	11.20	$ 0.14
	February	2009	$ 136.36	$ 389.68	$ 526.04	-	-	3669	9.6	$ 0.14
	March	2009	$ 142.78	$ 410.04	$ 552.82	-	-	3938	8.8	$ 0.14
	April	2009	$ 143.15	$ 406.97	$ 550.12	-	-	4029	9.6	$ 0.14
	May	2009	$ 179.33	$ 429.83	$ 609.16	-	-	3957	19.2	$ 0.15
	June	2009	$ 223.68	$ 416.16	$ 639.84	-	-	3272	19.2	$ 0.20
	July	2009	$ 284.24	$ 492.39	$ 776.64	-	-	3841	12.8	$ 0.20
	August	2009	$ 289.50	$ 491.39	$ 780.89	-	-	3884	14.4	$ 0.20
	September	2009	$ 225.23	$ 441.06	$ 666.29	-	-	3644	25.6	$ 0.18
	October	2009	$ 154.84	$ 420.20	$ 575.04	-	-	3844	9.6	$ 0.15
	November	2009	$ 163.08	$ 397.74	$ 560.82	-	-	3779	14.4	$ 0.15
	December	2009	$ 188.37	$ 445.89	$ 634.27	-	-	4349	14.4	$ 0.15

Month	Combined (KWH)	Demand (KW)
January	4568	11
February	3669	10
March	3938	9
April	4029	10
May	3957	19
June	3272	19
July	3841	13
August	3884	14
September	3644	26
October	3844	10
November	3779	14
December	4349	14
Total	**46773**	**169**

Electric Bills for Plots - Mile Hollow PS										
Comments	Month	Year	PSE&G Delivery Charges Act # 65-076-886-08 Meter # 298001832	Supply Charges Act #	Total Electric Charges	On Peak KWH	Off Peak KWH	Total KWH	Measured Demand	Cost Per kWh
	January	2007	$ -	$ -	$ -	-	-	-	-	-
	February	2007	$ -	$ -	$ -	-	-	-	-	-
	March	2007	$ -	$ -	$ -	-	-	-	-	-
	April	2007	$ -	$ -	$ -	-	-	-	-	-
	May	2007	$ -	$ -	$ -	-	-	-	-	-
	June	2007	$ -	$ -	$ -	-	-	-	-	-
	July	2007	$ -	$ -	$ -	-	-	-	-	-
	August	2007	$ -	$ -	$ -	-	-	-	-	-
	September	2007	$ -	$ -	$ -	-	-	-	-	-
	October	2007	$ -	$ -	$ -	-	-	-	-	-
	November	2007	$ -	$ -	$ -	-	-	-	-	-
	December	2007	$ -	$ -	$ -	-	-	-	-	-
	January	2008	$ -	$ -	$ -	-	-	-	-	-
	February	2008	$ -	$ -	$ -	-	-	-	-	-
	March	2008	$ -	$ -	$ -	-	-	-	-	-
	April	2008	$ -	$ -	$ -	-	-	-	-	-
	May	2008	$ -	$ -	$ -	-	-	-	-	-
	June	2008	$ -	$ -	$ -	-	-	-	-	-
	July	2008	$ -	$ -	$ -	-	-	-	-	-
	August	2008	$ -	$ -	$ -	-	-	-	-	-
	September	2008	$ -	$ -	$ -	-	-	-	-	-
	October	2008	$ -	$ -	$ -	-	-	-	-	-
	November	2008	$ -	$ -	$ -	-	-	-	-	-
	~~December~~	~~2008~~	~~$ 111.78~~	~~$ 264.16~~	~~$ 375.94~~	-	-	~~2586~~	-	~~$ 0.15~~
	January	2009	$ 348.31	$ 835.75	$ 1,184.05	-	-	7960	31.8	$ 0.15
	February	2009	$ 288.37	$ 739.50	$ 1,027.86	-	-	6789	30.0	$ 0.15
	March	2009	$ 291.88	$ 767.91	$ 1,059.79	-	-	7247	28.5	$ 0.15
	April	2009	$ 297.60	$ 790.47	$ 1,088.07	-	-	7651	28.8	$ 0.14
	May	2009	$ 377.23	$ 902.55	$ 1,279.78	-	-	8354	48.0	$ 0.15
	June	2009	$ 462.43	$ 926.12	$ 1,388.55	-	-	7576	40.2	$ 0.18
	July	2009	$ 593.47	$ 1,089.17	$ 1,682.65	-	-	8266	22.8	$ 0.20
	August	2009	$ 738.16	$ 1,146.43	$ 1,884.58	-	-	8880	38.4	$ 0.21
	September	2009	$ 562.67	$ 973.82	$ 1,536.49	-	-	7812	39.0	$ 0.20
	October	2009	$ 325.89	$ 937.05	$ 1,262.94	-	-	8274	20.4	$ 0.15
	November	2009	$ 339.22	$ 881.73	$ 1,220.95	-	-	8134	30.0	$ 0.15
	December	2009	$ 391.57	$ 956.60	$ 1,348.17	-	-	9002	30.0	$ 0.15

Month	Combined (KWH)	Demand (KW)
January	7960	32
February	6789	30
March	7247	29
April	7651	29
May	8354	48
June	7576	40
July	8266	23
August	8880	38
September	7812	39
October	8274	20
November	8134	30
December	9002	30
Total	**95945**	**388**

Electric Bills for Plots - Park Street #1 PS										
Comments	Month	Year	PSE&G Delivery Charges Act # 65-470-787-01 Meter # 726010562	Supply Charges Act #	Total Electric Charges	On Peak KWH	Off Peak KWH	Total KWH	Measured Demand	Cost Per kWh
	January	2007	$ -	$ -	$ -	-	-	-	-	-
	February	2007	$ -	$ -	$ -	-	-	-	-	-
	March	2007	$ -	$ -	$ -	-	-	-	-	-
	April	2007	$ -	$ -	$ -	-	-	-	-	-
	May	2007	$ -	$ -	$ -	-	-	-	-	-
	June	2007	$ -	$ -	$ -	-	-	-	-	-
	July	2007	$ -	$ -	$ -	-	-	-	-	-
	August	2007	$ -	$ -	$ -	-	-	-	-	-
	September	2007	$ -	$ -	$ -	-	-	-	-	-
	October	2007	$ -	$ -	$ -	-	-	-	-	-
	November	2007	$ -	$ -	$ -	-	-	-	-	-
	December	2007	$ -	$ -	$ -	-	-	-	-	-
	January	2008	$ -	$ -	$ -	-	-	-	-	-
	February	2008	$ -	$ -	$ -	-	-	-	-	-
	March	2008	$ -	$ -	$ -	-	-	-	-	-
	April	2008	$ -	$ -	$ -	-	-	-	-	-
	May	2008	$ -	$ -	$ -	-	-	-	-	-
	June	2008	$ -	$ -	$ -	-	-	-	-	-
	July	2008	$ -	$ -	$ -	-	-	-	-	-
	August	2008	$ -	$ -	$ -	-	-	-	-	-
	September	2008	$ -	$ -	$ -	-	-	-	-	-
	October	2008	$ -	$ -	$ -	-	-	-	-	-
	November	2008	$ -	$ -	$ -	-	-	-	-	-
	~~December~~	~~2008~~	~~$ 73.95~~	~~$ 189.10~~	~~$ 263.04~~	~~-~~	~~-~~	~~1843~~	~~-~~	~~$ 0.14~~
	January	2009	$ 264.45	$ 655.79	$ 920.24	-	-	6270	18.10	$ 0.15
	February	2009	$ 246.86	$ 624.40	$ 871.26	-	-	5723	27.4	$ 0.15
	March	2009	$ 195.91	$ 541.83	$ 737.74	-	-	4947	17.1	$ 0.15
	April	2009	$ 160.87	$ 454.16	$ 615.03	-	-	4178	14.8	$ 0.15
	May	2009	$ 234.30	$ 473.88	$ 708.18	-	-	3989	24.2	$ 0.18
	June	2009	$ 373.14	$ 519.74	$ 892.88	-	-	3747	44.6	$ 0.24
	July	2009	$ 470.84	$ 596.41	$ 1,067.24	-	-	3854	29.0	$ 0.28
	August	2009	$ 474.22	$ 602.43	$ 1,076.65	-	-	3970	29.7	$ 0.27
	September	2009	$ 352.13	$ 537.46	$ 889.58	-	-	3671	29.5	$ 0.24
	October	2009	$ 167.01	$ 527.37	$ 694.38	-	-	3834	11.7	$ 0.18
	November	2009	$ 186.77	$ 516.94	$ 703.71	-	-	4021	19.2	$ 0.18
	December	2009	$ 212.34	$ 559.07	$ 771.41	-	-	4533	19.2	$ 0.17

Month	Combined (KWH)	Demand (KW)
January	6270	18
February	5723	27
March	4947	17
April	4178	15
May	3989	24
June	3747	45
July	3854	29
August	3970	30
September	3671	30
October	3834	12
November	4021	19
December	4533	19
Total	**52735**	**285**

APPENDIX B

STATEMENT OF ENERGY PERFORMANCE

PORTFOLIO MANAGER REFERENCE SHEET

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Bordentown Sewerage Authority

Building ID: 2288992
For 12-month Period Ending: January 31, 2010[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: June 30, 2010

Facility
Bordentown Sewerage Authority
954 Farnsworth Avenue
Bordentown, NJ 08505

Facility Owner
Bordentown Sewerage Authority
954 Farnsworth Ave.
Bordentown, NJ 08505

Primary Contact for this Facility
Frank Hartman
954 Farnsworth Ave.
Bordentown, NJ 08505

Year Built: 1990
Energy Performance Rating[2] (1-100) 31

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	8,564,262
Natural Gas (kBtu)[4]	830,345
Total Energy (kBtu)	9,394,607

Energy Intensity[5]

Site (kBtu/gpd)	5
Source (kBtu/gpd)	16

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	1,348

Electric Distribution Utility
Public Service Elec & Gas Co

National Average Comparison

National Average Site EUI	4
National Average Source EUI	13
% Difference from National Average Source EUI	22%
Building Type	Wastewater

Stamp of Certifying Professional

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

Meets Industry Standards[6] **for Indoor Environmental Conditions:**

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

Certifying Professional
Matthew Goss
11 British American Blvd.
Latham, NY 12110

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

ENERGY STAR® Data Checklist for Commercial Buildings

In order for a building to qualify for the ENERGY STAR, a Professional Engineer (PE) must validate the accuracy of the data underlying the building's energy performance rating. This checklist is designed to provide an at-a-glance summary of a property's physical and operating characteristics, as well as its total energy consumption, to assist the PE in double-checking the information that the building owner or operator has entered into Portfolio Manager.

Please complete and sign this checklist and include it with the stamped, signed Statement of Energy Performance.
NOTE: You must check each box to indicate that each value is correct, OR include a note.

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	
Building Name	Bordentown Sewerage Authority	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Wastewater	Is this an accurate description of the space in question?		☐
Location	954 Farnsworth Avenue, Bordentown, NJ 08505	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Water Utility/Wastewater Plant	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		☐
Bordentown Wastewater Facility (Municipal Wastewater Treatment Plant)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	
Average Influent Flow	1.8MGD (million gallons per day)(Optional)	Is this the daily average actual flow of wastewater into the facility, measured in million gallons per day (MGD)? The average flow is likely to vary over time; this figure should reflect an annual average influent flow.		☐
Average Influent Biological Demand (BOD5) Concentration	185 mg/l (milligrams per liter)	Is this the average biological demand concentration of the wastewater flowing into the facility? This should be the average concentration estimated over a 12 month period. BOD5 should be reported in mg/l. BOD5 is not the same as CBOD5, the carbonaceous biological oxygen demand. BOD5 is required for the energy performance rating.		☐
Average Effluent Biological Demand (BOD5) Concentration	2 mg/l (milligrams per liter)	Is this the average biological demand concentration of the wastewater after it is treated and is leaving the facility? This should be the average concentration estimated over a 12 month period. BOD5 should be reported in mg/l. BOD5 is not the same as CBOD5, the carbonaceous biological oxygen demand. BOD5 is required for the energy performance rating.		☐
Plant Design Flow Rate	3 MGD (million gallons per day)	Is this the plant design flow rate, measured in million gallons per day (MGD)? This is the amount of flow the plant is designed to process.		☐
Fixed Film Trickle Filtration Process	No	Does this facility have an onsite fixed film trickle filtration process? Trickle filtration is a process used to reduce BOD, pathogens, and nitrogen levels.		☐
Nutrient Removal	Yes	Does this facility conduct nutrient removal as part of the treatment process? Nutrient removal is considered any process included for the purpose of removing nutrients (i.e., nitrogen, phosphorous). This may include biological nitrification, biological denitrification, phosphorus removal, or recirculating sand filters.		☐

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: Public Service Elec & Gas Co

Fuel Type: Electricity

Meter: WWTF: 778018216 (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
12/23/2009	01/22/2010	226,350.00
11/20/2009	12/22/2009	211,781.00
10/22/2009	11/19/2009	165,782.00
09/24/2009	10/21/2009	173,647.00
08/21/2009	09/23/2009	198,021.00
07/23/2009	08/20/2009	172,976.00
06/21/2009	07/22/2009	197,115.00
05/20/2009	06/20/2009	178,062.00
04/18/2009	05/19/2009	191,361.00
03/14/2009	04/17/2009	230,107.00
02/14/2009	03/13/2009	178,351.00
WWTF: 778018216 Consumption (kWh (thousand Watt-hours))		**2,123,553.00**
WWTF: 778018216 Consumption (kBtu (thousand Btu))		**7,245,562.84**

Meter: Bossert PS: 256002058 (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
12/09/2009	01/11/2010	5,964.00
11/06/2009	12/08/2009	2,232.00
10/08/2009	11/05/2009	1,764.00
09/09/2009	10/07/2009	1,608.00
08/07/2009	09/08/2009	1,944.00
07/10/2009	08/06/2009	1,788.00
06/06/2009	07/09/2009	1,920.00
05/07/2009	06/05/2009	1,500.00
04/04/2009	05/06/2009	1,920.00
02/28/2009	04/03/2009	2,256.00
02/03/2009	02/27/2009	2,280.00
Bossert PS: 256002058 Consumption (kWh (thousand Watt-hours))		**25,176.00**
Bossert PS: 256002058 Consumption (kBtu (thousand Btu))		**85,900.51**

Meter: Laurel Run PS: 728000239 (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
12/23/2009	01/23/2010	7,120.00
11/20/2009	12/22/2009	3,520.00
10/23/2009	11/19/2009	3,840.00
09/24/2009	10/22/2009	3,440.00
08/21/2009	09/23/2009	4,160.00
07/23/2009	08/20/2009	3,680.00
06/23/2009	07/22/2009	3,680.00
05/20/2009	06/22/2009	3,540.00
04/18/2009	05/19/2009	4,560.00
03/14/2009	04/17/2009	4,480.00
02/14/2009	03/13/2009	3,520.00
Laurel Run PS: 728000239 Consumption (kWh (thousand Watt-hours))		**45,540.00**
Laurel Run PS: 728000239 Consumption (kBtu (thousand Btu))		**155,382.48**

Meter: Mile Hollow PS: 298001832 (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
12/23/2009	01/22/2010	12,750.00
11/20/2009	12/22/2009	7,950.00
10/22/2009	11/19/2009	8,370.00
09/23/2009	10/21/2009	7,440.00
08/21/2009	09/22/2009	8,640.00
07/23/2009	08/20/2009	8,700.00
06/23/2009	07/22/2009	7,590.00
05/20/2009	06/22/2009	8,580.00
04/18/2009	05/19/2009	8,970.00
03/14/2009	04/17/2009	8,250.00
02/15/2009	03/13/2009	6,240.00
Mile Hollow PS: 298001832 Consumption (kWh (thousand Watt-hours))		**93,480.00**
Mile Hollow PS: 298001832 Consumption (kBtu (thousand Btu))		**318,953.76**

Meter: Park Street #1 PS: 726010562 (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
12/23/2009	01/22/2010	4,487.00
11/20/2009	12/22/2009	4,845.00
10/22/2009	11/19/2009	3,672.00
09/23/2009	10/21/2009	3,546.00
08/21/2009	09/22/2009	4,039.00
07/23/2009	08/20/2009	3,804.00
06/23/2009	07/22/2009	3,645.00

05/20/2009	06/22/2009	4,289.00
04/18/2009	05/19/2009	4,168.00
03/14/2009	04/17/2009	5,116.00
02/15/2009	03/13/2009	4,809.00
Park Street #1 PS: 726010562 Consumption (kWh (thousand Watt-hours))		**46,420.00**
Park Street #1 PS: 726010562 Consumption (kBtu (thousand Btu))		**158,385.04**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**7,964,184.63**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

Meter: WWTF: 2283589 (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
12/23/2009	01/23/2010	1,725.53
11/20/2009	12/22/2009	1,331.37
10/22/2009	11/19/2009	184.82
09/23/2009	10/21/2009	109.45
08/21/2009	09/22/2009	8.36
07/23/2009	08/20/2009	4.17
06/21/2009	07/22/2009	18.76
05/20/2009	06/20/2009	15.64
04/18/2009	05/19/2009	53.16
03/14/2009	04/17/2009	338.38
02/14/2009	03/13/2009	898.86
WWTF: 2283589 Consumption (therms)		**4,688.50**
WWTF: 2283589 Consumption (kBtu (thousand Btu))		**468,850.00**

Meter: Park Street No.1 Pump Station (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
12/23/2009	01/22/2010	4.13
11/20/2009	12/22/2009	13.46
10/22/2009	11/19/2009	6.23
09/23/2009	10/21/2009	8.34
08/21/2009	09/22/2009	11.50
07/23/2009	08/20/2009	22.93
06/23/2009	07/22/2009	8.34
05/20/2009	06/22/2009	10.42
04/18/2009	05/19/2009	9.38
03/14/2009	04/17/2009	13.16
02/15/2009	03/13/2009	8.37
Park Street No.1 Pump Station Consumption (therms)		**116.26**
Park Street No.1 Pump Station Consumption (kBtu (thousand Btu))		**11,626.00**

Meter: Mile Hollow Pump Station (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
12/23/2009	01/22/2010	694.35
11/20/2009	12/22/2009	129.41
10/22/2009	11/19/2009	130.83
09/23/2009	10/21/2009	78.18
08/21/2009	09/22/2009	20.91
07/23/2009	08/20/2009	21.89
06/23/2009	07/22/2009	22.93
05/20/2009	06/22/2009	27.10
04/18/2009	05/19/2009	50.03
03/14/2009	04/17/2009	232.90
02/15/2009	03/13/2009	399.73
Mile Hollow Pump Station Consumption (therms)		**1,808.26**
Mile Hollow Pump Station Consumption (kBtu (thousand Btu))		**180,826.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**661,302.00**
Is this the total Natural Gas consumption at this building including all Natural Gas meters?		☐

Additional Fuels	
Do the fuel consumption totals shown above represent the total energy use of this building? Please confirm there are no additional fuels (district energy, generator fuel oil) used in this facility.	☐

On-Site Solar and Wind Energy	
Do the fuel consumption totals shown above include all on-site solar and/or wind power located at your facility? Please confirm that no on-site solar or wind installations have been omitted from this list. All on-site systems must be reported.	☐

IT Energy Type: Average Influent Flow Meter		
Meter Name: Average Influent Flow Meter		
Start Date	**End Date**	**Energy Use (kWh)**
01/01/1990	12/31/2010	1.80
Average Influent Flow Meter (kWh)		**1.80**

Certifying Professional

(When applying for the ENERGY STAR, the Certifying Professional must be the same as the PE that signed and stamped the SEP.)

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

Please keep this Facility Summary for your own records; do not submit it to EPA. Only the Statement of Energy Performance (SEP) and Letter of Agreement need to be submitted to EPA when applying for the ENERGY STAR.

General Information:

Bordentown Sewerage Authority	
Year Built	1990
For 12-month Evaluation Period Ending Date:	January 31, 2010

Facility Space Use Summary

Bordentown Wastewater Facility	
Space Type	Municipal Wastewater Treatment Plant
Average Influent Biological Demand (BOD5) Concentration	185
Average Effluent Biological Demand (BOD5) Concentration	2
Plant Design Flow Rate	3
Fixed Film Trickle Filtration Process	No
Nutrient Removal	Yes

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date: 01/31/2010)	**Baseline** (Ending Date: 12/31/2009)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	**31**	**31**	75	N/A	50
Energy Intensity					
Site (kBtu/gpd)	5	5	N/A	N/A	4
Source (kBtu/gpd)	16	16	N/A	N/A	13
Energy Cost					
$/year	$ 317,332	$ 321,254	N/A	N/A	$ 260,796
$/mgpd/year	$176,295.39	$178,474.71	N/A	N/A	$144,886.44
Greenhouse Gas Emissions					
$MtCO_2e$/year	1,348	1,354	N/A	N/A	1,108
$kgCO_2e/ft^2$/year	N/A	N/A	N/A	N/A	N/A

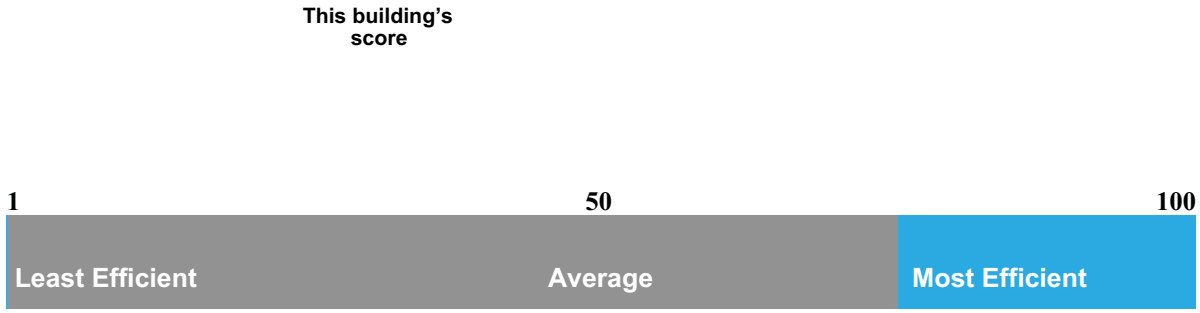
Statement of Energy Performance

2010

Bordentown Sewerage Authority
954 Farnsworth Avenue
Bordentown, NJ 08505

Portfolio Manager Building ID: 2288992

The energy use of this building has been measured and compared to other similar buildings using the Environmental Protection Agency's (EPA's) Energy Performance Scale of 1–100, with 1 being the least energy efficient and 100 the most energy efficient. For more information, visit energystar.gov/benchmark.



This building uses N/A kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending January 2010

Buildings with a score of 75 or higher may qualify for EPA's ENERGY STAR.

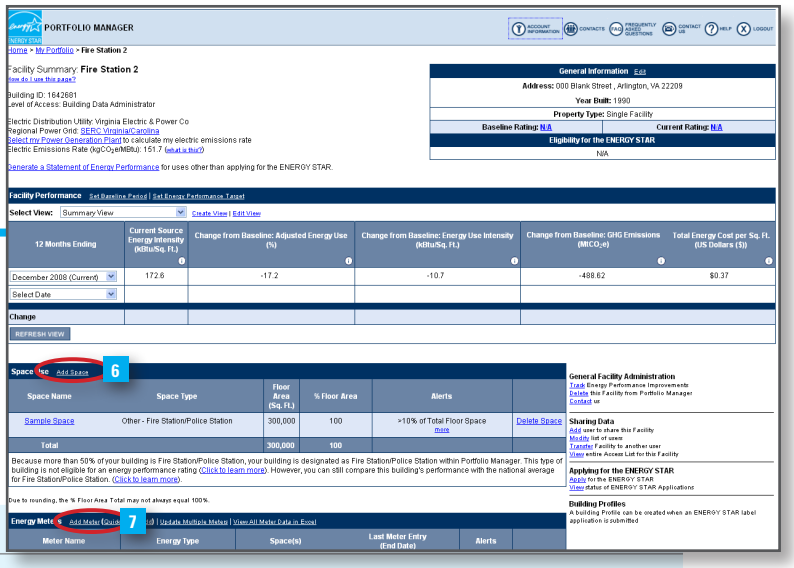
I certify that the information contained within this statement is accurate and in accordance with U.S. Environmental Protection Agency's measurement standards, found at energystar.gov

Date of certification

Date Generated: 06/30/2010

PORTFOLIO MANAGER QUICK REFERENCE GUIDE

Portfolio Manager is an interactive energy management tool that allows you to track and assess energy and water consumption across your entire portfolio of buildings in a secure online environment. Use this Quick Reference Guide to identify opportunities for energy efficiency improvements, track your progress over time, and verify results.

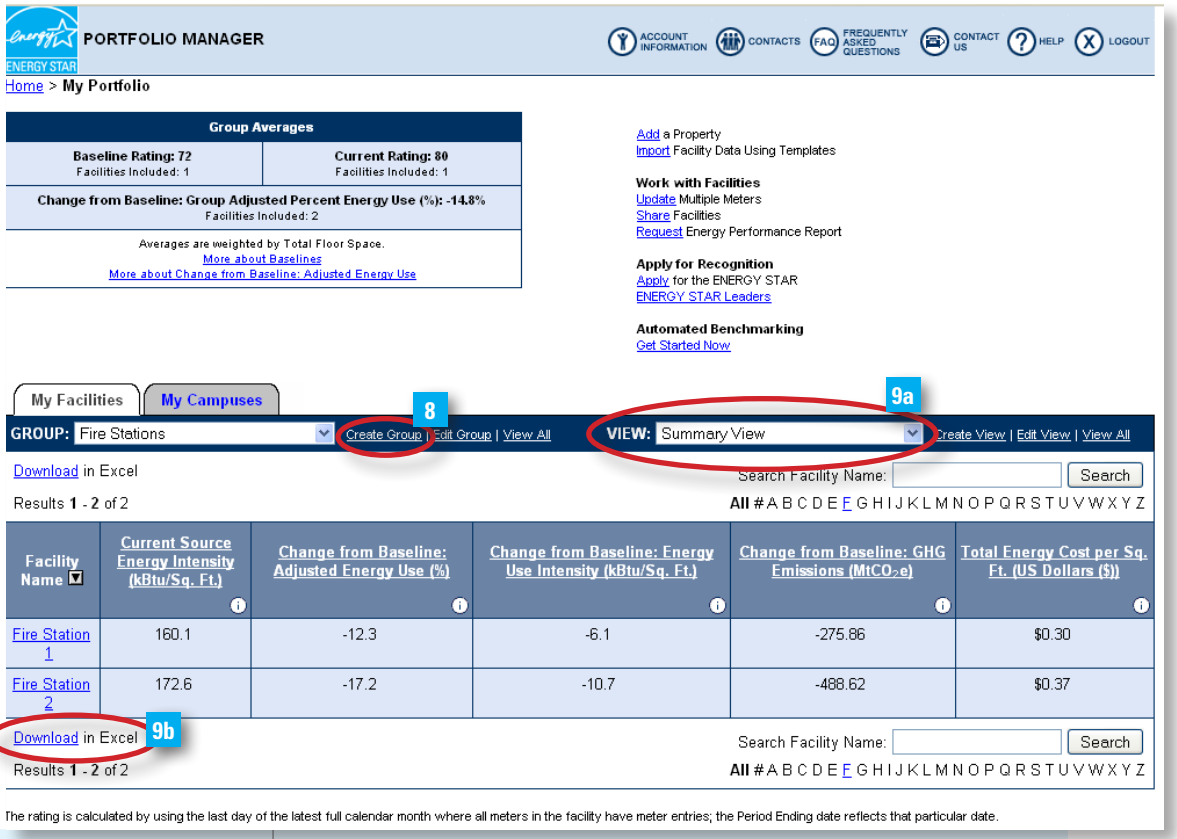


IDENTIFY ENERGY EFFICIENCY PROJECTS

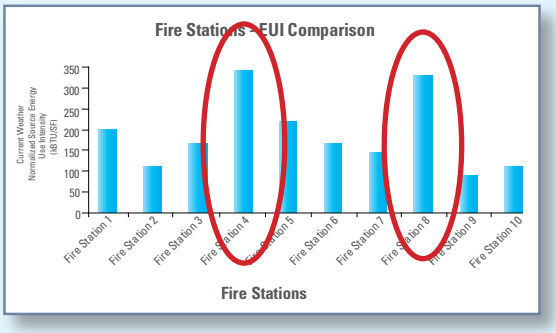
Use Portfolio Manager to identify under-performing buildings to target for energy efficiency improvements and establish baselines for setting and measuring progress for energy efficiency improvement projects over time.

STEP	ACTIVITY	ACTION
1	Access Portfolio Manager. (step not shown)	Visit **www.energystar.gov/benchmark**. Scroll down to the **Login** section on the right-hand side in the middle of the page.
2	Access your account: (step not shown) • Create a new account. • Login to an existing account.	• Click **REGISTER,** and follow instructions. • Enter user name and password, and click **LOGIN**.
3	Review system updates and enter account. (step not shown)	Click **ACCESS MY PORTFOLIO**, located below **Welcome to Portfolio Manager**.
4	Add a new facility. (step not shown)	Click **ADD** a Property, located in the upper right portion of the screen.
5	Select property type and enter general facility information. (step not shown)	Select the option that most closely resembles your facility and click **CONTINUE**. Enter general data and click **SAVE**. For more information on facility space types, see: www.energystar.gov/index.cfm?c=eligibility.bus_portfoliomanager_space_types.
6	Enter space use data.	From the **Facility Summary** page, shown above, go to the **Space Use** section, located half way down the page, and click **ADD SPACE**. • Enter a facility name. In the **Select a Space Type** menu, select the appropriate space type(s) for your building. If your space is not listed, select **Other**. Click **CONTINUE**. • Enter building characteristics. Click **SAVE**. Information required for each space type is listed here: www.energystar.gov/index.cfm?c=eligibility.bus_portfoliomanager_space_types. • Repeat steps above to add all major spaces in your facility. Use bulk import service to minimize manual data entry of large sets of facility data (10 or more facilities or campuses are required). • Go back to **My Portfolio** by clicking on the link in the upper left portion of the page. • Click **IMPORT** Facility Data Using Templates, located below **Add a Property**.
7	Enter energy use data.	From the **Facility Summary** page, go to the **Energy Meters** section, located below the **Space Use** section, and click **ADD METER**. • Enter meter name, type, and units. Click **SAVE**. • Enter number of months and start date. Click **CONTINUE**. • Enter energy use and cost for each month. Click **SAVE**. • Repeat for all energy meters and fuel types.

www.energystar.gov/benchmark



STEP	ACTIVITY	ACTION
8	Create custom groups.	Organize facilities into groups (e.g., Fire Stations, Northwest Region). Groups are completely customizable, and each facility may belong to multiple groups. • From the **My Portfolio** page, click **CREATE GROUP**, located directly to the right of the **Group** drop-down menu. • Follow instructions to select buildings and name your group. • Once they have been saved, custom groups will be available in the **Group** drop-down menu.
9	View and interpret results.	Option 1: Go to **My Portfolio** and view all buildings to compare performance metrics. Option 2: Export data to Microsoft® Excel. • On the **My Portfolio** page, select the view, from the **View** drop-down menu that will display the data you wish to export. The **My Portfolio** page will update to display the selected view. (9a) • Select the **DOWNLOAD IN EXCEL** link. A File Download dialog window will open. Follow the steps provided by Excel. (9b) • Use Excel functionality to view building energy performance graphically . The example below shows a comparison of Energy Use Intensity for a portfolio of fire stations, identifying under-performing buildings to target for energy eficiency improvements.



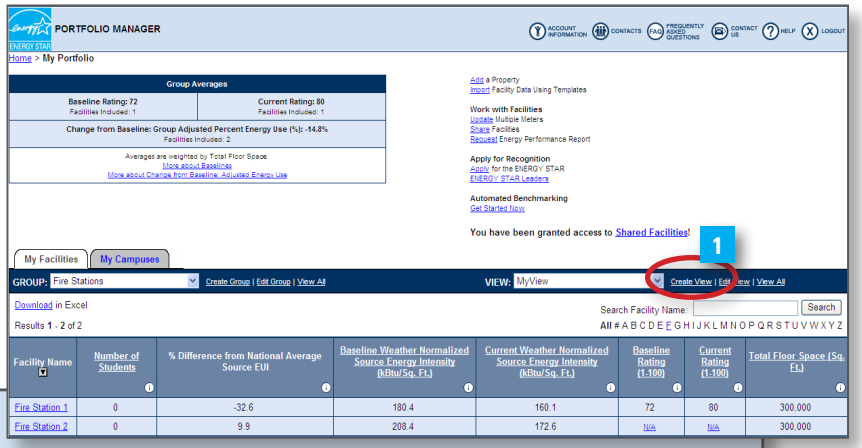
www.energystar.gov/benchmark

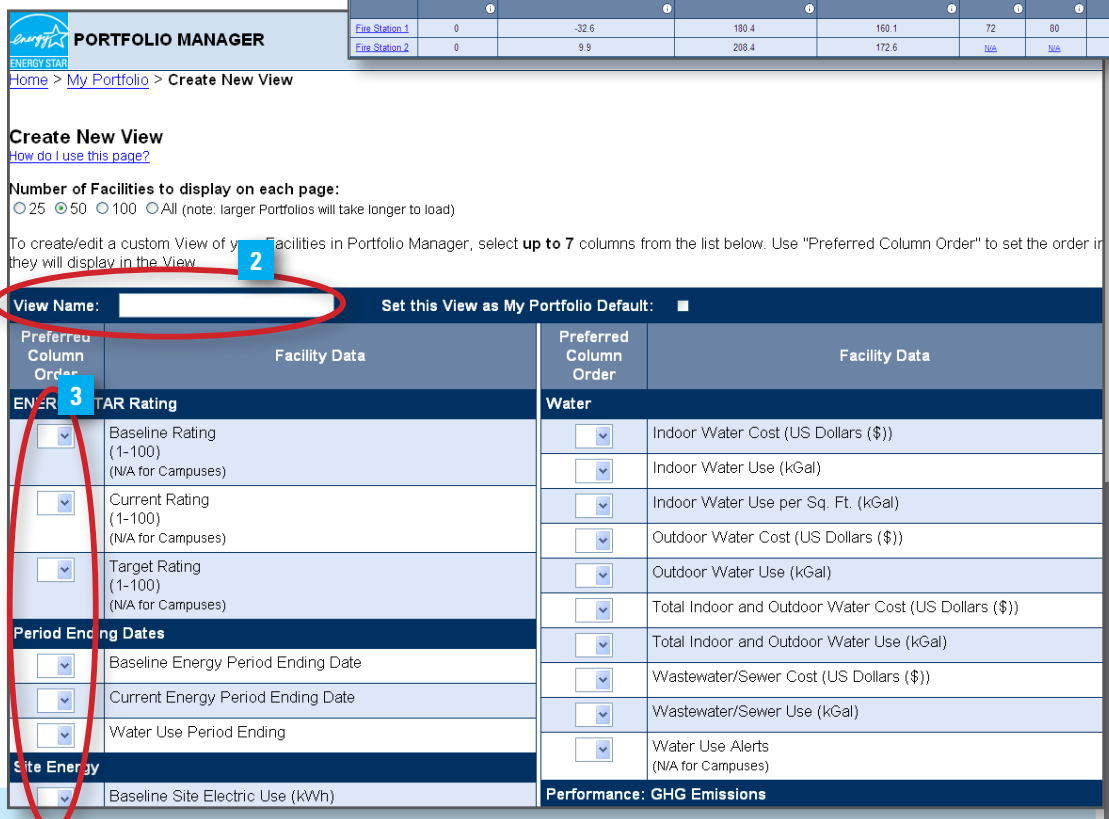
TRACK PROGRESS OVER TIME

Portfolio Manager comes pre-populated with nine standard summary views of facility data, which are displayed on the My Portfolio summary page. These standard views include:

- Summary: Energy Use
- Performance: Green House Gas Emissions
- Performance: Financial
- Performance: Water Use

Additionally, users can create and save custom downloadable views by choosing from more than 70 different metrics. The default view set by the user will display automatically after logging into Portfolio Manager, and data from all views can be exported to Microsoft® Excel.





CREATE A CUSTOM VIEW

STEP	ACTION
1	From the **My Portfolio** page or the **Facility Summary** page, select the **Create View** link, located directly to the right of the **View** drop-down menu.
2	Enter a name for the view. To set as the default view, select the box labeled **Set this View as My Portfolio Default**, located directly to the right of **View Name**. You may include up to 7 (seven) columns in each view.
3	Choose each metric to be included in the view by selecting an order number from the **Preferred Column Order** drop-down menu to the left of the **Facility Data** column.
4	Click **SAVE** at the bottom of the page. You will be returned to the **My Portfolio** page, and your custom view will be available in the **View** drop-down menu. (step not shown)

www.energystar.gov/benchmark

VERIFY AND DOCUMENT RESULTS

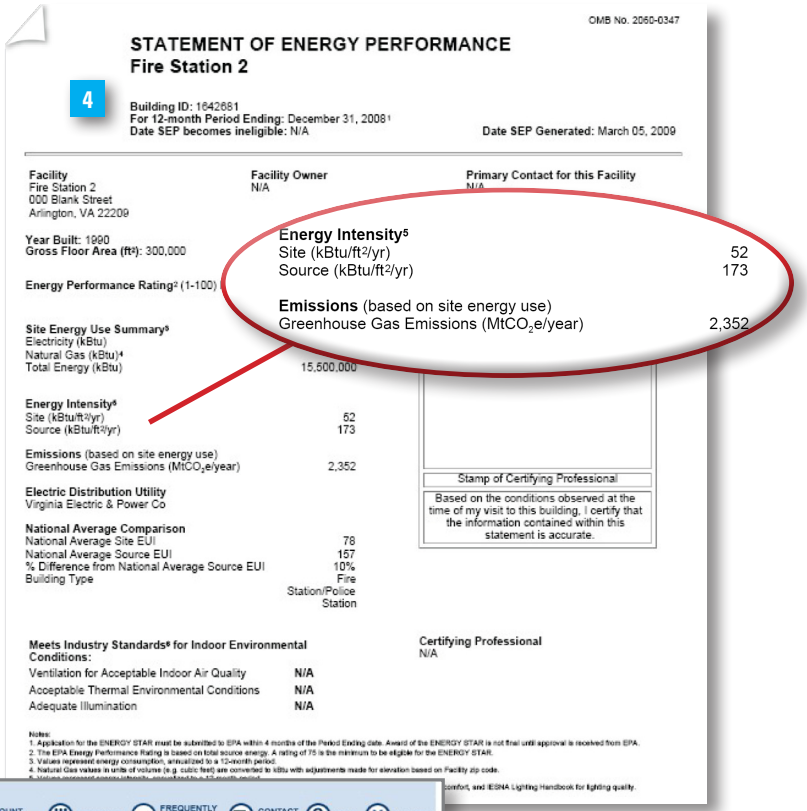
Use Portfolio Manager to quickly and accurately document reductions in energy use, greenhouse gas emissions, water use, and energy costs for an individual building or an entire portfolio. This valuable information can be used to provide a level of transparency and accountability to help demonstrate strategic use of funding.

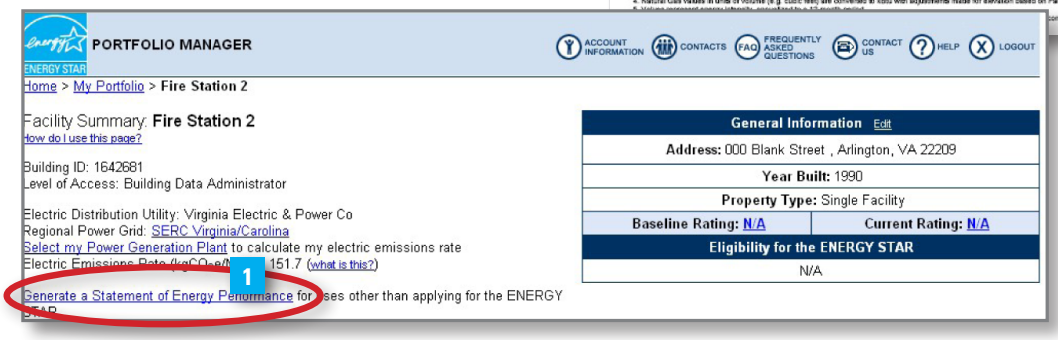
Generate a Statement of Energy Performance that includes valuable information about your building's performance, including:

- Normalized energy use intensity
- National average comparisons
- Greenhouse gas emissions
- Energy performance rating (if available)

In addition, you can also request an Energy Performance Report to see the change in performance over time for selected buildings or an entire portfolio. Available comparative metrics in this report include:

- Normalized energy use intensity
- Total electric use
- Total natural gas use
- Energy performance rating (if available)





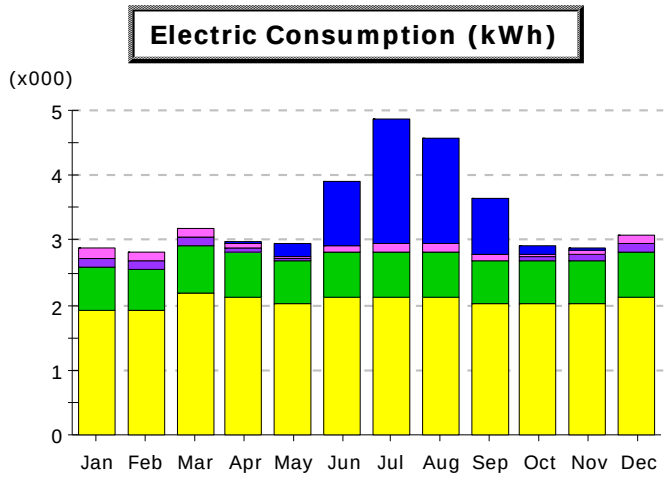
GENERATE A STATEMENT OF ENERGY PERFORMANCE AND AN ENERGY PERFORMANCE REPORT

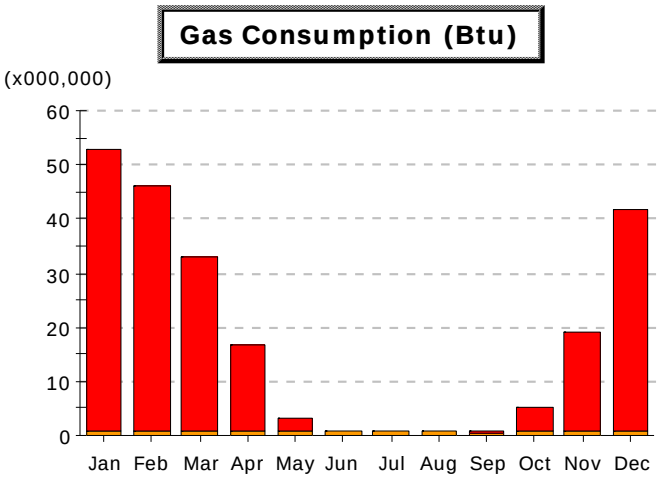
STEP	ACTION
1	From your selected building's **Facility Summary** page, click **GENERATE A STATEMENT OF ENERGY PERFORMANCE**.
2	On the next page, select a period ending date. (step not shown)
3	Click **GENERATE REPORT,** located in the bottom right corner of the screen. (step not shown)
4	Save the Statement of Energy Performance, accompanying Data Checklist, and Facility Summary that include information on energy use intensity and greenhouse gas emissions.
5	From the **My Portfolio** page, click **REQUEST ENERGY PERFORMANCE REPORT**, located under **Work with Facilities**, which shows reductions in key performance indicators over a user-specified time period. Specify the type of report, the facilities to be included, and the requested report columns. The report will be e-mailed to a user-specified address within one business day. (step not shown)

www.energystar.gov/benchmark

APPENDIX C eQUEST MODEL RUN

SUMMARIES



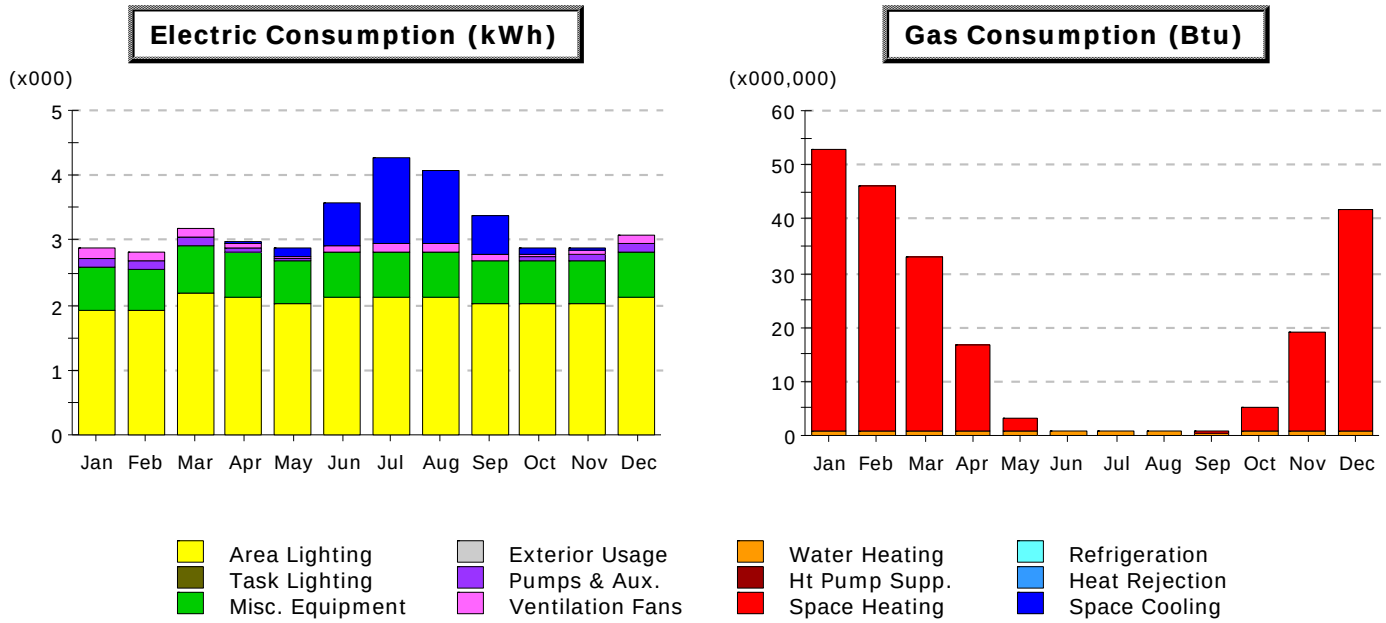


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	0.00	0.03	0.18	1.00	1.90	1.61	0.87	0.13	0.02	-	5.74
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	0.16	0.14	0.12	0.08	0.06	0.10	0.15	0.14	0.09	0.06	0.08	0.14	1.33
Pumps & Aux.	0.15	0.13	0.12	0.08	0.01	0.00	-	-	0.00	0.05	0.09	0.15	0.78
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.65	0.64	0.73	0.70	0.67	0.70	0.70	0.70	0.67	0.67	0.67	0.70	8.19
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	1.93	1.92	2.20	2.11	2.02	2.11	2.11	2.11	2.01	2.02	2.01	2.11	24.64
Total	2.88	2.83	3.17	2.99	2.94	3.91	4.86	4.57	3.65	2.93	2.87	3.09	40.68

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	52.04	45.43	32.04	15.79	2.49	0.02	-	-	0.02	4.47	18.38	40.79	211.48
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.74	0.76	0.86	0.81	0.71	0.68	0.63	0.60	0.57	0.61	0.66	0.75	8.38
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	52.78	46.19	32.91	16.60	3.20	0.70	0.63	0.60	0.60	5.08	19.05	41.54	219.85

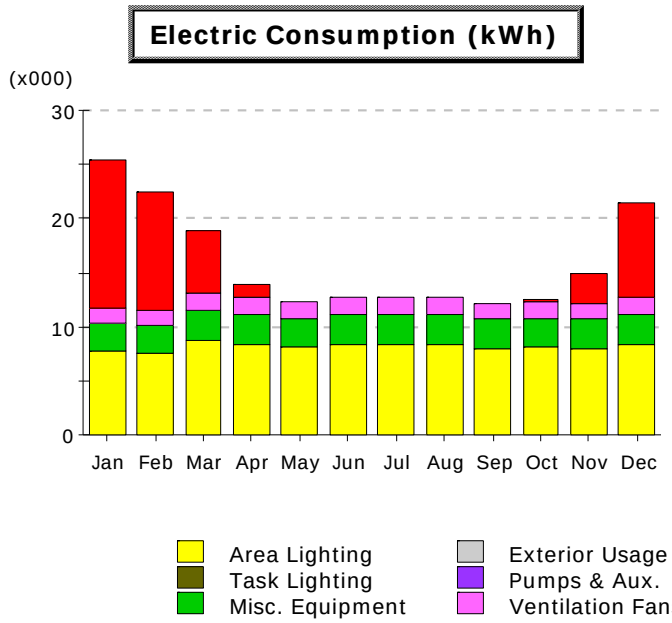


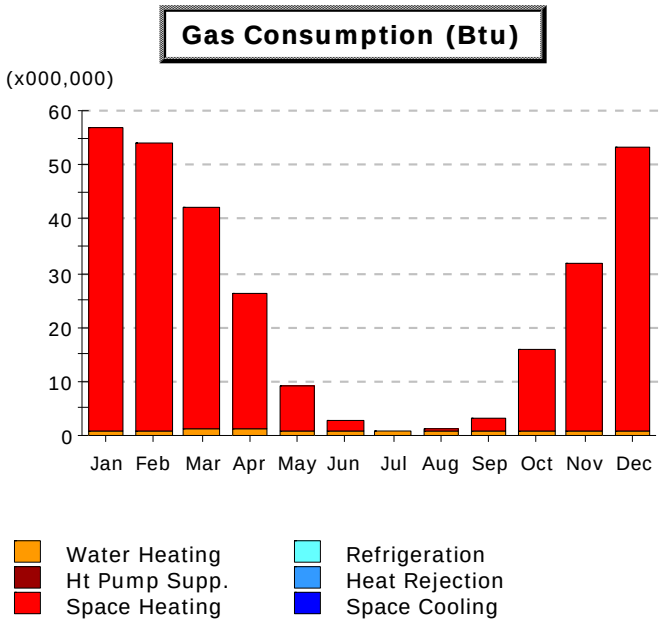
Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	0.00	0.02	0.12	0.69	1.30	1.11	0.60	0.09	0.01	-	3.94
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	0.16	0.14	0.12	0.08	0.06	0.10	0.15	0.14	0.09	0.06	0.08	0.14	1.33
Pumps & Aux.	0.15	0.13	0.12	0.08	0.01	0.00	-	-	0.00	0.05	0.09	0.15	0.78
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.65	0.64	0.73	0.70	0.67	0.70	0.70	0.70	0.67	0.67	0.67	0.70	8.19
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	1.93	1.92	2.20	2.11	2.02	2.11	2.11	2.11	2.01	2.02	2.01	2.11	24.64
Total	2.88	2.83	3.17	2.98	2.88	3.59	4.26	4.06	3.38	2.89	2.87	3.09	38.88

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	52.04	45.43	32.04	15.79	2.49	0.02	-	-	0.02	4.47	18.38	40.79	211.48
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.74	0.76	0.86	0.81	0.71	0.68	0.63	0.60	0.57	0.61	0.66	0.75	8.38
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	52.78	46.19	32.91	16.60	3.20	0.70	0.63	0.60	0.60	5.08	19.05	41.54	219.85



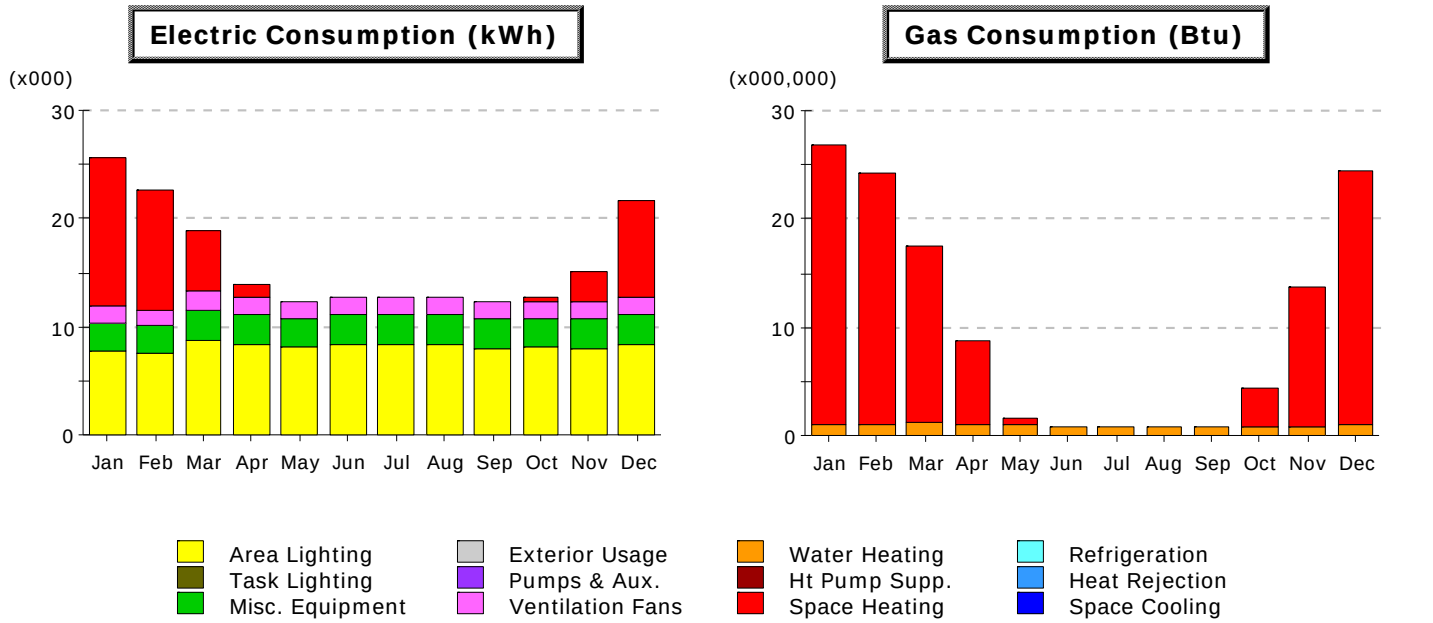


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	13.70	10.98	5.66	1.27	-	-	-	-	-	0.33	2.79	8.81	43.54
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	1.54	1.44	1.61	1.55	1.57	1.55	1.59	1.59	1.53	1.57	1.53	1.59	18.66
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	2.51	2.49	2.86	2.73	2.62	2.73	2.74	2.74	2.62	2.62	2.62	2.74	32.01
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	7.73	7.61	8.70	8.34	8.05	8.34	8.38	8.38	8.01	8.05	8.01	8.38	97.98
Total	25.48	22.52	18.83	13.90	12.24	12.63	12.71	12.71	12.16	12.57	14.95	21.51	192.20

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	55.92	53.16	40.80	25.23	8.38	1.80	0.03	0.47	2.33	15.17	30.81	52.41	286.52
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.95	0.98	1.12	1.05	0.93	0.89	0.83	0.79	0.75	0.79	0.86	0.97	10.91
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	56.87	54.13	41.92	26.28	9.31	2.69	0.86	1.26	3.08	15.96	31.67	53.38	297.42

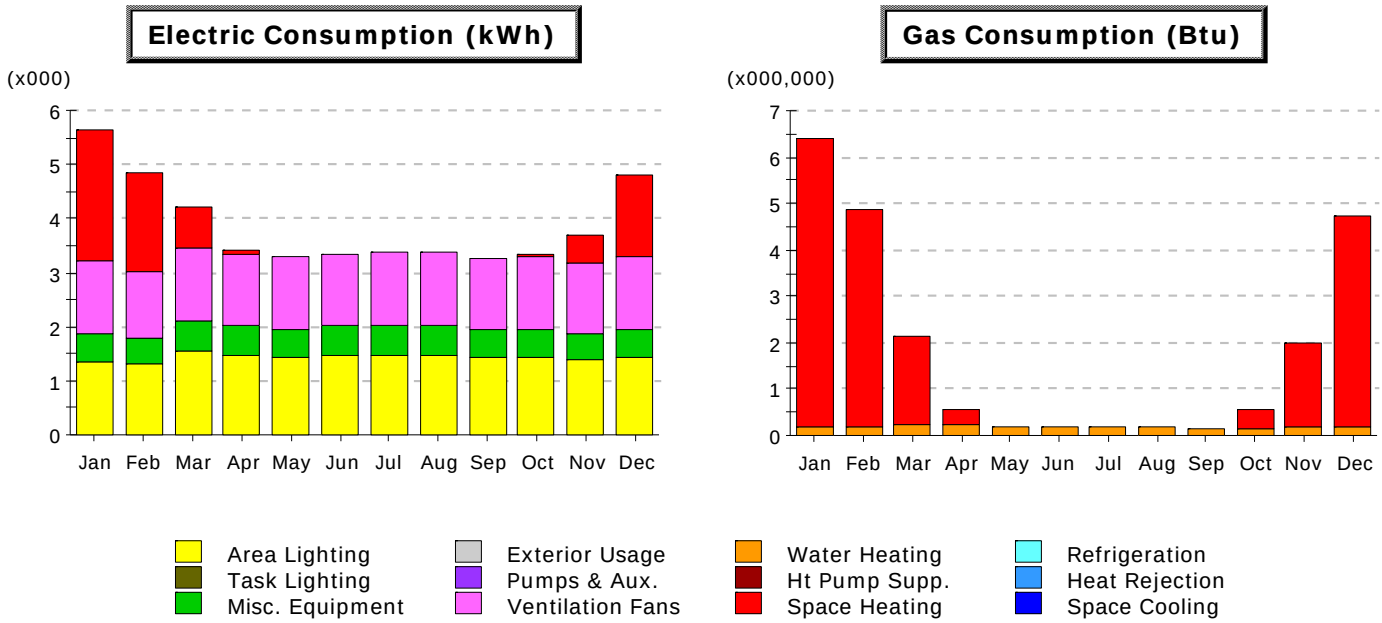


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	13.71	11.00	5.67	1.28	-	-	-	-	-	0.33	2.79	8.82	43.59
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	1.62	1.52	1.70	1.64	1.65	1.64	1.68	1.68	1.61	1.65	1.61	1.68	19.68
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	2.51	2.49	2.86	2.73	2.62	2.73	2.74	2.74	2.62	2.62	2.62	2.74	32.01
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	7.73	7.61	8.70	8.34	8.05	8.34	8.38	8.38	8.01	8.05	8.01	8.38	97.98
Total	25.57	22.61	18.93	13.99	12.33	12.71	12.79	12.79	12.24	12.65	15.03	21.61	193.26

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	25.83	23.31	16.42	7.70	0.58	-	-	-	0.08	3.67	12.82	23.51	113.90
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.95	0.98	1.12	1.05	0.93	0.89	0.83	0.79	0.75	0.79	0.86	0.97	10.91
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	26.78	24.29	17.54	8.75	1.51	0.89	0.83	0.79	0.83	4.46	13.67	24.48	124.81



Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	2.42	1.85	0.74	0.10	-	-	-	-	-	0.07	0.51	1.52	7.22
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	1.34	1.21	1.34	1.30	1.34	1.30	1.34	1.34	1.30	1.34	1.30	1.34	15.78
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.51	0.49	0.58	0.55	0.53	0.55	0.55	0.55	0.53	0.53	0.51	0.53	6.41
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	1.36	1.31	1.54	1.49	1.42	1.49	1.47	1.49	1.43	1.42	1.37	1.43	17.21
Total	5.62	4.86	4.20	3.44	3.28	3.34	3.36	3.38	3.26	3.36	3.69	4.83	46.62

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	6.20	4.66	1.92	0.35	-	-	-	-	-	0.38	1.82	4.52	19.86
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.19	0.19	0.23	0.22	0.19	0.18	0.17	0.16	0.16	0.16	0.17	0.19	2.22
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	6.39	4.86	2.15	0.57	0.19	0.18	0.17	0.16	0.16	0.54	1.99	4.71	22.08

APPENDIX D

LIGHTING UPGRADES ANALYSIS SPREADSHEET

Appendix D - Lighting Upgrades

																											Materials & Labor Data						
Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Existing Fixture Watts	Existing kW	Operating Hours	Existing kWh	Existing Annual Energy Cost	Proposed Replacement Solution	Quantity of Proposed Fixtures	Proposed Fixture Watts	Proposed kW Base	Proposed Operational Hours Without Sensors	Proposed Operational Hours With Sensors	Proposed kWh Without Sensors	Proposed kWh With Sensors	Proposed Occupancy Sensor Type	Occupancy Sensor Quantity	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/ Fixture/ Reflector Per Unit Price	Bulb (Per Unit Price)	Labor (Per Unit Price)	Occupancy Sensor (Per Unit Price)	Occupancy Sensor (Per Unit Labor Price)	Labor Subtotal	Materials Subtotal	Labor & Materials Subtotal	Labor Total	Materials Total	Labor & Materials Total
Administration Building - Interior	001	Hallway	2x2 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	6	513.6	0.51	2340	1202	$142.2	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	6	291.6	0.29	2340	1638	682	682	None Proposed	0	0.22	519	$61.45	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$390.0	$480.0	$870.0
Administration Building - Interior	001	Utility Room	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	1	85.6	0.09	520	45	$5.3	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	1	48.6	0.05	520	364	25	18	Automatic Wall Switch Occupancy Sensor	1	0.04	27	$3.17	$70.0	$10.0	$65.0	$63.5	$45.0	$65.0	$80.0	$145.0	$110.0	$143.5	$253.5
Administration Building - Interior	001	Garage 1	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	12	1027.2	1.03	2340	2404	$284.4	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	12	583.2	0.58	2340	1638	1365	1365	None Proposed	0	0.44	1039	$122.91	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$780.0	$960.0	$1,740.0
Administration Building - Interior	001	Garage 2	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	18	1540.8	1.54	2340	3605	$426.5	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	18	874.8	0.87	2340	1638	2047	2047	None Proposed	0	0.67	1558	$184.36	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$1,170.0	$1,440.0	$2,610.0
Administration Building - Interior	001	Main Lobby	2x2 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	4	342.4	0.34	8760	2999	$354.8	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	4	194.4	0.19	8760	6132	1703	1703	None Proposed	0	0.15	1296	$153.37	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$260.0	$320.0	$580.0
Administration Building - Interior	001	Billing Office	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	6	513.6	0.51	2340	1202	$142.2	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	6	291.6	0.29	2340	1638	682	478	Ceiling Mounted Occupancy Sensor	1	0.22	724	$85.67	$70.0	$10.0	$65.0	$103.0	$73.5	$65.0	$80.0	$145.0	$463.5	$583.0	$1,046.5
Administration Building - Interior	001	Storage Room	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	171.2	0.17	520	89	$10.5	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	97.2	0.10	520	364	51	35	Automatic Wall Switch Occupancy Sensor	1	0.07	54	$6.35	$70.0	$10.0	$65.0	$63.5	$45.0	$65.0	$80.0	$145.0	$175.0	$223.5	$398.5
Administration Building - Interior	001	Computer Room	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	171.2	0.17	2340	401	$47.4	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	97.2	0.10	2340	1638	227	159	Automatic Wall Switch Occupancy Sensor	1	0.07	241	$28.56	$70.0	$10.0	$65.0	$63.5	$45.0	$65.0	$80.0	$145.0	$175.0	$223.5	$398.5
Administration Building - Interior	001	Judy Kilm Office	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	1	85.6	0.09	2340	200	$23.7	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	1	48.6	0.05	2340	1638	114	80	Automatic Wall Switch Occupancy Sensor	1	0.04	121	$14.28	$70.0	$10.0	$65.0	$63.5	$45.0	$65.0	$80.0	$145.0	$110.0	$143.5	$253.5
Administration Building - Interior	001	Judy Kilm Office	60W Incandescent Fixture	1	60	0.06	2340	140	$16.6	Replace 60W Incandescent Fixture with 13W CFL	1	13	0.01	2340	1638	30	30	None Proposed	0	0.05	110	$13.01	$0.0	$5.0	$20.0	$0.0	$0.0	$20.0	$5.0	$25.0	$20.0	$5.0	$25.0
Administration Building - Interior	001	Conference Room	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	8	684.8	0.68	2340	1602	$189.6	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	8	388.8	0.39	2340	1638	910	637	Ceiling Mounted Occupancy Sensor	1	0.30	966	$114.23	$70.0	$10.0	$65.0	$103.0	$73.5	$65.0	$80.0	$145.0	$593.5	$743.0	$1,336.5
Administration Building - Interior	001	Ladies Room	2x2 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	1	85.6	0.09	2340	200	$23.7	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	1	48.6	0.05	2340	1638	114	80	Automatic Wall Switch Occupancy Sensor	1	0.04	121	$14.28	$70.0	$10.0	$65.0	$63.5	$45.0	$65.0	$80.0	$145.0	$110.0	$143.5	$253.5
Administration Building - Interior	001	Executive Director Office	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	4	342.4	0.34	2340	801	$94.8	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	4	194.4	0.19	2340	1638	455	318	Automatic Wall Switch Occupancy Sensor	1	0.15	483	$57.11	$70.0	$10.0	$65.0	$63.5	$45.0	$65.0	$80.0	$145.0	$305.0	$383.5	$688.5
Administration Building - Interior	001	Director of Operations Office	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	4	342.4	0.34	2340	801	$94.8	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	4	194.4	0.19	2340	1638	455	318	Automatic Wall Switch Occupancy Sensor	1	0.15	483	$57.11	$70.0	$10.0	$65.0	$63.5	$45.0	$65.0	$80.0	$145.0	$305.0	$383.5	$688.5
Administration Building - Interior	001	Hallway	2x2 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	4	342.4	0.34	2340	801	$94.8	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	4	194.4	0.19	2340	1638	455	455	None Proposed	0	0.15	346	$40.97	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$260.0	$320.0	$580.0
Administration Building - Interior	001	Laboratory	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	12	1027.2	1.03	2340	2404	$284.4	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	12	583.2	0.58	2340	1638	1365	955	Ceiling Mounted Occupancy Sensor	2	0.44	1448	$171.34	$70.0	$10.0	$65.0	$206.0	$147.0	$65.0	$80.0	$145.0	$1,074.0	$1,372.0	$2,446.0
Administration Building - Interior	001	Laboratory Hall	2x2 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	1	85.6	0.09	2340	200	$23.7	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	1	48.6	0.05	2340	1638	114	114	None Proposed	0	0.04	87	$10.24	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$65.0	$80.0	$145.0
Administration Building - Interior	001	Control Room	2x2 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	3	256.8	0.26	2340	601	$71.1	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	3	145.8	0.15	2340	1638	341	239	Automatic Wall Switch Occupancy Sensor	1	0.11	362	$42.84	$70.0	$10.0	$65.0	$63.5	$45.0	$65.0	$80.0	$145.0	$240.0	$303.5	$543.5
Administration Building - Interior	001	Control Room	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	171.2	0.17	2340	401	$47.4	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	97.2	0.10	2340	1638	227	227	None Proposed	0	0.07	173	$20.48	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$130.0	$160.0	$290.0
Administration Building - Interior	001	Electrical Room	2x2 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	171.2	0.17	2340	401	$47.4	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	97.2	0.10	2340	1638	227	159	Automatic Wall Switch Occupancy Sensor	1	0.07	241	$28.56	$70.0	$10.0	$65.0	$63.5	$45.0	$65.0	$80.0	$145.0	$175.0	$223.5	$398.5
Administration Building - Interior	001	Break Room	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	4	342.4	0.34	2340	801	$94.8	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	4	194.4	0.19	2340	1638	455	318	Automatic Wall Switch Occupancy Sensor	1	0.15	483	$57.11	$70.0	$10.0	$65.0	$63.5	$45.0	$65.0	$80.0	$145.0	$305.0	$383.5	$688.5
Administration Building - Interior	001	Mens Bathroom	2x2 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	7	599.2	0.60	2340	1402	$165.9	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	7	340.2	0.34	2340	1638	796	557	Ceiling Mounted Occupancy Sensor	1	0.26	845	$99.95	$70.0	$10.0	$65.0	$103.0	$73.5	$65.0	$80.0	$145.0	$528.5	$663.0	$1,191.5
Administration Building - Interior	001	Mens Bathroom	60W Incandescent Fixture	2	120	0.12	2340	281	$33.2	Replace 60W Incandescent Fixture with 13W CFL	2	26	0.03	2340	1638	61	61	None Proposed	0	0.09	220	$26.02	$0.0	$5.0	$20.0	$0.0	$0.0	$20.0	$5.0	$25.0	$40.0	$10.0	$50.0
Administration Building - Interior	001	Mens Bathroom	1x2 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	112	0.11	2340	262	$31.0	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	62	0.06	2340	1638	145	145	None Proposed	0	0.05	117	$13.84	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$130.0	$160.0	$290.0
Administration Building - Interior	001	Purchasing Coordinator	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	4	342.4	0.34	2340	801	$94.8	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	4	194.4	0.19	2340	1638	455	318	Automatic Wall Switch Occupancy Sensor	1	0.15	483	$57.11	$70.0	$10.0	$65.0	$63.5	$45.0	$65.0	$80.0	$145.0	$305.0	$383.5	$688.5
Administration Building - Interior	001	Womens Bathroom	2x2 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	4	342.4	0.34	2340	801	$94.8	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	4	194.4	0.19	2340	1638	455	318	Ceiling Mounted Occupancy Sensor	1	0.15	483	$57.11	$70.0	$10.0	$65.0	$103.0	$73.5	$65.0	$80.0	$145.0	$333.5	$423.0	$756.5
Administration Building - Interior	001	Womens Bathroom	60W Incandescent Fixture	2	120	0.12	2340	281	$33.2	Replace 60W Incandescent Fixture with 13W CFL	2	26	0.03	2340	1638	61	61	None Proposed	0	0.09	220	$26.02	$0.0	$5.0	$20.0	$0.0	$0.0	$20.0	$5.0	$25.0	$40.0	$10.0	$50.0
Administration Building - Interior	001	Womens Bathroom	1x2 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	1	56	0.06	2340	131	$15.5	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	1	31	0.03	2340	1638	73	73	None Proposed	0	0.03	59	$6.92	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$65.0	$80.0	$145.0
Administration Building - Exterior	-	Canopy	Exterior Fixture - (Assume 75W Incandescent Fixture)	3	225	0.23	4380	986	$116.6	Replace 75W Incandescent Fixture with 13W CFL	3	39	0.04	4380	3066	171	171	None Proposed	0	0.19	815	$96.38	$0.0	$5.0	$20.0	$0.0	$0.0	$20.0	$5.0	$25.0	$60.0	$15.0	$75.0
Administration Building - Exterior	-	Building Mounted	Exterior Fixture - 50W High Pressure Sodium	9	594	0.59	4380	2602	$307.8	Replace 50W High Pressure Sodium Fixture with Induction Wall Packs	9	396	0.40	4380	3066	1734	1734	None Proposed	0	0.20	867	$102.59	$0.0	$380.0	$137.0	$0.0	$0.0	$137.0	$380.0	$517.0	$1,233.0	$3,420.0	$4,653.0
Grit and Bar Screen Building - Interior	003	Motor Room	150W Explosion Proof High Pressure Sodium Fixtures	4	752	0.75	2340	1760	$208.2	Replace 150W High Pressure Sodium Fixtures with 4-Lamp T8 Explosion Proof Fixtures w/ 0.88 Ballast Factor Ballast	4	448	0.45	2340	1638	1048	1048	None Proposed	0	0.30	711	$84.15	$900.0	$0.0	$288.0	$0.0	$0.0	$288.0	$900.0	$1,188.0	$1,152.0	$3,600.0	$4,752.0
Grit and Bar Screen Building - Interior	002	Motor Room	150W Explosion Proof High Pressure Sodium Fixtures	4	752	0.75	2340	1760	$208.2	Replace 150W High Pressure Sodium Fixtures with 4-Lamp T8 Explosion Proof Fixtures w/ 0.88 Ballast Factor Ballast	4	448	0.45	2340	1638	1048	1048	None Proposed	0	0.30	711	$84.15	$900.0	$0.0	$288.0	$0.0	$0.0	$288.0	$900.0	$1,188.0	$1,152.0	$3,600.0	$4,752.0
Grit and Bar Screen Building - Interior	001	Entry	150W Explosion Proof High Pressure Sodium Fixtures	1	188	0.19	2340	440	$52.0	Replace 150W High Pressure Sodium Fixtures with 4-Lamp T8 Explosion Proof Fixtures w/ 0.88 Ballast Factor Ballast	1	112	0.11	2340	1638	262	262	None Proposed	0	0.08	178	$21.04	$900.0	$0.0	$288.0	$0.0	$0.0	$288.0	$900.0	$1,188.0	$288.0	$900.0	$1,188.0
Grit and Bar Screen Building - Exterior	-	Canopy	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	5	428	0.43	4380	1875	$221.8	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	5	243	0.24	4380	3066	1064	1064	None Proposed	0	0.19	810	$95.86	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$325.0	$400.0	$725.0
Grit and Bar Screen Building - Exterior	-	Building Mounted	Exterior Fixture - 50W High Pressure Sodium	5	330	0.33	4380	1445	$171.0	Replace 50W High Pressure Sodium Fixture with Induction Wall Packs	5	220	0.22	4380	3066	964	964	None Proposed	0	0.11	482	$57.00	$0.0	$380.0	$137.0	$0.0	$0.0	$137.0	$380.0	$517.0	$685.0	$1,900.0	$2,585.0
Solids Processing Building - Interior	001	Filter Press Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	39	3338.4	3.34	2340	7812	$924.1	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	39	1895.4	1.90	2340	1638	4435	4435	None Proposed	0	1.44	3377	$399.45	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$2,535.0	$3,120.0	$5,655.0
Solids Processing Building - Interior	001	MCC Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	6	513.6	0.51	2340	1202	$142.2	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	6	291.6	0.29	2340	1638	682	478	Automatic Wall Switch Occupancy Sensor	1	0.22	724	$85.67	$70.0	$10.0	$65.0	$63.5	$45.0	$65.0	$80.0	$145.0	$435.0	$543.5	$978.5
Solids Processing Building - Interior	000	Pump Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	29	2482.4	2.48	2340	5809	$687.2	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	29	1409.4	1.41	2340	1638	3298	2309	Ceiling Mounted Occupancy Sensor	2	1.07	3500	$414.08	$70.0	$10.0	$65.0	$206.0	$147.0	$65.0	$80.0	$145.0	$2,179.0	$2,732.0	$4,911.0
Solids Processing Building - Interior	000	Blower Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	14	1198.4	1.20	2340	2804	$331.7	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	14	680.4	0.68	2340	1638	1592	1114	Ceiling Mounted Occupancy Sensor	1	0.52	1690	$199.90	$70.0	$10.0	$65.0	$103.0	$73.5	$65.0	$80.0	$145.0	$983.5	$1,223.0	$2,206.5
Solids Processing Building - Exterior	-	Building Mounted	Exterior Fixture - 50W High Pressure Sodium	8	528	0.53	4380	2313	$273.6	Replace 50W High Pressure Sodium Fixture with Induction Wall Packs	8	352	0.35	4380	3066	1542	1542	None Proposed	0	0.18	771	$91.20	$0.0	$380.0	$137.0	$0.0	$0.0	$137.0	$380.0	$517.0	$1,096.0	$3,040.0	$4,136.0
Solids Holding Building - Interior	002	Sludge Thickener Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	6	513.6	0.51	2340	1202	$142.2	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	6	291.6	0.29	2340	1638	682	478	Ceiling Mounted Occupancy Sensor	1	0.22	724	$85.67	$70.0	$10.0	$65.0	$103.0	$73.5	$65.0	$80.0	$145.0	$463.5	$583.0	$1,046.5
Solids Holding Building - Interior	001	Bathroom	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	1	85.6	0.09	2340	200	$23.7	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	1	48.6	0.05	2340	1638	114	80	Automatic Wall Switch Occupancy Sensor	1	0.04	121	$14.28	$70.0	$10.0	$65.0	$63.5	$45.0	$65.0	$80.0	$145.0	$110.0	$143.5	$253.5
Solids Holding Building - Interior	001	Blower Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	7	599.2	0.60	2340	1402	$165.9	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	7	340.2	0.34	2340	1638	796	557	Ceiling Mounted Occupancy Sensor	1	0.26	845	$99.95	$70.0	$10.0	$65.0	$103.0	$73.5	$65.0	$80.0	$145.0	$528.5	$663.0	$1,191.5
Solids Holding Building - Interior	001	MCC Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	171.2	0.17	2340	401	$47.4	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	97.2	0.10	2340	1638	227	159	Automatic Wall Switch Occupancy Sensor	1	0.07	241	$28.56	$70.0	$10.0	$65.0	$63.5	$45.0	$65.0	$80.0	$145.0	$175.0	$223.5	$398.5
Solids Holding Building - Interior	000	Basement	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	9	770.4	0.77	2340	1803	$213.3	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	9	437.4	0.44	2340	1638	1024	1024	None Proposed	0	0.33	779	$92.18	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$585.0	$720.0	$1,305.0
Solids Holding Building - Exterior	-	Building Mounted	Exterior Fixture - 50W High Pressure Sodium	6	396	0.40	4380	1734	$205.2	Replace 50W High Pressure Sodium Fixture with Induction Wall Packs	6	264	0.26	4380	3066	1156	1156	None Proposed	0	0.13	578	$68.40	$0.0	$380.0	$137.0	$0.0	$0.0	$137.0	$380.0	$517.0	$822.0	$2,280.0	$3,102.0
Pump Station 1 - Interior	001	MCC Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	171.2	0.17	2340	401	$47.4	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	97.2	0.10	2340	1638	227	159	Ceiling Mounted Occupancy Sensor	1	0.07	241	$28.56	$70.0	$10.0	$65.0	$103.0	$73.5	$65.0	$80.0	$145.0	$203.5	$263.0	$466.5
Pump Station 1 - Interior	001	Storage Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	4	342.4	0.34	2340	801	$94.8	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	4	194.4	0.19	2340	1638	455	318	Ceiling Mounted Occupancy Sensor	1	0.15	483	$57.11	$70.0	$10.0	$65.0	$103.0	$73.5	$65.0	$80.0	$145.0	$333.5	$423.0	$756.5
Pump Station 1 - Exterior	-	Building Mounted	Exterior Fixture - 50W High Pressure Sodium	2	132	0.13	4380	578	$68.4	Replace 50W High Pressure Sodium Fixture with Induction Wall Packs	2	88	0.09	4380	3066	385	385	None Proposed	0	0.04	193	$22.80	$0.0	$380.0	$137.0	$0.0	$0.0	$137.0	$380.0	$517.0	$274.0	$760.0	$1,034.0

Appendix D - Lighting Upgrades

Building	Floor #	Location/Room #	Existing Fixture/Lamp & Ballast Description	Qty of Existing Fixtures	Existing Fixture Watts	Existing kW	Operating Hours	Existing kWh	Existing Annual Energy Cost	Proposed Replacement Solution	Quantity of Proposed Fixtures	Proposed Fixture Watts	Proposed kW Base	Proposed Operational Hours Without Sensors	Proposed Operational Hours With Sensors	Proposed kWh Without Sensors	Proposed kWh With Sensors	Proposed Occupancy Sensor Type	Occupancy Sensor Quantity	Total kW Saved	Total kWh Saved	Energy Cost Savings	Ballast/ Fixture/ Reflector Per Unit Price	Bulb (Per Unit Price)	Labor (Per Unit Price)	Occupancy Sensor (Per Unit Price)	Occupany Sensor (Per Unit Labor Price)	Labor Subtotal	Materials Subtotal	Labor & Materials Subtotal	Labor Total	Materials Total	Labor & Materials Total
Pump Station 1 - Exterior	-	Upper Deck	Exterior Fixture - 50W High Pressure Sodium	2	132	0.13	4380	578	$68.4	Replace 50W High Pressure Sodium Fixture with Induction Wall Packs	2	88	0.09	4380	3066	385	385	None Proposed	0	0.04	193	$22.80	$0.0	$380.0	$137.0	$0.0	$0.0	$137.0	$380.0	$517.0	$274.0	$760.0	$1,034.0
Pump Station 2 - Interior	001	MCC Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	171.2	0.17	2340	401	$47.4	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	97.2	0.10	2340	1638	227	159	Ceiling Mounted Occupancy Sensor	1	0.07	241	$28.56	$70.0	$10.0	$65.0	$103.0	$73.5	$65.0	$80.0	$145.0	$203.5	$263.0	$466.5
Pump Station 2 - Interior	001	Hallway	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	1	85.6	0.09	2340	200	$23.7	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	1	48.6	0.05	2340	1638	114	114	None Proposed	0	0.04	87	$10.24	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$65.0	$80.0	$145.0
Pump Station 2 - Interior	000	Pump Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	8	684.8	0.68	2340	1602	$189.6	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	8	388.8	0.39	2340	1638	910	637	Ceiling Mounted Occupancy Sensor	1	0.30	966	$114.23	$70.0	$10.0	$65.0	$103.0	$73.5	$65.0	$80.0	$145.0	$593.5	$743.0	$1,336.5
Pump Station 2 - Exterior	-	Building Mounted	Exterior Fixture - 50W High Pressure Sodium	1	66	0.07	4380	289	$34.2	Replace 50W High Pressure Sodium Fixture with Induction Wall Packs	1	44	0.04	4380	3066	193	193	None Proposed	0	0.02	96	$11.40	$0.0	$380.0	$137.0	$0.0	$0.0	$137.0	$380.0	$517.0	$137.0	$380.0	$517.0
Pump Station 2 - Exterior	-	Primary Clarifiers	Exterior Fixture - 50W High Pressure Sodium	2	132	0.13	4380	578	$68.4	Replace 50W High Pressure Sodium Fixture with Induction Wall Packs	2	88	0.09	4380	3066	385	385	None Proposed	0	0.04	193	$22.80	$0.0	$380.0	$137.0	$0.0	$0.0	$137.0	$380.0	$517.0	$274.0	$760.0	$1,034.0
Chlorine Building - Interior	001	Chlorine Scale Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	6	513.6	0.51	2340	1202	$142.2	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	6	291.6	0.29	2340	1638	682	478	Ceiling Mounted Occupancy Sensor	1	0.22	724	$85.67	$70.0	$10.0	$65.0	$103.0	$73.5	$65.0	$80.0	$145.0	$463.5	$583.0	$1,046.5
Chlorine Building - Interior	001	Chlorinator & Sulfinator Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	3	256.8	0.26	2340	601	$71.1	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	3	145.8	0.15	2340	1638	341	239	Ceiling Mounted Occupancy Sensor	1	0.11	362	$42.84	$70.0	$10.0	$65.0	$103.0	$73.5	$65.0	$80.0	$145.0	$268.5	$343.0	$611.5
Chlorine Building - Interior	001	Sulfer Dioxide Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	4	342.4	0.34	2340	801	$94.8	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	4	194.4	0.19	2340	1638	455	318	Ceiling Mounted Occupancy Sensor	1	0.15	483	$57.11	$70.0	$10.0	$65.0	$103.0	$73.5	$65.0	$80.0	$145.0	$333.5	$423.0	$756.5
Chlorine Building - Interior	001	Electrical Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	171.2	0.17	2340	401	$47.4	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	97.2	0.10	2340	1638	227	159	Ceiling Mounted Occupancy Sensor	1	0.07	241	$28.56	$70.0	$10.0	$65.0	$103.0	$73.5	$65.0	$80.0	$145.0	$203.5	$263.0	$466.5
Chlorine Building - Exterior	-	Canopy	Exterior Fixture - 50W High Pressure Sodium	9	594	0.59	4380	2602	$307.8	Replace 50W High Pressure Sodium Fixture with Induction Wall Packs	9	396	0.40	4380	3066	1734	1734	None Proposed	0	0.20	867	$102.59	$0.0	$380.0	$137.0	$0.0	$0.0	$137.0	$380.0	$517.0	$1,233.0	$3,420.0	$4,653.0
Chlorine Building - Exterior	-	Building Mounted	Exterior Fixture - 50W High Pressure Sodium	1	66	0.07	4380	289	$34.2	Replace 50W High Pressure Sodium Fixture with Induction Wall Packs	1	44	0.04	4380	3066	193	193	None Proposed	0	0.02	96	$11.40	$0.0	$380.0	$137.0	$0.0	$0.0	$137.0	$380.0	$517.0	$137.0	$380.0	$517.0
Chlorine Building - Exterior	-	Chlorine Contact Tanks	Exterior Fixture - 50W High Pressure Sodium	3	198	0.20	4380	867	$102.6	Replace 50W High Pressure Sodium Fixture with Induction Wall Packs	3	132	0.13	4380	3066	578	578	None Proposed	0	0.07	289	$34.20	$0.0	$380.0	$137.0	$0.0	$0.0	$137.0	$380.0	$517.0	$411.0	$1,140.0	$1,551.0
Mile Hollow Pump Station (Dog Pound) - Interior	001	Dog Pound Interior	1x4 Fixtures w/ 1-T12 Lamp Fixture w/ Magnetic Ballast	2	85.6	0.09	520	45	$7.4	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	48.64	0.05	520	364	25	25	None Proposed	1	0.04	19	$3.18	$35.0	$5.0	$65.0	$0.0	$0.0	$65.0	$40.0	$105.0	$130.0	$80.0	$210.0
Mile Hollow Pump Station (Main Building) - Interior	001	Main Building Interior	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	7	599.2	0.60	520	312	$51.5	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	7	340.2	0.34	520	364	177	177	None Proposed	1	0.26	135	$22.26	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$455.0	$560.0	$1,015.0
Mile Hollow Pump Station (Main Building) - Interior	001	Main Building Bathroom	60W Incandescent Fixture	2	120	0.12	520	62	$10.3	Replace 60W Incandescent Fixture with 13W CFL	2	26	0.03	520	364	14	14	None Proposed	1	0.09	49	$8.08	$0.0	$5.0	$20.0	$0.0	$0.0	$20.0	$5.0	$25.0	$40.0	$10.0	$50.0
Mile Hollow Pump Station (Main Building) - Interior	001	Main Building MCC Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	7	599.2	0.60	520	312	$51.5	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	7	340.2	0.34	520	364	177	177	None Proposed	1	0.26	135	$22.26	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$455.0	$560.0	$1,015.0
Mile Hollow Pump Station (Main Building) - Interior	000	Main Building Basement	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	16	1369.6	1.37	520	712	$117.7	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	16	777.6	0.78	520	364	404	404	None Proposed	0	0.59	308	$50.89	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$1,040.0	$1,280.0	$2,320.0
Mile Hollow Pump Station (Dog Pound) - Exterior	-	Dog Pound Building Mounted	60W Incandescent Fixture	1	60	0.06	4380	263	$43.4	Replace 60W Incandescent Fixture with 13W CFL	1	13	0.01	4380	3066	57	57	None Proposed	0	0.05	206	$34.03	$0.0	$5.0	$20.0	$0.0	$0.0	$20.0	$5.0	$25.0	$20.0	$5.0	$25.0
Mile Hollow Pump Station (Dog Pound) - Exterior	-	Dog Pound Building Mounted	2 Head-120W Incandescent Fixture	1	240	0.24	4380	1051	$173.8	None Proposed	1	240	0.24	4380	3066	1051	1051	None Proposed	0	0.00	0	$0.00	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Mile Hollow Pump Station (Main Building)- Exterior	-	Main Building Wall Mounted	3 Head-Assume 120W Incandescent Fixture	3	1080	1.08	4380	4730	$781.9	None Proposed	3	1080	1.08	4380	3066	4730	4730	None Proposed	0	0.00	0	$0.00	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Mile Hollow Pump Station (Main Building)- Exterior	-	Main Building Wall Mounted	60W Incandescent Fixture	3	180	0.18	4380	788	$130.3	Replace 60W Incandescent Fixture with 13W CFL	3	39	0.04	4380	3066	171	171	None Proposed	0	0.14	618	$102.09	$0.0	$5.0	$20.0	$0.0	$0.0	$20.0	$5.0	$25.0	$60.0	$15.0	$75.0
Laurel Run Pump Station - Interior	001	Garage 1	1X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	5	560	0.56	520	291	$46.0	None Proposed	5	560	0.56	520	364	291	291	None Proposed	0	0.00	0	$0.00	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Laurel Run Pump Station - Interior	001	Hallway	1x4 Fixtures w/ 4-T12 Lamp Fixture w/ Magnetic Ballast	2	342.4	0.34	520	178	$28.1	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	194.6	0.19	520	364	101	101	None Proposed	0	0.15	77	$12.14	$105.0	$20.0	$65.0	$0.0	$0.0	$65.0	$125.0	$190.0	$130.0	$250.0	$380.0
Laurel Run Pump Station - Interior	001	Laboratory Room	1x4 Fixtures w/ 4-T12 Lamp Fixture w/ Magnetic Ballast	2	342.4	0.34	520	178	$28.1	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	194.6	0.19	520	364	101	101	None Proposed	1	0.15	77	$12.14	$105.0	$20.0	$65.0	$0.0	$0.0	$65.0	$125.0	$190.0	$130.0	$250.0	$380.0
Laurel Run Pump Station - Interior	001	Filter Room	1x4 Fixtures w/ 4-T12 Lamp Fixture w/ Magnetic Ballast	6	1027.2	1.03	520	534	$84.3	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	6	583.8	0.58	520	364	304	304	None Proposed	1	0.44	231	$36.41	$105.0	$20.0	$65.0	$0.0	$0.0	$65.0	$125.0	$190.0	$390.0	$750.0	$1,140.0
Laurel Run Pump Station - Interior	001	Bathroom	1x4 Fixtures w/ 4-T12 Lamp Fixture w/ Magnetic Ballast	1	171.2	0.17	520	89	$14.1	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	1	97.3	0.10	520	364	51	51	None Proposed	1	0.07	38	$6.07	$105.0	$20.0	$65.0	$0.0	$0.0	$65.0	$125.0	$190.0	$65.0	$125.0	$190.0
Laurel Run Pump Station - Interior	001	Pump Room	1x4 Fixtures w/ 4-T12 Lamp Fixture w/ Magnetic Ballast	6	1027.2	1.03	520	534	$84.3	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	6	583.8	0.58	520	364	304	304	None Proposed	1	0.44	231	$36.41	$105.0	$20.0	$65.0	$0.0	$0.0	$65.0	$125.0	$190.0	$390.0	$750.0	$1,140.0
Laurel Run Pump Station - Interior	001	Storage Room	1X4 Fixtures w/ 4-T8 Lamps w/ Electronic Ballasts	4	448	0.45	520	233	$36.8	None Proposed	4	448	0.45	520	364	233	233	None Proposed	1	0.00	0	$0.00	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Laurel Run Pump Station - Interior	001	HVAC Room	60W Incandescent Fixture	1	60	0.06	520	31	$4.9	Replace 60W Incandescent Fixture with 13W CFL	1	13	0.01	520	364	7	7	None Proposed	1	0.05	24	$3.86	$0.0	$5.0	$20.0	$0.0	$0.0	$20.0	$5.0	$25.0	$20.0	$5.0	$25.0
Laurel Run Pump Station - Interior	001	Garage 2	1x4 Fixtures w/ 4-T12 Lamp Fixture w/ Magnetic Ballast	2	342.4	0.34	520	178	$28.1	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	194.6	0.19	520	364	101	101	None Proposed	0	0.15	77	$12.14	$105.0	$20.0	$65.0	$0.0	$0.0	$65.0	$125.0	$190.0	$130.0	$250.0	$380.0
Laurel Run Pump Station - Interior	001	Stairwell	60W Incandescent Fixture	1	60	0.06	520	31	$4.9	Replace 60W Incandescent Fixture with 13W CFL	1	13	0.01	520	364	7	7	None Proposed	0	0.05	24	$3.86	$0.0	$5.0	$20.0	$0.0	$0.0	$20.0	$5.0	$25.0	$20.0	$5.0	$25.0
Laurel Run Pump Station - Interior	001	Exit Signs	Incandescent Exit Sign	8	128	0.13	520	67	$10.5	Replace Incandescent Exit Sign with LED Exit Sign	8	40	0.04	520	364	21	21	None Proposed	0	0.09	46	$7.23	$0.0	$61.0	$63.0	$0.0	$0.0	$63.0	$61.0	$124.0	$504.0	$488.0	$992.0
Laurel Run Pump Station - Interior	000	Basement	1x4 Fixtures w/ 4-T12 Lamp Fixture w/ Magnetic Ballast	2	342.4	0.34	520	178	$28.1	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	194.6	0.19	520	364	101	101	None Proposed	0	0.15	77	$12.14	$105.0	$20.0	$65.0	$0.0	$0.0	$65.0	$125.0	$190.0	$130.0	$250.0	$380.0
Laurel Run Pump Station - Exterior	-	Building Mounted	100W Incandescent Fixture	2	200	0.20	4380	876	$138.3	Replace 100W Incandescent Fixture with 25W CFL	2	50	0.05	4380	3066	219	219	None Proposed	0	0.15	657	$103.74	$0.0	$7.0	$20.0	$0.0	$0.0	$20.0	$7.0	$27.0	$40.0	$14.0	$54.0
Park Street Pump Station - Interior	001	Generator Room	1X4 Fixtures w/ 2-T8 Lamps w/ Electronic Ballasts	2	101.4	0.10	520	53	$9.8	None Proposed	2	101.4	0.10	520	364	53	53	None Proposed	0	0.00	0	$0.00	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Park Street Pump Station - Interior	001	Generator Room	60W Incandescent Fixture	1	60	0.06	520	31	$5.8	Replace 60W Incandescent Fixture with 13W CFL	1	13	0.01	520	364	7	7	None Proposed	0	0.05	24	$4.57	$0.0	$5.0	$20.0	$0.0	$0.0	$20.0	$5.0	$25.0	$20.0	$5.0	$25.0
Park Street Pump Station - Interior	000	Basement	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	171.2	0.17	520	89	$16.6	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	97.2	0.10	520	364	51	51	None Proposed	0	0.07	38	$7.19	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$130.0	$160.0	$290.0
Park Street Pump Station - Exterior	-	Building Mounted	Exterior Fixture - 50W High Pressure Sodium	2	132	0.13	4380	578	$108.0	Replace 50W High Pressure Sodium Fixture with Induction Wall Packs	2	88	0.09	4380	3066	385	385	None Proposed	0	0.04	193	$36.00	$0.0	$380.0	$137.0	$0.0	$0.0	$137.0	$380.0	$517.0	$274.0	$760.0	$1,034.0
Bossert Pump Station - Interior	001	Control Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	5	428	0.43	520	223	$36.5	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	5	243	0.24	520	364	126	126	None Proposed	0	0.19	96	$15.76	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$325.0	$400.0	$725.0
Bossert Pump Station - Interior	001	Bathroom	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	1	85.6	0.09	520	45	$7.3	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	1	48.6	0.05	520	364	25	25	None Proposed	1	0.04	19	$3.15	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$65.0	$80.0	$145.0
Bossert Pump Station - Interior	000	Basement	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	8	684.8	0.68	520	356	$58.3	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	8	388.8	0.39	520	364	202	202	None Proposed	0	0.30	154	$25.21	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$520.0	$640.0	$1,160.0
Bossert Pump Station - Exterior	-	Building Mounted	60W Incandescent Fixture	4	240	0.24	4380	1051	$172.2	Replace 60W Incandescent Fixture with 13W CFL	4	52	0.05	4380	3066	228	228	None Proposed	0	0.19	823	$134.88	$0.0	$5.0	$20.0	$0.0	$0.0	$20.0	$5.0	$25.0	$80.0	$20.0	$100.0
Site & Roadway Lighting	-	Sewerage Authority Grounds	Exterior Fixture - 250W High Pressure Sodium	8	2376	2.38	4380	10407	$1,231.1	Replace 250W Fixture with Induction Light Fixture	8	880	0.88	4380	3066	3854	3854	None Proposed	0	1.50	6552	$775.16	$0.0	$390.0	$137.0	$0.0	$0.0	$137.0	$390.0	$527.0	$1,096.0	$3,120.0	$4,216.0

APPENDIX E

SOLAR PV SYSTEM FINANCIAL ANALYSIS

Black's Creek Wastewater Treatment Plant
Design Goal: Provide
32% of average annual electricity

Existing Conditons

Average Annual Electrical Usage (kWh)	2,303,602
Current Utility Price ($/kWh)	$0.1183

Calculations

Solar Rating (Zip Code: 07740)	4.48 kWh/sq-m/day
Solar Capacity Required (kW)	619.24
Ground Space Needed (sq-ft)	61,924
Annual Solar kWh (PV Watts)	729,805
Net System installation Cost ($9/kWh)	$5,573,160
Electrical Service Modification Cost	$100,000
Total System Installation Cost	**$5,673,160**
Materials	$3,971,212
Labor	$1,701,948
Engineer's Opinion of Probable Cost	$7,091,450

Assumptions

Annual System Degredation	0.50%
Annual Utility Inflation	3.00%
Annual Maintenance Costs	2%

Year	Utility Price	Solar kWh	Utility Savings	SRECS	Maintenance Costs	Annual Cash Flow	Cummulative Cash Flow	SREC Factor ($/kWh)*	REC Factor ($/kWh)
Install									
1	0.1183	729,805.0	$86,335.9	$308,708	($14,596)	$380,447.3	$380,447.3	$0.423	
2	0.1218	726,156.0	$88,481.4	$307,164	($14,523)	$381,122.2	$761,569.6	$0.423	
3	0.1255	722,525.2	$90,680.1	$305,628	($14,451)	$381,857.8	$1,143,427.4	$0.423	
4	0.1293	718,912.6	$92,933.5	$304,100	($14,378)	$382,655.3	$1,526,082.7	$0.423	
5	0.1331	715,318.0	$95,242.9	$302,580	($14,306)	$383,516.1	$1,909,598.8	$0.423	
6	0.1371	711,741.4	$97,609.7	$301,067	($14,235)	$384,441.5	$2,294,040.3	$0.423	
7	0.1413	708,182.7	$100,035.3	$299,561	($14,164)	$385,433.0	$2,679,473.3	$0.423	
8	0.1455	704,641.8	$102,521.2	$298,063	($14,093)	$386,491.9	$3,065,965.1	$0.423	
9	0.1499	701,118.6	$105,068.9	$296,573	($14,022)	$387,619.7	$3,453,584.8	$0.423	
10	0.1544	697,613.0	$107,679.8	$295,090	($13,952)	$388,817.9	$3,842,402.6	$0.423	
11	0.1590	694,124.9	$110,355.7	$293,615	($13,882)	$390,088.0	$4,232,490.6	$0.423	
12	0.1638	690,654.3	$113,098.0	$292,147	($13,813)	$391,431.7	$4,623,922.3	$0.423	
13	0.1687	687,201.0	$115,908.5	$290,686	($13,744)	$392,850.5	$5,016,772.8	$0.423	
14	0.1737	683,765.0	$118,788.8	$289,233	($13,675)	$394,346.1	$5,411,119.0	$0.423	
15	0.1789	680,346.2	$121,740.7	$287,786	($13,607)	$395,920.2	$5,807,039.2	$0.423	
16	0.1843	676,944.5	$124,766.0	$16,924	($13,539)	$128,150.7	$5,935,189.9		$0.025
17	0.1898	673,559.7	$127,866.4	$16,839	($13,471)	$131,234.2	$6,066,424.1		$0.025
18	0.1955	670,192.0	$131,043.9	$16,755	($13,404)	$134,394.8	$6,200,818.9		$0.025
19	0.2014	666,841.0	$134,300.3	$16,671	($13,337)	$137,634.5	$6,338,453.5		$0.025
20	0.2074	663,506.8	$137,637.7	$16,588	($13,270)	$140,955.2	$6,479,408.7		$0.025
21	0.2137	660,189.3	$141,058.0	$16,505	($13,204)	$144,358.9	$6,623,767.6		$0.025
22	0.2201	656,888.3	$144,563.3	$16,422	($13,138)	$147,847.7	$6,771,615.4		$0.025
23	0.2267	653,603.9	$148,155.7	$16,340	($13,072)	$151,423.7	$6,923,039.1		$0.025
24	0.2335	650,335.8	$151,837.3	$16,258	($13,007)	$155,089.0	$7,078,128.1		$0.025
25	0.2405	647,084.2	$155,610.5	$16,177	($12,942)	$158,845.9	$7,236,974.0		$0.025

* SREC factor is referenced from the NJBPU Solar Alternative Compliance Payment (SACP) schedule.

Mile Hollow Pump Station
Design Goal: Provide
52% of average annual electricity

Existing Conditons

Average Annual Electrical Usage (kWh)	95,945
Current Utility Price ($/kWh)	$0.1653

Calculations

Solar Rating (Zip Code: 07740)	4.48 kWh/sq-m/day
Solar Capacity Required (kW)	42.07
Ground Space Needed (sq-ft)	4,207
Annual Solar kWh (PV Watts)	49,582
Net System installation Cost ($9/kWh)	$378,630
Electrical Service Modification Cost	$100,000
Total System Installation Cost	**$478,630**
Materials	$335,041
Labor	$143,589
Engineer's Opinion of Probable Cost	$598,288

Assumptions

Annual System Degredation	0.50%
Annual Utility Inflation	3.00%
Annual Maintenance Costs	2%

Year	Utility Price	Solar kWh	Utility Savings	SRECS	Maintenance Costs	Annual Cash Flow	Cummulative Cash Flow	SREC Factor ($/kWh)*	REC Factor ($/kWh)
Install									
1	0.1653	49,582.0	$8,195.9	$20,973	($992)	$28,177.5	$28,177.5	$0.423	
2	0.1703	49,334.1	$8,399.6	$20,868	($987)	$28,281.2	$56,458.7	$0.423	
3	0.1754	49,087.4	$8,608.3	$20,764	($982)	$28,390.5	$84,849.2	$0.423	
4	0.1806	48,842.0	$8,822.2	$20,660	($977)	$28,505.5	$113,354.7	$0.423	
5	0.1860	48,597.8	$9,041.5	$20,557	($972)	$28,626.4	$141,981.1	$0.423	
6	0.1916	48,354.8	$9,266.1	$20,454	($967)	$28,753.1	$170,734.2	$0.423	
7	0.1974	48,113.0	$9,496.4	$20,352	($962)	$28,885.9	$199,620.1	$0.423	
8	0.2033	47,872.4	$9,732.4	$20,250	($957)	$29,025.0	$228,645.1	$0.423	
9	0.2094	47,633.1	$9,974.2	$20,149	($953)	$29,170.4	$257,815.5	$0.423	
10	0.2157	47,394.9	$10,222.1	$20,048	($948)	$29,322.2	$287,137.7	$0.423	
11	0.2221	47,157.9	$10,476.1	$19,948	($943)	$29,480.8	$316,618.5	$0.423	
12	0.2288	46,922.2	$10,736.4	$19,848	($938)	$29,646.1	$346,264.5	$0.423	
13	0.2357	46,687.5	$11,003.2	$19,749	($934)	$29,818.3	$376,082.8	$0.423	
14	0.2427	46,454.1	$11,276.7	$19,650	($929)	$29,997.7	$406,080.5	$0.423	
15	0.2500	46,221.8	$11,556.9	$19,552	($924)	$30,184.3	$436,264.8	$0.423	
16	0.2575	45,990.7	$11,844.1	$1,150	($920)	$12,074.0	$448,338.9		$0.025
17	0.2653	45,760.8	$12,138.4	$1,144	($915)	$12,367.2	$460,706.1		$0.025
18	0.2732	45,532.0	$12,440.0	$1,138	($911)	$12,667.7	$473,373.8		$0.025
19	0.2814	45,304.3	$12,749.2	$1,133	($906)	$12,975.7	$486,349.5		$0.025
20	0.2899	45,077.8	$13,066.0	$1,127	($902)	$13,291.4	$499,640.9		$0.025
21	0.2986	44,852.4	$13,390.7	$1,121	($897)	$13,615.0	$513,255.8		$0.025
22	0.3075	44,628.1	$13,723.5	$1,116	($893)	$13,946.6	$527,202.4		$0.025
23	0.3167	44,405.0	$14,064.5	$1,110	($888)	$14,286.5	$541,488.9		$0.025
24	0.3262	44,183.0	$14,414.0	$1,105	($884)	$14,634.9	$556,123.8		$0.025
25	0.3360	43,962.1	$14,772.2	$1,099	($879)	$14,992.0	$571,115.8		$0.025

* SREC factor is referenced from the NJBPU Solar Alternative Compliance Payment (SACP) schedule.

Laurel Run Pump Station
Design Goal: Provide
100% of average annual electricity

Existing Conditons

Average Annual Electrical Usage (kWh)	46,773
Current Utility Price ($/kWh)	$0.1579

Calculations

Solar Rating (Zip Code: 07740)	4.48 kWh/sq-m/day
Solar Capacity Required (kW)	40
Ground Space Needed (sq-ft)	4,000
Annual Solar kWh (PV Watts)	47,000
Net System installation Cost ($9/kWh)	$360,000
Electrical Service Modification Cost	$100,000
Total System Installation Cost	**$460,000**
Materials	$322,000
Labor	$138,000
Engineer's Opinion of Probable Cost	$575,000

Assumptions

Annual System Degredation	0.50%
Annual Utility Inflation	3.00%
Annual Maintenance Costs	2%

Year	Utility Price	Solar kWh	Utility Savings	SRECS	Maintenance Costs	Annual Cash Flow	Cummulative Cash Flow	SREC Factor ($/kWh)*	REC Factor ($/kWh)
Install									
1	0.1579	47,000.0	$7,421.3	$19,881	($940)	$26,362.3	$26,362.3	$0.423	
2	0.1626	46,765.0	$7,605.7	$19,782	($935)	$26,452.0	$52,814.3	$0.423	
3	0.1675	46,531.2	$7,794.7	$19,683	($931)	$26,546.8	$79,361.1	$0.423	
4	0.1725	46,298.5	$7,988.4	$19,584	($926)	$26,646.7	$106,007.8	$0.423	
5	0.1777	46,067.0	$8,186.9	$19,486	($921)	$26,751.9	$132,759.8	$0.423	
6	0.1830	45,836.7	$8,390.4	$19,389	($917)	$26,862.6	$159,622.3	$0.423	
7	0.1885	45,607.5	$8,598.9	$19,292	($912)	$26,978.7	$186,601.0	$0.423	
8	0.1942	45,379.5	$8,812.6	$19,196	($908)	$27,100.5	$213,701.5	$0.423	
9	0.2000	45,152.6	$9,031.6	$19,100	($903)	$27,228.0	$240,929.6	$0.423	
10	0.2060	44,926.8	$9,256.0	$19,004	($899)	$27,361.5	$268,291.1	$0.423	
11	0.2122	44,702.2	$9,486.0	$18,909	($894)	$27,501.0	$295,792.0	$0.423	
12	0.2186	44,478.7	$9,721.7	$18,814	($890)	$27,646.6	$323,438.7	$0.423	
13	0.2251	44,256.3	$9,963.3	$18,720	($885)	$27,798.6	$351,237.2	$0.423	
14	0.2319	44,035.0	$10,210.9	$18,627	($881)	$27,957.0	$379,194.2	$0.423	
15	0.2388	43,814.8	$10,464.6	$18,534	($876)	$28,122.0	$407,316.3	$0.423	
16	0.2460	43,595.7	$10,724.7	$1,090	($872)	$10,942.7	$418,258.9		$0.025
17	0.2534	43,377.8	$10,991.2	$1,084	($868)	$11,208.1	$429,467.0		$0.025
18	0.2610	43,160.9	$11,264.3	$1,079	($863)	$11,480.1	$440,947.1		$0.025
19	0.2688	42,945.1	$11,544.2	$1,074	($859)	$11,759.0	$452,706.1		$0.025
20	0.2769	42,730.3	$11,831.1	$1,068	($855)	$12,044.8	$464,750.9		$0.025
21	0.2852	42,516.7	$12,125.1	$1,063	($850)	$12,337.7	$477,088.6		$0.025
22	0.2937	42,304.1	$12,426.4	$1,058	($846)	$12,638.0	$489,726.5		$0.025
23	0.3026	42,092.6	$12,735.2	$1,052	($842)	$12,945.7	$502,672.2		$0.025
24	0.3116	41,882.1	$13,051.7	$1,047	($838)	$13,261.1	$515,933.3		$0.025
25	0.3210	41,672.7	$13,376.0	$1,042	($833)	$13,584.4	$529,517.7		$0.025

* SREC factor is referenced from the NJBPU Solar Alternative Compliance Payment (SACP) schedule.

Bossert Pump Station
Design Goal: Provide
100% of average annual electricity

Existing Conditons

Average Annual Electrical Usage (kWh)	28,219
Current Utility Price ($/kWh)	$0.1638

Calculations

Solar Rating (Zip Code: 07740)	4.48 kWh/sq-m/day
Solar Capacity Required (kW)	24
Ground Space Needed (sq-ft)	2,400
Annual Solar kWh (PV Watts)	28,285
Net System installation Cost ($9/kWh)	$216,000
Electrical Service Modification Cost	$100,000
Total System Installation Cost	**$316,000**
Materials	$221,200
Labor	$94,800
Engineer's Opinion of Probable Cost	$395,000

Assumptions

Annual System Degredation	0.50%
Annual Utility Inflation	3.00%
Annual Maintenance Costs	2%

Year	Utility Price	Solar kWh	Utility Savings	SRECS	Maintenance Costs	Annual Cash Flow	Cummulative Cash Flow	SREC Factor ($/kWh)*	REC Factor ($/kWh)
Install									
1	0.1638	28,285.0	$4,633.1	$11,965	($566)	$16,031.9	$16,031.9	$0.423	
2	0.1687	28,143.6	$4,748.2	$11,905	($563)	$16,090.1	$32,122.0	$0.423	
3	0.1738	28,002.9	$4,866.2	$11,845	($560)	$16,151.4	$48,273.4	$0.423	
4	0.1790	27,862.8	$4,987.1	$11,786	($557)	$16,215.9	$64,489.2	$0.423	
5	0.1844	27,723.5	$5,111.1	$11,727	($554)	$16,283.6	$80,772.9	$0.423	
6	0.1899	27,584.9	$5,238.1	$11,668	($552)	$16,354.8	$97,127.7	$0.423	
7	0.1956	27,447.0	$5,368.2	$11,610	($549)	$16,429.4	$113,557.0	$0.423	
8	0.2015	27,309.8	$5,501.6	$11,552	($546)	$16,507.5	$130,064.5	$0.423	
9	0.2075	27,173.2	$5,638.4	$11,494	($543)	$16,589.2	$146,653.7	$0.423	
10	0.2137	27,037.3	$5,778.5	$11,437	($541)	$16,674.5	$163,328.2	$0.423	
11	0.2201	26,902.2	$5,922.1	$11,380	($538)	$16,763.6	$180,091.8	$0.423	
12	0.2267	26,767.6	$6,069.2	$11,323	($535)	$16,856.6	$196,948.4	$0.423	
13	0.2335	26,633.8	$6,220.0	$11,266	($533)	$16,953.5	$213,901.9	$0.423	
14	0.2405	26,500.6	$6,374.6	$11,210	($530)	$17,054.4	$230,956.2	$0.423	
15	0.2478	26,368.1	$6,533.0	$11,154	($527)	$17,159.4	$248,115.6	$0.423	
16	0.2552	26,236.3	$6,695.4	$656	($525)	$6,826.6	$254,942.2		$0.025
17	0.2629	26,105.1	$6,861.8	$653	($522)	$6,992.3	$261,934.5		$0.025
18	0.2707	25,974.6	$7,032.3	$649	($519)	$7,162.1	$269,096.6		$0.025
19	0.2789	25,844.7	$7,207.0	$646	($517)	$7,336.2	$276,432.8		$0.025
20	0.2872	25,715.5	$7,386.1	$643	($514)	$7,514.7	$283,947.5		$0.025
21	0.2958	25,586.9	$7,569.7	$640	($512)	$7,697.6	$291,645.1		$0.025
22	0.3047	25,459.0	$7,757.8	$636	($509)	$7,885.1	$299,530.2		$0.025
23	0.3139	25,331.7	$7,950.5	$633	($507)	$8,077.2	$307,607.4		$0.025
24	0.3233	25,205.0	$8,148.1	$630	($504)	$8,274.1	$315,881.5		$0.025
25	0.3330	25,079.0	$8,350.6	$627	($502)	$8,476.0	$324,357.5		$0.025

* SREC factor is referenced from the NJBPU Solar Alternative Compliance Payment (SACP) schedule.

APPENDIX F

GLACIAL ENERGY ALTERNATIVE ENERGY SUPPLIER PROPOSAL

Savings Analysis Proposal - PSE&G

Glacial Energy

This analysis illustrates what your recent energy costs savings might have been had Glacial Energy been your preferred electricity supplier.
This proposal is based on your organization's estimated usage (kwh) and demand (kw) over the coming year.

Secure your savings today!

Contract Summary - Forecasted Price Comparison

Company Name: CDM on Behalf fo the Bordentown Sewerage Authority
Billing Address: Bord Georg Rd, Bordentown Twp, NJ 08505

Start Month:	Jun-10
Number of LDC Accounts:	4
Retail Margin Adder:	N/A

Estimated Rate over the next 12 months

Avg Rate ($/kwh)*:	$	0.12226
Annual Utility Charges:	$	29,097
Glacial Energy Index:	$	0.10864
Glacial Charges:	$	25,856

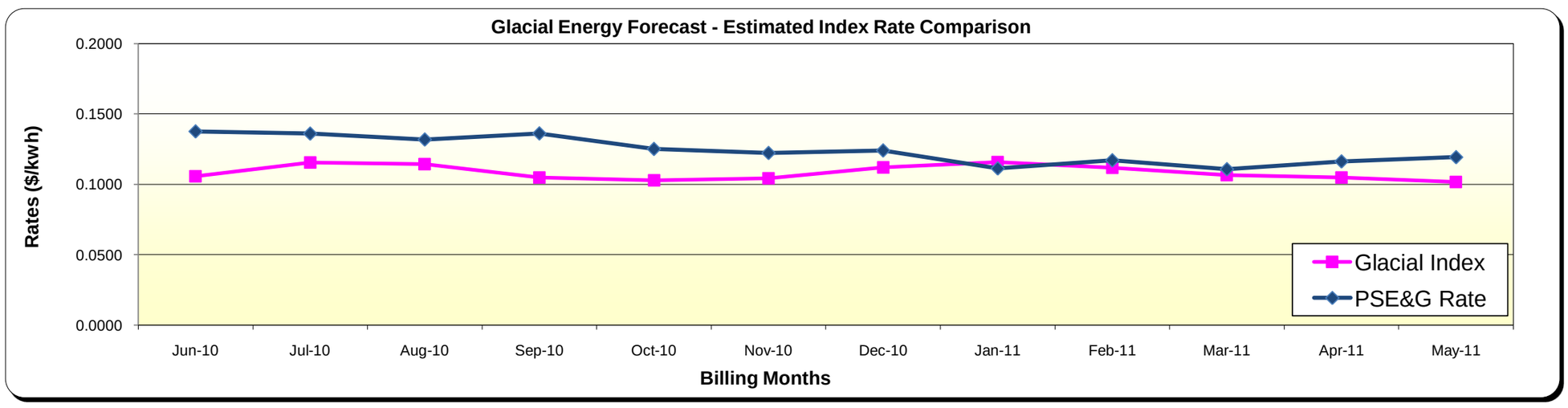
Forecasted Customer Usage Data Summary

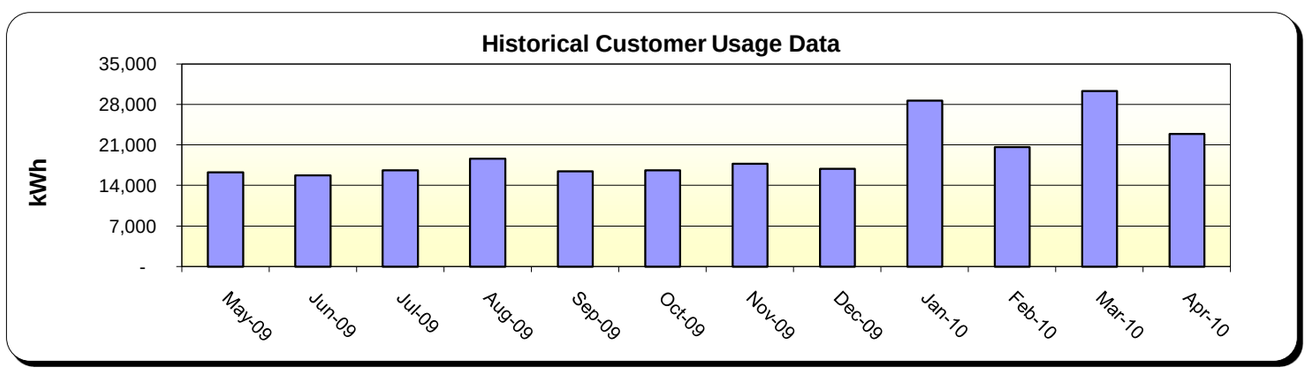
Usage (kwh):	237,993
Avg Monthly Usage (kwh):	19,833
Peak Monthly kw:	131
Peak Load Factor:	21%
Capacity PLC:	82
Transmission PLC:	65

Savings Summary

Estimated Savings vs. Utility	**$**	**3,241**
Savings (Glacial vs. Utility)		**11%**

The savings in this proposal are estimated, not guaranteed. Actual savings may vary.





Glacial Index Includes:
a. Wholesale Delivery Price of Energy
b. Energy Losses and Unaccounted for Energy (UFE)
c. Ancillary Services & other ISO Charges
d. Zonal Congestion
e. Retail Adder
f. Transmission Losses & Charges
g. Capacity Charges
h. NJ SUT (Tariff Rate also includes NJ SUT)

Glacial Index Excludes:
a. Distribution or other (wires) charges from the utility
b. Non NJ SUT Taxes.

	LDC Account No:	Physical Address:
1	PE000008308783338076	Bord Georg Rd, Bordentown Twp, NJ 08505
2	PE000009164584638076	60 Eaton Rd, Bordentown Twp, NJ 08505
3	PE000010741380938076	W. Statnon Ave, Bordentown Twp, NJ 08505
4	PE000011473825538076	Park Street, Bordentown City, NJ 08505

1. The Glacial Index price is a monthly variable rate, it is not a fixed rate.

2. The index is based in part on forecasted ISO charges, estimated future zonal energy prices and the cost to provide service.

3. The forward tariff rates are based on the latest, pending or estimated utility rates (inclusive of NJ SUT), as published by the utility or forecasted for this rate schedule.

Savings Analysis Proposal - PSE&G

Glacial Energy

This analysis illustrates what your recent energy costs savings might have been had Glacial Energy been your preferred electricity supplier.

Contract Summary - Historical Utility Charges

Company Name: CDM on Behalf fo the Bordentown Sewerage Authority
Billing Address: Bord Georg Rd, Bordentown Twp, NJ 08505

Historical Timeframe (mo.):	6
Start Month:	Nov-09
Number of LDC Accounts:	4

Estimated Historical Utility Charges

Avg Rate ($/kwh):	$	0.11205
Annual Utility Charges:	$	15,369
Historical Glacial Index:	$	0.10507
Historical Glacial Charges:	$	14,411

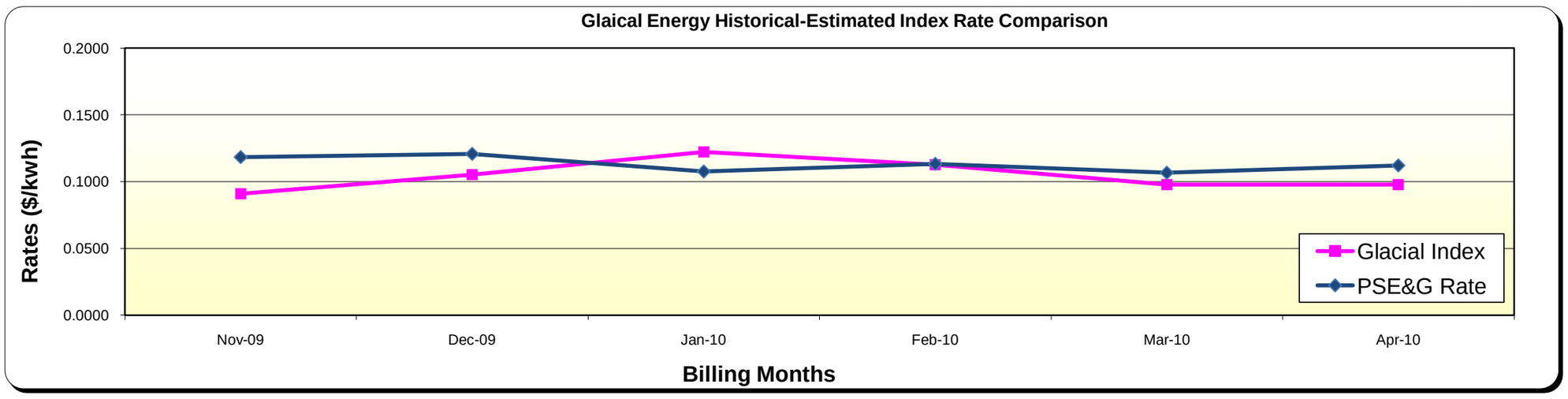
6 month Period Summary

Usage (kwh):	137,155
Avg Monthly Usage (kwh):	22,859
Peak Monthly kw:	124
Peak Load Factor:	25%
Capacity PLC:	82
Transmission PLC:	65

Savings Summary

Historical Savings vs. Utility	**$**	**958**
Historical Savings (Glacial vs. Utility)		**6%**

The savings in this proposal are estimated, not guaranteed. Actual savings will vary.



Glacial Index Includes:
a. Wholesale Delivery Price of Energy
b. Energy Losses and Unaccounted for Energy (UFE)
c. Ancillary Services & other ISO Charges
d. Zonal Congestion
e. Retail Adder
f. Transmission Losses & Charges
g. Capacity Charges
h. NJ SUT (Tariff Rate also includes NJ SUT)

Glacial Index Excludes:
a. Distribution or other (wires) charges from the utility
b. Non NJ SUT Taxes.

1. The historic tariff rate comparison is based on the customer's historical usage as provided or estimated and provided or estimated demand over the previous term.
2. Savings are based on the corresponding utility rates for the appropriate rate schedule over the analysis term.

APPENDIX G

NJ SMARTSTART INCENTIVES INFORMATION AND WORKSHEETS

New Jersey's Clean Energy PROGRAM™
Your Power to Save
njcleanenergy.com

New Jersey SmartStart BUILDINGS®

BPU

2009 Prescriptive Lighting Application

Customer Information

Company	Electric Utility Serving Applicant	Electric Account No.	Installation Date
Facility Address	City	State	Zip
Type of Project ❑ New Construction ❑ Renovation ❑ Equipment Replacement ❑ School		Size of Building	
Company Mailing Address	City	State	Zip
Contact Person (Name/Title)	Telephone No. ( )	Fax No. ( )	
Incorporated? ❑ Yes ❑ No ❑ Exempt	Federal Tax ID# or SSN	Email Address	
Incentive Payment to ❑ Customer ❑ Contractor ❑ Other	Please assign payment to contractor/vendor/other indicated below Customer Signature		

Payee Information (Must submit W-9 form with application)

Company	Contact Name		Incorporated? ❑ Yes ❑ No	Federal Tax ID#
Street Address	City	State	Zip	Telephone No. ( )

Email Address

Contractor/Vendor Information (if different from Payee)

Company	Contact Name		Incorporated? ❑ Yes ❑ No	Federal Tax ID#
Street Address	City	State	Zip	Telephone No. ( )

Email Address

Prescriptive Lighting Information

Total Incentives (per attached Worksheet calculations):

$_____

Note: Prescriptive Lighting Worksheet must accompany this application.

Specific Program Requirements* These requirements are in addition to the Program Terms and Conditions.

1. Please refer to the program guide for additional applicable technical requirements.
2. Include the manufacturer's specification sheet with the application package and mail or fax directly to the Commercial/Industrial Market Manager.
3. Incentives for T-5 and T-8 lamps with electronic ballasts are available only for fixtures with a Total Harmonic Distortion of ≤ 20%.
4. All eligible lighting devices must be UL listed.
5. Requirements for CFL fixtures (must meet all requirements):
   - Fixtures must be new and Energy Star qualified
   - Fixtures must have replaceable electronic ballasts
   - Total Harmonic Distortion (THD) must not exceed 33%
   - Power factor of the ballast must be no less than 90%
   - The manufacturer must warrant all fixtures for a minimum of 3 years. Warranty does not pertain to lamps or photocells not physically part of the fixture.
   - The installer must warrant installation of fixtures for a minimum of 1 year.
6. Pulse Start Metal Halide (including pole-mounted parking lot lighting) must have a 12% minimum wattage reduction.
7. T-5 or T-8 Fixtures replacing incandescent or T-12 fluorescent fixtures greater than 250 watt or High Intensity Discharge shall comply as follows:

7.1 T-5 fixtures replacing T-12 fluorescent or incandescent fixtures 250 watts or greater, or HID fixtures shall have a ballast factor greater than or equal to 1.0; have reflectivity greater than or equal to 91%; have a minimum 2 lamps; and be designated as F54T5 HO.

7.2 T-8 fixtures replacing T-12 fluorescent or incandescent fixtures 250 watts or greater, or HID fixtures shall have a ballast factor greater than or equal to 1.14; have reflectivity greater than or equal to 91%; have a minimum of 4 lamps; and be designated as F32T8, minimum 32 watts.

7.3 T-8 to T-8 replacement requires delamping and new reflectors resulting in a more efficient light system with maintained light levels.

ACKNOWLEDGEMENT

_____

CUSTOMER'S SIGNATURE

By signing, I certify that I have read, understand and agree to the Specific Program Requirements/Terms and Conditions listed on this application form, I will also submit for approval a properly completed application package, which includes this signed application, worksheet (if applicable), manufacturer's specification sheets and complete utility bill (name and address on utility bill must match name and address on application).

Prescriptive Lighting Measures and Incentives*

Type of Fixture	Incentive
Recessed and Surface-Mounted Compact Fluorescents (New Fixtures Replacing Incandescent Fixtures Only): Only available for hard-wired, electronically ballasted new fixtures with rare earth phosphor lamps and 4-pin based tubes (including: twin tube, quad tube, triple tube, 2D or circline lamps), THD<33% and BF>0.9	$25 per 1-lamp fixture $30 per 2-lamp or more fixture
High-Efficiency Fluorescent Fixtures:	
For retrofit of T-12 fixtures to T-5 or T-8 with electronic ballasts	$10 per fixture (1 & 2 lamps retrofit) $20 per fixture (3 & 4 lamps retrofit)

For replacement of fixtures with new T-5 or T-8 fixtures

Type of Old Fixture	Wattage of Old Fixture	Type of New Fixture	Incentive Per Fixture Removed
HID, T-12, Incandescent	≥ 1000 Watts	T-5, T-8	$284
HID, T-12, Incandescent	400-999 Watt	T-5, T-8	$100
HID, T-12, Incandescent	250-399 Watt	T-5, T-8	$50
HID only	175-249 Watt	T-5, T-8	$43
HID only	100-174 Watt	T-5, T-8	$30
HID only	75-99 Watt	T-5, T-8	$16
T-12 only	<250 Watt	T-5, T-8 (1 & 2 lamp)	$25
T-12 only	<250 Watt	T-5, T-8 (3 & 4 lamp)	$30

For retrofit of T-8 fixtures by permanent delamping & new reflectors	**$20 per fixture**
New Construction & Complete Renovation	**Performance based only**
LED Exit Signs (new fixtures only): For existing facilities with connected load ≤75 kW	**$20 per fixture**
For existing facilities with connected load ≥ 75 kW	**$10 per fixture**
Pulse Start Metal Halide (for fixtures ≥ 150 watts)	**$25 per fixture (includes parking lot lighting)**
Parking lot low bay - LED	**$43 per fixture**
T-12 to T-8 fixtures by permanent delamping & new reflectors	**$30 per fixture**

Mail or fax your application package DIRECTLY to the Commercial/Industrial Market Manager.

New Jersey's Clean Energy Program
c/o TRC Energy Services
900 Route 9 North, Suite 104 · Woodbridge, NJ 07095

Phone: 866-657-6278 · Fax: 732-855-0422

Visit our web site: www.NJCleanEnergy.com

*Incentives/Requirements subject to change.

NJ SmartStart Buildings®

Program Terms and Conditions

Definitions:

Design Incentives – Incentives that may be offered to design professionals by the Program.

Design Services – Services that may be offered to design professionals under the Program.

Energy-Efficient Measures – Any device eligible to receive a Program Incentive payment through the NJ Clean Energy Commercial and Industrial Program (New Jersey SmartStart Buildings).

New Jersey Utilities – The regulated electric and/or gas utilities in the State of New Jersey. They are: Atlantic City Electric, Jersey Central Power & Light, Rockland Electric Company, New Jersey Natural Gas, Elizabethtown Gas, PSE&G, and South Jersey Gas.

Administrator – New Jersey Board of Public Utilities, Office of Clean Energy

Participating Customers – Those non-residential electric and/or gas service customers of the New Jersey Utilities who participate in this Program.

Product Installation or Equipment Installation – Installation of the Energy-Efficient Measures.

Market Manager – TRC Energy Services (see below). The NJ Board of Public Utilities has transferred responsibility for the NJ SmartStart Buildings Program from the NJ Utilities to TRC.

Program – The Commercial and Industrial Energy-Efficient Construction Program (New Jersey SmartStart Buildings) offered herein by the New Jersey Board of Public Utilities, Office of Clean Energy pursuant to state regulatory approval under the New Jersey Electric Discount and Energy Competition Act, NJSA 48:3-49, et seq.

Program Incentives – Refers to the amount or level of incentive that the Program provides to participating customers pursuant to the Program offered herein (see description below under "Incentive Amount" heading).

Program Offer – Program Incentives are available to non-residential retail electric and/or gas service customers of the New Jersey Utilities identified above. Program Incentives for new construction are available only for projects in areas designated for growth in the State Plan. Public school (K-12) new construction projects are exempted from this restriction and are eligible for new Program incentives throughout the State. Customers, or their trade allies, can determine if a location is in a designated growth area by referring to the Smart Growth Locator available from the HMFA website or contact the Market Manager if you are uncertain about project eligibility.

Application and Eligibility Process – The Program pays incentives after the installation of qualified energy efficient measures that were pre-approved (for exceptions to this condition, please refer to "exceptions for approval".) In order to be eligible for Program Incentives, a Customer, or an agent (contractor/vendor) authorized by a Customer, must submit a properly completed application package. The package must include an application signed by the customer; a complete (current) utility bill; and technology worksheet and manufacturer's cut sheets (where appropriate). This information must be submitted to the Market Manager before equipment is installed. Applications for measures that are self installed by customers must be submitted by the customer and not the sales vendor of the measure, however, the customer may elect to assign payment of the incentives to the sales vendor. This application package must be received by the Market Manager on or before December 31, 2009 in order to be eligible for 2009 incentives. The Market Manager will review the application package to determine if the project is eligible for a Program Incentive. If eligible, the Customer will receive an approval letter with the estimated authorized incentive amount and the date by which the equipment must be installed in order for the approval to remain in effect. Upon receipt of an approval letter, the Customer may then proceed to install the equipment listed on the approved application. Equipment installed prior to the date of the Market Manager's approval letter is not eligible for an incentive. The Market Manager reserves the right to conduct a pre-inspection of the facility prior to the installation of equipment. This will be done prior to the issuance of the approval letter. All equipment must be purchased within 12 months of date of application. **Any Customer and/or Agent who purchases equipment prior to the receipt of an incentive approval letter does so at his/her own risk.**

Exceptions for Approval – The Application and Eligibility Process pertains to all projects except for those involving either Unitary HVAC or Motors having an incentive amount less than $5,000. These measures, at this incentive level, may be installed without prior approval. In addition, but at the sole discretion of the Market Manager, emergency replacement of equipment may not require a prior approval determination and letter. **In such cases, please notify the Market Manager of such emergencies as early as possible, that an application will soon be sent in that was not pre-approved.**

Post Installation Approval – After installation is completed, the Customer, or an agent authorized by the Customer, must finalize and submit an invoice for the purchase of the equipment (material cost must be broken out from labor costs), and any other required documentation as specified on the equipment application or in the Market Manager's initial approval letter.

Please refer to the Program Guide on the NJCleanEnergy.com/ssb website for the complete Application and Eligibility Process.

The Market Manager reserves the right to verify sales transactions and to have reasonable access to Participating Customer's facility to inspect both pre-existing product or equipment (if applicable) and the Energy-Efficient Measures installed under this Program, either prior to issuing incentives or at a later time.

Energy-Efficient Measures must be installed in buildings located within a New Jersey Utilities' service territory and designated on the Participating Customer's incentive application. Program Incentives are available for qualified Energy-Efficient Measures as listed and described in the Program materials and incentive applications. The Participating Customer must ultimately own the equipment, either through an up-front purchase or at the end of a short-term lease. (Design Incentives are available to design professionals as described in the Program materials and applications. A different and separate agreement must be executed by participating design professionals to be eligible for this type of incentive. The design professional does not need to be based in New Jersey.)

Equipment procured by Participating Customers through another program offered by New Jersey's Clean Energy Program or the New Jersey Utilities, as applicable, is not eligible for incentives through this program. Customers who have not contributed to the Societal Benefits Charge of the applicable New Jersey Utility are not be eligible for incentives offered through this program.

Incentive Amount – Program Incentives will equal either: a) the approved Program Incentive amount, or b) the actual equipment cost of the Energy-Efficient Measure, whichever is less, as determined by the Market Manager. Products offered at no direct cost to the customer are ineligible. Incomplete application submissions, applications requiring inspections and unanticipated high volume of activities may cause processing delays. Program Incentives are limited to $500,000 per utility account in a calendar year. Contact the Market Manager regarding any questions.

Tax Liability – The Market Manager will not be responsible for any tax liability that may be imposed on any Participating Customer as a result of the payment of Program Incentives. All Participating Customers must supply their Federal Tax Identification number or social security number to the Market Manager on the application form in order to receive a Program Incentive. In addition, Participating Customers must also provide a Tax Clearance Form (Business Assistance or Incentive Clearance Certificate) that is dated within 90 days of equipment installation

Endorsement – The Market Manager and Administrator do not endorse, support or recommend any particular manufacturer, product or system design in promoting this Program.

Warranties – THE MARKET MANAGER AND ADMINISTRATOR DO NOT WARRANT THE PERFORMANCE OF INSTALLED EQUIPMENT, AND/OR SERVICES RENDERED AS PART OF THIS PROGRAM, EITHER EXPRESSLY OR IMPLICITLY. NO WARRANTIES OR REPRESENTATIONS OF ANY KIND, WHETHER STATUTORY, EXPRESSED, OR IMPLIED, INCLUDING, WITHOUT LIMITATIONS, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE REGARDING EQUIPMENT OR SERVICES PROVIDED BY A MANUFACTURER OR VENDOR. CONTACT YOUR VENDOR/SERVICES PROVIDER FOR DETAILS REGARDING PERFORMANCE AND WARRANTIES.

Limitation of Liability – By virtue of participating in this Program, Participating Customers agree to waive any and all claims or damages against the Market Manager or the Administrator, except the receipt of the Program Incentive. Participating Customers agree that the Market Manager's and Administrator's liability, in connection with this Program, is limited to paying the Program Incentive specified. Under no circumstances shall the Market Manager, its representatives, or subcontractors, or the Administrator, be liable for any lost profits, special, punitive, consequential or incidental damages or for any other damages or claims connected with or resulting from participation in this Program. Further, any liability attributed to the Market Manager under this Program shall be individual, and not joint and/or several.

Assignment – The Participating Customer may assign Program Incentive payments to a specified vendor.

Participating Customer's Certification – Participating Customer certifies that he/she purchased and installed the equipment listed in their application at their defined New Jersey location. Participating Customer agrees that all information is true and that he/she has conformed to all of the Program and equipment requirements listed in the application.

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New Jersey's Clean Energy PROGRAM™ Your Power to Save njcleanenergy.com

New Jersey SmartStart BUILDINGS®

BPU New Jersey Board of Public Utilities

2009 Prescriptive Lighting Incentive Worksheet

Customer Information

Company	Facility Address
☐ Check here if multiple worksheets are being submitted for one project/building.	Date Submitted

Prescriptive Lighting Information

For additional fixtures, attach additional sheets and check here ☐

Reason N–New R–Replaced	**Fixture Type Installed**	**Fixture Type Removed**	**Location** (Bldg/Rm)	**Size of Replaced Lamps in Watts**	**A Incentive Per Fixture** (Table)	**B # of Units**	**Total Incentives (AxB)**
(Examples) R	2x4 3L T-5	2x4 3L T-12	Office		$20	8	$20 x 8 = $160
R	2x2 2L T-8	2x2 2L T-12	Office		$10	10	$10 x 10 = $100
R	28w CFL	100w Incan.	Supply Room		$25	3	$25 x 3 = $75
R	250w Pulse Start Metal Halide	400w Mercury Vapor	Warehouse		$45	3	$45 x 3 = $135
					Total (including additional sheets)		

Specific Program Requirements* These requirements are in addition to the Program Terms and Conditions.

1. Please refer to the program guide for additional applicable technical requirements.
2. Include the manufacturer's specification sheet with the application package and mail or fax directly to the Commercial/Industrial Market Manager.
3. Incentives for T-5 and T-8 lamps with electronic ballasts are available only for fixtures with a Total Harmonic Distortion of ≤ 20%.
4. All eligible lighting devices must be UL listed.
5. Requirements for CFL fixtures (must meet all requirements):
   - Fixtures must be new and Energy Star qualified
   - Fixtures must have replaceable electronic ballasts
   - Total Harmonic Distortion (THD) must not exceed 33%
   - Power factor of the ballast must be no less than 90%
   - The manufacturer must warrant all fixtures for a minimum of 3 years. Warranty does not pertain to lamps or photocells not physically part of the fixture.
   - The installer must warrant installation of fixtures for a minimum of 1 year.
6. Pulse Start Metal Halide (including pole-mounted parking lot lighting) must have a 12% minimum wattage reduction.
7. T-5 or T-8 Fixtures replacing incandescent or T-12 fluorescent fixtures greater than 250 watt or High Intensity Discharge shall comply as follows:

7.1 T-5 fixtures replacing T-12 fluorescent or incandescent fixtures 250 watts or greater, or HID fixtures shall have a ballast factor greater than or equal to 1.0; have reflectivity greater than or equal to 91%; have a minimum 2 lamps; and be designated as F54T5 HO.

7.2 T-8 fixtures replacing T-12 fluorescent or incandescent fixtures 250 watts or greater, or HID fixtures shall have a ballast factor greater than or equal to 1.14; have reflectivity greater than or equal to 91%; have a minimum of 4 lamps; and be designated as F32T8, minimum 32 watts.

7.3 T-8 to T-8 replacement requires delamping and new reflectors resulting in a more efficient light system with maintained light levels.

ACKNOWLEDGEMENT

_____

CUSTOMER'S SIGNATURE

By signing, I certify that I have read, understand and agree to the Specific Program Requirements/Terms and Conditions listed on this application form, I will also submit for approval a properly completed application package, which includes this signed application, worksheet (if applicable), manufacturer's specification sheets and complete utility bill (name and address on utility bill must match name and address on application).

Prescriptive Lighting Measures and Incentives*

Type of Fixture	Incentive
Recessed and Surface-Mounted Compact Fluorescents (New Fixtures Replacing Incandescent Fixtures Only): Only available for hard-wired, electronically ballasted new fixtures with rare earth phosphor lamps and 4-pin based tubes (including: twin tube, quad tube, triple tube, 2D or circline lamps), THD<33% and BF>0.9	$25 per 1-lamp fixture $30 per 2-lamp or more fixture
High-Efficiency Fluorescent Fixtures:	
For retrofit of T-12 fixtures to T-5 or T-8 with electronic ballasts	$10 per fixture (1 & 2 lamps retrofit) $20 per fixture (3 & 4 lamps retrofit)

For replacement of fixtures with new T-5 or T-8 fixtures

Type of Old Fixture	Wattage of Old Fixture	Type of New Fixture	Incentive Per Fixture Removed
HID, T-12, Incandescent	≥ 1000 Watts	T-5, T-8	$284
HID, T-12, Incandescent	400-999 Watt	T-5, T-8	$100
HID, T-12, Incandescent	250-399 Watt	T-5, T-8	$50
HID only	175-249 Watt	T-5, T-8	$43
HID only	100-174 Watt	T-5, T-8	$30
HID only	75-99 Watt	T-5, T-8	$16
T-12 only	<250 Watt	T-5, T-8 (1 & 2 lamp)	$25
T-12 only	<250 Watt	T-5, T-8 (3 & 4 lamp)	$30

For retrofit of T-8 fixtures by permanent delamping & new reflectors	**$20 per fixture**
New Construction & Complete Renovation	**Performance based only**
LED Exit Signs (new fixtures only): For existing facilities with connected load ≤75 kW	**$20 per fixture**
For existing facilities with connected load ≥ 75 kW	**$10 per fixture**
Pulse Start Metal Halide (for fixtures ≥ 150 watts)	**$25 per fixture (includes parking lot lighting)**
Parking lot low bay - LED	**$43 per fixture**
T-12 to T-8 fixtures by permanent delamping & new reflectors	**$30 per fixture**

Mail or fax your application package DIRECTLY to the Commercial/Industrial Market Manager.

New Jersey's Clean Energy Program
c/o TRC Energy Services
900 Route 9 North, Suite 104 · Woodbridge, NJ 07095

Phone: 866-657-6278 · Fax: 732-855-0422

Visit our web site: www.NJCleanEnergy.com

*Incentives/Requirements subject to change.

NJ SmartStart Buildings®

Program Terms and Conditions

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Design Incentives – Incentives that may be offered to design professionals by the Program.

Design Services – Services that may be offered to design professionals under the Program.

Energy-Efficient Measures – Any device eligible to receive a Program Incentive payment through the NJ Clean Energy Commercial and Industrial Program (New Jersey SmartStart Buildings).

New Jersey Utilities – The regulated electric and/or gas utilities in the State of New Jersey. They are: Atlantic City Electric, Jersey Central Power & Light, Rockland Electric Company, New Jersey Natural Gas, Elizabethtown Gas, PSE&G, and South Jersey Gas.

Administrator – New Jersey Board of Public Utilities, Office of Clean Energy

Participating Customers – Those non-residential electric and/or gas service customers of the New Jersey Utilities who participate in this Program.

Product Installation or Equipment Installation – Installation of the Energy-Efficient Measures.

Market Manager – TRC Energy Services (see below). The NJ Board of Public Utilities has transferred responsibility for the NJ SmartStart Buildings Program from the NJ Utilities to TRC.

Program – The Commercial and Industrial Energy-Efficient Construction Program (New Jersey SmartStart Buildings) offered herein by the New Jersey Board of Public Utilities, Office of Clean Energy pursuant to state regulatory approval under the New Jersey Electric Discount and Energy Competition Act, NJSA 48:3-49, et seq.

Program Incentives – Refers to the amount or level of incentive that the Program provides to participating customers pursuant to the Program offered herein (see description below under "Incentive Amount" heading).

Program Offer – Program Incentives are available to non-residential retail electric and/or gas service customers of the New Jersey Utilities identified above. Program Incentives for new construction are available only for projects in areas designated for growth in the State Plan. Public school (K-12) new construction projects are exempted from this restriction and are eligible for new Program incentives throughout the State. Customers, or their trade allies, can determine if a location is in a designated growth area by referring to the Smart Growth Locator available from the HMFA website or contact the Market Manager if you are uncertain about project eligibility.

Application and Eligibility Process – The Program pays incentives after the installation of qualified energy efficient measures that were pre-approved (for exceptions to this condition, please refer to "exceptions for approval".) In order to be eligible for Program Incentives, a Customer, or an agent (contractor/vendor) authorized by a Customer, must submit a properly completed application package. The package must include an application signed by the customer; a complete (current) utility bill; and technology worksheet and manufacturer's cut sheets (where appropriate). This information must be submitted to the Market Manager before equipment is installed. Applications for measures that are self installed by customers must be submitted by the customer and not the sales vendor of the measure, however, the customer may elect to assign payment of the incentives to the sales vendor. This application package must be received by the Market Manager on or before December 31, 2009 in order to be eligible for 2009 incentives. The Market Manager will review the application package to determine if the project is eligible for a Program Incentive. If eligible, the Customer will receive an approval letter with the estimated authorized incentive amount and the date by which the equipment must be installed in order for the approval to remain in effect. Upon receipt of an approval letter, the Customer may then proceed to install the equipment listed on the approved application. Equipment installed prior to the date of the Market Manager's approval letter is not eligible for an incentive. The Market Manager reserves the right to conduct a pre-inspection of the facility prior to the installation of equipment. This will be done prior to the issuance of the approval letter. All equipment must be purchased within 12 months of date of application. **Any Customer and/or Agent who purchases equipment prior to the receipt of an incentive approval letter does so at his/her own risk.**

Exceptions for Approval – The Application and Eligibility Process pertains to all projects except for those involving either Unitary HVAC or Motors having an incentive amount less than $5,000. These measures, at this incentive level, may be installed without prior approval. In addition, but at the sole discretion of the Market Manager, emergency replacement of equipment may not require a prior approval determination and letter. **In such cases, please notify the Market Manager of such emergencies as early as possible, that an application will soon be sent in that was not pre-approved.**

Post Installation Approval – After installation is completed, the Customer, or an agent authorized by the Customer, must finalize and submit an invoice for the purchase of the equipment (material cost must be broken out from labor costs), and any other required documentation as specified on the equipment application or in the Market Manager's initial approval letter.

Please refer to the Program Guide on the NJCleanEnergy.com/ssb website for the complete Application and Eligibility Process.

The Market Manager reserves the right to verify sales transactions and to have reasonable access to Participating Customer's facility to inspect both pre-existing product or equipment (if applicable) and the Energy-Efficient Measures installed under this Program, either prior to issuing incentives or at a later time.

Energy-Efficient Measures must be installed in buildings located within a New Jersey Utilities' service territory and designated on the Participating Customer's incentive application. Program Incentives are available for qualified Energy-Efficient Measures as listed and described in the Program materials and incentive applications. The Participating Customer must ultimately own the equipment, either through an up-front purchase or at the end of a short-term lease. (Design Incentives are available to design professionals as described in the Program materials and applications. A different and separate agreement must be executed by participating design professionals to be eligible for this type of incentive. The design professional does not need to be based in New Jersey.)

Equipment procured by Participating Customers through another program offered by New Jersey's Clean Energy Program or the New Jersey Utilities, as applicable, is not eligible for incentives through this program. Customers who have not contributed to the Societal Benefits Charge of the applicable New Jersey Utility are not be eligible for incentives offered through this program.

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Limitation of Liability – By virtue of participating in this Program, Participating Customers agree to waive any and all claims or damages against the Market Manager or the Administrator, except the receipt of the Program Incentive. Participating Customers agree that the Market Manager's and Administrator's liability, in connection with this Program, is limited to paying the Program Incentive specified. Under no circumstances shall the Market Manager, its representatives, or subcontractors, or the Administrator, be liable for any lost profits, special, punitive, consequential or incidental damages or for any other damages or claims connected with or resulting from participation in this Program. Further, any liability attributed to the Market Manager under this Program shall be individual, and not joint and/or several.

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New Jersey's Clean Energy PROGRAM™
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New Jersey SmartStart BUILDINGS®

BPU

2009 Lighting Controls Application

Customer Information

Company	Electric Utility Serving Applicant	Electric Account No.	Installation Date
Facility Address	City	State	Zip
Type of Project ❑ New Construction ❑ Renovation ❑ Equipment Replacement ❑ School		Size of Building	
Company Mailing Address	City	State	Zip
Contact Person (Name/Title)	Telephone No. ( )	Fax No. ( )	
Incorporated? ❑ Yes ❑ No ❑ Exempt	Federal Tax ID# or SSN	Email Address	
Incentive Payment to ❑ Customer ❑ Contractor ❑ Other	Please assign payment to contractor/vendor/other indicated below Customer Signature		

Payee Information (Must submit W-9 form with application)

Company	Contact Name		Incorporated? ❑ Yes ❑ No	Email Address Federal Tax ID#
Street Address	City	State	Zip	Telephone No. ( )

Contractor/Vendor Information (if different from Payee)

Company	Contact Name		Incorporated? ❑ Yes ❑ No	Email Address Federal Tax ID#
Street Address	City	State	Zip	Telephone No. ( )

Lighting Control Information

Total Incentives (per attached Worksheet calculations):

$_____

Use Lighting Controls Incentive Worksheet.

Specific Program Requirements* These requirements are in addition to the Program Terms and Conditions.

1. Please refer to the program guide for additional applicable technical requirements, including special requirements for lighting controls.
2. Include the manufacturer's specification sheet with the application package and mail or fax directly to the Commercial/Industrial Market Manager.
3. All lighting controls eligible for incentives must be UL listed.
4. Lighting control incentives are only available for control of eligible energy efficient lighting fixtures.
5. If more than one eligible lighting control device is associated with the same eligible fixture, the incentive paid will be for the lighting control device that yields the largest incentive only.
6. Occupancy Sensor Controls (Existing Facilities Only):
   - There is no incentive available for occupancy sensors installed in a space where they are prohibited by state or local building or safety code. Additionally, no incentive is eligible for occupancy sensors in the following specific spaces in all cases: stairways, restrooms (remote mounted only allowed), elevators, corridors/hallways, lobbies, and closets/storage areas.
   - Incentives will only be paid for eligible occupancy sensors (OSW & OSR) controlling at least 2 eligible lighting fixtures and, for OSR installations, a minimum total connected load of 180 watts.
   - Incentives will only be paid for eligible OSRH occupancy sensors controlling eligible fixtures when the controlled wattage is greater than 180 watts.
   - Occupancy sensors with manual override to the "ON" position are ineligible for incentive.
7. High-Low Controls (OHLF and OHLH):
   - Incentives will not be paid for high-low controls on eligible fluorescent fixtures where daylight dimming controls can be effectively employed.
   - Incentives will not be paid for spaces where the bottom of the fixture does not comply with the appropriate Prescriptive Lighting 2008 incentives, nor in spaces smaller than 250 square feet.
   - Incentives available only when "low level" is no more than 60% of "high level."
   - Incentives are not available for the following spaces: stairways, elevators, corridors/hallways, or lobbies.
   - OHLF will control fixtures that have a ballast factor less than 1.0 for T-5s and 1.14 for T-8s.
   - OHLH will control fixtures that have a ballast factor greater than or equal to 1.0 for T-5s and 1.14 for T-8s.
8. Daylight Dimming Controls for Eligible Fixtures:
   - Incentives will only be paid for eligible daylight dimming controls operating at least 4 eligible ballasts with a minimum total connected load of 240 watts.
   - Dimming shall be continuous or stepped at 4 or more levels.
   - Incentives will be paid only for eligible daylight dimming control systems designed in accordance with IESNA practice as delineated in "RP-5-99, IESNA Recommended Practice of Daylighting."
   - DLD will control fixtures that have a ballast factor less than 1.0 for T-5s and 1.14 for T-8s.
   - DDH will control fixtures that have a ballast factor greater than or equal to 1.0 for T-5s and 1.14 for T-8s.

ACKNOWLEDGEMENT

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CUSTOMER'S SIGNATURE

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Lighting Control Prescriptive Incentives*

Control Device Type	Incentive per Unit
OSW – Occupancy Sensor Wall Mounted (Existing facilities only)	$20 per control
OSR – Occupancy Sensor Remote Mounted (Existing facilities only)	$35 per control
DLD – Fluorescent Daylight Dimming	$25 per fixture controlled
OHLF – Occupancy Controlled High-Low with Step Ballast	$25 per fixture controlled
OSRH – Occupancy Sensor Remote Mounted	$35 per control
OHLH – Occupancy Controlled High-Low with Step Ballast	$75 per fixture controlled
DDH – Daylight Dimming	$75 per fixture controlled

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Termination – The New Jersey Board of Public Utilities reserves the right to extend, modify (this includes modification of Program Incentive levels) or terminate this Program without prior or further notice.

Acknowledgement – I have read, understood and am in compliance with all rules and regulations concerning this incentive program. I certify that all information provided is correct to the best of my knowledge, and I give the Market Manager permission to share my records with the New Jersey Board of Public Utilities, and contractors it selects to manage, coordinate or evaluate the NJ SmartStart Buildings Program. Additionally, I allow reasonable access to my property to inspect the installation and performance of the technologies and installations that are eligible for incentives under the guidelines of New Jersey's Clean Energy Program.

New Jersey's Clean Energy Program™ — Your Power to Save — njcleanenergy.com

New Jersey SmartStart Buildings®

2009 Lighting Controls Incentive Worksheet

Customer Information

Company	Facility Address
☐ Check here if multiple worksheets are being submitted for one project/building.	Date Submitted

Lighting Controls Information

For additional fixtures, attach additional sheets and check here ☐

Location	Reason N–New R–Replaced	Control Device Type	Fixture Type Controlled	Watts Controlled per Device	A # of Fixtures Controlled per Device	B # of Units*	C Incentive per Unit	Total Incentive (B x C)
	(Examples) R	OSW	4-lamp, T8		2	4	$20	4 x $20 = $80
	R	OSR	2-lamp, T8		6	2	$35	2 x $35 = $70
	R	DLD	2-lamp, T8			6	$25	6 x $25 = $150
	R	OHLF	4-lamp, T8			12	$25	12 x $25 = $300
	R	OHLH	150w MH		10	5	$75	5 x $75 = $375
	R	DDH	250w HPS		12	4	$75	4 x $75 = $300

*For OSW and OSR, insert number of control devices; for DLD and OHLF, insert total number of ballasts controlled; for OHLH and DDH, insert total number of fixtures controlled.

Total (including additional sheets) ______

Specific Program Requirements* These requirements are in addition to the Program Terms and Conditions.

1. Please refer to the program guide for additional applicable technical requirements, including special requirements for lighting controls.
2. Include the manufacturer's specification sheet with the application package and mail or fax directly to the Commercial/Industrial Market Manager.
3. All lighting controls eligible for incentives must be UL listed.
4. Lighting control incentives are only available for control of eligible energy efficient lighting fixtures.
5. If more than one eligible lighting control device is associated with the same eligible fixture, the incentive paid will be for the lighting control device that yields the largest incentive only.
6. Occupancy Sensor Controls (Existing Facilities Only):
   - There is no incentive available for occupancy sensors installed in a space where they are prohibited by state or local building or safety code. Additionally, no incentive is eligible for occupancy sensors in the following specific spaces in all cases: stairways, restrooms (remote mounted only allowed), elevators, corridors/hallways, lobbies, and closets/storage areas.
   - Incentives will only be paid for eligible occupancy sensors (OSW & OSR) controlling at least 2 eligible lighting fixtures and, for OSR installations, a minimum total connected load of 180 watts.
   - Incentives will only be paid for eligible OSRH occupancy sensors controlling eligible fixtures when the controlled wattage is greater than 180 watts.
   - Occupancy sensors with manual override to the "ON" position are ineligible for incentive.
7. High-Low Controls (OHLF and OHLH):
   - Incentives will not be paid for high-low controls on eligible fluorescent fixtures where daylight dimming controls can be effectively employed.
   - Incentives will not be paid for spaces where the bottom of the fixture does not comply with the appropriate Prescriptive Lighting 2008 incentives, nor in spaces smaller than 250 square feet.
   - Incentives available only when "low level" is no more than 60% of "high level."
   - Incentives are not available for the following spaces: stairways, elevators, corridors/hallways, or lobbies.
   - OHLF will control fixtures that have a ballast factor less than 1.0 for T-5s and 1.14 for T-8s.
   - OHLH will control fixtures that have a ballast factor greater than or equal to 1.0 for T-5s and 1.14 for T-8s.
8. Daylight Dimming Controls for Eligible Fixtures:
   - Incentives will only be paid for eligible daylight dimming controls operating at least 4 eligible ballasts with a minimum total connected load of 240 watts.
   - Dimming shall be continuous or stepped at 4 or more levels.
   - Incentives will be paid only for eligible daylight dimming control systems designed in accordance with IESNA practice as delineated in "RP-5-99, IESNA Recommended Practice of Daylighting."
   - DLD will control fixtures that have a ballast factor less than 1.0 for T-5s and 1.14 for T-8s.
   - DDH will control fixtures that have a ballast factor greater than or equal to 1.0 for T-5s and 1.14 for T-8s.

Lighting Control Prescriptive Incentives*

Control Device Type	Incentive per Unit
OSW – Occupancy Sensor Wall Mounted (Existing facilities only)	$20 per control
OSR – Occupancy Sensor Remote Mounted (Existing facilities only)	$35 per control
DLD – Fluorescent Daylight Dimming	$25 per fixture controlled
OHLF – Occupancy Controlled High-Low with Step Ballast	$25 per fixture controlled
OSRH – Occupancy Sensor Remote Mounted	$35 per control
OHLH – Occupancy Controlled High-Low with Step Ballast	$75 per fixture controlled
DDH – Daylight Dimming	$75 per fixture controlled

Mail or fax your application package DIRECTLY to the Commercial/Industrial Market Manager.

New Jersey's Clean Energy Program
c/o TRC Energy Services
900 Route 9 North, Suite 104
Woodbridge, NJ 07095

Phone: 866-657-6278
Fax: 732-855-0422

Visit our web site: www.NJCleanEnergy.com

NJ SmartStart Buildings®

Program Terms and Conditions

Definitions:

Design Incentives – Incentives that may be offered to design professionals by the Program.

Design Services – Services that may be offered to design professionals under the Program.

Energy-Efficient Measures – Any device eligible to receive a Program Incentive payment through the NJ Clean Energy Commercial and Industrial Program (New Jersey SmartStart Buildings).

New Jersey Utilities – The regulated electric and/or gas utilities in the State of New Jersey. They are: Atlantic City Electric, Jersey Central Power & Light, Rockland Electric Company, New Jersey Natural Gas, Elizabethtown Gas, PSE&G, and South Jersey Gas.

Administrator – New Jersey Board of Public Utilities, Office of Clean Energy

Participating Customers – Those non-residential electric and/or gas service customers of the New Jersey Utilities who participate in this Program.

Product Installation or Equipment Installation – Installation of the Energy-Efficient Measures.

Market Manager – TRC Energy Services (see below). The NJ Board of Public Utilities has transferred responsibility for the NJ SmartStart Buildings Program from the NJ Utilities to TRC.

Program – The Commercial and Industrial Energy-Efficient Construction Program (New Jersey SmartStart Buildings) offered herein by the New Jersey Board of Public Utilities, Office of Clean Energy pursuant to state regulatory approval under the New Jersey Electric Discount and Energy Competition Act, NJSA 48:3-49, et seq.

Program Incentives – Refers to the amount or level of incentive that the Program provides to participating customers pursuant to the Program offered herein (see description below under "Incentive Amount" heading).

Program Offer – Program Incentives are available to non-residential retail electric and/or gas service customers of the New Jersey Utilities identified above. Program Incentives for new construction are available only for projects in areas designated for growth in the State Plan. Public school (K-12) new construction projects are exempted from this restriction and are eligible for new Program incentives throughout the State. Customers, or their trade allies, can determine if a location is in a designated growth area by referring to the Smart Growth Locator available from the HMFA website or contact the Market Manager if you are uncertain about project eligibility.

Application and Eligibility Process – The Program pays incentives after the installation of qualified energy efficient measures that were pre-approved (for exceptions to this condition, please refer to "exceptions for approval".) In order to be eligible for Program Incentives, a Customer, or an agent (contractor/vendor) authorized by a Customer, must submit a properly completed application package. The package must include an application signed by the customer; a complete (current) utility bill; and technology worksheet and manufacturer's cut sheets (where appropriate). This information must be submitted to the Market Manager before equipment is installed. Applications for measures that are self installed by customers must be submitted by the customer and not the sales vendor of the measure, however, the customer may elect to assign payment of the incentives to the sales vendor. This application package must be received by the Market Manager on or before December 31, 2009 in order to be eligible for 2009 incentives. The Market Manager will review the application package to determine if the project is eligible for a Program Incentive. If eligible, the Customer will receive an approval letter with the estimated authorized incentive amount and the date by which the equipment must be installed in order for the approval to remain in effect. Upon receipt of an approval letter, the Customer may then proceed to install the equipment listed on the approved application. Equipment installed prior to the date of the Market Manager's approval letter is not eligible for an incentive. The Market Manager reserves the right to conduct a pre-inspection of the facility prior to the installation of equipment. This will be done prior to the issuance of the approval letter. All equipment must be purchased within 12 months of date of application. **Any Customer and/or Agent who purchases equipment prior to the receipt of an incentive approval letter does so at his/her own risk.**

Exceptions for Approval – The Application and Eligibility Process pertains to all projects except for those involving either Unitary HVAC or Motors having an incentive amount less than $5,000. These measures, at this incentive level, may be installed without prior approval. In addition, but at the sole discretion of the Market Manager, emergency replacement of equipment may not require a prior approval determination and letter. **In such cases, please notify the Market Manager of such emergencies as early as possible, that an application will soon be sent in that was not pre-approved.**

Post Installation Approval – After installation is completed, the Customer, or an agent authorized by the Customer, must finalize and submit an invoice for the purchase of the equipment (material cost must be broken out from labor costs), and any other required documentation as specified on the equipment application or in the Market Manager's initial approval letter.

Please refer to the Program Guide on the NJCleanEnergy.com/ssb website for the complete Application and Eligibility Process.

The Market Manager reserves the right to verify sales transactions and to have reasonable access to Participating Customer's facility to inspect both pre-existing product or equipment (if applicable) and the Energy-Efficient Measures installed under this Program, either prior to issuing incentives or at a later time.

Energy-Efficient Measures must be installed in buildings located within a New Jersey Utilities' service territory and designated on the Participating Customer's incentive application. Program Incentives are available for qualified Energy-Efficient Measures as listed and described in the Program materials and incentive applications. The Participating Customer must ultimately own the equipment, either through an up-front purchase or at the end of a short-term lease. (Design Incentives are available to design professionals as described in the Program materials and applications. A different and separate agreement must be executed by participating design professionals to be eligible for this type of incentive. The design professional does not need to be based in New Jersey.)

Equipment procured by Participating Customers through another program offered by New Jersey's Clean Energy Program or the New Jersey Utilities, as applicable, is not eligible for incentives through this program. Customers who have not contributed to the Societal Benefits Charge of the applicable New Jersey Utility are not be eligible for incentives offered through this program.

Incentive Amount – Program Incentives will equal either: a) the approved Program Incentive amount, or b) the actual equipment cost of the Energy-Efficient Measure, whichever is less, as determined by the Market Manager. Products offered at no direct cost to the customer are ineligible. Incomplete application submissions, applications requiring inspections and unanticipated high volume of activities may cause processing delays. Program Incentives are limited to $500,000 per utility account in a calendar year. Contact the Market Manager regarding any questions.

Tax Liability – The Market Manager will not be responsible for any tax liability that may be imposed on any Participating Customer as a result of the payment of Program Incentives. All Participating Customers must supply their Federal Tax Identification number or social security number to the Market Manager on the application form in order to receive a Program Incentive. In addition, Participating Customers must also provide a Tax Clearance Form (Business Assistance or Incentive Clearance Certificate) that is dated within 90 days of equipment installation

Endorsement – The Market Manager and Administrator do not endorse, support or recommend any particular manufacturer, product or system design in promoting this Program.

Warranties – THE MARKET MANAGER AND ADMINISTRATOR DO NOT WARRANT THE PERFORMANCE OF INSTALLED EQUIPMENT, AND/OR SERVICES RENDERED AS PART OF THIS PROGRAM, EITHER EXPRESSLY OR IMPLICITLY. NO WARRANTIES OR REPRESENTATIONS OF ANY KIND, WHETHER STATUTORY, EXPRESSED, OR IMPLIED, INCLUDING, WITHOUT LIMITATIONS, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE REGARDING EQUIPMENT OR SERVICES PROVIDED BY A MANUFACTURER OR VENDOR. CONTACT YOUR VENDOR/SERVICES PROVIDER FOR DETAILS REGARDING PERFORMANCE AND WARRANTIES.

Limitation of Liability – By virtue of participating in this Program, Participating Customers agree to waive any and all claims or damages against the Market Manager or the Administrator, except the receipt of the Program Incentive. Participating Customers agree that the Market Manager's and Administrator's liability, in connection with this Program, is limited to paying the Program Incentive specified. Under no circumstances shall the Market Manager, its representatives, or subcontractors, or the Administrator, be liable for any lost profits, special, punitive, consequential or incidental damages or for any other damages or claims connected with or resulting from participation in this Program. Further, any liability attributed to the Market Manager under this Program shall be individual, and not joint and/or several.

Assignment – The Participating Customer may assign Program Incentive payments to a specified vendor.

Participating Customer's Certification – Participating Customer certifies that he/she purchased and installed the equipment listed in their application at their defined New Jersey location. Participating Customer agrees that all information is true and that he/she has conformed to all of the Program and equipment requirements listed in the application.

Termination – The New Jersey Board of Public Utilities reserves the right to extend, modify (this includes modification of Program Incentive levels) or terminate this Program without prior or further notice.

Acknowledgement – I have read, understood and am in compliance with all rules and regulations concerning this incentive program. I certify that all information provided is correct to the best of my knowledge, and I give the Market Manager permission to share my records with the New Jersey Board of Public Utilities, and contractors it selects to manage, coordinate or evaluate the NJ SmartStart Buildings Program. Additionally, I allow reasonable access to my property to inspect the installation and performance of the technologies and installations that are eligible for incentives under the guidelines of New Jersey's Clean Energy Program.

New Jersey Clean Energy Program

Technical Worksheet – Solar Electric Equipment Information

Please carefully read all of the following information. With the help of your Installation Contractor, fully complete Sections A through D, as applicable, of the attached Technical Worksheet for Solar Electric Equipment, as well as the New Jersey Clean Energy Program Rebate Application Form.

GENERAL TERMS AND CONDITIONS

Rebates will be processed based on the date the New Jersey Clean Energy Program (NJCEP) approves the Final Application Form, not on the purchase date of the equipment. Program procedures and rebates are subject to change or cancellation without notice.

To qualify for a rebate, Applicant must comply with all Program Eligibility Requirements, Terms and Conditions, and Installation Requirements, and submit a completed Pre-Installation Application Form. For more information about the New Jersey Clean Energy Program, or for assistance in completing applications or forms, please see www.njcleanenergy.com or call 866-NJSMART

INSTALLATION REQUIREMENTS

Equipment installation must meet the following minimum requirements in order to qualify for payment under the provisions of the New Jersey Clean Energy Program; proposed changes to the requirements will be considered, but they must be documented by the Applicant or Installation Contractor and approved by the NJCEP. These requirements are not all-encompassing and are intended only to address certain minimum safety and efficiency standards.

A: Code Requirements

1. The installation must comply with the provisions of the National Electrical Code and all other applicable local, state and federal codes or practices.
2. All required permits must be properly obtained and posted.
3. The NJCEP Inspection must be performed before the local Building Code Enforcement Office. If not, this may delay the processing of the rebate
4. All required inspections must be performed (i.e., Electrical/NEC, Local Building Codes Enforcement Office, etc.). Note: In order to ensure compliance with provisions of the NEC, an inspection by a state-licensed electrical inspector is mandatory.

B: Solar Electric Module Array

1. Modules must be UL Listed and must be properly installed according to manufacturer's instructions.
2. The maximum amount of sunlight available year-round on a daily basis should not be obstructed. All applications must include documentation of the impact from any obstruction on the annual performance of the solar electric array. This analysis can be performed by using the New Jersey Clean Power Estimator on the program website www.njcep.com.
3. In order to qualify for program incentives, the solar electric system must adhere to a minimum design threshold, relative to the estimated system production using PVWATTS:
    - Solar electric array orientations require that the calculated system output must be at least 80% of the default output calculated by PVWatts. Additionally, all individual series strings of modules output must be at least 70% of the default output calculated by PVWatts.
    - For building integrated solar electric systems (i.e., part of the building envelope materials are comprised of solar electric components), the estimated system output must be 40% of the default output estimated by PVWATTS.
4. System wiring must be installed in accordance with the provisions of the NEC.
5. All modules installed in a series string must be installed in the same plane.

C: Inverter and Controls

1. The inverter and controls must be properly installed according to manufacturer's instructions.
2. The inverter must be certified as compliant with the requirements of IEEE 929 for small photovoltaic systems and with UL 1741.
3. The system should be equipped with the following visual indicators and/or controls:
    - On/off switch • Operating mode setting indicator • AC/DC over current protection • Operating status indicator
4. Warning labels must be posted on the control panels and junction boxes indicating that the circuits are energized by an alternate power source independent of utility-provided power.
5. Operating instructions must be posted on or near the system, or on file with facilities operation and maintenance documents.
6. Systems must have monitoring capability that is readily accessible to the owner. This monitor (meter or display) must at minimum display instantaneous and cumulative production. All projects greater than 10kW must have an output meter that meets ANSI C.12 standards

D: Control Panel to Solar Electric Array Wire Runs

1. Areas where wiring passes through ceilings, walls or other areas of the building must be properly restored, booted and sealed.
2. All interconnecting wires must be copper. (Some provisions may be made for aluminum wiring; approval must be received from utility engineering departments prior to acceptance.)
3. Thermal insulation in areas where wiring is installed must be replaced to "as found or better condition." Access doors to these areas must be properly sealed and gasketed.
4. Wiring connections must be properly made, insulated and weather-protected.
5. All wiring must be attached to the system components by the use of strain relief's or cable clamps, unless enclosed in conduit.
6. All outside wiring must be rated for wet conditions and/or encased in liquid-tight conduit.
7. Insulation on any wiring located in areas with potential high ambient temperature must be rated at 90° C or higher.
8. All wiring splices must be contained in UL-approved workboxes.

E: Batteries (If Applicable)

1. The batteries must be installed according to the manufacturer's instructions.
2. Battery terminals must be adequately protected from accidental contact.
3. DC-rated over current protection must be provided in accordance with the provisions of the NEC.

New Jersey Clean Energy Program

Technical Worksheet – Solar Electric Equipment Information

Original Application Date: _____ Revised Application Date: _____

Customer Name: _____ Application Number: _____

(Corresponding to Rebate Application Form) (Assigned by the NJBPU)

A: EQUIPMENT INFORMATION

1. Solar Electric Module Manufacturer: _____ Module Model Number: _____
2. Power Rating per Module: _____ DC Watts (Refer to STC conditions) Number of Modules: _____
3. Total Array Output: _____ DC Watts (No. of Modules x Power Rating)
4. Inverter Manufacturer: _____ Inverter Model Number: _____
5. Inverter's Continuous AC Rating: _____ AC Watts Number of Inverters: _____
6. Total Inverter Output: _____ AC Watts (Inverter Continuous AC Rating x Number of Inverters)
7. Inverter's Peak Efficiency: _____ (Refer to manufacturer's peak efficiency rating)

B: PROPOSED INSTALLATION/INTERCONNECTION INFORMATION

1. Solar Electric Array Location: _ Rooftop _ Pole Mount or Ground Mount Location:
2. Solar Electric Module Orientation: _____ degrees (e.g., 180 degrees magnetic south)

   Note: in Central New Jersey, magnetic south compass reading is 10 degrees east of true south.
3. Solar Electric Module Tilt: _____ degrees (e.g., flat mount = 0 degrees; vertical mount = 90 degrees)
4. Solar Electric Module Tracking: _Fixed _Single-axis _Double-axis
5. Inverter Location: _ Indoor _ Outdoor Location: _____
6. Utility-Accessible AC Disconnect Switch Location: _____
7. System Type and Mode of Operation:
   - _ Utility interactive (parallel/capable of back feeding the meter) (_ with battery backup)
   - _ Dedicated circuit, utility power as backup (transfer switch) (_ with battery charging)
   - _ Stand-alone (system confined to an independent circuit, no utility backup) (_ with battery charging)

C: INCENTIVE REQUEST CALCULATION

1. System rated output (Section A, line 3 above): _____ DC Watts
2. Incentive Calculation (Calculate appropriate incentive based on System Rated Output):

Residential Applicants that perform Energy Efficiency Audit

a. 0 to 10,000 Watts x $1.75/Watt = $_____+

Residential Applicants that <u>do not</u> perform Energy Efficiency Audit

b. 0 to 10,000 Watts x $1.55/Watt = $_____+

Commercial, Farm, Public and Non-Profit

0 to 50,000 Watts x $1.00/Watt = $_____+

<u>Large PV Project Applications</u>

> 50,000 Watts = $____Not eligible for rebates_____

d. Total Rebate Calculation: $_____

Total Rebate Calculation: $_____

3. School Applicants: Maximum Annual School Rebate: $_____
   (For Public School applicants, enter the lesser value from no. 6 on the School Application form or $50,000)
4. Total Installed System Cost: $_____
   (Eligible installed system cost includes all equipment, installation, and applicable interconnection costs before the New Jersey Clean Energy Program incentive.)
5. **Requested Incentive** (Enter the appropriate value from C2. b or c): $_____

D: WARRANTY INFORMATION

1. Module: _____ Years at _____ Percent of Rated Power Output 2. Inverter: _____ Years 3. Installation: _____ Years

Revised January 2009

APPENDIX H

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COSTS

CDM

11 British American Blvd
Latham, NY 12110
Phone (518) 782-4500
Fax (518) 786-3810

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Location: Bordentown Sewerage Authority
Estimate by: MJR
Checked by: CDW

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL* UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR** COST	LABOR SUBTOTAL	TOTAL
	Administration Building									
1	Condensing Unit with Puron Refrigerant, 5 tons	2	ea.	$ 2,274.00	$ 4,548.00	1	ea.	$ 375.00	$ 375.00	$ 4,923.00
1	Base Model Condensing Unit with Puron Refrigerant, 5 tons,	1	ea.	$ 1,762.00	$ 1,762.00	1	ea.	$ 375.00	$ 375.00	$ 2,137.00
1	Heat Pump with Puron Refrigerant, 5 tons,	1	ea.	$ 3,227.00	$ 3,227.00	1	ea.	$ 1,500.00	$ 1,500.00	$ 4,727.00
	Subtotal				9,537.00				2,250.00	

*Pricing per Quote 2010
**Pricing per RS Means Costworks 2010

SUBTOTAL =	$	11,787.00
MARKUP % =	$	0.15
MARKUP =	$	1,768.05
SUB-TOTAL w/ OH & P =	$	13,555.05
CONTINGENCY % =		0.25
CONTINGENCY =	$	3,388.76
BUDGET COST ESTIMATE =	$	16,943.81

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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Location: Bordentown Sewerage Authority
Estimate by: MJR
Checked by: CDW

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL* UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR** COST	LABOR SUBTOTAL	TOTAL
1	**Solids Processing Building** Heat Recovery Ventilator, includes corrosion resistant coating	4	ea.	$ 74,400.00	$ 297,600.00	4	ea.	$ 1,255.00	$ 5,020.00	$ 302,620.00
	Subtotal				297,600.00				5,020.00	

*Pricing per Quote 2010
**Pricing per RS Means Costworks 2010

SUBTOTAL =	$	302,620.00
MARKUP % =	$	0.15
MARKUP =	$	45,393.00
SUB-TOTAL w/ OH & P =	$	348,013.00
CONTINGENCY % =		0.25
CONTINGENCY =	$	87,003.25
BUDGET COST ESTIMATE =	$	435,016.25

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Bordentown Sewerage Authority
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Administration Building** Lighting Upgrades - Interior	1	ls.		$ 10,747.50	1	ls.	$ 8,658.00	$ 8,658.00	$ 19,405.50
	Subtotal				10,747.50				8,658.00	

SUBTOTAL =	$	19,405.50
MARKUP % =	$	0.15
MARKUP =	$	2,910.83
SUB-TOTAL w/ OH & P =	$	22,316.33
CONTINGENCY % =		0.25
CONTINGENCY =	$	5,579.08
BUDGET COST ESTIMATE =	$	27,895.41

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Grit and Bar Screen Building** Lighting Upgrades - Interior	1	ls.		$ 8,100.00	1	ls.	$ 2,592.00	$ 2,592.00	$ 10,692.00
	Subtotal				8,100.00				2,592.00	

SUBTOTAL =	$	10,692.00
MARKUP % =	$	0.15
MARKUP =	$	1,603.80
SUB-TOTAL w/ OH & P =	$	12,295.80
CONTINGENCY % =		0.25
CONTINGENCY =	$	3,073.95
BUDGET COST ESTIMATE =	$	15,369.75

CDM

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Fax (518) 786-3810

ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Bordentown Sewerage Authority
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Solids Processing Building** Lighting Upgrades - Interior	1	ls.		$ 7,618.50	1	ls.	$ 6,132.50	$ 6,132.50	$ 13,751.00
	Subtotal				7,618.50				6,132.50	

SUBTOTAL =	$	13,751.00
MARKUP % =	$	0.15
MARKUP =	$	2,062.65
SUB-TOTAL w/ OH & P =	$	15,813.65
CONTINGENCY % =		0.25
CONTINGENCY =	$	3,953.41
BUDGET COST ESTIMATE =	$	19,767.06

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Solids Holding Building** Lighting Upgrades - Interior	1	ls.		$ 2,333.00	1	ls.	$ 1,862.00	$ 1,862.00	$ 4,195.00
	Subtotal				2,333.00				1,862.00	

SUBTOTAL =	$	4,195.00
MARKUP % =	$	0.15
MARKUP =	$	629.25
SUB-TOTAL w/ OH & P =	$	4,824.25
CONTINGENCY % =		0.25
CONTINGENCY =	$	1,206.06
BUDGET COST ESTIMATE =	$	6,030.31

CDM

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Bordentown Sewerage Authority
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Pump Station 1									
1	Lighting Upgrades - Interior	1	ls.		$ 686.00	1	ls.	$ 537.00	$ 537.00	$ 1,223.00
	Subtotal				686.00				537.00	

SUBTOTAL =	$	1,223.00
MARKUP % =	$	0.15
MARKUP =	$	183.45
SUB-TOTAL w/ OH & P =	$	1,406.45
CONTINGENCY % =		0.25
CONTINGENCY =	$	351.61
BUDGET COST ESTIMATE =	$	1,758.06

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Pump Station 2									
1	Lighting Upgrades - Interior	1	ls.		$ 1,086.00	1	ls.	$ 862.00	$ 862.00	$ 1,948.00
	Subtotal				1,086.00				862.00	

SUBTOTAL =	$	1,948.00
MARKUP % =	$	0.15
MARKUP =	$	292.20
SUB-TOTAL w/ OH & P =	$	2,240.20
CONTINGENCY % =		0.25
CONTINGENCY =	$	560.05
BUDGET COST ESTIMATE =	$	2,800.25

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Bordentown Sewerage Authority
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Chlorine and Sulfur Dioxide Building** Lighting Upgrades - Interior	1	ls.		$ 1,612.00	1	ls.	$ 1,269.00	$ 1,269.00	$ 2,881.00
	Subtotal				1,612.00				1,269.00	

SUBTOTAL =	$	2,881.00
MARKUP % =	$	0.15
MARKUP =	$	432.15
SUB-TOTAL w/ OH & P =	$	3,313.15
CONTINGENCY % =		0.25
CONTINGENCY =	$	828.29
BUDGET COST ESTIMATE =	$	4,141.44

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Mile Hollow Pump Station (Main Building)** Lighting Upgrades - Interior	1	ls.		$ 2,410.00	1	ls.	$ 1,990.00	$ 1,990.00	$ 4,400.00
	Subtotal				2,410.00				1,990.00	

SUBTOTAL =	$	4,400.00
MARKUP % =	$	0.15
MARKUP =	$	660.00
SUB-TOTAL w/ OH & P =	$	5,060.00
CONTINGENCY % =		0.25
CONTINGENCY =	$	1,265.00
BUDGET COST ESTIMATE =	$	6,325.00

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Bordentown Sewerage Authority
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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Mile Hollow Pump Station (Dog Pound)									
1	Lighting Upgrades - Interior	1	ls.		$ 80.00	1	ls.	$ 130.00	$ 130.00	$ 210.00
	Subtotal				80.00				130.00	

SUBTOTAL =	$	210.00
MARKUP % =	$	0.15
MARKUP =	$	31.50
SUB-TOTAL w/ OH & P =	$	241.50
CONTINGENCY % =		0.25
CONTINGENCY =	$	60.38
BUDGET COST ESTIMATE =	$	301.88

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Laurel Run Pump Station									
1	Lighting Upgrades - Interior	1	ls.		$ 3,123.00	1	ls.	$ 1,909.00	$ 1,909.00	$ 5,032.00
	Subtotal				3,123.00				1,909.00	

SUBTOTAL =	$	5,032.00
MARKUP % =	$	0.15
MARKUP =	$	754.80
SUB-TOTAL w/ OH & P =	$	5,786.80
CONTINGENCY % =		0.25
CONTINGENCY =	$	1,446.70
BUDGET COST ESTIMATE =	$	7,233.50

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Bordentown Sewerage Authority
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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Park Street No.1 Pump Station** Lighting Upgrades - Interior	1	ls.		$ 165.00	1	ls.	$ 150.00	$ 150.00	$ 315.00
	Subtotal				165.00				150.00	

SUBTOTAL =	$	315.00
MARKUP % =	$	0.15
MARKUP =	$	47.25
SUB-TOTAL w/ OH & P =	$	362.25
CONTINGENCY % =		0.25
CONTINGENCY =	$	90.56
BUDGET COST ESTIMATE =	$	452.81

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Bossert Pump Station** Lighting Upgrades - Interior	1	ls.		$ 1,120.00	1	ls.	$ 910.00	$ 910.00	$ 2,030.00
	Subtotal				1,120.00				910.00	

SUBTOTAL =	$	2,030.00
MARKUP % =	$	0.15
MARKUP =	$	304.50
SUB-TOTAL w/ OH & P =	$	2,334.50
CONTINGENCY % =		0.25
CONTINGENCY =	$	583.63
BUDGET COST ESTIMATE =	$	2,918.13

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Administration Building** Lighting Upgrades - Exterior	1	ls.		$ 3,435.00	1	ls.	$ 1,293.00	$ 1,293.00	$ 4,728.00
	Subtotal				3,435.00				1,293.00	

SUBTOTAL =	$	4,728.00
MARKUP % =	$	0.15
MARKUP =	$	709.20
SUB-TOTAL w/ OH & P =	$	5,437.20
CONTINGENCY % =		0.25
CONTINGENCY =	$	1,359.30
BUDGET COST ESTIMATE =	$	6,796.50

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Grit and Bar Screen Building** Lighting Upgrades - Exterior	1	ls.		$ 2,300.00	1	ls.	$ -	$ 1,010.00	$ 3,310.00
	Subtotal				2,300.00				1,010.00	

SUBTOTAL =	$	3,310.00
MARKUP % =	$	0.15
MARKUP =	$	496.50
SUB-TOTAL w/ OH & P =	$	3,806.50
CONTINGENCY % =		0.25
CONTINGENCY =	$	951.63
BUDGET COST ESTIMATE =	$	4,758.13

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Solids Processing Building** Lighting Upgrades - Exterior	1	ls.		$ 3,040.00	1	ls.	$ 1,096.00	$ 1,096.00	$ 4,136.00
	Subtotal				3,040.00				1,096.00	

SUBTOTAL =	$	4,136.00
MARKUP % =	$	0.15
MARKUP =	$	620.40
SUB-TOTAL w/ OH & P =	$	4,756.40
CONTINGENCY % =		0.25
CONTINGENCY =	$	1,189.10
BUDGET COST ESTIMATE =	$	5,945.50

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Solids Holding Building** Lighting Upgrades - Exterior	1	ls.		$ 2,280.00	1	ls.	$ 822.00	$ 822.00	$ 3,102.00
	Subtotal				2,280.00				822.00	

SUBTOTAL =	$	3,102.00
MARKUP % =	$	0.15
MARKUP =	$	465.30
SUB-TOTAL w/ OH & P =	$	3,567.30
CONTINGENCY % =		0.25
CONTINGENCY =	$	891.83
BUDGET COST ESTIMATE =	$	4,459.13

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Pump Station 1									
1	Lighting Upgrades - Exterior	1	ls.		$ 1,520.00	1	ls.	$ 548.00	$ 548.00	$ 2,068.00
	Subtotal				1,520.00				548.00	

SUBTOTAL =	$	2,068.00
MARKUP % =	$	0.15
MARKUP =	$	310.20
SUB-TOTAL w/ OH & P =	$	2,378.20
CONTINGENCY % =		0.25
CONTINGENCY =	$	594.55
BUDGET COST ESTIMATE =	$	2,972.75

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Pump Station 2									
1	Lighting Upgrades - Exterior	1	ls.		$ 1,140.00	1	ls.	$ 411.00	$ 411.00	$ 1,551.00
	Subtotal				1,140.00				411.00	

SUBTOTAL =	$	1,551.00
MARKUP % =	$	0.15
MARKUP =	$	232.65
SUB-TOTAL w/ OH & P =	$	1,783.65
CONTINGENCY % =		0.25
CONTINGENCY =	$	445.91
BUDGET COST ESTIMATE =	$	2,229.56

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Bordentown Sewerage Authority
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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Chlorine and Sulfur Dioxide Building** Lighting Upgrades - Exterior	1	ls.		$ 4,940.00	1	ls.	$ 1,781.00	$ 1,781.00	$ 6,721.00
	Subtotal				4,940.00				1,781.00	

SUBTOTAL =	$	6,721.00
MARKUP % =	$	0.15
MARKUP =	$	1,008.15
SUB-TOTAL w/ OH & P =	$	7,729.15
CONTINGENCY % =		0.25
CONTINGENCY =	$	1,932.29
BUDGET COST ESTIMATE =	$	9,661.44

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Mile Hollow Pump Station (Dog Pound)** Lighting Upgrades - Exterior	1	ls.		$ 5.00	1	ls.	$ 20.00	$ 20.00	$ 25.00
	Subtotal				5.00				20.00	

SUBTOTAL =	$	25.00
MARKUP % =	$	0.15
MARKUP =	$	3.75
SUB-TOTAL w/ OH & P =	$	28.75
CONTINGENCY % =		0.25
CONTINGENCY =	$	7.19
BUDGET COST ESTIMATE =	$	35.94

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Mile Hollow Pump Station (Main Building)									
1	Lighting Upgrades - Exterior	1	ls.		$ 15.00	1	ls.	$ 60.00	$ 60.00	$ 75.00
	Subtotal				15.00				60.00	

SUBTOTAL =	$	75.00
MARKUP % =	$	0.15
MARKUP =	$	11.25
SUB-TOTAL w/ OH & P =	$	86.25
CONTINGENCY % =		0.25
CONTINGENCY =	$	21.56
BUDGET COST ESTIMATE =	$	107.81

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Laurel Run Pump Station									
1	Lighting Upgrades - Exterior	1	ls.		$ 14.00	1	ls.	$ 40.00	$ 40.00	$ 54.00
	Subtotal				14.00				40.00	

SUBTOTAL =	$	54.00
MARKUP % =	$	0.15
MARKUP =	$	8.10
SUB-TOTAL w/ OH & P =	$	62.10
CONTINGENCY % =		0.25
CONTINGENCY =	$	15.53
BUDGET COST ESTIMATE =	$	77.63

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Bordentown Sewerage Authority
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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Park Street No.1 Pump Station									
1	Lighting Upgrades - Exterior	1	ls.		$ 760.00	1	ls.	$ 274.00	$ 274.00	$ 1,034.00
	Subtotal				760.00				274.00	

SUBTOTAL =	$	1,034.00
MARKUP % =	$	0.15
MARKUP =	$	155.10
SUB-TOTAL w/ OH & P =	$	1,189.10
CONTINGENCY % =		0.25
CONTINGENCY =	$	297.28
BUDGET COST ESTIMATE =	$	1,486.38

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Bossert Pump Station									
1	Lighting Upgrades - Exterior	1	ls.		$ 20.00	1	ls.	$ 80.00	$ 80.00	$ 100.00
	Subtotal				20.00				80.00	

SUBTOTAL =	$	100.00
MARKUP % =	$	0.15
MARKUP =	$	15.00
SUB-TOTAL w/ OH & P =	$	115.00
CONTINGENCY % =		0.25
CONTINGENCY =	$	28.75
BUDGET COST ESTIMATE =	$	143.75

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Site & Roadway Lighting** Lighting Upgrades - Exterior	1	ls.		$ 3,120.00	1	ls.	$ 1,096.00	$ 1,096.00	$ 4,216.00
	Subtotal				3,120.00				1,096.00	

SUBTOTAL =	$	4,216.00
MARKUP % =	$	0.15
MARKUP =	$	632.40
SUB-TOTAL w/ OH & P =	$	4,848.40
CONTINGENCY % =		0.25
CONTINGENCY =	$	1,212.10
BUDGET COST ESTIMATE =	$	6,060.50

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Administration Building** Lighting Upgrades - Interior & Exterior	1	ls.		$ 14,182.50	1	ls.	$ 9,951.00	$ 9,951.00	$ 24,133.50
	Subtotal				14,182.50				9,951.00	

SUBTOTAL =	$	24,133.50
MARKUP % =	$	0.15
MARKUP =	$	3,620.03
SUB-TOTAL w/ OH & P =	$	27,753.53
CONTINGENCY % =		0.25
CONTINGENCY =	$	6,938.38
BUDGET COST ESTIMATE =	$	34,691.91

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Grit and Bar Screen Building** Lighting Upgrades - Interior & Exterior	1	ls.		$ 10,400.00	1	ls.	$ 3,602.00	$ 3,602.00	$ 14,002.00
	Subtotal				10,400.00				3,602.00	

SUBTOTAL =	$	14,002.00
MARKUP % =	$	0.15
MARKUP =	$	2,100.30
SUB-TOTAL w/ OH & P =	$	16,102.30
CONTINGENCY % =		0.25
CONTINGENCY =	$	4,025.58
BUDGET COST ESTIMATE =	$	20,127.88

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Solids Processing Building** Lighting Upgrades - Interior & Exterior	1	ls.		$ 10,658.50	1	ls.	$ 7,228.50	$ 7,228.50	$ 17,887.00
	Subtotal				10,658.50				7,228.50	

SUBTOTAL =	$	17,887.00
MARKUP % =	$	0.15
MARKUP =	$	2,683.05
SUB-TOTAL w/ OH & P =	$	20,570.05
CONTINGENCY % =		0.25
CONTINGENCY =	$	5,142.51
BUDGET COST ESTIMATE =	$	25,712.56

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Solids Holding Building** Lighting Upgrades - Interior & Exterior	1	ls.		$ 4,613.00	1	ls.	$ 2,684.00	$ 2,684.00	$ 7,297.00
	Subtotal				4,613.00				2,684.00	

SUBTOTAL =	$	7,297.00
MARKUP % =	$	0.15
MARKUP =	$	1,094.55
SUB-TOTAL w/ OH & P =	$	8,391.55
CONTINGENCY % =		0.25
CONTINGENCY =	$	2,097.89
BUDGET COST ESTIMATE =	$	10,489.44

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Pump Station 1** Lighting Upgrades - Interior & Exterior	1	ls.		$ 2,206.00	1	ls.	$ 1,085.00	$ 1,085.00	$ 3,291.00
	Subtotal				2,206.00				1,085.00	

SUBTOTAL =	$	3,291.00
MARKUP % =	$	0.15
MARKUP =	$	493.65
SUB-TOTAL w/ OH & P =	$	3,784.65
CONTINGENCY % =		0.25
CONTINGENCY =	$	946.16
BUDGET COST ESTIMATE =	$	4,730.81

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Pump Station 2** Lighting Upgrades - Interior & Exterior	1	ls.		$ 2,226.00	1	ls.	$ 1,273.00	$ 1,273.00	$ 3,499.00
	Subtotal				2,226.00				1,273.00	

SUBTOTAL =	$	3,499.00
MARKUP % =	$	0.15
MARKUP =	$	524.85
SUB-TOTAL w/ OH & P =	$	4,023.85
CONTINGENCY % =		0.25
CONTINGENCY =	$	1,005.96
BUDGET COST ESTIMATE =	$	5,029.81

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Chlorine and Sulfur Dioxide Building** Lighting Upgrades - Interior & Exterior	1	ls.		$ 6,552.00	1	ls.	$ 3,050.00	$ 3,050.00	$ 9,602.00
	Subtotal				6,552.00				3,050.00	

SUBTOTAL =	$	9,602.00
MARKUP % =	$	0.15
MARKUP =	$	1,440.30
SUB-TOTAL w/ OH & P =	$	11,042.30
CONTINGENCY % =		0.25
CONTINGENCY =	$	2,760.58
BUDGET COST ESTIMATE =	$	13,802.88

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Mile Hollow Pump Station (Dog Pound)** Lighting Upgrades - Interior & Exterior	1	ls.		$ 85.00	1	ls.	$ 150.00	$ 150.00	$ 235.00
	Subtotal				85.00				150.00	

SUBTOTAL =	$	235.00
MARKUP % =	$	0.15
MARKUP =	$	35.25
SUB-TOTAL w/ OH & P =	$	270.25
CONTINGENCY % =		0.25
CONTINGENCY =	$	67.56
BUDGET COST ESTIMATE =	$	337.81

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Mile Hollow Pump Station (Main Building)** Lighting Upgrades - Interior & Exterior	1	ls.		$ 2,425.00	1	ls.	$ 2,050.00	$ 2,050.00	$ 4,475.00
	Subtotal				2,425.00				2,050.00	

SUBTOTAL =	$	4,475.00
MARKUP % =	$	0.15
MARKUP =	$	671.25
SUB-TOTAL w/ OH & P =	$	5,146.25
CONTINGENCY % =		0.25
CONTINGENCY =	$	1,286.56
BUDGET COST ESTIMATE =	$	6,432.81

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Laurel Run Pump Station** Lighting Upgrades - Interior & Exterior	1	ls.		$ 3,137.00	1	ls.	$ 1,949.00	$ 1,949.00	$ 5,086.00
	Subtotal				3,137.00				1,949.00	

SUBTOTAL =	$	5,086.00
MARKUP % =	$	0.15
MARKUP =	$	762.90
SUB-TOTAL w/ OH & P =	$	5,848.90
CONTINGENCY % =		0.25
CONTINGENCY =	$	1,462.23
BUDGET COST ESTIMATE =	$	7,311.13

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

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ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Park Street No.1 Pump Station** Lighting Upgrades - Interior & Exterior	1	ls.		$ 925.00	1	ls.	$ 424.00	$ 424.00	$ 1,349.00
	Subtotal				925.00				424.00	

SUBTOTAL =	$	1,349.00
MARKUP % =	$	0.15
MARKUP =	$	202.35
SUB-TOTAL w/ OH & P =	$	1,551.35
CONTINGENCY % =		0.25
CONTINGENCY =	$	387.84
BUDGET COST ESTIMATE =	$	1,939.19

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Bossert Pump Station** Lighting Upgrades - Interior & Exterior	1	ls.		$ 1,140.00	1	ls.	$ 990.00	$ 990.00	$ 2,130.00
	Subtotal				1,140.00				990.00	

SUBTOTAL =	$	2,130.00
MARKUP % =	$	0.15
MARKUP =	$	319.50
SUB-TOTAL w/ OH & P =	$	2,449.50
CONTINGENCY % =		0.25
CONTINGENCY =	$	612.38
BUDGET COST ESTIMATE =	$	3,061.88

CDM

11 British American Blvd
Latham, NY 12110
Phone (518) 782-4500
Fax (518) 786-3810

ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Bordentown Sewerage Authority
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Grit and Bar Screen Building									
1	Motor Upgrades	1	ls.		$ 1,020.00	1	ls.	$ 248.00	$ 248.00	$ 1,268.00
	Subtotal				1,020.00				248.00	

SUBTOTAL =	$	1,268.00
MARKUP % =	$	0.15
MARKUP =	$	190.20
SUB-TOTAL w/ OH & P =	$	1,458.20
CONTINGENCY % =		0.25
CONTINGENCY =	$	364.55
BUDGET COST ESTIMATE =	$	1,822.75

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Solids Processing Building									
1	Motor Upgrades	1	ea.		$ 21,445.00	1	ea.	$ 4,039.00	$ 4,039.00	$ 25,484.00
2	VFD Upgrades	1	ls.		$ 14,450.00	1	ls.	$ 6,200.00	$ 6,200.00	$ 20,650.00
	Subtotal				35,895.00				10,239.00	

SUBTOTAL =	$	46,134.00
MARKUP % =	$	0.15
MARKUP =	$	6,920.10
SUB-TOTAL w/ OH & P =	$	53,054.10
CONTINGENCY % =		0.25
CONTINGENCY =	$	13,263.53
BUDGET COST ESTIMATE =	$	66,317.63

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Bordentown Sewerage Authority
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Solids Holding Building** Motor Upgrades	1	ls.		$ 2,825.00	1	ls.	$ 370.00	$ 370.00	$ 3,195.00
	Subtotal				2,825.00				370.00	

SUBTOTAL =	$	3,195.00
MARKUP % =	$	0.15
MARKUP =	$	479.25
SUB-TOTAL w/ OH & P =	$	3,674.25
CONTINGENCY % =		0.25
CONTINGENCY =	$	918.56
BUDGET COST ESTIMATE =	$	4,592.81

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Pump Station 1** Motor Upgrades	1	ls.		$ 4,350.00	1	ls.	$ 645.00	$ 645.00	$ 4,995.00
	Subtotal				4,350.00				645.00	

SUBTOTAL =	$	4,995.00
MARKUP % =	$	0.15
MARKUP =	$	749.25
SUB-TOTAL w/ OH & P =	$	5,744.25
CONTINGENCY % =		0.25
CONTINGENCY =	$	1,436.06
BUDGET COST ESTIMATE =	$	7,180.31

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Bordentown Sewerage Authority
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Pump Station 2									
1	Motor Upgrades	1	ls.		$ 1,240.00	1	ls.	$ 258.00	$ 258.00	$ 1,498.00
	Subtotal				1,240.00				258.00	

SUBTOTAL =	$	1,498.00
MARKUP % =	$	0.15
MARKUP =	$	224.70
SUB-TOTAL w/ OH & P =	$	1,722.70
CONTINGENCY % =		0.25
CONTINGENCY =	$	430.68
BUDGET COST ESTIMATE =	$	2,153.38

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Oxidation Ditch									
1	Motor Upgrades	1	ls.		$ 30,600.00	1	ls.	$ 4,968.00	$ 4,968.00	$ 35,568.00
2	VFD Upgrades	1	ls.		$ 64,200.00	1	ls.	$ 37,200.00	$ 37,200.00	$ 101,400.00
	Subtotal				94,800.00				42,168.00	

SUBTOTAL =	$	136,968.00
MARKUP % =	$	0.15
MARKUP =	$	20,545.20
SUB-TOTAL w/ OH & P =	$	157,513.20
CONTINGENCY % =		0.25
CONTINGENCY =	$	39,378.30
BUDGET COST ESTIMATE =	$	196,891.50

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Bordentown Sewerage Authority
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Mile Hollow Pump Station** Motor Upgrades	1	ls.		$ 8,475.00	1	ls.	$ 1,110.00	$ 1,110.00	$ 9,585.00
	Subtotal				8,475.00				1,110.00	

SUBTOTAL =	$	9,585.00
MARKUP % =	$	0.15
MARKUP =	$	1,437.75
SUB-TOTAL w/ OH & P =	$	11,022.75
CONTINGENCY % =		0.25
CONTINGENCY =	$	2,755.69
BUDGET COST ESTIMATE =	$	13,778.44

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Laurel Run Pump Station** Motor Upgrades	1	ls.		$ -	1	ls.	$ -	$ -	$ -
	Subtotal				0.00				0.00	

SUBTOTAL =	$	-
MARKUP % =	$	0.15
MARKUP =	$	-
SUB-TOTAL w/ OH & P =	$	-
CONTINGENCY % =		0.25
CONTINGENCY =	$	-
BUDGET COST ESTIMATE =	$	-

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Bordentown Sewerage Authority
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Park Street No.1 Pump Station** Motor Upgrades	1	ls.		$ 2,550.00	1	ls.	$ 414.00	$ 414.00	$ 2,964.00
	Subtotal				2,550.00				414.00	

SUBTOTAL =	$	2,964.00
MARKUP % =	$	0.15
MARKUP =	$	444.60
SUB-TOTAL w/ OH & P =	$	3,408.60
CONTINGENCY % =		0.25
CONTINGENCY =	$	852.15
BUDGET COST ESTIMATE =	$	4,260.75

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Bossert Pump Station** Motor Upgrades	1	ls.		$ 1,590.00	1	ls.	$ 324.00	$ 324.00	$ 1,914.00
	Subtotal				1,590.00				324.00	

SUBTOTAL =	$	1,914.00
MARKUP % =	$	0.15
MARKUP =	$	287.10
SUB-TOTAL w/ OH & P =	$	2,201.10
CONTINGENCY % =		0.25
CONTINGENCY =	$	550.28
BUDGET COST ESTIMATE =	$	2,751.38

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Bordentown Sewerage Authority
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Bordentown Sewerage Plant** Solary PV Array System	1	ls.		$ 3,971,212.00	1	ls.	$ 1,701,948.00	$ 1,701,948.00	$ 5,673,160.00
	Subtotal				3,971,212.00				1,701,948.00	
									SUBTOTAL =	$ 5,673,160.00
									CONTINGENCY % =	0.25
									CONTINGENCY =	$ 1,418,290.00
									BUDGET COST ESTIMATE =	$ 7,091,450.00

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Mile Hollow Pump Station** Solary PV Array System	1	ls.		$ 335,041.00	1	ls.	$ 143,589.00	$ 143,589.00	$ 478,630.00
	Subtotal				335,041.00				143,589.00	
									SUBTOTAL =	$ 478,630.00
									CONTINGENCY % =	0.25
									CONTINGENCY =	$ 119,657.50
									BUDGET COST ESTIMATE =	$ 598,287.50

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Laurel Run Pump Station** Solary PV Array System	1	ls.		$ 322,000.00	1	ls.	$ 138,000.00	$ 138,000.00	$ 460,000.00
	Subtotal				322,000.00				138,000.00	
									SUBTOTAL =	$ 460,000.00
									CONTINGENCY % =	0.25
									CONTINGENCY =	$ 115,000.00
									BUDGET COST ESTIMATE =	$ 575,000.00

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Bossert Pump Station** Solary PV Array System	1	ls.		$ 221,200.00	1	ls.	$ 94,800.00	$ 94,800.00	$ 316,000.00
	Subtotal				221,200.00				94,800.00	
									SUBTOTAL =	$ 316,000.00
									CONTINGENCY % =	0.25
									CONTINGENCY =	$ 79,000.00
									BUDGET COST ESTIMATE =	$ 395,000.00

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ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Bordentown Sewerage Authority
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Bordentown Sewerage Authority** 10KW Wind Turbine	1	ls.		$ 43,645.00	1	ls.	$ 4,000.00	$ 4,000.00	$ 47,645.00
	Subtotal				43,645.00				4,000.00	

SUBTOTAL =	$	47,645.00
MARKUP % =	$	0.15
MARKUP =	$	7,146.75
SUB-TOTAL w/ OH & P =	$	54,791.75
CONTINGENCY % =		0.25
CONTINGENCY =	$	13,697.94
BUDGET COST ESTIMATE =	$	68,489.69

CDM

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Raritan Plaza 1, Raritan Center
Edison, New Jersey 08818
Phone (732) 225-7000
Fax (732) 225-7851

Location: Bordentown
ITEM **New Positive Displacement Blowers - Alt. 1a**
Estimate by: Christie Arlotta
Checked by:

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	Blowers - Positive Displacement and Install Labor	2	ea.	$ 22,500.00	$ 45,000.00	80	hrs	$ 70.00	$ 5,600.00	$ 50,600.00
2	Remove Existing Blowers	2	ea.	$ -	$ -	80	hrs	$ 70.00	$ 5,600.00	$ 5,600.00
3	Rigging	1	ls	$ 5,000.00	$ 5,000.00	1	ea.	$ 5,000.00	$ 5,000.00	$ 10,000.00
4	Miscellaneous Piping Replacement	2	ea.	$ 5,000.00	$ 10,000.00	100	hrs	$ 70.00	$ 7,000.00	$ 17,000.00
5	Sludge Tank Instrumentation and Controls	1	l.s.	$ 2,000.00	$ 2,000.00	0	hrs	$ 70.00	$ -	$ 2,000.00
6	Electrical Work	2	l.s.	$ 3,000.00	$ 6,000.00	0	hrs	$ 70.00	$ -	$ 6,000.00
7	System Testing	1	l.s.	$ 2,000.00	$ 2,000.00	16	hrs	$ 70.00	$ 1,120.00	$ 3,120.00
8	concrete equipment pads	1	ls	$ 2,500.00	$ 2,500.00				$ -	$ 2,500.00
9	miscellaneous concrete pad demolition	1	ls	$ 5,000.00	$ 5,000.00				$ -	$ 5,000.00
					$ -				$ -	$ -
	Subtotal				77,500.00				24,320.00	

SUBTOTAL =	$	101,820.00
MARKUP % =	$	0.20
MARKUP =	$	20,364.00
SUB-TOTAL w/ OH & P =	$	122,184.00
CONTINGENCY % =		0.30
CONTINGENCY =	$	36,655.20
BUDGET COST ESTIMATE =	$	158,839.20

CDM

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Raritan Plaza 1, Raritan Center

Edison, New Jersey 08818
Phone (732) 225-7000
Fax (732) 225-7851

Location: Bordentown
New Positive Displacement Blowers & VFDs - Alt.
ITEM **1b**
Estimate by: Christie Arlotta
Checked by:

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	Blowers - Positive Displacement and Install Labor	2	ea.	$ 22,500.00	$ 45,000.00	80	hrs	$ 70.00	$ 5,600.00	$ 50,600.00
2	VFDs	2	ea.	$ 6,333.33	$ 12,666.67	80	hrs	$ 70.00	$ 5,600.00	$ 18,266.67
3	Remove Existing Blowers	2	ea.	$ -	$ -	80	hrs	$ 70.00	$ 5,600.00	$ 5,600.00
4	Rigging	1	ls	$ 5,000.00	$ 5,000.00	1	ea.	$ 5,000.00	$ 5,000.00	$ 10,000.00
5	Miscellaneous Piping Replacement	2	ea.	$ 5,000.00	$ 10,000.00	100	hrs	$ 70.00	$ 7,000.00	$ 17,000.00
6	Sludge Tank Instrumentation and Controls	1	l.s.	$ 2,000.00	$ 2,000.00	0	hrs	$ 70.00	$ -	$ 2,000.00
7	Electrical Work	2	l.s.	$ 3,000.00	$ 6,000.00	0	hrs	$ 70.00	$ -	$ 6,000.00
8	System Testing	1	l.s.	$ 2,000.00	$ 2,000.00	0	hrs	$ 70.00	$ -	$ 2,000.00
8	concrete equipment pads	1	ls	$ 2,500.00	$ 2,500.00				$ -	$ 2,500.00
9	miscellaneous concrete pad demolition	1	ls	$ 5,000.00	$ 5,000.00				$ -	$ 5,000.00
					$ -				$ -	$ -
	Subtotal				90,166.67				28,800.00	

SUBTOTAL =	$	118,966.67
MARKUP % =	$	0.20
MARKUP =	$	23,793.33
SUB-TOTAL w/ OH & P =	$	142,760.00
CONTINGENCY % =		0.30
CONTINGENCY =	$	42,828.00
BUDGET COST ESTIMATE =	$	185,588.00

CDM

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

110 Fieldcrest Avenue, 6th Floor
Edison, New Jersey 08837
Phone (732) 225-7000
Fax (732) 225-7851

Location: Bordentown
ITEM Jet Mixing/Aeration System
Estimate by: EY
Checked by: RC

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	30 Hp Air Blower	1	ea.	$ 15,000.00	$ 15,000.00	32	hrs	$ 70.00	$ 2,240.00	$ 17,240.00
2	Jet Mixing System, pump, piping, and supports	1	ea	$ 35,000.00	$ 35,000.00	90	hrs	$ 70.00	$ 6,300.00	$ 41,300.00
3	Instrumentation and Controls	1	l.s.	$ 2,000.00	$ 2,000.00	0	hrs	$ 70.00	$ -	$ 2,000.00
4	Electrical Work	1	l.s.	$ 10,000.00	$ 10,000.00	0	hrs	$ 70.00	$ -	$ 10,000.00
5	Pipe demolition inside tank	1	ls	$ -	$ -	32	hrs	$ 70.00	$ 2,240.00	$ 2,240.00
6	Cleaning Sludge From Tank	1	ls	$ 2,500.00	$ 2,500.00	24	hrs	$ 70.00	$ 1,680.00	$ 4,180.00
7	External Piping Installation	1	ea	$ 3,500.00	$ 3,500.00	32	hrs	$ 70.00	$ 2,240.00	$ 5,740.00
8	Structural Equipment Pads	1	ls	$ 2,000.00	$ 2,000.00	0	hrs	$ 70.00	$ -	$ 2,000.00
9	Core drill existing tank wall w/linkseal	1	ls	$ 2,500.00	$ 2,500.00	0	hrs	$ 70.00	$ -	$ 2,500.00
10	demolition of existing 60 Hp Blower	1	ls	$ 5,000.00	$ 5,000.00	0	hrs	$ 70.00	$ -	$ 5,000.00
					$ -		hrs	$ 70.00	$ -	$ -
	Subtotal				77,500.00				14,700.00	

SUBTOTAL =	$	92,200.00
MARKUP % =	$	0.20
MARKUP =	$	18,440.00
SUB-TOTAL w/ OH & P =	$	110,640.00
CONTINGENCY % =		0.30
CONTINGENCY =	$	33,192.00
BUDGET COST ESTIMATE =	$	143,832.00

APPENDIX I

ECRM FINANCIAL ANALYSES

ECM	Administration Building - Condensing Unit and Heat Pump Upgrade	Solids Processing Building - HRVs
Assumed Inflation (Gas)	2%	2%
Initial Yearly Savings (Gas)		$2,072.00
Assumed Inflation (Electricity)	3%	3% -
Initial Yearly Savings (Electricity)	$213.00	-$121.00
Assumed Average Useful Life (Years)	15	15
Lifetime Savings	**$3,961.57**	**$33,581.49**
Year	Annual Savings	Annual Savings
1	$213.00	$1,951.00
2	$219.39	$1,988.81
3	$225.97	$2,027.34
4	$232.75	$2,066.60
5	$239.73	$2,106.61
6	$246.93	$2,147.38
7	$254.33	$2,188.93
8	$261.96	$2,231.26
9	$269.82	$2,274.40
10	$277.92	$2,318.35
11	$286.25	$2,363.14
12	$294.84	$2,408.78
13	$303.69	$2,455.28
14	$312.80	$2,502.66
15	$322.18	$2,550.94

IRR, NPV, AROI - HVAC ECRMS

Condensing Unit and Heat Pump Upgrade Administration Building		HRVs Solids Processing Building	
Year	Cash Flow	Year	Cash Flow
0	($15,524.00)	0	($435,016.00)
1	$213.00	1	$1,951.00
2	$219.39	2	$2,009.53
3	$225.97	3	$2,069.82
4	$232.75	4	$2,131.91
5	$239.73	5	$2,195.87
6	$246.93	6	$2,261.74
7	$254.33	7	$2,329.60
8	$261.96	8	$2,399.48
9	$269.82	9	$2,471.47
10	$277.92	10	$2,545.61
11	$286.25	11	$2,621.98
12	$294.84	12	$2,700.64
13	$303.69	13	$2,781.66
14	$312.80	14	$2,865.11
15	$322.18	15	$2,951.06
IRR	-13.1%	IRR	-21.13%
NPV	($12,422.06)	NPV	($406,603.38)
AROI	-5.29%	AROI	-6.22%

ECM	Administration Building - Interior	Grit and Bar Screen Building - Interior	Solids Processing Building Building - Interior	Solids Holding Building - Interior	Pump Station 1 - Interior	Pump Station 2 - Interior	Chlorine and Sulfur Dioxide Building - Interior	Mills Hollow Pump Station (Dog Pound) - Interior	Mills Hollow Pump Station (Main Building) - Interior	Laurel Run Pump Station - Interior	Park Street Pump Station - Interior	Bossert Pump Station - Interior
Assumed Inflation (Gas)												
Initial Yearly Savings (Gas)												
Assumed Inflation (Electricity)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$1,574.40	$180.30	$1,099.10	$320.60	$85.70	$153.00	$214.20	$3.20	$103.50	$142.40	$11.60	$44.10
Assumed Average Useful Life (Years)	15	15	15	15	15	15	15	15	15	15	15	15
Lifetime Savings	$28,282.13	$3,320.77	$20,442.07	$5,962.81	$1,589.33	$2,845.83	$3,983.89	$59.52	$1,926.99	$2,648.49	$215.47	$820.21
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$1,574.40	$180.30	$1,099.10	$320.60	$85.70	$153.00	$214.20	$3.20	$103.50	$142.40	$11.60	$44.10
2	$1,621.63	$194.66	$1,132.07	$330.22	$88.27	$157.59	$220.63	$3.26	$106.61	$146.67	$12.15	$45.42
3	$1,670.28	$200.63	$1,166.04	$340.12	$90.92	$162.32	$227.24	$3.39	$109.80	$151.07	$12.52	$46.79
4	$1,720.39	$206.65	$1,201.02	$350.33	$93.65	$167.19	$234.06	$3.60	$113.10	$155.60	$12.88	$48.19
5	$1,772.00	$213.06	$1,237.05	$360.84	$96.46	$172.20	$241.08	$3.60	$116.49	$160.27	$13.28	$49.63
6	$1,825.16	$219.45	$1,274.16	$371.66	$99.35	$177.37	$248.32	$3.71	$119.98	$165.08	$13.66	$51.12
7	$1,879.92	$226.00	$1,312.38	$382.81	$102.33	$182.69	$255.77	$3.82	$123.58	$170.03	$14.09	$52.66
8	$1,936.31	$232.82	$1,351.75	$394.30	$105.40	$188.17	$263.44	$3.94	$127.29	$175.13	$14.51	$54.24
9	$1,994.40	$239.80	$1,392.31	$406.13	$108.56	$193.82	$271.34	$4.05	$131.11	$180.39	$14.95	$55.86
10	$2,054.23	$246.99	$1,434.08	$418.31	$111.82	$199.65	$279.48	$4.18	$135.04	$185.80	$15.40	$57.54
11	$2,115.86	$254.40	$1,477.10	$430.86	$115.17	$205.62	$287.87	$4.30	$139.10	$191.37	$15.86	$59.27
12	$2,179.34	$262.04	$1,521.41	$443.79	$118.63	$211.79	$296.50	$4.43	$143.27	$197.11	$16.33	$61.04
13	$2,244.72	$269.90	$1,567.05	$457.10	$122.19	$218.14	$305.40	$4.56	$147.57	$203.03	$16.82	$62.86
14	$2,312.06	$277.99	$1,614.07	$470.81	$125.85	$224.69	$314.56	$4.70	$151.99	$209.12	$17.33	$64.74
15	$2,381.42	$286.33	$1,662.49	$484.94	$129.63	$231.43	$324.00	$4.84	$156.55	$215.39	$17.85	$66.71

ECM	Administration Building - Exterior	Grit and Bar Screen Building - Exterior	Solids Processing Building Building - Exterior	Solids Holding Building - Exterior	Pump Station 1 - Exterior	Pump Station 2 - Exterior	Chlorine and Sulfur Dioxide Building - Exterior	Mills Hollow Pump Station (Dog Pound) - Exterior	Mills Hollow Pump Station (Main Building) - Exterior	Laurel Run Pump Station - Exterior	Park Street Pump Station - Exterior	Bossert Pump Station - Exterior	Site & Roadway - Exterior
Assumed Inflation (Gas)													
Initial Yearly Savings (Gas)													
Assumed Inflation (Electricity)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$199.00	$152.90	$91.20	$66.40	$45.60	$84.20	$148.20	$34.00	$102.10	$103.70	$36.00	$134.00	$775.20
Assumed Average Useful Life (Years)	15	15	15	15	15	15	15	15	15	15	15	15	15
Lifetime Savings	$3,701.18	$2,843.77	$1,696.20	$1,272.17	$848.11	$636.08	$2,756.36	$632.36	$1,898.85	$1,928.71	$669.58	$2,508.99	$14,417.68
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$199.00	$152.90	$91.20	$66.40	$45.60	$84.20	$148.20	$34.00	$102.10	$103.70	$36.00	$134.00	$775.20
2	$204.97	$157.49	$93.94	$70.45	$46.97	$35.23	$152.65	$35.02	$105.16	$106.81	$37.08	$138.05	$798.46
3	$211.12	$162.21	$96.75	$72.57	$48.38	$36.28	$157.23	$36.07	$108.32	$110.02	$38.19	$143.12	$822.41
4	$217.45	$167.08	$99.65	$74.74	$49.83	$37.37	$161.94	$37.15	$111.57	$113.32	$39.34	$147.41	$847.08
5	$223.98	$172.09	$102.65	$76.98	$51.32	$38.49	$166.80	$38.27	$114.91	$116.72	$40.52	$151.83	$872.49
6	$230.70	$177.25	$105.73	$79.29	$52.86	$39.65	$171.80	$39.42	$118.36	$120.22	$41.73	$156.39	$898.67
7	$237.62	$182.57	$108.90	$81.67	$54.45	$40.84	$176.96	$40.60	$121.91	$123.82	$42.99	$161.08	$925.63
8	$244.74	$188.05	$112.16	$84.12	$56.08	$42.06	$182.27	$41.82	$125.57	$127.54	$44.28	$165.91	$953.40
9	$252.09	$193.69	$115.53	$86.65	$57.76	$43.32	$187.74	$43.07	$129.34	$131.38	$45.60	$170.89	$982.00
10	$259.65	$199.50	$119.00	$89.25	$59.50	$44.62	$193.37	$44.36	$133.22	$135.30	$46.97	$176.01	$1,011.46
11	$267.44	$205.48	$122.57	$91.92	$61.28	$45.96	$199.17	$45.69	$137.21	$139.36	$48.38	$181.29	$1,041.80
12	$275.46	$211.65	$126.24	$94.68	$63.12	$47.34	$205.14	$47.06	$141.33	$143.55	$49.83	$186.73	$1,073.06
13	$283.73	$218.00	$130.03	$97.52	$65.01	$48.76	$211.30	$48.48	$145.57	$147.85	$51.33	$192.34	$1,105.25
14	$292.24	$224.54	$133.93	$100.45	$66.97	$50.22	$217.64	$49.93	$149.94	$152.29	$52.87	$198.11	$1,138.41
15	$301.01	$231.27	$137.95	$103.46	$68.97	$51.73	$224.17	$51.43	$154.44	$156.86	$54.46	$204.05	$1,172.56

ECM	Administration Building - Interior & Exterior	Grit and Bar Screen Building - Interior & Exterior	Solids Processing Building Building - Interior & Exterior	Solids Holding Building - Interior & Exterior	Pump Station 1 - Interior & Exterior	Pump Station 2 - Interior & Exterior	Chlorine and Sulfur Dioxide Building - Interior & Exterior	Mills Hollow Pump Station (Dog Pound) - Interior & Exterior	Mills Hollow Pump Station (Main Building) - Interior & Exterior	Laurel Run Pump Station - Interior & Exterior	Park Street Pump Station - Interior & Exterior	Bossert Pump Station - Interior & Exterior
Assumed Inflation (Gas)												
Initial Yearly Savings (Gas)												
Assumed Inflation (Electricity)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$1,773.40	$342.20	$1,190.30	$386.00	$131.30	$187.20	$362.40	$37.20	$205.60	$246.10	$47.60	$178.00
Assumed Average Useful Life (Years)	15	15	15	15	15	15	15	15	15	15	15	15
Lifetime Savings	$32,983.31	$6,364.66	$22,138.29	$7,234.89	$2,442.04	$3,481.72	$6,740.25	$691.89	$3,823.94	$4,577.18	$885.03	$3,328.21
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$1,773.40	$342.20	$1,190.30	$386.00	$131.30	$187.20	$362.40	$37.20	$205.60	$246.10	$47.60	$178.00
2	$1,826.60	$352.47	$1,226.01	$400.67	$135.24	$192.82	$373.27	$38.32	$211.77	$253.48	$49.23	$184.57
3	$1,881.40	$363.04	$1,262.79	$412.69	$139.30	$198.60	$384.47	$39.47	$218.12	$261.09	$50.71	$190.60
4	$1,937.84	$373.93	$1,300.67	$425.07	$143.48	$204.56	$396.00	$40.65	$224.66	$268.92	$52.23	$196.80
5	$1,995.98	$385.15	$1,339.69	$437.82	$147.78	$210.70	$407.88	$41.87	$231.40	$276.99	$53.80	$201.47
6	$2,055.86	$396.70	$1,379.88	$450.96	$152.21	$217.02	$420.12	$43.12	$238.35	$285.30	$55.41	$207.51
7	$2,117.53	$408.60	$1,421.28	$464.49	$156.78	$223.53	$432.72	$44.42	$245.50	$293.86	$57.08	$213.74
8	$2,181.06	$420.86	$1,463.92	$478.42	$161.48	$230.23	$445.71	$45.75	$252.86	$302.67	$58.79	$220.15
9	$2,246.49	$433.49	$1,507.84	$492.77	$166.33	$237.14	$459.08	$47.12	$260.45	$311.75	$60.55	$226.75
10	$2,313.84	$446.49	$1,553.07	$507.56	$171.32	$244.25	$472.85	$48.54	$268.26	$321.10	$62.37	$233.56
11	$2,383.30	$459.89	$1,599.66	$522.78	$176.46	$251.58	$487.04	$49.99	$276.31	$330.74	$64.24	$240.56
12	$2,454.80	$473.68	$1,647.65	$538.47	$181.75	$259.13	$501.65	$51.49	$284.60	$340.66	$66.17	$247.78
13	$2,528.44	$487.90	$1,697.08	$554.62	$187.20	$266.90	$516.70	$53.04	$293.14	$350.88	$68.15	$255.21
14	$2,604.30	$502.53	$1,748.00	$571.26	$192.82	$274.91	$532.20	$54.63	$301.93	$361.41	$70.20	$262.87
15	$2,682.43	$517.61	$1,800.44	$588.40	$198.60	$283.16	$548.16	$56.27	$310.99	$372.25	$72.30	$270.75

ECM	Motor Upgrades & VFD Additions - Grit and Bar Screen Building	Motor Upgrades & VFD Additions - Solids Processing Building	Motor Upgrades & VFD Additions - Solids Handling Building	Motor Upgrades & VFD Additions - Pump Station 1 Building	Motor Upgrades & VFD Additions - Pump Station 2 Building	Motor Upgrades & VFD Additions - Oxidation Ditch	Motor Upgrades & VFD Additions - Mile Hollow Pump Station	Motor Upgrades & VFD Additions - Laural Run Pump Station	Motor Upgrades & VFD Additions - Park Street Pump Station	Motor Upgrades & VFD Additions - Bossert Pump Station	Motor Upgrades & VFD Additions - All Combined Motors
Assumed Inflation (Gas)											
Initial Yearly Savings (Gas)											
Assumed Inflation (Electricity)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$331.47	$10,824.12	$256.34	$136.30	$0.54	$73,992.10	$276.40	$0.00	$123.77	$277.54	$85,904.31
Assumed Average Useful Life (Years)	15	15	15	15	15	15	15	15	15	15	15
Lifetime Savings	$5,164.99	$201,318.68	$4,804.84	$2,572.23	$10.04	$1,376,172.70	$5,141.96	$0.00	$2,301.89	$5,161.94	$1,598,842.80
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$331.47	$10,824.12	$256.34	$136.30	$0.54	$73,992.10	$276.40	$0.00	$123.77	$277.54	$85,904.31
2	$341.41	$11,148.84	$266.00	$142.45	$0.56	$76,211.86	$284.75	$0.00	$127.48	$285.87	$88,543.24
3	$351.66	$11,483.31	$274.97	$146.72	$0.57	$78,498.22	$293.30	$0.00	$131.31	$294.44	$91,199.54
4	$362.21	$11,827.61	$282.32	$151.12	$0.59	$80,853.17	$302.10	$0.00	$135.26	$303.28	$93,935.52
5	$373.07	$12,182.64	$290.78	$155.66	$0.61	$83,278.76	$311.16	$0.00	$139.30	$312.37	$96,753.59
6	$384.26	$12,548.12	$299.48	$160.33	$0.63	$85,777.12	$320.49	$0.00	$143.48	$321.74	$99,656.20
7	$395.78	$12,924.57	$308.47	$165.14	$0.64	$88,350.44	$330.11	$0.00	$147.78	$331.40	$102,646.88
8	$407.67	$13,312.30	$317.73	$170.09	$0.66	$91,000.95	$340.01	$0.00	$152.22	$341.34	$105,726.28
9	$419.90	$13,711.67	$327.26	$175.19	$0.69	$93,730.98	$350.21	$0.00	$156.79	$351.58	$108,897.02
10	$432.48	$14,123.02	$337.06	$180.45	$0.70	$96,542.91	$360.72	$0.00	$161.49	$362.13	$112,163.93
11	$445.47	$14,546.71	$347.19	$185.86	$0.73	$99,439.20	$371.54	$0.00	$166.34	$372.99	$115,528.84
12	$458.80	$14,983.11	$357.60	$191.44	$0.75	$102,422.37	$382.69	$0.00	$171.33	$384.18	$118,994.71
13	$472.60	$15,432.61	$368.33	$197.19	$0.77	$105,495.04	$394.17	$0.00	$176.47	$395.71	$122,564.55
14	$486.77	$15,895.59	$379.38	$203.10	$0.79	$108,659.89	$405.99	$0.00	$181.76	$407.58	$126,241.49
15	$501.36	$16,372.45	$390.76	$209.19	$0.82	$111,919.69	$418.17	$0.00	$187.21	$419.80	$130,028.73

ECM	Black Creek Wastewater Treatment Plant - Solar PV System	Mile Hollow Pump Station - Solar PV System	Laurel Run Pump Station - Solar PV System	Bossert Pump Station - Solar PV System
Assumed Inflation (Gas)				
Initial Yearly Savings (Gas)				
Assumed Inflation (Electricity)	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$66,335.90	$8,195.90	$7,421.30	$4,633.10
Assumed Average Useful Life (Years)	25	25	25	25
Lifetime Savings	**$3,147,743.40**	**$298,916.48**	**$270,979.14**	**$168,819.42**

Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$66,335.90	$8,195.90	$7,421.30	$4,633.10
2	$66,825.98	$8,441.76	$7,643.94	$4,772.09
3	$81,593.76	$8,695.03	$7,873.26	$4,915.26
4	$84,341.57	$8,955.88	$8,109.45	$5,062.71
5	$87,171.62	$9,224.56	$8,352.74	$5,214.59
6	$100,086.97	$9,501.29	$8,603.32	$5,371.03
7	$103,089.58	$9,786.33	$8,861.42	$5,532.16
8	$106,182.27	$10,079.92	$9,127.26	$5,698.13
9	$109,367.74	$10,382.32	$9,401.08	$5,869.07
10	$112,648.77	$10,693.79	$9,683.11	$6,045.14
11	$116,028.23	$11,014.60	$9,973.61	$6,226.50
12	$119,509.08	$11,345.04	$10,272.81	$6,413.29
13	$123,094.35	$11,685.39	$10,581.00	$6,605.69
14	$126,787.18	$12,035.96	$10,898.43	$6,803.86
15	$130,590.80	$12,397.03	$11,225.38	$7,007.98
16	$134,508.52	$12,768.95	$11,562.14	$7,218.22
17	$138,543.77	$13,152.01	$11,909.01	$7,434.77
18	$142,700.08	$13,546.57	$12,266.28	$7,657.81
19	$146,981.09	$13,952.97	$12,634.27	$7,887.54
20	$151,390.52	$14,371.56	$13,013.29	$8,124.17
21	$155,932.24	$14,802.71	$13,403.69	$8,367.89
22	$160,610.21	$15,246.79	$13,805.80	$8,618.93
23	$165,428.51	$15,704.19	$14,219.98	$8,877.50
24	$170,391.37	$16,175.32	$14,646.58	$9,143.82
25	$175,503.11	$16,660.58	$15,085.97	$9,418.14

ECM	Wind Turbine - Min Wind Speed	Wind Turbine - Max Wind Speed	Wind Turbine - Avg wind Speed
Assumed Inflation (Gas)			
Initial Yearly Savings (Gas)			
Assumed Inflation (Electricity)	3%	3%	3%
Initial Yearly Savings (Electricity)	$726.20	$2,061.60	$1,266.10
Assumed Average Useful Life (Years)	25	25	25
Lifetime Savings	**$26,476.72**	**$75,164.42**	**$46,233.99**

Year	Annual Savings	Annual Savings	Annual Savings
1	$726.20	$2,061.60	$1,266.10
2	$747.99	$2,123.45	$1,304.14
3	$770.43	$2,187.15	$1,343.33
4	$793.54	$2,252.77	$1,383.69
5	$817.34	$2,320.35	$1,425.20
6	$841.86	$2,389.96	$1,470.08
7	$867.12	$2,461.66	$1,514.18
8	$893.13	$2,535.51	$1,559.60
9	$919.93	$2,611.57	$1,606.39
10	$947.53	$2,689.92	$1,654.58
11	$975.96	$2,770.62	$1,704.22
12	$1,005.23	$2,853.74	$1,755.35
13	$1,035.39	$2,939.36	$1,808.01
14	$1,066.45	$3,027.53	$1,862.25
15	$1,098.44	$3,118.35	$1,918.12
16	$1,131.40	$3,211.91	$1,975.66
17	$1,165.34	$3,308.26	$2,034.93
18	$1,200.30	$3,407.51	$2,095.98
19	$1,236.31	$3,509.74	$2,158.86
20	$1,273.40	$3,615.03	$2,223.62
21	$1,311.60	$3,723.48	$2,290.33
22	$1,350.95	$3,835.18	$2,359.04
23	$1,391.47	$3,950.24	$2,429.81
24	$1,433.22	$4,068.75	$2,502.71
25	$1,476.22	$4,190.81	$2,577.79

Financial Calculations

Based on inflation of: 3%

	Lighting - Interior Administration Building	Lighting - Interior Grit and Bar Screen Building	Lighting - Interior Solids Processing Building	Lighting - Interior Solids Holding Building	Lighting - Interior Pump Station 1	Lighting - Interior Pump Station 2
Life of ECRM (Yrs):	15	15	15	15	15	15
Year	Cash Flow	Cash Flow	Cash Flow	Cash Flow	Cash Flow	Cash Flow
0	($21,774.60)	($15,235.60)	($18,332.19)	($5,645.30)	($1,598.10)	($2,565.30)
1	$2,044.00	$200.60	$1,368.50	$397.20	$104.00	$186.70
2	$2,105.32	$206.62	$1,409.56	$409.12	$107.12	$192.30
3	$2,168.48	$212.82	$1,451.84	$421.38	$110.33	$198.07
4	$2,233.53	$219.20	$1,495.40	$434.03	$113.64	$204.01
5	$2,300.54	$225.78	$1,540.26	$447.05	$117.05	$210.13
6	$2,369.56	$232.56	$1,586.47	$460.46	$120.56	$216.44
7	$2,440.64	$239.53	$1,634.06	$474.28	$124.18	$222.93
8	$2,513.86	$246.71	$1,683.08	$488.51	$127.91	$229.62
9	$2,589.28	$254.11	$1,733.57	$503.16	$131.74	$236.51
10	$2,666.94	$261.74	$1,785.58	$518.26	$135.70	$243.60
11	$2,746.97	$269.59	$1,839.15	$533.80	$139.77	$250.91
12	$2,829.37	$277.68	$1,894.32	$549.82	$143.96	$258.44
13	$2,914.26	$286.01	$1,951.15	$566.31	$148.28	$266.19
14	$3,001.68	$294.59	$2,009.69	$583.30	$152.73	$274.18
15	$3,091.73	$303.43	$2,069.98	$600.80	$157.31	$282.40
IRR	4.91%	-13.34%	4.10%	3.65%	2.32%	3.78%
NPV	$3,391.58	($12,304.44)	$1,807.51	$238.17	($63.54)	$153.63
AROI	1.30%	-5.35%	0.80%	0.60%	-0.18%	0.61%

	Lighting - Interior Chlorine & Sulfur Dioxide Building	Lighting - Interior Mile Hollow Pump Station (Dog Pound)	Lighting - Interior Mile Hollow Pump Station (Main Building)	Lighting - Interior Laurel Run Pump Station	Lighting - Interior Park Street No.1 Pump Station	Lighting - Interior Bossert Pump Station
Life of ECRM (Yrs):	15	15	15	15	15	15
Year	Cash Flow	Cash Flow	Cash Flow	Cash Flow	Cash Flow	Cash Flow
0	($3,776.40)	($271.00)	($5,475.00)	($6,838.50)	($422.60)	($2,742.10)
1	$260.10	$5.40	$242.40	$299.60	$41.40	$87.00
2	$267.90	$5.56	$249.67	$308.59	$42.64	$89.61
3	$275.94	$5.73	$257.16	$317.85	$43.92	$92.30
4	$284.22	$5.90	$264.88	$327.38	$45.24	$95.07
5	$292.74	$6.08	$272.82	$337.20	$46.60	$97.92
6	$301.53	$6.26	$281.01	$347.32	$47.99	$100.86
7	$310.57	$6.45	$289.44	$357.74	$49.43	$103.88
8	$319.89	$6.64	$298.12	$368.47	$50.92	$107.00
9	$329.49	$6.84	$307.07	$379.52	$52.44	$110.21
10	$339.37	$7.05	$316.28	$390.91	$54.02	$113.52
11	$349.55	$7.26	$325.77	$402.64	$55.64	$116.92
12	$360.04	$7.47	$335.54	$414.72	$57.31	$120.43
13	$370.84	$7.70	$345.60	$427.16	$59.03	$124.04
14	$381.97	$7.93	$355.97	$439.97	$60.80	$127.76
15	$393.42	$8.17	$366.65	$453.17	$62.62	$131.60
IRR	3.04%	-9.97%	-2.08%	-2.31%	7.99%	-9.02%
NPV	$11.46	($193.26)	($2,344.90)	($2,475.39)	$160.11	($1,441.11)
AROI	0.22%	-4.60%	-2.54%	-2.29%	3.13%	-3.40%

	Lighting - Exterior Administration Building	Lighting - Exterior Grit and Bar Screen Building	Lighting - Exterior Solids Processing Building	Lighting - Exterior Solids Holding Building	Lighting - Exterior Pump Station 1	Lighting - Exterior Pump Station 2	Lighting - Exterior Chlorine & Sulfur Dioxide Building
Life of ECRM (Yrs):	15	15	15	15	15	15	15
Year	Cash Flow	Cash Flow	Cash Flow	Cash Flow	Cash Flow	Cash Flow	Cash Flow
0	($4,798.50)	($4,758.10)	($5,945.50)	($4,459.30)	($2,972.60)	($2,229.60)	($9,661.40)
1	$272.80	$170.00	$94.10	$70.60	$47.10	$35.30	$152.90
2	$280.98	$175.10	$96.92	$72.72	$48.51	$36.36	$157.49
3	$289.41	$180.35	$99.83	$74.90	$49.97	$37.45	$162.21
4	$298.10	$185.76	$102.83	$77.15	$51.47	$38.57	$167.08
5	$307.04	$191.34	$105.91	$79.46	$53.01	$39.73	$172.09
6	$316.25	$197.08	$109.09	$81.85	$54.60	$40.92	$177.25
7	$325.74	$202.99	$112.36	$84.30	$56.24	$42.15	$182.57
8	$335.51	$209.08	$115.73	$86.83	$57.93	$43.41	$188.05
9	$345.57	$215.35	$119.20	$89.43	$59.66	$44.72	$193.69
10	$355.94	$221.81	$122.78	$92.12	$61.45	$46.06	$199.50
11	$366.62	$228.47	$126.46	$94.88	$63.30	$47.44	$205.48
12	$377.62	$235.32	$130.26	$97.73	$65.20	$48.86	$211.65
13	$388.95	$242.38	$134.16	$100.66	$67.15	$50.33	$218.00
14	$400.62	$249.65	$138.19	$103.68	$69.17	$51.84	$224.54
15	$412.63	$257.14	$142.33	$106.79	$71.24	$53.39	$231.27
IRR	-3.25%	-4.48%	-11.89%	-11.89%	-11.89%	-11.89%	-11.89%
NPV	($2,473.04)	($2,267.37)	($4,575.11)	($3,430.94)	($2,244.40)	($1,715.53)	($7,434.70)
AROI	-2.85%	-3.09%	-5.08%	-5.08%	-5.08%	-5.08%	-5.08%

	Lighting - Exterior Mile Hollow Pump Station (Dog Pound)	Lighting - Exterior Mile Hollow Pump Station (Main Building)	Lighting - Exterior Laurel Run Pump Station	Lighting - Exterior Park Street No.1 Pump Station	Lighting - Exterior Bossert Pump Station	Lighting - Exterior Site & Roadway Lighting
Life of ECRM (Yrs):	15	15	15	15	15	15
Year	Cash Flow	Cash Flow	Cash Flow	Cash Flow	Cash Flow	Cash Flow
0	($35.90)	($107.90)	($77.60)	($1,464.40)	($143.60)	($6,060.50)
1	$57.50	$172.59	$150.80	$36.70	$228.90	$784.50
2	$59.23	$177.74	$155.32	$37.80	$235.77	$808.04
3	$61.00	$183.11	$159.96	$38.94	$242.84	$832.28
4	$62.83	$188.60	$164.78	$40.10	$250.13	$857.24
5	$64.72	$194.26	$169.73	$41.31	$257.63	$882.96
6	$66.66	$200.09	$174.82	$42.55	$265.36	$909.45
7	$68.66	$206.09	$180.04	$43.82	$273.32	$936.73
8	$70.72	$212.26	$185.46	$45.14	$281.52	$964.84
9	$72.84	$218.64	$191.03	$46.49	$289.96	$993.78
10	$75.02	$225.20	$196.75	$47.89	$298.66	$1,023.59
11	$77.27	$231.96	$202.66	$49.32	$307.62	$1,054.30
12	$79.59	$238.92	$208.74	$50.80	$316.85	$1,085.93
13	$81.98	$246.09	$215.00	$52.33	$326.36	$1,118.51
14	$84.44	$253.47	$221.45	$53.90	$336.15	$1,152.06
15	$86.97	$261.07	$228.10	$55.51	$346.23	$1,186.63
IRR	163.17%	163.11%	197.33%	-6.03%	162.19%	12.00%
NPV	$801.46	$2,405.79	$2,116.52	($991.93)	$3,189.70	$5,344.26
AROI	153.50%	153.44%	187.86%	-4.20%	152.51%	6.28%

	Lighting - Interior & Exterior Administration Building	Lighting - Interior & Exterior Grit and Bar Screen Building	Lighting - Interior & Exterior Solids Processing Building	Lighting - Interior & Exterior Solids Holding Building	Lighting - Interior & Exterior Pump Station 1	Lighting - Interior & Exterior Pump Station 2	Lighting - Interior & Exterior Chlorine & Sulfur Dioxide Building
Life of ECRM (Yrs):	15	15	15	15	15	15	15
Year	Cash Flow	Cash Flow	Cash Flow	Cash Flow	Cash Flow	Cash Flow	Cash Flow
0	($26,573.10)	($19,993.70)	($24,247.60)	($10,104.40)	($4,570.60)	($4,794.90)	($13,437.80)
1	$2,316.80	$370.00	$1,462.60	$467.80	$151.10	$222.00	$413.00
2	$2,386.30	$381.10	$1,506.48	$481.83	$155.63	$228.66	$425.39
3	$2,457.89	$392.53	$1,551.67	$496.29	$160.30	$235.52	$438.15
4	$2,531.63	$404.31	$1,598.22	$511.18	$165.11	$242.59	$451.30
5	$2,607.58	$416.44	$1,646.17	$526.51	$170.06	$249.86	$464.84
6	$2,685.81	$428.93	$1,695.55	$542.31	$175.17	$257.36	$478.78
7	$2,766.38	$441.80	$1,746.42	$558.58	$180.42	$265.08	$493.14
8	$2,849.37	$455.05	$1,798.81	$575.33	$185.83	$273.03	$507.94
9	$2,934.85	$468.70	$1,852.78	$592.60	$191.41	$281.22	$523.18
10	$3,022.90	$482.77	$1,908.36	$610.37	$197.15	$289.66	$538.87
11	$3,113.59	$497.26	$1,965.61	$628.68	$203.07	$298.35	$555.04
12	$3,206.99	$512.17	$2,024.58	$647.54	$209.16	$307.30	$571.69
13	$3,303.20	$527.53	$2,085.32	$666.97	$215.43	$316.52	$588.84
14	$3,402.30	$543.36	$2,147.88	$686.98	$221.90	$326.01	$606.50
15	$3,504.37	$559.66	$2,212.31	$707.59	$228.56	$335.79	$624.70
IRR	3.66%	-10.56%	1.36%	-1.08%	-0.24%	-1.70%	-5.86%
NPV	$1,197.81	($14,595.70)	($2,567.60)	($3,191.79)	($2,176.31)	($1,561.79)	($7,423.34)
AROI	0.46%	-4.62%	-0.64%	-1.98%	-3.35%	-2.04%	-3.58%

	Lighting - Interior & Exterior Mile Hollow Pump Station (Dog Pound)	Lighting - Interior & Exterior Mile Hollow Pump Station (Main Building)	Lighting - Interior & Exterior Laurel Run Pump Station	Lighting - Interior & Exterior Park Street No.1 Pump Station	Lighting - Interior & Exterior Bossert Pump Station
Life of ECRM (Yrs):	15	15	15	15	15
Year	Cash Flow	Cash Flow	Cash Flow	Cash Flow	Cash Flow
0	($307.80)	($5,582.90)	($6,916.10)	($1,909.20)	($2,851.00)
1	$62.90	$415.00	$450.30	$78.10	$315.90
2	$64.79	$427.45	$463.81	$80.44	$325.38
3	$66.73	$440.27	$477.72	$82.86	$335.14
4	$68.73	$453.48	$492.05	$85.34	$345.19
5	$70.79	$467.09	$506.82	$87.90	$355.55
6	$72.92	$481.10	$522.02	$90.54	$366.21
7	$75.11	$495.53	$537.68	$93.26	$377.20
8	$77.36	$510.40	$553.81	$96.05	$388.52
9	$79.68	$525.71	$570.43	$98.93	$400.17
10	$82.07	$541.48	$587.54	$101.90	$412.18
11	$84.53	$557.73	$605.17	$104.96	$424.54
12	$87.07	$574.46	$623.32	$108.11	$437.28
13	$89.68	$591.69	$642.02	$111.35	$450.40
14	$92.37	$609.44	$661.28	$114.69	$463.91
15	$95.14	$627.72	$681.12	$118.13	$477.83
IRR	21.78%	3.13%	2.32%	-3.05%	8.87%
NPV	$608.22	$60.60	($358.33)	($771.07)	$1,746.59
AROI	13.77%	0.27%	-0.18%	-2.64%	4.45%

	Motor Upgrades and VFD Additions Grit and Bar Screen Building	Motor Upgrades and VFD Additions Solids Processing Building	Motor Upgrades and VFD Additions Solids Holding Building	Motor Upgrades and VFD Additions Pump Station 1	Motor Upgrades and VFD Additions Pump Station 2	Motor Upgrades and VFD Additions Oudesian Ditch
Life of ECRM (Yrs):	15	15	15	15	15	15
Year	Cash Flow	Cash Flow	Cash Flow	Cash Flow	Cash Flow	Cash Flow
0	($1,960.75)	($64,492.03)	($4,354.81)	($6,910.31)	($1,073.36)	($194,053.50)
1	$331.47	$10,824.12	$258.34	$138.30	$0.54	$73,992.10
2	$341.41	$11,148.84	$266.09	$142.45	$0.56	$76,211.86
3	$351.66	$11,483.31	$274.07	$146.72	$0.57	$78,498.22
4	$362.21	$11,827.81	$282.30	$151.12	$0.59	$80,853.17
5	$373.07	$12,182.64	$290.76	$155.66	$0.61	$83,278.76
6	$384.26	$12,548.12	$299.49	$160.33	$0.63	$85,777.12
7	$395.79	$12,924.57	$308.47	$165.14	$0.64	$88,350.44
8	$407.67	$13,312.30	$317.73	$170.09	$0.66	$91,000.95
9	$419.90	$13,711.67	$327.26	$175.19	$0.68	$93,730.98
10	$432.49	$14,123.02	$337.08	$180.45	$0.70	$96,542.91
11	$445.47	$14,546.71	$347.19	$185.86	$0.73	$99,439.20
12	$458.83	$14,983.11	$357.60	$191.44	$0.75	$102,422.37
13	$472.60	$15,432.61	$368.33	$197.18	$0.77	$105,495.04
14	$486.77	$15,895.58	$379.38	$203.10	$0.79	$108,659.89
15	$501.38	$16,372.45	$390.76	$209.19	$0.82	$111,919.69
IRR	21.33%	17.44%	1.16%	-6.90%	#DIV/0!	40.77%
NPV	$3,166.40	$83,138.19	($1,096.50)	($4,696.23)	($1,065.02)	$883,471.30
AROI	13.29%	10.12%	-0.74%	-4.47%	-6.64%	31.46%

	Motor Upgrades and VFD Additions Mile Hollow Pump Station	Motor Upgrades and VFD Additions Laurel Run Pump Station	Motor Upgrades and VFD Additions Park Street No.1 Pump Station	Motor Upgrades and VFD Additions Bossert Pump Station	Motor Upgrades and VFD Additions All Combined Motors
Life of ECRM (Yrs):	15	15	15	15	15
Year	Cash Flow	Cash Flow	Cash Flow	Cash Flow	Cash Flow
0	($13,076.44)	$0.00	($4,026.75)	($2,543.38)	($293,134.94)
1	$276.46	$0.00	$123.77	$277.54	$85,888.31
2	$284.75	$0.00	$127.48	$285.87	$88,045.24
3	$293.30	$0.00	$131.31	$294.44	$91,190.54
4	$302.10	$0.00	$135.25	$303.28	$93,935.02
5	$311.16	$0.00	$139.30	$312.37	$96,753.69
6	$320.49	$0.00	$143.48	$321.74	$99,656.30
7	$330.11	$0.00	$147.79	$331.40	$102,645.99
8	$340.01	$0.00	$152.22	$341.34	$105,725.36
9	$350.21	$0.00	$156.79	$351.58	$108,897.03
10	$360.72	$0.00	$161.49	$362.13	$112,163.93
11	$371.54	$0.00	$166.34	$372.99	$115,528.84
12	$382.69	$0.00	$171.33	$384.18	$118,994.71
13	$394.17	$0.00	$176.47	$395.71	$122,564.55
14	$405.99	$0.00	$181.76	$407.58	$126,241.49
15	$418.17	$0.00	$187.21	$419.80	$130,028.73
IRR	-8.42%	#NUM!	-5.96%	9.63%	31.98%
NPV	($9,050.12)	$0.00	($2,224.27)	$1,496.48	$858,780.49
AROI	-4.55%	#DIV/0!	-3.59%	4.25%	22.88%

IRR, NPV, AROI - Wind Energy Systems

Financial Calculations

Based on inflation of:	3%
O&M inflation:	3%

Wind Turbine - Minimum Wind Speed			
REIP Incentive:	$18,371		
Year	Energy Savings	REC Sales	Cash Flow
0			($50,118.69)
1	$726	$144	$870
2	$744	$143	$887
3	$763	$142	$905
4	$782	$141	$923
5	$801	$141	$942
6	$821	$140	$961
7	$841	$139	$981
8	$862	$139	$1,001
9	$884	$138	$1,022
10	$906	$137	$1,043
11	$928	$137	$1,065
12	$951	$136	$1,087
13	$975	$135	$1,110
14	$999	$134	$1,134
15	$1,024	$134	$1,158
16	$1,050	$133	$1,183
17	$1,076	$132	$1,208
18	$1,102	$132	$1,234
19	$1,130	$131	$1,261
20	$1,158	$130	$1,288
21	$1,187	$130	$1,316
22	$1,216	$129	$1,345
23	$1,246	$128	$1,375
24	$1,277	$128	$1,406
25	$1,309	$127	$1,436
		IRR	-3.8%
		NPV	-$31,137
		AROI	-2.3%

Wind Turbine - Maximum Wind Speed			
REIP Incentive:	$52,150		
Year	Energy Savings	REC Sales	Cash Flow
0			($16,339.69)
1	$2,062	$407	$2,469
2	$2,113	$405	$2,518
3	$2,165	$403	$2,569
4	$2,219	$401	$2,620
5	$2,274	$399	$2,674
6	$2,331	$397	$2,728
7	$2,389	$395	$2,784
8	$2,448	$393	$2,841
9	$2,509	$391	$2,900
10	$2,571	$389	$2,961
11	$2,635	$388	$3,023
12	$2,701	$386	$3,086
13	$2,768	$384	$3,151
14	$2,836	$382	$3,218
15	$2,907	$380	$3,287
16	$2,979	$378	$3,357
17	$3,053	$376	$3,429
18	$3,129	$374	$3,503
19	$3,207	$372	$3,579
20	$3,287	$370	$3,657
21	$3,368	$369	$3,737
22	$3,452	$367	$3,819
23	$3,538	$365	$3,903
24	$3,626	$363	$3,989
25	$3,716	$361	$4,077
		IRR	18.8%
		NPV	$37,544
		AROI	11.1%

Wind Turbine - Average Wind Speed			
REIP Incentive:	$34,301		
Year	Energy Savings	REC Sales	Cash Flow
0			($34,188.69)
1	$1,268	$268	$1,536
2	$1,300	$267	$1,566
3	$1,332	$265	$1,597
4	$1,365	$264	$1,629
5	$1,399	$263	$1,662
6	$1,434	$261	$1,695
7	$1,469	$260	$1,729
8	$1,506	$259	$1,765
9	$1,543	$257	$1,801
10	$1,582	$256	$1,838
11	$1,621	$255	$1,876
12	$1,661	$254	$1,915
13	$1,702	$252	$1,955
14	$1,745	$251	$1,996
15	$1,788	$250	$2,038
16	$1,832	$249	$2,081
17	$1,878	$247	$2,125
18	$1,925	$246	$2,171
19	$1,973	$245	$2,217
20	$2,022	$244	$2,265
21	$2,072	$242	$2,314
22	$2,123	$241	$2,364
23	$2,176	$240	$2,416
24	$2,230	$239	$2,469
25	$2,286	$238	$2,523
		IRR	2.6%
		NPV	-$758
		AROI	0.5%

	Gardner Denver	Gardner Denver	*Aerzen costs are es* *Aerzen*
	Alt. 1 – New Positive Displacement Blowers	**Alt. 2 – New Positive Displacement Blowers and VFDs**	***Alt. 1a – New Positive Displacement Blowers***
Installation Cost	$159,000	$186,000	*$267,000*
Annual Energy Savings	$14,500	$23,200	*$15,400*
Annual O&M Cost	$6,000	$6,000	*$6,000*
Simple Payback Period, years	18.7	10.8	*28.4*
Lifetime, years	20	20	*20*
Internal Rate of Return (IRR)	6.6%	10.9%	*1.4%*
Net Present Value (NPV)	$57,000	$159,000	*-$38,000*

Energy Savings Breakdown

Centrifugal energy use	375,400		
current Centrifugal estimated use	$44,400	$44,400	$44,400
PD energy use	244,900		
current PD estimated use	$29,000	$29,000	$29,000
current total estimated use	$73,400	$73,400	$73,400
future average HP use	76	65	75
future kWh	504,600	430,500	496,700
future	$58,900	$50,200	$58,000
savings	$14,500	$23,200	$15,400
kWh savings	115,700	189,800	

Year	**PD**	**PD with VFDs**	**PD**
0	($159,000)	($186,000)	($267,000)
1	$14,500	$23,200	$15,400
2	$14,500	$23,200	$15,400
3	$14,500	$23,200	$15,400
4	$14,500	$23,200	$15,400
5	$14,500	$23,200	$15,400
6	$14,500	$23,200	$15,400
7	$14,500	$23,200	$15,400
8	$14,500	$23,200	$15,400
9	$14,500	$23,200	$15,400
10	$14,500	$23,200	$15,400
11	$14,500	$23,200	$15,400
12	$14,500	$23,200	$15,400
13	$14,500	$23,200	$15,400
14	$14,500	$23,200	$15,400
15	$14,500	$23,200	$15,400
16	$14,500	$23,200	$15,400
17	$14,500	$23,200	$15,400
18	$14,500	$23,200	$15,400
19	$14,500	$23,200	$15,400
20	$14,500	$23,200	$15,400
IRR	6.6%	10.9%	1.4%
NPV	$56,723	$159,157	($37,887)

Energy cost= 0.1183 per kw-hr
Energy cost= $34,826.17

	New System
Installation Cost	$144,000
Annual Energy Savings	$39,854
Annual O&M Cost	$1,000
Simple Payback Period, years	3.7
Lifetime, years	20
Internal Rate of Return (IRR)	27.5%
Net Present Value (NPV)	$449,000

assume $1000/yr per system

JET MIXING SYSTEM

Year	New System
0	($144,000)
1	$39,854
2	$39,854
3	$39,854
4	$39,854
5	$39,854
6	$39,854
7	$39,854
8	$39,854
9	$39,854
10	$39,854
11	$39,854
12	$39,854
13	$39,854
14	$39,854
15	$39,854
16	$39,854
17	$39,854
18	$39,854
19	$39,854
20	$39,854
IRR	27.5%
NPV	$448,927

APPENDIX J

WIND TURBINE ENERGY SYSTEM
WIND CAD ANALYSIS

WindCad Turbine Performance Model

BWC EXCEL-S, Grid - Intertie

Tier/neo-SH3055-23-BWC

Prepared For:	**Bordentown Sewerage Authority**
Site Location:	**Bordentown, NJ 08505**
Data Source:	**NASA**
Date:	**6/29/2010**

10 kW

Inputs:

Min. Wind (m/s) =	3.81
Weibull K =	2
Site Altitude (m) =	3
Wind Shear Exp. =	0.180
Anem. Height (m) =	30
Tower Height (m) =	30
Turbulence Factor =	5.0%

Results:

Hub Average Wind Speed (m/s) =	3.81
Air Density Factor =	0%
Average Output Power (kW) =	0.66
Daily Energy Output (kWh) =	15.7
Annual Energy Output (kWh) =	**5,741**
Monthly Energy Output =	478
Percent Operating Time =	51.2%

Weibull Performance Calculations

Wind Speed Bin (m/s)	Power (kW)	Wind Probability (f)	Net kW @ V
1	0.00	10.33%	0.000
2	0.00	17.55%	0.000
3	0.13	20.04%	0.027
4	0.41	18.23%	0.074
5	0.84	13.95%	0.117
6	1.43	9.18%	0.132
7	2.23	5.27%	0.118
8	3.26	2.66%	0.087
9	4.56	1.18%	0.054
10	6.10	0.47%	0.028
11	7.80	0.16%	0.013
12	9.52	0.05%	0.005
13	10.80	0.01%	0.002
14	11.17	0.00%	0.000
15	11.45	0.00%	0.000
16	11.53	0.00%	0.000
17	11.54	0.00%	0.000
18	11.49	0.00%	0.000
19	11.32	0.00%	0.000
20	10.87	0.00%	0.000
2008, BWC	Totals:	99.09%	0.655

Weibull Calculations:
Wind speed probability is calculated as a Weibull curve defined by the average wind speed and a shape factor, K. To facilitate piece-wise integration, the wind speed range is broken down into "bins" of 1 m/s in width (Column 1). For each wind speed bin, instantaneous wind turbine power (W, Column 2)) is multiplied by the Weibull wind speed probability (f, Column 3). This cross product (Net W, Column 4) is the contribution to average turbine power output contributed by wind speeds in that bin. The sum of these contributions is the average power output of the turbine on a continuous, 24 hour, basis.
Best results are achieved using annual or monthly average wind speeds. Use of daily or hourly average speeds is not recommended.

WindCad Turbine Performance Model

BWC EXCEL-S, Grid - Intertie

Tier/neo-SH3055-23-BWC

Prepared For:	**Bordentown Sewerage Authority**
Site Location:	**Bordentown, NJ 08505**
Data Source:	**NASA**
Date:	**6/29/2010**

10 kW

Inputs:

Max. Wind (m/s) =	5.52
Weibull K =	2
Site Altitude (m) =	3
Wind Shear Exp. =	0.180
Anem. Height (m) =	30
Tower Height (m) =	30
Turbulence Factor =	5.0%

Results:

Hub Average Wind Speed (m/s) =	5.52
Air Density Factor =	0%
Average Output Power (kW) =	1.86
Daily Energy Output (kWh) =	44.7
Annual Energy Output (kWh) =	**16,297**
Monthly Energy Output =	1,358
Percent Operating Time =	72.8%

Weibull Performance Calculations

Wind Speed Bin (m/s)	Power (kW)	Wind Probability (f)	Net kW @ V
1	0.00	5.07%	0.000
2	0.00	9.37%	0.000
3	0.13	12.34%	0.016
4	0.41	13.72%	0.056
5	0.84	13.57%	0.113
6	1.43	12.24%	0.175
7	2.23	10.18%	0.227
8	3.26	7.88%	0.257
9	4.56	5.70%	0.260
10	6.10	3.86%	0.236
11	7.80	2.46%	0.192
12	9.52	1.48%	0.141
13	10.80	0.84%	0.090
14	11.17	0.45%	0.050
15	11.45	0.22%	0.026
16	11.53	0.11%	0.012
17	11.54	0.05%	0.006
18	11.49	0.02%	0.002
19	11.32	0.01%	0.001
20	10.87	0.00%	0.000
2008, BWC	Totals:	99.56%	1.860

Weibull Calculations:
Wind speed probability is calculated as a Weibull curve defined by the average wind speed and a shape factor, K. To facilitate piece-wise integration, the wind speed range is broken down into "bins" of 1 m/s in width (Column 1). For each wind speed bin, instantaneous wind turbine power (W, Column 2)) is multiplied by the Weibull wind speed probability (f, Column 3). This cross product (Net W, Column 4) is the contribution to average turbine power output contributed by wind speeds in that bin. The sum of these contributions is the average power output of the turbine on a continuous, 24 hour, basis.
Best results are achieved using annual or monthly average wind speeds. Use of daily or hourly average speeds is not recommended.

WindCad Turbine Performance Model

BWC EXCEL-S, Grid - Intertie

Tier/neo-SH3055-23-BWC

Prepared For:	**Bordentown Sewerage Authority**
Site Location:	**Bordentown, NJ 08505**
Data Source:	**NASA**
Date:	**6/29/2010**

10 kW

Inputs:

Ave. Wind (m/s) =	4.72
Weibull K =	2
Site Altitude (m) =	3
Wind Shear Exp. =	0.180
Anem. Height (m) =	30
Tower Height (m) =	30
Turbulence Factor =	5.0%

Results:

Hub Average Wind Speed (m/s) =	4.72
Air Density Factor =	0%
Average Output Power (kW) =	1.22
Daily Energy Output (kWh) =	29.4
Annual Energy Output (kWh) =	**10,719**
Monthly Energy Output =	893
Percent Operating Time =	64.7%

Weibull Performance Calculations

Wind Speed Bin (m/s)	Power (kW)	Wind Probability (f)	Net kW @ V
1	0.00	6.86%	0.000
2	0.00	12.34%	0.000
3	0.13	15.49%	0.021
4	0.41	16.10%	0.066
5	0.84	14.62%	0.122
6	1.43	11.86%	0.170
7	2.23	8.72%	0.195
8	3.26	5.84%	0.190
9	4.56	3.59%	0.164
10	6.10	2.03%	0.124
11	7.80	1.06%	0.083
12	9.52	0.51%	0.049
13	10.80	0.23%	0.025
14	11.17	0.09%	0.010
15	11.45	0.04%	0.004
16	11.53	0.01%	0.001
17	11.54	0.00%	0.000
18	11.49	0.00%	0.000
19	11.32	0.00%	0.000
20	10.87	0.00%	0.000
2008, BWC	Totals:	99.41%	1.224

Weibull Calculations:
Wind speed probability is calculated as a Weibull curve defined by the average wind speed and a shape factor, K. To facilitate piece-wise integration, the wind speed range is broken down into "bins" of 1 m/s in width (Column 1). For each wind speed bin, instantaneous wind turbine power (W, Column 2)) is multiplied by the Weibull wind speed probability (f, Column 3). This cross product (Net W, Column 4) is the contribution to average turbine power output contributed by wind speeds in that bin. The sum of these contributions is the average power output of the turbine on a continuous, 24 hour, basis.
Best results are achieved using annual or monthly average wind speeds. Use of daily or hourly average speeds is not recommended.

APPENDIX K

WIND TURBINE ENERGY SYSTEM
FINANCIAL ANALYSIS

Bordentown Sewerage Authority
(Minimum Average Site Wind Speed @30m – 8.52 mph)

Annual kWh	5,741
Engineer's Opinion of Probable Cost	$68,489.69

Assumptions

Annual System Degredation	0.50%
Annual Utility Inflation	3.00%
Annual Maintenance Costs	$0.02/kWh Production
REC Factor	$25/MWh Production
REIP Incentive	$3.20/kWh First 16,000 kWh
	$0.50/kWh 16,000 kWh - 750,000 kWh

Year	Utility Price	Annual Wind kWh Production	Utility Savings	Renewable Energy Credits (RECs)	Renewable Energy Incentive Program (REIP)	Maintenance Costs	Annual Cash Flow	Cumulative Cash Flow
1	0.1265	5,741.0	$726.2	$144	$18,371	($115)	$754.9	$754.9
2	0.1303	5,712.3	$744.3	$143	$0	($114)	$772.8	$1,527.8
3	0.1342	5,683.7	$762.8	$142	$0	($114)	$791.2	$2,319.0
4	0.1382	5,655.3	$781.7	$141	$0	($113)	$810.0	$3,129.0
5	0.1424	5,627.0	$801.2	$141	$0	($113)	$829.3	$3,958.3
6	0.1466	5,598.9	$821.1	$140	$0	($112)	$849.1	$4,807.4
7	0.1510	5,570.9	$841.5	$139	$0	($111)	$869.3	$5,676.7
8	0.1556	5,543.1	$862.4	$139	$0	($111)	$890.1	$6,566.8
9	0.1602	5,515.3	$883.8	$138	$0	($110)	$911.4	$7,478.2
10	0.1651	5,487.8	$905.8	$137	$0	($110)	$933.2	$8,411.4
11	0.1700	5,460.3	$928.3	$137	$0	($109)	$955.6	$9,367.0
12	0.1751	5,433.0	$951.4	$136	$0	($109)	$978.5	$10,345.5
13	0.1804	5,405.9	$975.0	$135	$0	($108)	$1,002.0	$11,347.5
14	0.1858	5,378.8	$999.2	$134	$0	($108)	$1,026.1	$12,373.6
15	0.1913	5,351.9	$1,024.1	$134	$0	($107)	$1,050.8	$13,424.4
16	0.1971	5,325.2	$1,049.5	$133	$0	($107)	$1,076.1	$14,500.6
17	0.2030	5,298.5	$1,075.6	$132	$0	($106)	$1,102.1	$15,602.6
18	0.2091	5,272.1	$1,102.3	$132	$0	($105)	$1,128.7	$16,731.3
19	0.2154	5,245.7	$1,129.7	$131	$0	($105)	$1,155.9	$17,887.2
20	0.2218	5,219.5	$1,157.8	$130	$0	($104)	$1,183.9	$19,071.1
21	0.2285	5,193.4	$1,186.5	$130	$0	($104)	$1,212.5	$20,283.6
22	0.2353	5,167.4	$1,216.0	$129	$0	($103)	$1,241.9	$21,525.5
23	0.2424	5,141.6	$1,246.2	$129	$0	($103)	$1,272.0	$22,797.4
24	0.2497	5,115.9	$1,277.2	$128	$0	($102)	$1,302.8	$24,100.2
25	0.2571	5,090.3	$1,309.0	$127	$0	($102)	$1,334.4	$25,434.7

Bordentown Sewerage Authority
(Maximum Average Site Wind Speed @30m - 12.35 mph)

Annual kWh	16,297
Engineer's Opinion of Probable Cost	$68,489.69

Assumptions

Annual System Degredation	0.50%
Annual Utility Inflation	3.00%
Annual Maintenance Costs	$0.02/kWh Production
REC Factor	$25/MWh Production
REIP Incentive	$3.20/kWh First 16,000 kWh
	$0.50/kWh 16,000 kWh - 750,000 kWh

Year	Utility Price	Annual Wind kWh Production	Utility Savings	Renewable Energy Credits (RECs)	Renewable Energy Incentive Program (REIP)	Maintenance Costs	Annual Cash Flow	Cumulative Cash Flow
1	0.1265	16,297.0	$2,061.6	$407	$52,150	($326)	$2,143.1	$2,143.1
2	0.1303	16,215.5	$2,112.8	$405	$0	($324)	$2,193.9	$4,336.9
3	0.1342	16,134.4	$2,165.3	$403	$0	($323)	$2,246.0	$6,582.9
4	0.1382	16,053.8	$2,219.1	$401	$0	($321)	$2,299.4	$8,882.3
5	0.1424	15,973.5	$2,274.3	$399	$0	($319)	$2,354.1	$11,236.4
6	0.1466	15,893.6	$2,330.8	$397	$0	($318)	$2,410.2	$13,646.7
7	0.1510	15,814.2	$2,388.7	$395	$0	($316)	$2,467.8	$16,114.4
8	0.1556	15,735.1	$2,448.1	$393	$0	($315)	$2,526.7	$18,641.1
9	0.1602	15,656.4	$2,508.9	$391	$0	($313)	$2,587.2	$21,228.3
10	0.1651	15,578.1	$2,571.2	$389	$0	($312)	$2,649.1	$23,877.4
11	0.1700	15,500.2	$2,635.1	$388	$0	($310)	$2,712.6	$26,590.1
12	0.1751	15,422.7	$2,700.6	$386	$0	($308)	$2,777.7	$29,367.8
13	0.1804	15,345.6	$2,767.7	$384	$0	($307)	$2,844.4	$32,212.2
14	0.1858	15,268.9	$2,836.5	$382	$0	($305)	$2,912.8	$35,125.1
15	0.1913	15,192.6	$2,907.0	$380	$0	($304)	$2,982.9	$38,108.0
16	0.1971	15,116.6	$2,979.2	$378	$0	($302)	$3,054.8	$41,162.8
17	0.2030	15,041.0	$3,053.3	$376	$0	($301)	$3,128.5	$44,291.3
18	0.2091	14,965.8	$3,129.1	$374	$0	($299)	$3,204.0	$47,495.2
19	0.2154	14,891.0	$3,206.9	$372	$0	($298)	$3,281.3	$50,776.6
20	0.2218	14,816.5	$3,286.6	$370	$0	($296)	$3,360.7	$54,137.2
21	0.2285	14,742.4	$3,368.2	$369	$0	($295)	$3,442.0	$57,579.2
22	0.2353	14,668.7	$3,452.0	$367	$0	($293)	$3,525.3	$61,104.5
23	0.2424	14,595.4	$3,537.7	$365	$0	($292)	$3,610.7	$64,715.2
24	0.2497	14,522.4	$3,625.6	$363	$0	($290)	$3,698.3	$68,413.5
25	0.2571	14,449.8	$3,715.7	$361	$0	($289)	$3,788.0	$72,201.4

Bordentown Sewerage Authority
(Average Site Wind Speed @30m - 10.56 mph)

Annual kWh	10,719
Engineer's Opinion of Probable Cost	$68,489.69

Assumptions

Annual System Degredation	0.50%
Annual Utility Inflation	3.00%
Annual Maintenance Costs	$0.02/kWh Production
REC Factor	$25/MWh Production
REIP Incentive	$3.20/kWh First 16,000 kWh
	$0.50/kWh 16,000 kWh - 750,000 kWh

Year	Utility Price	Annual Wind kWh Production	Utility Savings	Renewable Energy Credits (RECs)	Renewable Energy Incentive Program (REIP)	Maintenance Costs	Annual Cash Flow	Cumulative Cash Flow
1	0.1183	10,719.0	$1,268.1	$268	$34,301	($214)	$1,321.7	$1,321.7
2	0.1218	10,665.4	$1,299.6	$267	$0	($213)	$1,352.9	$2,674.5
3	0.1255	10,612.1	$1,331.9	$265	$0	($212)	$1,384.9	$4,059.5
4	0.1293	10,559.0	$1,365.0	$264	$0	($211)	$1,417.8	$5,477.2
5	0.1331	10,506.2	$1,398.9	$263	$0	($210)	$1,451.4	$6,928.6
6	0.1371	10,453.7	$1,433.6	$261	$0	($209)	$1,485.9	$8,414.5
7	0.1413	10,401.4	$1,469.3	$260	$0	($208)	$1,521.3	$9,935.8
8	0.1455	10,349.4	$1,505.8	$259	$0	($207)	$1,557.5	$11,493.3
9	0.1499	10,297.7	$1,543.2	$257	$0	($206)	$1,594.7	$13,088.0
10	0.1544	10,246.2	$1,581.5	$256	$0	($205)	$1,632.8	$14,720.8
11	0.1590	10,194.9	$1,620.8	$255	$0	($204)	$1,671.8	$16,392.6
12	0.1638	10,144.0	$1,661.1	$254	$0	($203)	$1,711.8	$18,104.5
13	0.1687	10,093.3	$1,702.4	$252	$0	($202)	$1,752.9	$19,857.3
14	0.1737	10,042.8	$1,744.7	$251	$0	($201)	$1,794.9	$21,652.3
15	0.1789	9,992.6	$1,788.1	$250	$0	($200)	$1,838.0	$23,490.3
16	0.1843	9,942.6	$1,832.5	$249	$0	($199)	$1,882.2	$25,372.5
17	0.1898	9,892.9	$1,878.0	$247	$0	($198)	$1,927.5	$27,300.0
18	0.1955	9,843.4	$1,924.7	$246	$0	($197)	$1,973.9	$29,273.9
19	0.2014	9,794.2	$1,972.5	$245	$0	($196)	$2,021.5	$31,295.4
20	0.2074	9,745.2	$2,021.6	$244	$0	($195)	$2,070.3	$33,365.7
21	0.2137	9,696.5	$2,071.8	$242	$0	($194)	$2,120.3	$35,486.0
22	0.2201	9,648.0	$2,123.3	$241	$0	($193)	$2,171.5	$37,657.5
23	0.2267	9,599.8	$2,176.0	$240	$0	($192)	$2,224.0	$39,881.5
24	0.2335	9,551.8	$2,230.1	$239	$0	($191)	$2,277.9	$42,159.4
25	0.2405	9,504.0	$2,285.5	$238	$0	($190)	$2,333.0	$44,492.4

APPENDIX L

FACILITY DATA FORMS

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APPENDIX C - FACILITY DATA FORM

*Complete one Facility Data Form for **each** building. If you are seeking to energy audit multiple buildings, complete one Facility Data Form for each.*

FACILITY INFORMATION

Please complete the information below for this specific facility that is seeking enrollment in the Program.

Facility Name & Address
Bordentown Sewerage Authority, 954 Farnsworth Avenue, P.O. Box 396, Bordentown, NJ 08505
Facility's Description
Administration Building B-1: Administration Offices, Laboratory and 3 Bay Garage

Total Square Footage	**Year Built**
5,288	1990
Number of Hours Occupied per Week	**Number of Employees**
56	16

ENERGY DATA

Please complete the energy information below for the most recent 12 month period available. In order to gain a complete picture of the facility's energy use, be sure to include all types of energy used by the facility. Do not include vehicle fuel.

The Data Below is for the 12 Month Period: 12/24/07 to 12/21/08

ELECTRICITY

Multiple Buildings on this Electric Meter

Electric Utility Name & Account Number(s)
PSE&G 62-659-951-54

Annual kWh Use	**Annual Electricity Cost**
201,610	$318,614.64
Max Summer kW	**Max Winter kW**
348.60	462

NATURAL GAS

Natural Gas Utility Name & Account Number(s)	
PSE&G 62-659-951-54	
Annual Use in Therms	**Annual Natural Gas Cost**
6,169.988	$8,933.14

FUEL OIL

Fuel Oil Utility Name & Account Number(s)	
Annual Use in Gallons	**Annual Fuel Oil Cost**

PROPANE

Propane Utility Name & Account Number(s)	
Annual Use in Gallons	**Annual Propane Cost**

OTHER

In this section please indicate any other fuel type that the facility uses, such as: solar energy, wind energy, bio-fuel, cogeneration, fuel cells.

Other Fuel Type:	
Annual Energy Use (indicate units)	**Annual Energy Cost**

STAFF USE ONLY

Date Received: Project No.:

APPENDIX C - FACILITY DATA FORM

*Complete one Facility Data Form for **each** building. If you are seeking to energy audit multiple buildings, complete one Facility Data Form for each.*

FACILITY INFORMATION

Please complete the information below for this specific facility that is seeking enrollment in the Program.

Facility Name & Address	
Bordentown Sewerage Authority, 954 Farnsworth Avenue, P.O. Box 396, Bordentown, NJ 08505	
Facility's Description Grit and Bar Screen Building B-2: Bar Screen/Grit Removal	
Total Square Footage 1,388	**Year Built** 1990
Number of Hours Occupied per Week 20	**Number of Employees** 1 - 5

ENERGY DATA

Please complete the energy information below for the most recent 12 month period available. In order to gain a complete picture of the facility's energy use, be sure to include all types of energy used by the facility. Do not include vehicle fuel.

The Data Below is for the 12 Month Period: ___/___/_____ to ___/___/_____

ELECTRICITY

Included with Administration Building

Electric Utility Name & Account Number(s)	
PSE&G 62-659-951-54	
Annual kWh Use	**Annual Electricity Cost**
Max Summer kW	**Max Winter kW**

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APPENDIX C - FACILITY DATA FORM

*Complete one Facility Data Form for **each** building. If you are seeking to energy audit multiple buildings, complete one Facility Data Form for each.*

FACILITY INFORMATION

Please complete the information below for this specific facility that is seeking enrollment in the Program.

Facility Name & Address	
Bordentown Sewerage Authority, 954 Farnsworth Avenue, P.O. Box 396, Bordentown, NJ 08505	
Facility's Description Solids Processing Building B-3: Belt Filter Press, Air Compressors and Pumping Capabilities	
Total Square Footage 12,216	**Year Built** 1990
Number of Hours Occupied per Week 59	**Number of Employees** 1 - 2

ENERGY DATA

Please complete the energy information below for the most recent 12 month period available. In order to gain a complete picture of the facility's energy use, be sure to include all types of energy used by the facility. Do not include vehicle fuel.

The Data Below is for the 12 Month Period: ___/___/_____ to ___/___/_____

ELECTRICITY Included with Administration Building

Electric Utility Name & Account Number(s) PSE&G 62-659-951-54	
Annual kWh Use	**Annual Electricity Cost**
Max Summer kW	**Max Winter kW**

APPENDIX C - FACILITY DATA FORM

*Complete one Facility Data Form for **each** building. If you are seeking to energy audit multiple buildings, complete one Facility Data Form for each.*

FACILITY INFORMATION

Please complete the information below for this specific facility that is seeking enrollment in the Program.

Facility Name & Address	
Bordentown Sewerage Authority, 954 Farnsworth Avenue, P.O. Box 396, Bordentown, NJ 08505	
Facility's Description Solids Holding Building EB-1: Sludge Storage, Aeration Supply - Compressors	
Total Square Footage 2,200	**Year Built** Unknown, Upgraded in 1990
Number of Hours Occupied per Week 7	**Number of Employees** 1 - 2

ENERGY DATA

Please complete the energy information below for the most recent 12 month period available. In order to gain a complete picture of the facility's energy use, be sure to include all types of energy used by the facility. Do not include vehicle fuel.

The Data Below is for the 12 Month Period: ___/___/_____ to ___/___/_____

ELECTRICITY Included with Administration Building

Electric Utility Name & Account Number(s) PSE&G 62-659-951-54	
Annual kWh Use	**Annual Electricity Cost**
Max Summer kW	**Max Winter kW**

APPENDIX C - FACILITY DATA FORM

*Complete one Facility Data Form for **each** building. If you are seeking to energy audit multiple buildings, complete one Facility Data Form for each.*

FACILITY INFORMATION

Please complete the information below for this specific facility that is seeking enrollment in the Program.

Facility Name & Address Bordentown Sewerage Authority, 954 Farnsworth Avenue, P.O. Box 396, Bordentown, NJ 08505	
Facility's Description Pump Station 1 PS-1: Screw Pump Station and Pumping Raw Wastewater	
Total Square Footage 468	**Year Built** 1990
Number of Hours Occupied per Week 7	**Number of Employees** 1 - 2

ENERGY DATA

Please complete the energy information below for the most recent 12 month period available. In order to gain a complete picture of the facility's energy use, be sure to include all types of energy used by the facility. Do not include vehicle fuel.

The Data Below is for the 12 Month Period: ___/___/_____ to ___/___/_____

ELECTRICITY Included with Administration Building

Electric Utility Name & Account Number(s) PSE&G 62-659-951-54	
Annual kWh Use	**Annual Electricity Cost**
Max Summer kW	**Max Winter kW**

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njcleanenergy.com

APPENDIX C - FACILITY DATA FORM

*Complete one Facility Data Form for **each** building. If you are seeking to energy audit multiple buildings, complete one Facility Data Form for each.*

FACILITY INFORMATION

Please complete the information below for this specific facility that is seeking enrollment in the Program.

Facility Name & Address	
Bordentown Sewerage Authority, 954 Farnsworth Avenue, P.O. Box 396, Bordentown, NJ 08505	
Facility's Description Pump Station 2 PS-2: Pumping of Sludges and Recirculation	
Total Square Footage 840	**Year Built** 1990
Number of Hours Occupied per Week 7	**Number of Employees** 1 - 2

ENERGY DATA

Please complete the energy information below for the most recent 12 month period available. In order to gain a complete picture of the facility's energy use, be sure to include all types of energy used by the facility. Do not include vehicle fuel.

The Data Below is for the 12 Month Period: ___/___/_____ to ___/___/_____

ELECTRICITY Included with Administration Building

Electric Utility Name & Account Number(s)	
PSE&G 62-659-951-54	
Annual kWh Use	**Annual Electricity Cost**
Max Summer kW	**Max Winter kW**

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APPENDIX C - FACILITY DATA FORM

*Complete one Facility Data Form for **each** building. If you are seeking to energy audit multiple buildings, complete one Facility Data Form for each.*

FACILITY INFORMATION

Please complete the information below for this specific facility that is seeking enrollment in the Program.

Facility Name & Address	
Bordentown Sewerage Authority, 954 Farnsworth Avenue, P.O. Box 396, Bordentown, NJ 08505	
Facility's Description Chlorine and Sulfur Dioxide Building B-4: Chlorine Feed and Sulfur Dioxide Feed (Disinfection)	
Total Square Footage 1,040	**Year Built** 1990
Number of Hours Occupied per Week 14	**Number of Employees** 1 - 2

ENERGY DATA

Please complete the energy information below for the most recent 12 month period available. In order to gain a complete picture of the facility's energy use, be sure to include all types of energy used by the facility. Do not include vehicle fuel.

The Data Below is for the 12 Month Period: ___/___/_____ to ___/___/_____

ELECTRICITY

Included with Administration Building

Electric Utility Name & Account Number(s) PSE&G 62-659-951-54	
Annual kWh Use	**Annual Electricity Cost**
Max Summer kW	**Max Winter kW**

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APPENDIX C - FACILITY DATA FORM

*Complete one Facility Data Form for **each** building. If you are seeking to energy audit multiple buildings, complete one Facility Data Form for each.*

FACILITY INFORMATION

Please complete the information below for this specific facility that is seeking enrollment in the Program.

Facility Name & Address
Bordentown Sewerage Authority, Mile Hollow Pumping Station, W. Stanton Ave., Bordentown, NJ 08505
Facility's Description
Main Building: Pumping of Raw Wastewater; Closed Wastewater Treatment Plant

Total Square Footage	**Year Built**
3,096	1960
Number of Hours Occupied per Week	**Number of Employees**
7	2

ENERGY DATA

Please complete the energy information below for the most recent 12 month period available. In order to gain a complete picture of the facility's energy use, be sure to include all types of energy used by the facility. Do not include vehicle fuel.

The Data Below is for the 12 Month Period: 12/27/07 to 12/21/08

ELECTRICITY

Electric Utility Name & Account Number(s)
PSE&G 62-678-357-58

Annual kWh Use	**Annual Electricity Cost**
88,410	$13,416.85
Max Summer kW	**Max Winter kW**
29.10	30.30

APPENDIX C - FACILITY DATA FORM

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FACILITY INFORMATION

Please complete the information below for this specific facility that is seeking enrollment in the Program.

Facility Name & Address	
Bordentown Sewerage Authority, Bossert Pumping Station, Eaton Rd., Bordentown, NJ 08505	
Facility's Description	
Pumping Raw Sewage - 2 Floors	
Total Square Footage	**Year Built**
928	1966
Number of Hours Occupied per Week	**Number of Employees**
5	2

ENERGY DATA

Please complete the energy information below for the most recent 12 month period available. In order to gain a complete picture of the facility's energy use, be sure to include all types of energy used by the facility. Do not include vehicle fuel.

The Data Below is for the 12 Month Period: 12/10/07 to 12/09/08

ELECTRICITY

Electric Utility Name & Account Number(s)	
PSE&G 62-224-180-58	
Annual kWh Use	**Annual Electricity Cost**
37,728	$5,318.55
Max Summer kW	**Max Winter kW**
10.80	15.40

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APPENDIX C - FACILITY DATA FORM

*Complete one Facility Data Form for **each** building. If you are seeking to energy audit multiple buildings, complete one Facility Data Form for each.*

FACILITY INFORMATION

Please complete the information below for this specific facility that is seeking enrollment in the Program.

Facility Name & Address
Bordentown Sewerage Authority, Laurel Run Pumping Station, Georgetown Rd., Bordentown, NJ 08505
Facility's Description
Pumping Station (Raw Wastewater) - Closed Wastewater Treatment Plant

Total Square Footage	**Year Built**
3,024	1985
Number of Hours Occupied per Week	**Number of Employees**
5	2

ENERGY DATA

Please complete the energy information below for the most recent 12 month period available. In order to gain a complete picture of the facility's energy use, be sure to include all types of energy used by the facility. Do not include vehicle fuel.

The Data Below is for the 12 Month Period: 12/24/07 to 12/21/08

ELECTRICITY

Electric Utility Name & Account Number(s)
PSE&G 62-673-024-58

Annual kWh Use	**Annual Electricity Cost**
46,720	$6,886.91
Max Summer kW	**Max Winter kW**
12.00	21.60

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APPENDIX C - FACILITY DATA FORM

*Complete one Facility Data Form for **each** building. If you are seeking to energy audit multiple buildings, complete one Facility Data Form for each.*

FACILITY INFORMATION

Please complete the information below for this specific facility that is seeking enrollment in the Program.

Facility Name & Address	
Bordentown Sewerage Authority, Mile Hollow Pumping Station, W. Stanton Ave., Bordentown, NJ 08505	
Facility's Description Dog Pound: Once Housed the Bordentown Township Dog Pound	
Total Square Footage 432	**Year Built** Unknown
Number of Hours Occupied per Week 7	**Number of Employees** 2

ENERGY DATA

Please complete the energy information below for the most recent 12 month period available. In order to gain a complete picture of the facility's energy use, be sure to include all types of energy used by the facility. Do not include vehicle fuel.

The Data Below is for the 12 Month Period: 12/27/07 to 12/21/08

ELECTRICITY Included with Main Building Information

Electric Utility Name & Account Number(s) PSE&G 62-678-357-58	
Annual kWh Use	**Annual Electricity Cost**
Max Summer kW	**Max Winter kW**

APPENDIX C - FACILITY DATA FORM

*Complete one Facility Data Form for **each** building. If you are seeking to energy audit multiple buildings, complete one Facility Data Form for each.*

FACILITY INFORMATION

Please complete the information below for this specific facility that is seeking enrollment in the Program.

Facility Name & Address	
Bordentown Sewerage Authority, Park Street #1 Pumping Station, Park St., Bordentown, NJ 08505	
Facility's Description Pumping Raw Sewage	
Total Square Footage 425	**Year Built** 1908
Number of Hours Occupied per Week 5	**Number of Employees** 2

ENERGY DATA

Please complete the energy information below for the most recent 12 month period available. In order to gain a complete picture of the facility's energy use, be sure to include all types of energy used by the facility. Do not include vehicle fuel.

The Data Below is for the 12 Month Period: 12/24/07 to 12/21/08

ELECTRICITY

Electric Utility Name & Account Number(s)	
PSE&G 62-661-229-60	
Annual kWh Use 50,828	**Annual Electricity Cost** $8,451.57
Max Summer kW 30.8	**Max Winter kW** 19.9

APPENDIX M

MOTOR AND VFG UPGRADES ANALYSIS

Appendix M

Standard Efficiency				VFD			Premium Efficiency																	
Description	Location	Horsepower	Efficiency	Equipment Cost	Labor Cost	Total Cost	Equipment Cost	Efficiency	Labor Cost	Total Cost	Total (VFD+PE Motor)	Markup[3]	Inflated Total (VFD+PE Motor)	Cost Difference	Yearly Runtime	kW Usage Prior to Upgrades	kWh/Yr Prior to Upgrades	Energy Cost Prior to Upgrades	kW Usage with VFD & Motor Upgrades	kWh/Yr After Upgrades	Annual Energy Cost After Upgrades	Energy Savings	Incentive	Simple Payback (Years)
Blower #1	Grit Building	7.5	86.5				$510.0	91.00	124.00	634.00	634.00	277.38	$911	$911.4	4380	6.47	28330.8	$3,351.5	6.15	26929.78	$3,185.79	$165.73	$81.00	5.01
Blower #2	Grit Building	7.5	86.5				$510.0	91.00	124.00	634.00	634.00	277.38	$911	$911.4	4380	6.47	28330.8	$3,351.5	6.15	26929.78	$3,185.79	$165.73	$81.00	5.01
Polymer Feed Pump #1	Solids Processing Building	5	84				$405.0	89.50	115.00	520.00	520.00	227.50	$748	$747.5	2190	4.44	9724.6	$1,150.4	4.17	9127.04	$1,079.73	$70.70	$54.00	9.81
Polymer Feed Pump #2	Solids Processing Building	5	84				$405.0	89.50	115.00	520.00	520.00	227.50	$748	$747.5	2190	4.44	9724.6	$1,150.4	4.17	9127.04	$1,079.73	$70.70	$54.00	9.81
Polymer Feed Pump #3	Solids Processing Building	5	84				$405.0	89.50	115.00	520.00	520.00	227.50	$748	$747.5	2190	4.44	9724.6	$1,150.4	4.17	9127.04	$1,079.73	$70.70	$54.00	9.81
Sludge Thickener Polymer Transfer Pump	Solids Processing Building	5	84				$405.0	92.40	115.00	520.00	520.00	227.50	$748	$747.5	0	0.00	0.0	$0.0	0.00	0.00	$0.00	$0.00	$0.00	N/A
Belt Filter Press Polymer Transfer Pump	Solids Processing Building	5	84				$405.0	92.40	115.00	520.00	520.00	227.50	$748	$747.5	2190	4.44	9724.6	$1,150.4	4.04	8840.58	$1,045.84	$104.58	$54.00	6.63
Splitter Box 3 Transfer Pump	Solids Processing Building	5	84				$405.0	92.40	115.00	520.00	520.00	227.50	$748	$747.5	0	0.00	0.0	$0.0	0.00	0.00	$0.00	$0.00	$0.00	N/A
Liquid Loader Pump #1	Solids Processing Building	20	91.7				$1,025.0	92.40	199.00	1224.00	1224.00	535.50	$1,760	$1,759.5	0	0.00	0.0	$0.0	0.00	0.00	$0.00	$0.00	$0.00	N/A
Liquid Loader Pump #2	Solids Processing Building	20	91.7				$1,025.0	92.40	199.00	1224.00	1224.00	535.50	$1,760	$1,759.5	0	0.00	0.0	$0.0	0.00	0.00	$0.00	$0.00	$0.00	N/A
Macerator Pump #1	Solids Processing Building	7.5	89.5				$510.0	91.00	124.00	634.00	634.00	277.38	$911	$911.4	2190	6.25	13690.6	$1,619.6	6.15	13464.89	$1,592.90	$26.70	$81.00	31.10
Macerator Pump #2	Solids Processing Building	7.5	89.5				$510.0	91.00	124.00	634.00	634.00	277.38	$911	$911.4	2190	6.25	13690.6	$1,619.6	6.15	13464.89	$1,592.90	$26.70	$81.00	31.10
Macerator Pump #3	Solids Processing Building	7.5	89.5				$510.0	91.00	124.00	634.00	634.00	277.38	$911	$911.4	2190	6.25	13690.6	$1,619.6	6.15	13464.89	$1,592.90	$26.70	$81.00	31.10
Blower #1	Solids Processing Building	50	93				$1,950.0	94.50	325.00	2275.00	2275.00	995.31	$3,270	$3,270.3	2903	40.11	116432.2	$13,773.9	39.47	114584.02	$13,555.29	$218.63	$198.00	14.05
Blower #2	Solids Processing Building	50	93				$1,950.0	94.50	325.00	2275.00	2275.00	995.31	$3,270	$3,270.3	1087	40.11	43596.9	$5,157.5	39.47	42904.87	$5,075.65	$81.87	$198.00	37.53
Blower #3	Solids Processing Building	50	93				$1,950.0	94.50	325.00	2275.00	2275.00	995.31	$3,270	$3,270.3	2596	40.11	104119.1	$12,317.3	39.47	102466.46	$12,121.78	$195.51	$198.00	15.71
Secondary Scum Pump #1	Solids Processing Building	5	85.5				$405.0	89.50	115.00	520.00	520.00	227.50	$748	$747.5	182	4.36	794.0	$93.9	4.17	758.50	$89.73	$4.20	$54.00	165.20
Secondary Scum Pump #2	Solids Processing Building	5	85.5				$405.0	89.50	115.00	520.00	520.00	227.50	$748	$747.5	182	4.36	794.0	$93.9	4.17	758.50	$89.73	$4.20	$54.00	165.20
Waste Activated Sludge Pump #1	Solids Processing Building	5	88.5					88.50		0.00	0.00	0.00	$0	$0.0	130	4.21	547.9	$64.8	4.21	547.91	$64.82	$0.00	$0.00	N/A
Waste Activated Sludge Pump #2	Solids Processing Building	5	88.5					88.50		0.00	0.00	0.00	$0	$0.0	134	4.21	564.8	$66.8	4.21	564.77	$66.81	$0.00	$0.00	N/A
Return Activated Sludge Pump #1	Solids Processing Building	20	89.5				$1,025.0	90.20	199.00	1224.00	1224.00	535.50	$1,760	$1,759.5	2883	16.67	48060.7	$5,685.6	16.54	47687.76	$5,641.46	$44.12	$113.00	37.32
Return Activated Sludge Pump #2	Solids Processing Building	20	89.5				$1,025.0	90.20	199.00	1224.00	1224.00	535.50	$1,760	$1,759.5	2797	16.67	46627.1	$5,516.0	16.54	46265.23	$5,473.18	$42.81	$113.00	38.46
Return Activated Sludge Pump #3	Solids Processing Building	20	89.5				$1,025.0	90.20	199.00	1224.00	1224.00	535.50	$1,760	$1,759.5	2308	16.67	38475.3	$4,551.6	16.54	38176.67	$4,516.30	$35.32	$113.00	46.61
Utility Water Pump #1	Solids Processing Building	40	91.7	$3,950	$1,550	$5,500	$1,900.0	94.10	259.00	2159.00	7659.00	3350.81	$11,010	$11,009.8	0	0.00	0.0	$0.0	0.00	0.00	$0.00	$0.00	$0.00	N/A
Utility Water Pump #2	Solids Processing Building	40	91.7	$3,950	$1,550	$5,500	$1,900.0	94.10	259.00	2159.00	7659.00	3350.81	$11,010	$11,009.8	4226	32.54	137517.8	$16,268.4	23.78	100507.84	$11,890.08	$4,378.28	$162.00	2.48
Utility Water Pump #3	Solids Processing Building	40	91.7	$3,950	$1,550	$5,500	$1,900.0	94.10	259.00	2159.00	7659.00	3350.81	$11,010	$11,009.8	4194	32.54	136476.5	$16,145.2	23.78	99746.78	$11,800.04	$4,345.13	$162.00	2.50
Utility Water Booster Pump #1	Solids Processing Building	7.5	88.5	$1,300	$775	$2,075		88.50		0.00	2075.00	907.81	$2,983	$2,982.8	2190	6.32	13845.3	$1,637.9	4.74	10383.94	$1,228.42	$409.47	$0.00	7.28
Utility Water Booster Pump #2	Solids Processing Building	7.5	88.5	$1,300	$775	$2,075		88.50		0.00	2075.00	907.81	$2,983	$2,982.8	2190	6.32	13845.3	$1,637.9	4.74	10383.94	$1,228.42	$409.47	$0.00	7.28
Blower	Solids Holding Building	60	94.5				$2,825.0	95.00	370.00	3195.00	3195.00	1397.81	$4,593	$4,592.8	8760	47.37	414918.1	$49,084.8	47.12	412734.32	$48,826.47	$258.34	$234.00	16.87
Raw Sewage Screw Lift Pump #1	Pump Station #1	30	93.6				$1,450.0	94.10	215.00	1665.00	1665.00	728.44	$2,393	$2,393.4	0	0.00	0.0	$0.0	0.00	0.00	$0.00	$0.00	$0.00	N/A
Raw Sewage Screw Lift Pump #2	Pump Station #1	30	93.6				$1,450.0	94.10	215.00	1665.00	1665.00	728.44	$2,393	$2,393.4	5665	23.91	135451.6	$16,023.9	23.78	134731.88	$15,938.78	$85.14	$135.00	26.53
Raw Sewage Screw Lift Pump #3	Pump Station #1	30	93.6				$1,450.0	94.10	215.00	1665.00	1665.00	728.44	$2,393	$2,393.4	3537	23.91	84570.6	$10,004.7	23.78	84121.21	$9,951.54	$53.16	$135.00	42.48
Primary Scum Pump #1	Pump Station #2	5	89.5					89.50		0.00	0.00	0.00	$0	$0.0	182	4.17	758.5	$125.4	4.17	758.50	$125.38	$0.00	$0.00	N/A
Primary Scum Pump #2	Pump Station #2	5	89.5					89.50		0.00	0.00	0.00	$0	$0.0	182	4.17	758.5	$125.4	4.17	758.50	$125.38	$0.00	$0.00	N/A
Primary Sludge Pump #1	Pump Station #2	10	90.2				$620.0	91.70	129.00	749.00	749.00	327.69	$1,077	$1,076.7	12	8.27	99.2	$16.4	8.14	97.62	$16.14	$0.27	$90.00	3676.81
Primary Sludge Pump #2	Pump Station #2	10	90.2				$620.0	91.70	129.00	749.00	749.00	327.69	$1,077	$1,076.7	12	8.27	99.2	$16.4	8.14	97.62	$16.14	$0.27	$90.00	3676.81
Oxidation Ditch Motors #1	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	8760	20.05	175671.0	$29,038.4	14.94	130908.65	$21,639.20	$7,399.21	$117.00	1.09
Oxidation Ditch Motors #2	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	8760	20.05	175671.0	$29,038.4	14.94	130908.65	$21,639.20	$7,399.21	$117.00	1.09
Oxidation Ditch Motors #3	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	8760	20.05	175671.0	$29,038.4	14.94	130908.65	$21,639.20	$7,399.21	$117.00	1.09
Oxidation Ditch Motors #4	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	8760	20.05	175671.0	$29,038.4	14.94	130908.65	$21,639.20	$7,399.21	$117.00	1.09
Oxidation Ditch Motors #5	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	8760	20.05	175671.0	$29,038.4	14.94	130908.65	$21,639.20	$7,399.21	$117.00	1.09
Oxidation Ditch Motors #6	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	8760	20.05	175671.0	$29,038.4	14.94	130908.65	$21,639.20	$7,399.21	$117.00	1.09
Oxidation Ditch Motors #7	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	8760	20.05	175671.0	$29,038.4	14.94	130908.65	$21,639.20	$7,399.21	$117.00	1.09
Oxidation Ditch Motors #8	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	8760	20.05	175671.0	$29,038.4	14.94	130908.65	$21,639.20	$7,399.21	$117.00	1.09
Oxidation Ditch Motors #9	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	8760	20.05	175671.0	$29,038.4	14.94	130908.65	$21,639.20	$7,399.21	$117.00	1.09
Oxidation Ditch Motors #10	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	8760	20.05	175671.0	$29,038.4	14.94	130908.65	$21,639.20	$7,399.21	$117.00	1.09
Oxidation Ditch Motors #11	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	0	0.00	0.0	$0.0	0.00	0.00	$0.00	$0.00	$0.00	N/A
Oxidation Ditch Motors #12	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	0	0.00	0.0	$0.0	0.00	0.00	$0.00	$0.00	$0.00	N/A
Oxidation Ditch Motors #13	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	0	0.00	0.0	$0.0	0.00	0.00	$0.00	$0.00	$0.00	N/A
Oxidation Ditch Motors #14	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	0	0.00	0.0	$0.0	0.00	0.00	$0.00	$0.00	$0.00	N/A
Oxidation Ditch Motors #15	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	0	0.00	0.0	$0.0	0.00	0.00	$0.00	$0.00	$0.00	N/A
Oxidation Ditch Motors #16	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	0	0.00	0.0	$0.0	0.00	0.00	$0.00	$0.00	$0.00	N/A
Oxidation Ditch Motors #17	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	0	0.00	0.0	$0.0	0.00	0.00	$0.00	$0.00	$0.00	N/A
Oxidation Ditch Motors #18	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	0	0.00	0.0	$0.0	0.00	0.00	$0.00	$0.00	$0.00	N/A
Oxidation Ditch Motors #19	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	0	0.00	0.0	$0.0	0.00	0.00	$0.00	$0.00	$0.00	N/A
Oxidation Ditch Motors #20	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	0	0.00	0.0	$0.0	0.00	0.00	$0.00	$0.00	$0.00	N/A
Oxidation Ditch Motors #21	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	0	0.00	0.0	$0.0	0.00	0.00	$0.00	$0.00	$0.00	N/A
Oxidation Ditch Motors #22	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	0	0.00	0.0	$0.0	0.00	0.00	$0.00	$0.00	$0.00	N/A
Oxidation Ditch Motors #23	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	0	0.00	0.0	$0.0	0.00	0.00	$0.00	$0.00	$0.00	N/A
Oxidation Ditch Motors #24	Oxidation Ditch	25	93	$2,675	$1,550	$4,225	$1,275.0	93.60	207.00	1482.00	5707.00	2496.81	$8,204	$8,203.8	0	0.00	0.0	$0.0	0.00	0.00	$0.00	$0.00	$0.00	N/A
Pump #1	Mile Hollow Pump Station	60	93.6				$2,825.0	95.00	370.00	3195.00	3195.00	1397.81	$4,593	$4,592.8	730	47.82	34909.0	$6,521.0	47.12	34394.53	$6,424.90	$96.10	$234.00	45.36
Pump #2	Mile Hollow Pump Station	60	93.6				$2,825.0	95.00	370.00	3195.00	3195.00	1397.81	$4,593	$4,592.8	730	47.82	34909.0	$6,521.0	47.12	34394.53	$6,424.90	$96.10	$234.00	45.36
Pump #3	Mile Hollow Pump Station	60	93.6				$2,825.0	95.00	370.00	3195.00	3195.00	1397.81	$4,593	$4,592.8	730	47.82	34909.0	$5,718.1	47.12	34394.53	$5,633.82	$84.27	$234.00	51.73
Pump #1	Laurel Run Pump Station	20	93					93.00		0.00	0.00	0.00	$0	$0.0	475	16.04	7620.4	$1,248.2	16.04	7620.43	$1,248.23	$0.00	$0.00	N/A
Pump #2	Laurel Run Pump Station	20	93					93.00		0.00	0.00	0.00	$0	$0.0	1095	16.04	17567.1	$2,877.5	16.04	17567.10	$2,877.49	$0.00	$0.00	N/A
Pump #1	Park Street No.1 Pump Station	25	92.4				$1,275.0	93.60	207.00	1482.00	1482.00	648.38	$2,130	$2,130.4	1460	20.18	29468.6	$4,827.0	19.93	29090.81	$4,765.08	$61.88	$117.00	32.53
Pump #2	Park Street No.1 Pump Station	25	92.4				$1,275.0	93.60	207.00	1482.00	1482.00	648.38	$2,130	$2,130.4	1460	20.18	29468.6	$4,827.0	19.93	29090.81	$4,765.08	$61.88	$117.00	32.53
Pump #1	Bossert Pump Station	15	89.5				$795.0	93.00	162.00	957.00	957.00	418.69	$1,376	$1,375.7	1581	12.50	19766.9	$3,237.8	12.03	19023.00	$3,115.97	$121.85	$104.00	10.44
Pump #2	Bossert Pump Station	15	89.5				$795.0	93.00	162.00	957.00	957.00	418.69	$1,376	$1,375.7	2020	12.50	25255.6	$4,136.9	12.03	24305.16	$3,981.19	$155.69	$104.00	8.17

Note:
1. VFD energy savings is attributed to a 6.25% reduction effective motor horsepower.
2. This piece of equipment has an existing VFD, this calculation only takes into account upgrading the pump to a higher efficiency model.
3. Markup amount includes 15% overhead & profit, and 25% contigency, see Appendix G for a complete breakdown.
4. Motor efficiencies marked in red were estimated with NEMA standard efficiency tables.

Bordentown Plant Rate per kWh	$0.1183
Mile Hollow Pump Station Rate per kWh	$0.1653
Park Street Pump Station Rate per kWh	$0.1868
Bossert Pump Station Rate per kWh	$0.1638

For All Motors Represented:

Material & Labor	$299,748.94
Total Incentives	$6,622.00
Savings	$85,964.31
Payback	**3.41**
Energy Savings (KW)	80.98
Energy Savings (kWh)	547,087.97

	Total Materials After Markup	Base Motor Cost	Base Motor Labor	Base VFD Cost	Base VFD Labor	Savings	Incentive	Payback	Materials - Incentive		Energy Savings (kWh)	Energy Savings (KW)
Grit and Bar Screen Building	$1,822.75	$1,020.00	$248.00	$0.00	$0.00	$331.47	$162.00	5.0	$1,660.75		2801.94	0.64
Solids Processing Building	$66,317.63	$21,445.00	$4,039.00	$14,450.00	$6,200.00	$10,824.12	$1,824.00	6.0	$64,493.63		89313.42	24.90
Solids Holding Building	$4,592.81	$2,825.00	$370.00	$0.00	$0.00	$258.34	$234.00	16.9	$4,358.81		2183.78	0.25
Pump Station 1	$7,180.31	$4,350.00	$645.00	$0.00	$0.00	$138.30	$270.00	50.0	$6,910.31		1169.09	0.25
Pump Station 2	$2,153.38	$1,240.00	$258.00	$0.00	$0.00	$0.54	$180.00	3,676.8	$1,973.38		3.25	0.27
Oxidation Ditch	$196,891.50	$30,600.00	$4,968.00	$64,200.00	$37,200.00	$73,992.10	$2,808.00	2.6	$194,083.50		447623.14	51.10
Mile Hollow Pump Station	$13,778.44	$8,475.00	$1,110.00	$0.00	$0.00	$276.46	$702.00	47.3	$13,076.44		1543.34	2.11
Laurel Run Pump Station	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	N/A	$0.00		0.00	0.00
Park Street Pump Station	$4,260.75	$2,550.00	$414.00	$0.00	$0.00	$123.77	$234.00	32.5	$4,026.75		755.61	0.52
Bossert Pump Station	$2,751.38	$1,590.00	$324.00	$0.00	$0.00	$277.54	$208.00	9.2	$2,543.38		1694.40	0.94
Total	**$299,748.94**	**$74,095.00**	**$12,376.00**	**$64,200.00**	**$37,200.00**	**$86,222.65**	**$6,622.00**		**$293,126.94**		**547087.97**	**80.98**

APPENDIX N

JET MIXING / AERATION SYSTEM

MIXING SYSTEMS, INC. **Tel: 937-435-7227**
7058 Corporate Way, Dayton, OH 45459-4243 Fax: 937-435-9200
♦ *Web site: www.mixing.com* ♦ *E-mail: mixing@mixing.com* ♦

June 10, 2010

CDM
110 Fieldcrest Ave
6 th floor
Edison, NJ 08837
Ph:732-225-7000x54750 Yanoseyea@cdm.com
:
ATTN: MS. ELIZABETH YANOSEY

REF: BORDENTOWN SEWAGE AUTHORITY - SLUDGE TANKS
MIXING SYSTEMS REF: 101 NEW 10

Elizabeth:

Mixing Systems, Inc. is pleased to propose a jet mixing / aeration system for two sludge holding tanks with Bordentown Sewage Authority.

PROPOSED SYSTEM

The proposed system for each tank shall consist of one twelve jet eddy jet mixer / aerator and one 20 HP external recirculation pump. The existing blowers can be modified to draw 27 BHP with a 30 HP motor.

Each tank will require approximately 250 SCFM air at 8.3 psig. The oxygen transfer under these conditions is 70 lb/hr.

When the digester is full, the proposed jet mixer is capable of transferring 135 lb/hr SOR at 500 SCFM air at full digester.

DESIGN SUMMARY

Number of sludge holding tanks	2
Tank diameter	35 ft
Water depth	7 to 19 ft
Design D.O.	2 mg/l
Solids concentration	1 %
Tank volume	137,000 gallons
Jet mixers / aerators required per tank	1
Jets per mixer / aerator	12
Recirculation pumps per tank	1
Pump GPM	2400
Pump TDH	20 ft
Pump BHP	18
Motor HP	20
Oxygen transfer at 250 SCFM air (19 ft swd)	70 lb/hr
Oxygen transfer at 500 SCFM air (19 ft swd)	135 lb/hr
Blower SCFM	500
Blower psig	8.3

Blower BHP	27
Blower motor HP	30
Liquid line size	10 inches
Air line size	4 inches
Total pump BHP	18
Total blower BHP (at 500 SCFM)	27
Total pump and blower BHP	45 BHP
Mixing intensity	328 BHP / MG
Time for one tank turnover	10 minutes
Price per tank of one jet mixer / aerator, one 20 HP pump, in-basin air and liquid lines and supports	$35,000 per tank.
Air blower (if required)	$15,000 per tank.

Liz, have a great vacation. Please call me if you have any questions.

Very truly yours,

Prakash R. Bathija, P.E.
Mixing Systems, Inc.

PRB/me

ADVANTAGES OF JET AERATORS OVER OTHER AERATORS

COST EFFECTIVE AND ENERGY SAVING JET AERATION SYSTEM

Mixing Systems, Inc. (MSI) jet aeration system is a submerged aeration system which produces fine gas bubbles and enhances mixing between the gas and liquid phases. The fine bubble and intimate contacting results in increased absorption efficiency. Less operating horsepower is required which results in substantial energy savings.

ELIMINATES SPLASHING

The jet aeration system are installed near the bottom of the tank and do not splash wastewater into the atmosphere. Surface aerators splash wastewater into the atmosphere to transfer oxygen. In this process the surface aerators strip VOCs into the atmosphere. Due to the low quantity of air required by the jet aeration system this VOC stripping to the atmosphere is minimized.

LOWER OFF GASES

In deep aeration tanks the oxygen absorption efficiency is in the range of 25 to 80 percent. Therefore, for the same oxygen transfer, the amount of air required with the jet aeration system in 25 to 50 percent of what is required with conventional diffused aeration systems. In instances where the off gases from the aeration tanks have to be treated, such as thermal oxidation, lower quantities of air need to be treated with jet aeration systems.

DEEP TANK OPERATION

Jet aeration systems have been operated in tanks with liquid depths of 20 to 65 feet. Absorption efficiencies in the range of 25 to 80 percent are achievable in deep tanks. This high efficiency is the result of the following factors that enhance mixing and mass transfer:

- Smaller bubble produced in deep tanks due to higher partial pressures.
- Air bubble stays longer in wastewater in deep tanks

INCREASED MECHANICAL RELIABILITY OVER MECHANICAL AERATORS

The history of maintenance of high and low speed surface aerators shows a substantial annual outlay for routine maintenance and replacement parts. Increased problems are associated with the greater sizes of the high speed unit. Major problems and failures occur with the motor seals and bearings due to close proximity to the waste as well as plugging of close clearance of the impeller and chamber with debris. In colder climates, frequent winter time shutdown is common due to freezing.

INCREASED RELIABILITY OVER FINE BUBBLE DIFFUSED AIR SYSTEMS

Fine bubble diffused air systems are adversely affected by wastewater conditions. Actual performance in wastewater is significantly reduced by the presence of detergents in the waste which affect oxygen transfer rates. Carbonate build up in the diffuser elements results in progressive deterioration in the performance. Periodic system shutdown is required for system cleaning and repair. In addition, electrostatic precipitators and/or extra filter media are required for the air filtering system. MSI jet systems are not affected by detergents and there are no small passages or orifices to clog. In addition, the pneumatic backflush system assures high efficiency.

EFFICIENT MIXING

Each jet discharges a high energy stream of small air bubbles and recirculated mixed liquor in the bottom region of the aeration basin. The combined action of the horizontally directed jet flow, and the rising air plume provide mixing in the aeration tank and minimizes settling of biological solids.

INDEPENDENT CONTROL OF MIXING AND OXYGEN TRANSFER

Mixing Systems, Inc. jet aeration system has recirculation pumps to maintain mixing action, air flow rates can be regulated to produce oxygen transfer rates to meet process requirements. During non peak periods, air flow rates can be reduced and substantial power savings achieved. The air flow can be turned off completely to achieve denitrification and phosphorus removal. the tanks can also be run in the aerobic/anoxic modes to control nitrification/denitrification and carboneous removal.

LOW MAINTENANCE

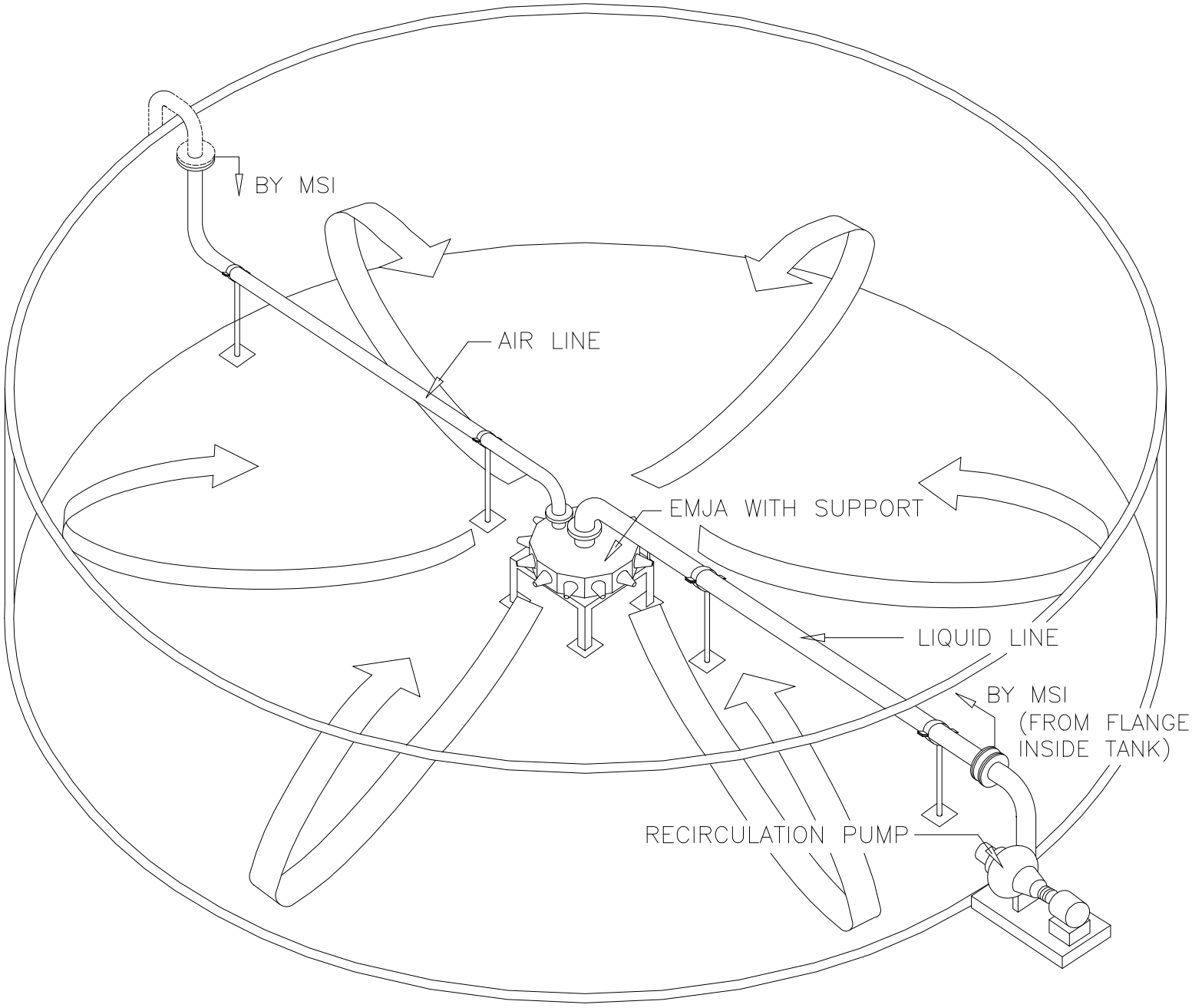
MSI systems are made from quality components with high reliability. The jets are fabricated from abrasion resistant fiberglass reinforced plastic (FRP) and the distribution chamber is constructed from either FRP or heavy duty, epoxy coated steel fabricated for durability. The pneumatic backflush system minimizes in-basin maintenance by cleaning the jets of accumulation of debris which may impair operating efficiency.

SOLIDS HANDLING CAPACITY

The jet aeration system as proposed will pass 2.2 inch solids. The fine bubble is produced by the hydraulic shear in the jet nozzle. The fine bubbles produced by the jet aerator are in the range of 0.1 to 0.4 mm.

TOXICITY REMOVAL

The jet aeration systems have been found to be efficient mixing devices. Experience has shown that jet aeration systems result in high toxicity removal efficiencies in refinery waste waters.



SINGLE EDDY MIX JET AERATOR
IN A ROUND TANK

MIXING SYSTEMS, INC.
7058 CORPORATE WAY
DAYTON, OH 45459
PH: 937-435-7227
FAX: 937-435-9200