MADISON-CHATHAM JOINT MEETING

FINAL

Energy Audit Report
Molitor Water Pollution Control Facility

December 2010






listen. think. deliver.

CDM®

Contents

Executive Summary

As part of an initiative to reduce energy cost and consumption, the Madison-Chatham Joint Meeting (MCJM) has secured the services of Camp Dresser and McKee (CDM) to perform an energy audit for the Molitor Water Pollution Control Facility (WPCF) in an effort to develop comprehensive Energy Conservation and Retrofit Measures (ECRMs).

CDM's energy audit team visited the WPCF on May 27th, 2010. As a result of the site visit and evaluation of the historical energy usage of the facilities, CDM was successful in identifying various treatment processes and building system components that present feasible opportunities for energy savings measures.

CDM has also evaluated the potential for renewable energy technologies to be implemented at the Water Pollution Control Facility to offset the facility's electrical energy usage. Specifically, the use of solar electric photovoltaic panels, wind turbines, and methods to increase digester gas production to fuel the existing engine driven blowers and boiler were investigated.

Not all ECRMs identified as a result of the energy audit are recommended. ECRMs must be economically feasible to be recommended to the MCJM 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. ECRMs with a payback period of 20 years or less are recommended.

The payback periods presented herein do not account for additional cost savings associated with participation in the Clean Energy Programs, Pay for Performance Program or the Direct Install Program. The eligibility requirements for participation in these programs and the associated cost savings from these Programs are discussed in Section 7.2.

Historical Energy Usage

Table ES-1 summarizes the historical energy usage at the WPCF as presented in Section 3. These values can serve as a bench-marking tool, along with the building profiles that have been established through the EPA's Portfolio Manager Program, 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 (April 2009 – March 2010)						
	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
WPCF	2,213,387	386	462	77,163	$334,742	$69,350

Recommended ECRMs

The following table, Table ES-2, presents the ranking of recommended ECRMs identified for treatment processes and equipment and various building system components at the WPCF. Additional ECRMs were identified and evaluated, as discussed in Section 4; however, were not recommended due to longer payback periods. Table ES-2 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 their simple payback period.

Table ES-2 Ranking of Recommended ECRM's					
Overall Ranking (Based on Simple Payback)	ECRM	Total Cost(1)	Project Annual Energy Savings (kWh or Therms)	Projected Annual Fiscal Savings(2)	Simple Payback Period (years)
Water Pollution Control Facility Process Improvements/Additions					
1	Aerations Basins, New Motors and VFDs for Mechanical Aerators	$85,076	134,036 kWh	$15,293	**5.6**
2	Oxidation Ditches, New Motors and VFDs for Existing Aerators	$383,460	398,943 kWh	$56,400	**6.8**

3	Digesters	$409,656	34,039 Therms	$47,030	**8.7**
4	New Solar Powered Aerators and DO Control System	$354,954	190,885 kWh	$28,900	**13.5**
HVAC Improvements					
1	Steam Pipe Insulation	$955	1,379 Therms	$1,475	**0.6**
Lighting Systems					
1	Waste Oil Building – Total Lighting	$78	1,034 kWh	$204	**0.4**
2	Administration Building – Total Lighting	$14,732	11,213 kWh	$1,956	**7.5**
3	Blower Building – Interior Lighting	$1,539	891 kWh	$158	**9.7**
4	Roadway and Process - Exterior Lighting	$15,853	10,534 kWh	$1,610	**9.8**
5	Sludge Handling Building – Total Lighting	$12,351	7,249 kWh	$1,240	**10.0**
6	Clarifier #3 & #4 Building – Interior Lighting	$4,463	1,509 kWh	$269	**16.6**
Electric Motor Replacements					
1	Final Clarifier Building #1 & #2 – Motor & VFD Upgrades	$8,586	19,001 kWh	$2,877	**3.0**
2	Outdoor Process – Motor & VFD Upgrades	$12,867	23,214 kWh	$3,515	**3.7**
3	Final Clarifier Building #3 & #4 – Motor & VFD Upgrades	$17,772	26,096 kWh	$3,951	**4.5**

1. 'Total Cost' takes into account any applicable rebates.

2. 'Annual Fiscal Savings' takes into account operation and maintenance cost savings, if any.

Table ES-3 summarizes the Total Engineer's Opinion of Construction Cost, annual energy savings, projected annual energy cost savings, and average simple payback based on the implementation of all the recommended ECRMs at the facility.

Table ES-3
Recommended ECRM's – WPCF(1)

Total Cost	Project Annual Energy Savings (kWh or Therms)	Projected Annual Fiscal Savings	Average Simple Payback Period (years)
$1,322,342	824,605 kWh 35,418 Therms	$116,373 electricity $48,505 natural gas	**8.0**

Note 1: Does not include energy savings associated with solar or wind energy system, with the exception of the solar powered aerators for the Stabilization Pond, which are included.

Renewable Energy Technologies

- **Solar Energy**

Section 4.5.1 of the report provides for an economic evaluation of a PV solar system that was evaluated to be installed at WPCF. The evaluation covered the economic feasibility of WPCF 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-4, it would benefit Madison-Chatham Joint Meeting to further investigate the installation of a solar energy system at the WPCF. This is primarily based on the initial upfront capital investment required for a solar energy system installation and the combined 16.6 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 4.5.1.

Table ES-4 includes a simple payback analysis for the installation of a solar energy system at WPCF. Refer to Appendix K for a more detailed solar financing spreadsheet.

Table ES-4
Simple Payback Analysis for Solar Energy System

Parameter	Solar
Engineer's Opinion of Probable Cost	$15,248,668
1st Year Production	1,601,345 kWh
Annual Electric Savings	$242,443.6
Annual Estimated SREC Revenue	$677,369
Project Simple Payback	**16.6 Years**

- **Wind Power Generation**

Section 4.5.3 of the report provides for an economic evaluation of a wind turbine energy system recommended to be installed at WPCF. The evaluation covered the economic feasibility of MCJM furnishing and installing a wind turbine energy system under a typical construction contract and to assume full responsibility of the operation of such a system.

CDM completed a preliminary desktop wind power production analysis and has concluded that an additional on-site feasibility study is warranted and recommended. Such a feasibility study would include the installation of a wind test rig to measure actual wind conditions as observed on-site.

Wind power as a renewable energy source also qualifies for Renewable Energy Certificates (REC's). The prevailing energy market, REIP and REC's comprise the major factors influencing a wind turbine energy system installation. Other options, such as government bonds or a Power Purchase Agreement are potentially available and can assist with the financing of this project.

Table ES-5 includes a simple payback analysis for the installation of a wind turbine energy system at the WPCF. Refer to Appendix M for a more detailed wind energy financing spreadsheet.

Table ES-5: Ranking of Energy Savings Measures Summary – Wind Turbine Energy System

Table ES-5 Ranking of Energy Savings Measures Summary – Wind Turbine Energy System			
Parameter	**Wind Turbine (Minimum Site Wind Speed – 8.52 mph)**	**Wind Turbine (Average Site Wind Speed – 10.56 mph)**	**Wind Turbine (Maximum Site Wind Speed – 12.35 mph)**
Engineer's Opinion of Probable Cost	$68,489.69	$68,489.69	$68,489.69
Renewable Energy Incentive Program**	-$18,198.00	-$33,978	-$51,661.00
Total Cost	$50,291.69	$34,511.69	$16,282.69
1st Year Production	5,687 kWh	10,618 kWh	16,144 kWh
Annual Estimated Electric Savings	$861.0	$1,607.6	$2,444.2
Annual Estimated REC Revenue	$142.00	$265.00	$407.00
Project Simple Payback	**50.1 Years**	**18.4 Years**	**5.9 Years**

Section 1
Introduction

1.1 General

As part of an initiative to reduce energy cost and consumption, the Madison-Chatham Joint Meeting (MCJM) has secured the services of Camp Dresser and McKee (CDM) to perform an energy audit for their wastewater treatment plant 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 1.1-1 is a schematic representation of the phases utilized by CDM to prepare the Energy Audit Report.

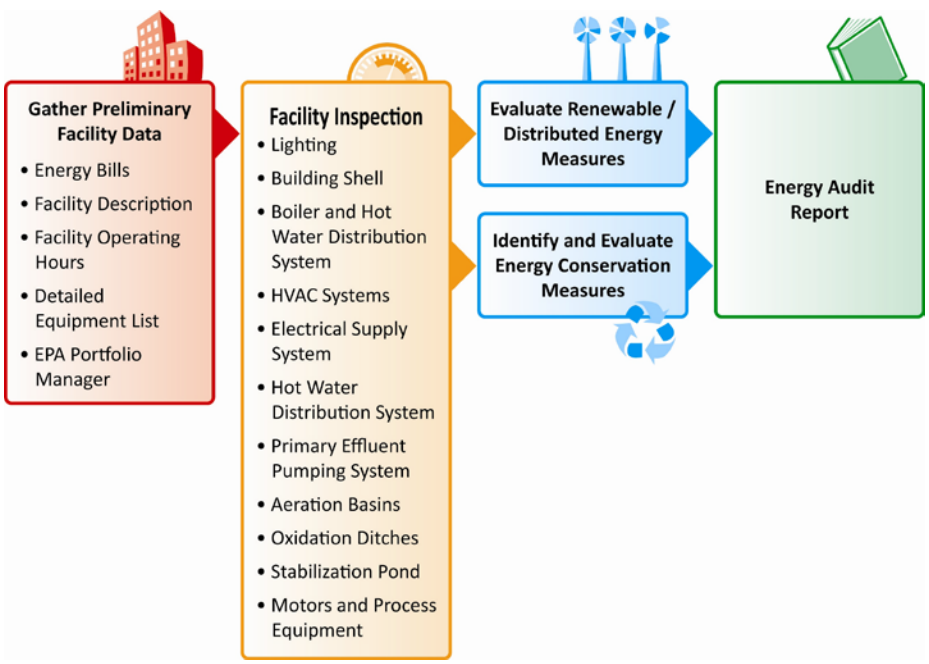


Figure 1.1-1: Energy Audit Phases

1.2 Background

The Madison-Chatham Joint Meeting (MCJM) is a Joint Meeting providing wastewater treatment service to the Borough of Madison and the Borough of Chatham.

The MCJM maintains and operates the Molitor Water Pollution Control Facility (WPCF). The WPCF is an activated sludge wastewater treatment plant providing advanced secondary treatment and is located in the Borough of Chatham, Morris County, New Jersey. The plant operates under NJPDES Permit No. NJ0024937 and discharges directly to the Passaic River. The MCJM also maintains and operates the main 42-inch interceptor that collects and conveys the wastewater from the Boroughs to the WPCP. The individual Boroughs are responsible for maintaining and operating the branch sanitary sewer collection systems and associated pump stations.

The wastewater treatment processes at the WPCF provide primary and secondary treatment for the removal of BOD_5, ammonia, and suspended solids in the wastewater flow. Wastewater entering the WPCF is first conveyed by gravity to the grit chamber and manual bar rack at the Inlet Facilities. The wastewater is then conveyed by gravity to three Primary Clarifiers. The Primary Effluent Pump Station then pumps the primary clarifier effluent to Distribution Box No. 1, where 43% of the wastewater flow is diverted to the Aeration Basins and 57% of the wastewater flow is conveyed to Distribution Box No. 2 for flow distribution to two Oxidation Ditches (Oxidation Ditch A and Oxidation Ditch B).

The Aeration Basins consist of a total of 11 bays. Two of the bays, however, have been removed from service, leaving the remaining nine bays in service for treatment. The wastewater is first conveyed to three bays that are aerated via mechanical aerators. The wastewater is then conveyed to the remaining six bays that have a course bubble diffused air system. The mixed liquor from the Aeration Basins is then conveyed by gravity to Control Chamber No. 1, where the wastewater is conveyed to two final clarifiers (Final Clarifier No. 1 and Final Clarifier No. 2). The final clarifier effluent is then routed to the Stabilization Pond Influent Chamber and then conveyed to the Stabilization Pond in order to raise the dissolved oxygen level.

The mixed liquor that is conveyed from the Oxidation Ditches is then routed back to Distribution Box No. 2, for discharge to Final Clarifier No. 3 and Final Clarifier No. 4. The final clarifier effluent is then conveyed to Control Chamber No. 2 and then to the Stabilization Pond Influent Chamber, where the wastewater is then routed to the Stabilization Pond.

Following passage through the Stabilization Pond, the wastewater is conveyed to the Chlorine Contact Tanks for disinfection utilizing sodium hypochlorite. The treated effluent is then dechlorinated utilizing sodium bisulfite prior to ultimate discharge to the Passaic River.

Raw primary sludge from the Primary Clarifiers is conveyed to two Primary Anaerobic Digesters. The primary digested sludge is then sent to the Secondary Digester. The supernatant is conveyed to the Inlet Facilities and the digested sludge is dewatered prior to being hauled for ultimate disposal.

The waste activated sludge from Final Clarifier No. 1 and Final Clarifier No. 2 (following the Aeration Basins) is conveyed to the Inlet Facilities of the plant and is recycled into the wastewater process stream. The waste activated sludge from Final Clarifier No. 3 and Final Clarifier No. 4 (following the Oxidation Ditches) is thickened via gravity belt thickeners prior to being blended with the Primary Sludge at the Primary Digesters.

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 on a case-by-case basis.

The purpose of this energy audit is to identify the various critical processes and pumping systems within the wastewater treatment plant facility that are major consumers of electrical energy and are clear candidates for energy savings measures. In addition, potential energy producing systems such as the existing combined heat and power co-generation and new 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:

<u>Water Pollution Control Plant</u>

- Primary Effluent Pump Station;
- Aeration System and Controls;

- Oxidation Ditches and Controls;
- Stabilization Pond and Controls;
- Anaerobic Digestion System;
- Building HVAC Systems; and
- Building Lighting Systems.

A feasibility analysis of the existing internal combustion engines and a new solar energy and wind power generation system at the wastewater treatment plant was conducted. A discussion on these technologies is included in Section 4 Energy Conservation and Retrofit Measures (ECRM).

In addition to identifying ECRMs and the potential for on-site energy generation, alternate third party suppliers were not contacted, because MCJM is currently utilizing an alternate third party supplier. This is discussed further in Section 5.

Section 2
Facility Description

2.1 Water Pollution Control Plant

The Madison-Chatham Joint Meeting owns and operates the Molitor Water Pollution Control Plant (WPCP) located on North Passaic Avenue in the Borough of Chatham, Morris County, New Jersey. The WPCF is an activated sludge wastewater treatment plant providing advanced secondary treatment and is located in the Borough of Chatham, Morris County, New Jersey. The WPCF treats wastewater from the Borough of Madison and the Borough of Chatham. The plant operates under NJPDES Permit No. NJ0024937, is rated at an annual average flow of 3.5 MGD, and discharges directly to the Passaic River. The individual Boroughs are responsible for maintaining and operating the sanitary sewer collection systems and associated pump stations.

The existing treatment plant utilizes the Activated Sludge Process. Wastewater enters the Inlet Facilities of the WPCF via the main 42-inch interceptor that collects and conveys the wastewater from the Boroughs to the WPCF. The Inlet Facilities consist of a bar rack, an 18-inch Parshall Flume, and a grit chamber. The wastewater is conveyed by gravity from the Inlet Facilities to the Primary Clarifiers. Following the three Primary Clarifiers, the wastewater flow is split with 43% of the flow being conveyed to the Aeration Basins and 57% of the flow being routed to two parallel Oxidation Ditches. The Aeration Basins and Oxidation Ditches serve as treatment units for the reduction of BOD_5 and ammonia from the raw wastewater. Dual Final Clarifiers follow both the Aeration Basins and the Oxidation Ditches (for a total of four Final Clarifiers) and operate in parallel for settling of mixed liquor suspended solids created in the aeration tanks. Chemical addition is currently not used to remove phosphorus from the wastewater. However, provisions exist to enable the plant to begin utilizing chemical addition, if needed. The final clarifier effluent is then conveyed to the Stabilization Pond for raising of the dissolved oxygen concentration of the wastewater prior to the wastewater being conveyed to the Chlorine Contact Tanks. At the Chlorine Contact Tanks, sodium hypochlorite is added for disinfection. The treated effluent is then dechlorinated utilizing sodium bisulfite prior to ultimate discharge to the Passaic River.

Raw primary sludge from the Primary Clarifiers is conveyed to two Primary Anaerobic Digesters. The primary digested sludge is then sent to the Secondary Digester. The supernatant is conveyed to the Inlet Facilities and the digested sludge is dewatered prior to being hauled for ultimate disposal.

The waste activated sludge from Final Clarifier No. 1 and Final Clarifier No. 2 (following the Aeration Basins) is conveyed to the Inlet Facilities of the plant where it is recycled into the wastewater process stream. The waste activated sludge from Final Clarifier No. 3 and Final Clarifier No. 4 (following the Oxidation Ditches) is thickened via gravity belt thickeners prior to being blended with the Primary Sludge at the Primary Digesters.

2.1.1 Inlet Facilities

The inlet facilities consist of a manually cleaned bar rack, and a parshall flume that is rated for a peak flow of 15.8 MGD, and a mechanically cleaned grit chamber that is 16-feet in diameter with 1.7 feet of sidewater depth.

2.1.2 Primary Clarifiers

The three primary clarifiers are each 35 feet in diameter with 9.0 feet of sidewater depth and operate in parallel. The primary clarifiers are equipped with mechanical sludge removal and scum removal mechanisms. Primary clarifier effluent is transferred by gravity to the Primary Clarifier Effluent Pump Station. Primary sludge is conveyed to two Primary Anaerobic Digesters. The primary digested sludge is then sent to the Secondary Digester. The supernatant is conveyed to the Inlet Facilities and the digested sludge is dewatered prior to being hauled for ultimate disposal.

2.1.3 Primary Effluent Pump Station

Primary clarifier effluent flows by gravity to the Primary Effluent Pump Station, which consists of three-30 Hp, variable speed, dry pit submersible pumps. The Primary Effluent Pumps convey the wastewater to Distribution Box No. 1. At Distribution Box No. 1, 43% of the wastewater flow is diverted to the Aeration Basins and 57% of the wastewater flow is diverted to Distribution Box No. 2. Distribution Box No. 2 then splits the wastewater flow to Oxidation Ditch A and Oxidation Ditch B, which operate in parallel.

2.1.4 Aeration Basins

The Aeration Basins consist of a total of 11 bays. There are three bays that are mechanically aerated; one bay is 30 feet wide by 30 feet long by 14 feet sidewater depth and two bays are 30 feet wide by 30 feet long by 10 feet sidewater depth. There are also six bays that are each 10 feet wide by 105 feet long by 9½ feet sidewater depth and contain a course bubble diffuser aeration system. There are also two additional bays that are each 32 feet wide by 25½ feet long by 11.2 feet sidewater depth that have been removed from service. The Aeration Basins operate in series and are a conventional activated sludge system with single stage nitrification for the reduction of BOD_5 and ammonia for 43% of the WPCP's total flow. The remaining 57% of the WPCP's flow is diverted to the Oxidation Ditches, as further discussed herein.

Mechanical Aerator

The three mechanically aerated bays each have one mechanical aerator rated at 15 Hp each. The course bubble diffuser aeration system that is installed in the six bays following the mechanically aerated bays includes seven drop legs per bay. Each drop leg includes ten course bubble diffusers for a total of 70 diffusers per bay and a total of 420 diffusers in all six bays.

There are a total of four blowers that can supply air to the course bubble diffused aeration system. Two of the blowers are engine driven Roots rotary positive displacement blowers, rated at a volume of 4,445 SCFM and a discharge pressure of 6.0 psig each. There are also two 75 Hp electric rotary blowers, as manufactured by Kaeser Compressors, rated at a volume of 1,926 SCFM and a discharge pressure of 6.0 psig. The speed of the electric blowers can be manually adjusted by Variable Frequency Drives. The plant typically runs the three mechanical aerators continuously and either one of the engine driven blowers or both electric blowers at 90% capacity.

2.1.5 Final Clarifier Nos. 1 & 2

The mixed liquor from the Aeration Basins is conveyed to Final Clarifier No. 1 and Final Clarifier No. 2, which operate in parallel and are each 65 feet in diameter with 10.0 feet of sidewater depth.

Waste activated sludge settled in the clarifiers is discharged to the Inlet Facilities at the head of the WPCP. The sludge is then co- settled with solids from the raw sewage in the primary clarifiers.

Return activated sludge from the clarifiers is conveyed back to the Aeration Basins.

2.1.6 Oxidation Ditches A & B

The two Oxidation Ditches are designed for two passes per tank, with each pass being 26 feet wide by 163 feet long by 13.67 feet sidewater depth, for the reduction of BOD_5 and ammonia. The Oxidation Ditches operate in parallel and treat 57% of the WPCP's flow that is diverted from Distribution Box No. 1. Each Oxidation Ditch includes one constant speed 75 Hp mechanical aerator.

2.1.7 Final Clarifier Nos. 3 & 4

The mixed liquor from the Oxidation Ditches is conveyed to Final Clarifier No. 3 and Final Clarifier No. 4, which operate in parallel and are each 65 feet in diameter with 12.0 feet of sidewater depth.

Waste activated sludge settled in the clarifiers is thickened via gravity belt thickeners prior to being blended with the Primary Sludge at the Primary Digesters.

Return activated sludge from the clarifiers is conveyed back to the Oxidation Ditches.

2.1.8 Stabilization Pond

The final clarifier effluent from Final Clarifier Nos. 1 and 2 is conveyed directly to the Stabilization Pond Influent Chamber. The effluent from Final Clarifiers Nos. 3 & 4 is conveyed through Control Chamber No. 2 and then combines with the effluent from Final Clarifier Nos. 1 and 2 in the Stabilization Pond Influent Chamber. The combined secondary effluent is then conveyed to the Stabilization Pond for raising of the dissolved oxygen concentration. The Stabilization Pond has a surface area of 106,900 square feet and a volume of 8.0 million gallons.

The Stabilization Pond is equipped with four 10 Hp AIRE-O_2 mechanical aerators, which are mounted on individual floatation assemblies. Three of the four mechanical aerators are operated on a full-time basis.

2.1.9 Chlorine Contact Tanks

The wastewater from the Stabilization Pond is then conveyed to two Chlorine Contact Tanks operating in parallel. Each Chlorine Contact Tank is 17.25 feet wide by 55 feet long by 5 feet sidewater depth. At the Chlorine Contact Tanks, sodium hypochlorite is added for disinfection. The treated effluent is then dechlorinated utilizing sodium bisulfite prior to ultimate discharge to the Passaic River.

2.1.10 Anaerobic Digestion

The anaerobic digester system consists of two primary digesters and one secondary digester configured in a two-stage digestion system. In this configuration, the primary digesters (high-rate digesters) are coupled in series with a secondary digestion tank. The contents of the primary digesters are heated and mixed to facilitate volatile solid destruction, gas production and to avoid grit and sludge accumulation in order to maintain usable digester volume. The secondary digester is used for the storage and concentration of digested sludge and for the formation of a relatively clear supernatant.

The three (3) digesters have varying usage volumes. Primary Digester No. 1 is 50 feet in diameter with a 21 foot side water depth resulting in a usable volume of 41,233 cubic feet. Primary Digester No. 2 is 60 feet in diameter with a 23 foot side water depth resulting in a usable volume of 65,031 cubic feet. The corresponding secondary digester is 50 feet in diameter with an 18 foot side water depth resulting in a usable volume of 35,343 cubic feet. Blended primary and waste activated sludge from Final Clarifier Nos. 3 and 4 is conveyed to the primary digesters with 40% of this sludge flow being sent to Primary Digester No. 1 and 60% of the sludge volume being sent to Primary Digester No. 2.

The Primary Digesters currently are equipped with Pearth gas mixing systems in order to facilitate volatile solid destruction, gas production, and to minimize grit and sludge accumulation in order to maintain usable digester volume. However, the existing Pearth gas mixing system in Primary Digester No. 1 is currently being replaced with mechanical draft tube mixers; the Pearth gas mixing system in Primary Digester No. 2 will remain in service and is not being replaced at this time. The secondary digester is used for the storage and concentration of digested sludge and for the formation of a relatively clear supernatant. The supernatant is then conveyed to the Inlet Facilities of the WPCP and the digested sludge is sent to either Sludge Drying Beds or the Digested Sludge Wet Well for dewatering in the belt filter presses.

Waste activated sludge from the Final Clarifiers is either conveyed back to the Inlet Facilities or to the Waste Activated Sludge Wet Well for thickening. The thickened sludge is then pumped back to the Primary Digesters or into tanker trucks for off-site disposal.

The design of the digestion system was based upon the following parameters:

Digestion System Design Parameters[1]	
Total Solids Loading:	8,964 lbs/day
Total Volume of Sludge:	23,885 gpd
Volatile Solids Loading to Primary Digesters:	0.054 lbs/ft^3/day
Detention Time:	49 days

1. Design Parameters from a 1990 report developed by Killam Associates.

Based upon the design volatile solids loading to the primary digester of 0.054 lbs/ft^3/day, it can be computed that the volatile solid portion of the incoming sludge is 5,738 lb/d or a volatile suspended solids (VSS) to total suspended solids (TSS) ratio of 0.64 lb VSS/lb TSS.

Although not provided for in the aforementioned basis of design report, based upon a detention time of 49 days and a feed sludge volatile solid of approximately 0.64 lb VSS/lb TSS, the estimated reduction in volatile solids is 49 percent (see Figure 2-1). Based upon the estimated reduction in volatile solids destruction and using an average gas production rate of 15 ft^3/lb of volatile solids destroyed, the calculated design gas production from the primary digesters based upon average month condition is as follows:

8,964 lb/d x 0.64 lb VSS/lb TSS x 0.49 x 15 ft^3 /lb of VSS destroyed = 42,167 ft^3/day.

The design sludge heating requirements based upon mesophillic digestion operation at the design solid loading condition is computed to be as follows:

Heating Load = 8,964 gpd x (1 BTU/LB-°F) x 8.34 lb/gal x (95°F – 50°F) = 3,364,189 Btu/day or 140,174 Btu/hr.

For estimating purposes and based on an assumed sludge temperature loss of 1^0F /day, the estimated heat loss from both primary digesters is computed to be as follows:

Heat Loss = (41,233 + 65,031) ft^3 x 62.4 lb/ft^3 x (1 BTU/LB-°F) x 1°F/day = 6,630,873 Btu/day or 276,286 Btu/hr.

Therefore, the total design heat load is computed to be 140,174 Btu/hr + 276,286 Btu/hr = 416,460 Btu/hr.

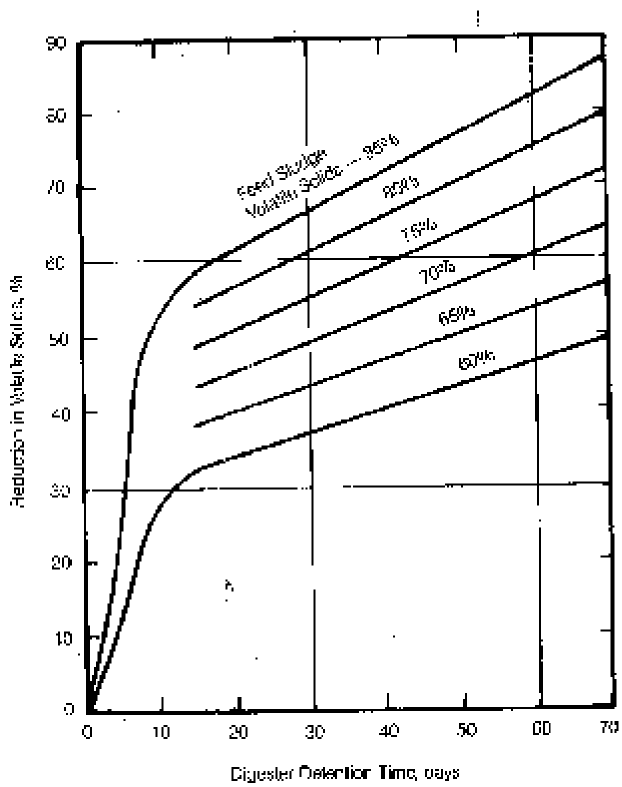


Figure 2-1: Effect of Detention Time and
Initial Volatile Solids Content on Digester Efficiency

2.2 Administration Building

2.2.1 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 concrete masonry (CMU) back up blocks. The existing roofing system on the North-West side of the building consists of EPDM membrane with 1 ½" rigid insulation over flat roof decks. The older section consists of ballasted built-up roofing over flat roof decks.

The windows throughout the building are insulating double pane windows with weatherstripping. 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 are 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.

2.2.2 Description of Building HVAC

The Administration Building office area is heated and cooled by a Trane rooftop unit. This gas fired unit has a heating output capacity of 200 MBH with an efficiency of 80 percent, and a cooling capacity of 10 tons. Conditioned air is distributed throughout the office by use of ductwork. Ceiling mounted diffusers release or remove air from the spaces. There is an Emerson digital thermostat located next to the conference room which provides control for the office spaces. The basement and electrical room are heated by Airtherm gas fired unit heaters. It was undetermined at the time of the audit if the gas fired unit heaters are currently operated. The sulfur dioxide storage, chlorine room, and bisulfite room are all heated by electric unit heaters. Roof mounted exhaust fans exhaust air from respective spaces through means of ductwork. Wall mounted exhaust fans exhaust air from both the chlorine room and laboratory.

2.2.3 Description of Building Lighting

The Administration Building's existing lighting system consists of 1X4 (2 lamp), 1X8 (2 lamp), 2x4 (4 lamp) T12 standard efficiency linear fluorescent fixtures with magnetic ballasts, regular and explosion-proof incandescent, and mercury vapor fixtures. Existing exterior lighting consists of mercury vapor, and compact fluorescent fixtures. Refer to Section 4 for a more detailed description.

The roadway and process existing lighting system consists of pole mounted fixtures, which are assumed to have high pressure sodium lamps. Refer to Section 4 for a more detailed description.

2.3 Grit Building

2.3.1 Description of Building Envelope

The Grit Building is a prefabricated fiberglass building. The windows used for the prefabricated building are single pane.

Our inspection has revealed that the building envelope is in good condition. Due to the size of the building 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 Grit Building is heated by a Sentinel explosion proof electric unit heater. There is a roof mounted exhaust fan that exhausts air from the space.

2.3.3 Description of Building Lighting

The Grit Building's existing lighting system consists of explosion-proof incandescent fixtures. No existing exterior lighting is present. Refer to Section 4 for a more detailed description.

2.4 Digester No. 1 Building

2.4.1 Description of Building Envelope

The Digester No. 1 Building walls consist of poured concrete with concrete masonry (CMU) back up blocks. The existing roofing system of the building consists of EPDM roofing over flat roof decks. The roof was in immaculate condition and there were no signs of interior leakage from the roof.

The windows throughout the building are insulating double pane windows with weatherstripping. The exterior doors are FRP doors and as indicated in Section 2.2.1, 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.

2.4.2 Description of Building HVAC

The Digester No. 1 Building is heated by the Buderus cast-iron boiler with a 711 MBH heating capacity. This boiler has an input of 944 MBH giving it a combustion efficiency of 75 percent. It is also used for heating the sludge in the digester. The two gas trains allow the boiler to be run by natural or digester gas. Hot water is sent to fin tube radiators and a unit heater that is located in the boiler room. There is an exhaust fan located on the roof which exhausts air from all floors of the building.

2.4.3 Description of Building Lighting

The Digester No. 1 Building's existing lighting system consists of explosion-proof incandescent fixtures. Existing exterior lighting consists of an explosion-proof incandescent fixture. Refer to Section 4 for a more detailed description.

2.5 Digester No. 2 Building

2.5.1 Description of Building Envelope

The Digester No. 2 Building walls consist of poured concrete with portions of the exterior walls constructed of brick and mortar facade. The existing roofing system of the building consists of EPDM roofing over flat roof decks. The equipment room had many stained acoustic tiles, which is an indication of leakage.

Interior Leakage in Equipment Room

It should be determined if the stained acoustic tiles is due to roof leakage. If the staining is due to roof leakage, it is recommended to completely tear-off the remainder of the original roofing system of the C-Wing including membranes, flashings, insulation, etc., down to the base substrate. An isocyanurate insulation system is recommended to promote positive drainage to existing roof drains. Installation of 1/2-in thick, high-density wood fiber recovery board insulation is also recommended. It is recommended to install a new modified asphalt 3-ply built-up system with polyester felts and white or cool colored granulated cap sheet or a modified bitumen hot or cold applied system, including a 20 year warranty. Built-up or modified bitumen systems permit maximum movement of the membrane and flashing, without failure, due to its elasticity. In addition, the roofing system would then be consistent throughout the building.

It is recommended that a qualified roofing contractor evaluate the system, including the structural capacity of the building frame. Due to the cost of a roof replacement, it is anticipated that the payback will be in excess of 20 years; as such this recommendation has not been evaluated further.

The type of windows along the SouthEast wall were not able to be confirmed because their high placement. The exterior doors are FRP doors and as indicated in Section 2.2.1, are recommended on an energy efficiency level. The exterior doors were sealed well with no signs of infiltration.

2.5.2 Description of Building HVAC

The Digester No. 2 Building is heated by a Buderus cast-iron high efficiency boiler with a 1,110 MBH input and a combustion efficiency of 93 percent. It is also used for heating the sludge in the digester. The two gas trains allow the boiler to be run by natural or digester gas. Hot water is sent to fin tube radiators in the storage and equipment room. There are three gravity ventilators on the roof exhausting air from the engine, boiler, equipment, and storage room.

2.5.3 Description of Building Lighting

The Digester No. 2 Building's existing lighting system consists of explosion-proof mercury vapor and incandescent fixtures. Existing exterior lighting consists of a compact fluorescent fixture. Refer to Section 4 for a more detailed description.

2.6 Waste Oil Building

2.6.1 Description of Building Envelope

The Waste Oil Building walls consist of Brick and Mortar. The roof consists of asphalt shingles over pitched roof decks.

The front door at the Waste Oil Building is an aging wooden door. FRP 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. It is recommended that any wooden exterior doors are replaced with FRP doors.

The windows at the Waste Oil Building consist of insulating double pane windows.

Waste Oil Building Front Door

2.6.2 Description of Building HVAC

The Waste Oil Building is heated by a Qmark electric unit heater.

2.6.3 Description of Building Lighting

The Waste Oil Building's existing lighting system consists of an incandescent fixture. The existing exterior lighting consists of an incandescent fixture. Refer to Section 4 for a more detailed description.

2.7 Blower Building

2.7.1 Description of Building Envelope

The Blower Building's walls consist of brick or poured concrete. The roofing system consists of clay roof tile over pitched roof decks. There were no signs of interior leakage from the roof.

The windows throughout the building are insulating double pane windows. The exterior doors are FRP doors and as indicated in Section 2.2.1, 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.

2.7.2 Description of Building HVAC

The Blower Building is heated by a steam Utica boiler with an output heating capacity of 243 MBH. The gas fired Utica boiler has an input rating of 300 MBH giving it a combustion efficiency of 80 percent. A one pipe steam system distributes the steam to the American Radiator radiators. A steam unit heater provides heating to the basement space. There is a belt driven ventilation fan located in the blower room on the first floor.

2.7.3 Description of Building Lighting

The Blower Building's existing lighting system consists of 1X4 (1 lamp) T8 standard efficiency linear fluorescent fixture, 1X8 (2 lamp) T12 linear fluorescent fixtures with magnetic ballasts, compact fluorescent, and incandescent fixtures. No existing exterior lighting is present. Refer to Section 4 for a more detailed description.

2.8 Sludge Handling Building

2.8.1 Description of Building Envelope

The Sludge Handling Building walls are composite walls consisting of brick and mortar façade or poured concrete, and CMU back up blocks. The existing roofing system consists of ballasted EPDM roofing with rigid insulation over flat metal roof decks.

The windows are insulating double pane windows. The exterior doors are FRP doors and as indicated in Section 2.2.1, 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 Sludge Handling Building hot water unit heaters are served by a 1,087 MBH Raypak modulating gas fired boiler. The boiler has an input rating of 1,250 MBH giving it a combustion efficiency of 87 percent. This gas fired boiler serves the hot water unit heaters that are located in the mechanical room, electrical room, pump room, filter room, and the mezzanine level. Trane heating and ventilating units serve the pump room, janitor's closet, restroom, and locker room. A Trane roof mounted heating and ventilating unit serves the filter room, and the sludge handling area. Unit ventilators provide heating to the stairwells. Cooling is provided to the break, and control room by two Trane condensing units located on the roof. These condensing units have efficiencies of 10 and 13.25 SEER. Roof mounted exhaust fans, ventilators, and motor operated wall louvers provide ventilation for the building.

2.8.3 Description of Building Lighting

The Sludge Handling Building's existing lighting system consists of 1X3 (1 lamp), 1X4 (1 and 2 lamp), 2X2 (2 lamp), 2X4 (2 and 4 lamp) T12 linear fluorescent fixtures with magnetic ballasts, and explosion-proof mercury vapor fixtures. Existing exterior fixtures consist of building mounted wallpacks, the lamps are assumed to be high pressure sodium. Refer to Section 4 for a more detailed description.

2.9 Final Clarifiers Building No. 1 & 2

2.9.1 Description of Building Envelope

The Final Clarifiers Building was an underground structure consisting of poured concrete.

2.9.2 Description of Building HVAC

The Final Clarifiers Building No. 1 & 2 is heated by a Dayton electric unit heater. The building is exhausted by a gravity ventilator located outside on a concrete slab.

2.9.3 Description of Building Lighting

The Final Clarifiers Building No. 1 & 2 existing lighting system consists of 1X8 (2 lamp) T12 linear fluorescent fixtures with magnetic ballasts. No existing exterior lighting is present. Refer to Section 4 for a more detailed description.

2.10 Final Clarifiers Building No. 3 & 4

2.10.1 Description of Building Envelope

The walls of the Final Clarifiers Building No. 3 & 4 consist of brick and mortar façade with CMU back up blocks. Signs of interior leakage were observed at the time of the audit. CDM did not have access to the roof at the time of the audit so the roof condition could not be observed.

It should be determined if the stained acoustic tiles is due to roof leakage. If the staining is due to roof leakage, it is recommended to completely tear-off the remainder of the original roofing system of the C-Wing including membranes, flashings, insulation, etc., down to the base substrate. An isocyanurate insulation system is recommended to promote positive drainage to existing roof drains. Installation of 1/2-in thick, high-density wood fiber recovery board insulation is also recommended. It is recommended to install a new modified asphalt 3-ply built-up system with polyester felts and white or cool colored granulated cap sheet or a modified bitumen hot or cold applied system, including a 20 year warranty. Built-up or modified bitumen systems permit maximum movement of the membrane and flashing, without failure, due to its elasticity. In addition, the roofing system would then be consistent throughout the building.

It is recommended that a qualified roofing contractor evaluate the system, including the structural capacity of the building frame. Due to the cost of a roof replacement, it is anticipated that the payback will be in excess of 20 years; as such this recommendation has not been evaluated further.

The exterior doors are of FRP construction and as indicated in Section 2.2.1, are recommended on an energy efficiency level.

2.10.2 Description of Building HVAC

Hot water from the Sludge Handling Building provides heat to this building. Various hot water fin tube radiators provide heat to the building. A Trane heating and ventilating unit with hot water coils located in the electrical room provides heat to the basement. A hot water unit heater in the basement provides additional heat to the basement. A gravity roof ventilator supplies air through the H&V unit. Another gravity roof ventilator provides supply air to the electrical room. Two roof mounted exhaust fans exhaust air from the building.

2.10.3 Description of Building Lighting

The Final Clarifiers No. 3 & 4 Building's existing lighting system consists of 1x4 (2 lamp), 2X2 (2 lamp), 2X4 (2 lamp) T12 linear fluorescent fixtures with magnetic ballasts. Existing exterior lighting consists of one wallpack, it is assumed to be a high pressure sodium fixture. Refer to Section 4 for a more detailed description.

Section 3
Baseline Energy Use

3.1 Historical 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 for the wastewater treatment plant were analyzed and unit costs of energy were obtained. The unit cost of energy, as determined from the information provided by the Joint Meeting, 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 MCJM.

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.

JCP&L is the distributor of electric energy for MCJM and FirstEnergy Solutions Corps. is the third party supplier.

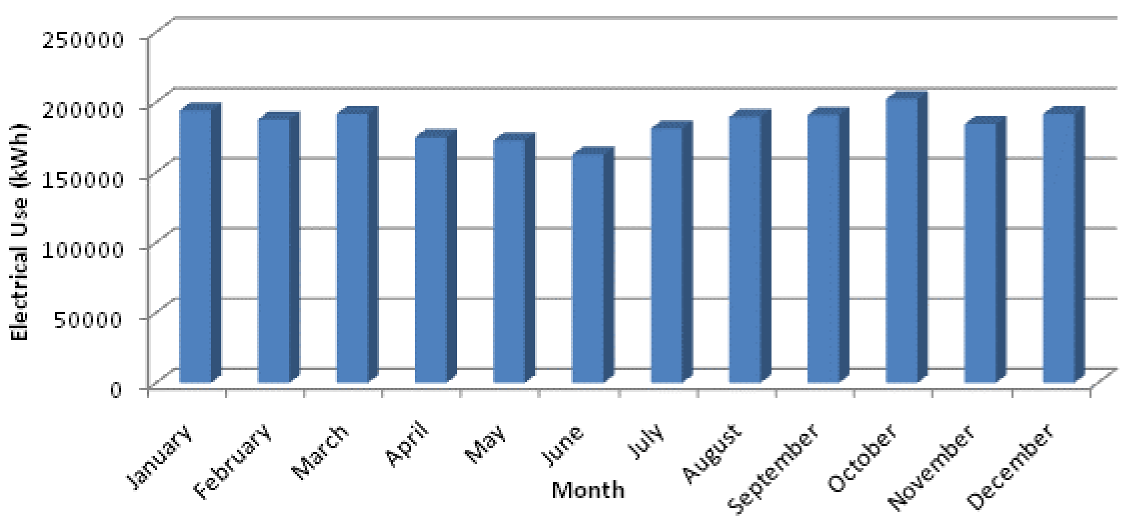
PSE&G is the current distributor and Gateway Energy Services Corporation is the current supplier of gas for the MCJM WPCP. MCJM is charged for the cost of the natural gas, a delivery charge and a customer charge, which covers gas administration charges.

3.1.1 Water Pollution Control Facility

Electric power for the Water Pollution Control Facility is fed from one General Secondary Service three phase line from JCP&L. Figure 3.1-1 illustrates the average monthly total energy consumption from December 2007 through April 2010. For example, for the month of November, the bar graph represents average energy consumption for November 2008 & 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 151,000 kWh / month.

Figure 3.1-1: WPCP's Electrical Usage



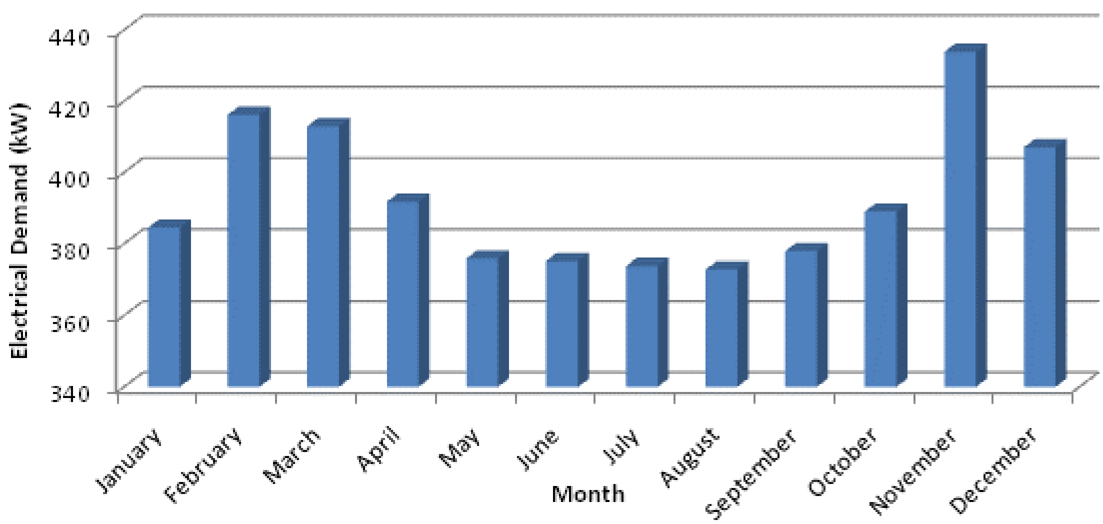
The most recent tariff rates available at the time of this audit for the WPCP's electrical service can be found on the electrical bills provided by JCP&L and are as follows:

	Acct #: 100005606627
Customer Charge:	$11.65/month
Basic Generation Service:	$0.1058/kWh
Non-Utility Generation Service:	$0.016960/kWh
Delivery Service Charges:	$0.004958/kWh

	$6.47/kW
Societal Benefits Charge:	$0.006322/kWh
System Control Charge:	$0.000079/kWh
RGGI Recovery Charge:	$0.000100/kWh
Transitional Assessment Charge	$0.002928/kWh

Figure 3.1-2 illustrates the average monthly demand load for the wastewater treatment plant facility from December 2007 through April 2010.

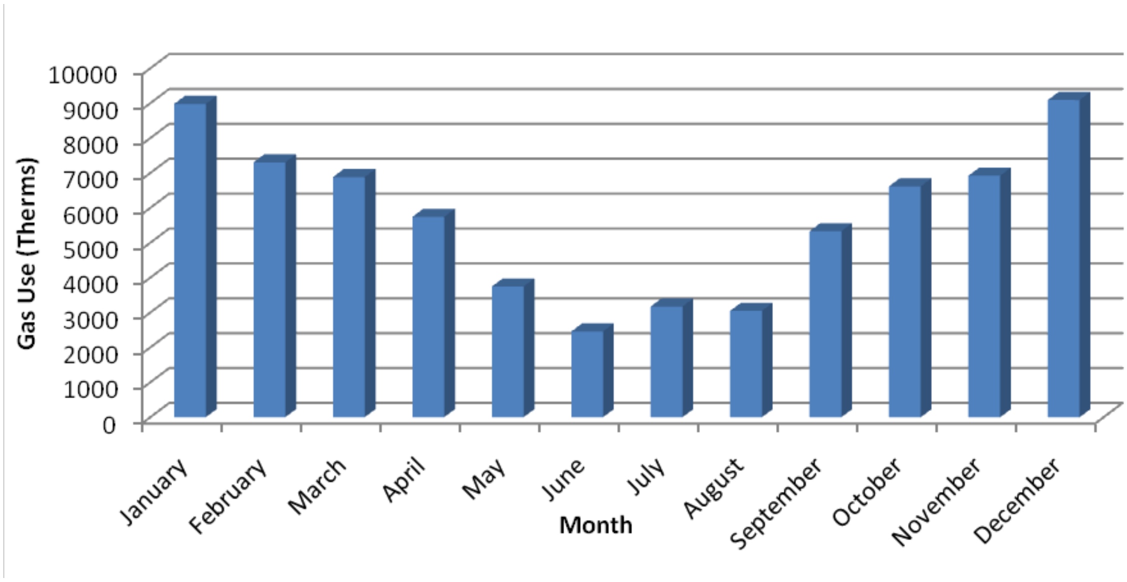
Figure 3.1-2: WPCP's Maximum Monthly Demand



Refer to Table 3.2-1, in Section 3.2 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 Water Pollution Control Plant is metered at two locations. The monthly total gas consumption from December 2007 through April 2010 at the plant is illustrated in Figure 3.2-3.

Figure 3.2-3: WPCP's Total Gas Usage



For more on the wastewater treatment plant facility's gas usage, refer to Section 4.

3.2 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 3.2-1 and Table 3.2-2 summarize the aggregate costs for electrical energy consumption and therms utilized, respectively.

Table 3.2-1: Electrical Aggregate Unit Costs

Service Location	Aggregate $ / kW-hr
Water Pollution Control Plant	$0.1514

Table 3.2-2: Natural Gas Aggregate Unit Costs

Service Location	Aggregate $ / therm
Water Pollution Control Plant	$1.07

3.3 Portfolio Manager

3.3.1 Portfolio Manager Overview

Portfolio Manager is an interactive energy management tool that allows Madison-Chatham Joint Meeting to track and assess the energy consumption of the WPCP. Portfolio Manager can help MCJM set investment priorities, verify efficiency improvements, and receive EPA recognition for superior energy performance.

3.3.2 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 is eligible to receive a rating, yet is not eligible for an Energy Star label.

3.3.3 Portfolio Manager Account Information

A Portfolio Manager account has been established for MCJM, which includes a profile for the wastewater treatment plant facility. 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 33.

Appendix B contains the Statement of Energy Performance and 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 MCJM:

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

[redacted]

[redacted]

Section 4
Energy Conservation and Retrofit Measures (ECRM)

4.1 Water Pollution Control Plant

4.1.1 Aeration Basins

Aeration systems are used in the activated sludge process to provide oxygen for the biological oxidation of carbonaceous and nitrogenous matter and to maintain the biological solids mixed within the wastewater. Aeration devices for wastewater treatment can be classified into two basic types:

(1) Agitating wastewater mechanically to dissolve oxygen from atmospheric air into the wastewater (mechanical aeration); or

(2) Introducing air or pure oxygen into the wastewater with submerged diffusers (diffused air).

The aeration system at MCJM consists of eleven total bays, two of which have been removed from service. Of the nine active bays, the first three are mechanically aerated and the following six bays utilize a coarse bubble diffuser system with positive displacement blowers supplying the air. The mechanical aerators are constant speed and are operated continuously. Table 4.1-1 summarizes the existing aeration system and equipment.

Table 4.1-1
Existing Aeration System

	2 Bays	3 Bays	6 Bays
Total Volume (gallons)	155,584	228,888	435,874
Aerator Equipment	(not in service)	Mechanical Surface Aerators	Coarse Bubble Diffusers
- Quantity	-	3 (one per Bay)	420 total
- Motor Horsepower	-	15 each; 45 total	-
- Run Time	-	24/7	-
- SOTE (lbs O_2/hp-hr)	-	3	2

1. Standard Oxygen Transfer Efficiency (SOTE)

There are four blowers that can be utilized to supply the air to the coarse bubble diffuser system; two electric Kaeser compressors with variable frequency drives (VFDs) and two Roots blowers that are direct driven from MCJM's digester gas driven engines. The aeration basins do not currently have a DO control system and, as such, the VFDs for the electric blowers are adjusted manually. Discussion with plant staff and analysis of the motor run time data provided indicates that the plant is typically running the three mechanical aerators continuously and either one of the engine driven blowers or both electric blowers at 90% capacity. The engine driven blowers are the primary source of aeration air. Table 4.1-2 summarizes the existing blower design information.

Table 4.1-2
Existing Blower Information

	Existing Electric Blowers	Existing Engine Driven Blowers
Number of Units	2	2
Capacity (scfm)	1,926	4,445
Discharge Pressure (psig)	6	6
Motor Horsepower	75 hp	138 bhp

1. Based on the run-time data of the existing blowers and mechanical aerators, with the engine driven blower being utilized 75% of the time in 2009, it was estimated that the current annual aeration system energy cost is $82,986((15 hp/89.5% eff. * 3 mixers * 0.746 kW/hp * 24hr/day * 365 days/yr + (2X75 hp/90% eff.) * 0.746 kW/hp * 2,180 hrs/2009) * $0.1514/kWh).

In most wastewater treatment plants, a minimum dissolved oxygen (DO) level of 2.0 mg/l is commonly maintained in the aeration basins. The facility currently has eight DO sample locations, but does not have an aeration control system to utilize the DO readings to adjust blower speed and valve positions to optimize the operation of the system by controlling the amount of air that is delivered to the aeration tanks. Based on a review of plant operating data, the dissolved oxygen concentration in the aeration tanks typically varies from 1.2 to 3.1 mg/l at the first four sampling locations, which is an acceptable range for this type of process. However, the DO concentrations at the remaining four sample locations typically vary between 3.5 to 11.2 mg/l. This is the result of an equal volume being delivered across the aeration basin volume, whereas the biological oxygen demand (BOD) will decrease over the length of the aeration tank as the mixed liquor is aerated.

Table 4.1-3 summarizes the operating conditions utilized to estimate the annual cost of operation.

Table 4.1-3 Existing Annual Energy Consumption and Cost	
Mechanical Aerators:	24 hour, 7 day operation
Mechanical Aerators (annual kWh):	328,574
Engine Driven Blowers:	6,580 hours of operation
Engine Drive Blowers (annual kWh):	677,398 (free energy source)
2 Electric Blowers:	2,180 hours of operation (@ 90% speed)
Electric Blowers (annual kWh):	219,548
Total Annual Energy Consumption (kWh):	1,225,520
Associated Annual Cost[1]:	$82,986

1. Annual energy cost: 328,574 kWh + 219,548 kWh X $0.1514/kWh

MCJM is saving $100,328 annually (677,398 kWh) as the energy to run the primary aeration blower is supplied from the facility's digester gas.

Although there is currently only an adequate supply of digester gas to operate one engine and, as such, one engine driven blower, one engine driven blower is more than adequate to satisfy the DO demand of the aeration basins. CDM analyzed the design conditions as well as the existing conditions to determine if energy savings can be realized with aeration equipment modifications or replacements. In addition to potential equipment modifications or replacements, one of the more critical elements to any energy conservation project for aeration systems is a dissolved oxygen control system.

Oxygen requirements change continuously based on daily fluctuations in plant flow and loadings. Providing the correct monitoring and control systems for the aeration process is critical, since energy demand increases as the DO demand increases. The installation of a DO control system would automatically control blower output and optimize energy usage.

A typical automated DO control system is known as a DO loop. A DO loop control system consists of DO probes in each aeration bay to continuously monitor the DO levels, which are then fed back to the main control panel (MCP). The DO readings from the DO transmitters would be wired to a new PLC which could be connected to a SCADA system for monitoring and DO set point input. A software program in the PLC interprets the readings and sends a signal to the blower VFDs to maintain, increase, or decrease speed, depending on the DO reading when compared to a set DO point or range. The individual DO readings from each bay and measured air flow rates into each diffuser grid will be used to control the inlet air valves of each diffuser grid to maintain the desired DO concentration in each pass automatically. Each diffuser grid drop leg will be provided with one modulating control valve, one thermal dispersion flow meter and one isolation valve.

Since a course or fine bubble diffused air system distributes air at the bottom of the tank and the probe is at the water surface, the mixed liquor dissolved oxygen is fairly constant throughout the tank. Therefore, this type of control system works well for a course or fine bubble diffused aeration system providing instantaneous change in blower output under varying flows and loads to the plant. The control system would also allow for sequencing between the available four blowers, depending upon the air demand. If a DO control loop was applied in mechanically aerated bays, the recommended DO probes for this type of application are capable of being fully submerged to a depth in excess of 20 feet.

Common methods of reducing energy consumption of mechanical aerators include installing DO probes and reducing aerator-operating time during low load periods or installing VFDs to turn down the speed of the mechanical aerators. Since older surface mechanical aerators are less energy efficient and have limited means of control, they have frequently been replaced with more efficient fine bubble diffuser systems. However, recent advances in mechanical aeration equipment have made them cost competitive with diffused air systems, depending on the size of the plant.

Design Conditions

Table 4.1-4 presents a summary of the relevant design parameters used to calculate the amount of air required based on the design conditions. The design conditions were provided in a report completed by Killam Associates. The maximum month and day flows were estimated from current flow peaking factors. Diffuser efficiency was based on a typical transfer efficiency of coarse bubble diffusers.

This aeration analysis to determine the oxygen demand in lbs/day was completed on the 9 active aeration bays, a volume of 664,762 gallons. The conversion to air flow (scfm) was based on the oxygen transfer efficiency (OTE) of coarse bubble diffusers.

Table 4.1-4
Aeration System Calculation Summary – Design Conditions

		Average	Max Month	Max Day
Flow	mgd	1.5	1.9	3.6
Wastewater Temperature	deg C	17	17	17
Beta		0.95	0.95	0.95
Alpha		0.65	0.65	0.65
Oxygen Saturation (Cd, based on WW temp)	mg/L	9.58	9.58	9.58
Dissolved Oxygen Concentration	mg/L	2	2	2
Oxygen Saturation (Cs, based on Standard Conditions)	mg/L	9.09	9.09	9.09
Oxygen Demand/BOD removed	lb/lb	1.2	1.2	1.2
Oxygen Demand/TKN removed	lb/lb	4.25	4.25	4.25
Influent BOD Concentration	mg/L	196	223	150
Influent BOD Load	lb/day	2,463	3,441	4,454
Influent Nitrogen Concentration	mg/L	49	51	32
Influent Nitrogen Load	lb/day	617	787	950
Oxygen Demand	lb/day	3,143	4,216	4,796
Density of Air		0.075	0.075	0.075
Diffuser Efficiency	%	12	12	12
Oxygen in Air	%	23.20%	23.20%	23.20%
Standard Oxygen Rate (SOR)	lb/day	6,963	9,729	12,645
Oxygen Transfer Efficiency (OTE), field	%	3.8%	3.8%	3.8%
Air Flow	scfm	3,103	4,163	4,736
Air Flow (summer)	acfm	3,552	4,764	5,420
Associated Blower hp	hp	143	192	218

Actual Current Conditions

The facility influent data was analyzed to determine the actual required blower demands. Table 4.1-5 presents a summary of the relevant design parameters used to calculate the amount of air needed based on the actual current conditions.

This aeration analysis to determine the oxygen demand in lbs/day was completed on the nine (9) active aeration bays, a volume of 664,762 gallons. The conversion to air flow (scfm) was based on the OTE of coarse bubble diffusers.

Table 4.1-5
Aeration System Calculation Summary – Actual Conditions

		Average	Max Month	Max Day
Aeration Tank Influent Flow	mgd	1.1	1.3	2.6
Wastewater Temperature	deg C	17.4	17.4	17.4
Beta		0.95	0.95	0.95
Alpha		0.65	0.65	0.65
Oxygen Saturation (Cd, based on WW temp)	mg/L	9.58	9.58	9.58
Dissolved Oxygen Concentration	mg/L	2	2	2
Oxygen Saturation (Cs, based on Standard Conditions)	mg/L	9.09	9.09	9.09
Oxygen Demand/BOD removed	lb/lb	1.2	1.2	1.2
Oxygen Demand/TKN removed	lb/lb	4.25	4.25	4.25
Influent BOD Concentration	mg/L	183	214	126
Influent BOD Load	lb/day	1,664	2,392	5,016
Influent Nitrogen Concentration	mg/L	49	51	32
Influent Nitrogen Load	lb/day	445	570	689
Oxygen Demand	lb/day	2,173	2,907	3,306
Density of Air		0.075	0.075	0.075
Diffuser Efficiency	%	12	12	12
Oxygen in Air	%	23.20%	23.20%	23.20%
Standard Oxygen Rate (SOR)	lb/day	4,691	6,750	7,698
Oxygen Transfer Efficiency (OTE), field	%	3.8%	3.8%	3.8%
Air Flow	scfm	2,146	2,871	3,264
Air Flow (summer)	acfm	2,456	3,285	3,736
Associated Blower hp	hp	99	132	150

The results of the aeration air analysis show that there is enough blower capacity to meet the air flow requirements for the current and design average, max month and max day conditions.

Under the current average flow and load conditions, the operation of both electric blowers at approximately 67% capacity or one engine driven blower at approximately 72% capacity is required to satisfy the oxygen demand and maintain a dissolved oxygen concentration of 2.0 mg/L through these nine (9) aeration bays.

The air demand under current average flow and load equates to an annual energy consumption of approximately 647,000 kWh, which is approximately 72% of the blower energy that is currently utilized for six (6) of the nine (9) aeration bays and

53% of the blower and mixer energy that is currently utilized for the nine (9) aeration bays.

The following Table 4.1-6 summarizes the oxygen demand under the current average, max month and max day flow and load conditions and the percent of which is supplied through the operation of the mechanical aerators, assuming 3 lbs 0_2 delivered/hp-hr.

Table 4.1-6
Current Oxygen Demand

	Current Average	Current Max Month	Current Max Day
Oxygen Demand (lb/day):	2,173	2,907	3,306
Oxygen Delivered by Mechanical Aerators (lbs/day):	1,080	1,080	1,080
% of Oxygen Demand:	50%	37%	33%

4.1.2 Aeration System Improvement Alternatives

The actual facility influent data as well as the design conditions were used to estimate the amount of air required for the aeration system. The range as shown in Tables 4.1-4 and 4.1-5 is from 2,146 to 4,736 scfm; with the lower end of this range corresponding to the current average and the higher end corresponding to the design maximum day.

To achieve energy savings for the aeration system, two (2) alternatives were evaluated: installing premium efficiency motors and VFDs on the mechanical mixers to run at a lower speed and installing fine bubble diffusers through the nine aerated bays. The installation of a fine bubble diffuser system includes the implementation of a dissolved oxygen control system.

A dissolved oxygen sensor and controller would be provided for each tank. Although the installation of the dissolved oxygen sensor and controller will not be utilized to turn-down the engine driven blowers and ultimately will not result in an energy savings, the dissolved oxygen controller along with the air flow as measured through the existing air flow meters would throttle a new motorized butterfly valve controlling the air flow to each respective aeration bay. Additionally, assuming that the recommendations outlined in Section 4.1.6 regarding the Anaerobic Digestion System are implemented, it is anticipated that the operation of the existing electrical blowers will be minimal. This is based on the assumption that there will be an adequate supply of biogas to fuel the engines. However, since the existing electrical blowers are currently operated with VFDs (which are manually controlled) and the electric blowers should remain in the event that the engine driven blowers are out of service for maintenance, the DO control system can further be utilized to automate the VFD operation of these electric blowers.

Alternative 1: Premium Efficiency Motors & VFDs on Mechanical Aerators

Review of the design and current operation of the aeration system has lead to the determination that there is adequate aeration air available through the operation of the existing blowers to maintain the process with a minimum DO set point of 2 mg/L throughout the aeration system volume. However, because there are no air diffusers installed in the first three bays, the ability currently does not exist to deliver aeration air to the first three bays with the operation of the blowers.

As such, since it is recommended from an energy standpoint to supply as much aeration air as possible through the operation of the engine driven blowers, the first alternative is to retrofit the existing mechanical aerators with new premium efficiency motors and variable frequency drives (VFDs). This will allow for the mechanical aerators to operate at a minimum speed, with the intent to maintain a certain level of agitation of the mixed liquor suspended solids, as this volume in the aeration system has been determined to be required.

The current operation of the three (3) mechanical aerators (15 hp, continuous operation) results in an annual energy consumption of 328,574 kWh, or $49,746. The installation of premium efficiency motors (90.7%) and VFDs will allow for the aerators to be run at 60% speed. The annual electrical energy savings from the installation of premium efficiency motors is estimated to be 134,038 kWh ($20,293).

Alternative 2: Installing Fine Bubble Diffuser System

Oxygen transfer efficiency (OTE) is a measure of the amount of oxygen transferred to the liquid by the aeration equipment. This efficiency affects both the initial and operating costs of the installation; the more efficient the system, the lower the total power required to operate it.

A fine bubble diffuser system has an OTE of approximately 2 times that of a coarse bubble diffuser system. The following table summarizes the air flow to maintain the process at a dissolved oxygen concentration of 2 mg/L with a fine bubble system.

Table 4.1-7
Summary of Fine Bubble Diffuser System
Air Flow & Associated Blower hp

	Current Average	Current Max Month	Current Max Day
Air Flow (scfm):	1,895	2,722	3,231
Associated Blower bhp:	53	76	93

The installation of a fine bubble diffuser system and DO control system as previously discussed throughout the nine (9) active aeration bays will result in an annual average energy consumption of 346,353 kWh, which can be met through the use of the digester gas fueled engine driven blowers, with the installation of mechanical sheaves to reduce the speed of the blowers. The installation of this system throughout the nine (9) aeration bays will eliminate the current annual energy consumption associated with the three (3) mechanical aerators of 294,073 kWh, or an electrical energy cost savings of $44,522. Additionally, the installation of the fine bubble aeration system will eliminate the use of the electric blowers, an annual electrical energy cost savings of $33,240, assuming an adequate supply of biogas to fuel the engines.

4.1.3 Economic Analysis

Table 4.1-8 summarizes the simple payback associated with the ECRMs evaluated for the aeration basins. Included in this 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 (NPVs) 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 Cn=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 MCJM is currently experiencing a lower return on their capital than the IRR, the project is financially advantageous. This measure also allows MCJM to compare ECM's against each other to determine the most appealing choices.

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

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

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

Table 4.1-8
Aeration Basin ECRMs

	Alt. 1 – Premium Eff. Motors and VFDs on Mech. Aerators	**Alt. 2 – Fine Bubble Diffuser System & DO Control System**
Engineers Opinion of Probable Construction Cost[1]	$85,388	$1,357,200
New Jersey SmartStart Rebate	$312	$0
Total Cost	$85,076	$1,357,200
Annual Electrical Energy Cost Savings	$20,293	$77,763
Annual Maintenance Cost Savings (AMCS)	($5,000)	$4,000

Simple Payback (years)	**5.6**	**16.6**
Annual Return on Investment (AROI)	12.98%	1.03%
Lifetime Energy Savings[2]	$545,280	$2,089,520
Internal Rate of Return (IRR)	21.0%	1.25%
Net Present Value (NPV)	$234,575	$212,471

1. The Engineer's Option of Construction Cost is based solely upon a conceptual engineering level of effort. A more detailed construction cost estimate should be prepared as design documents are progressed.
2. 3% yearly inflation on electricity costs. Assumption on equipment life is based on manufacturer information.

Both of the above alternatives have a reasonable simple payback period. However, it is recommended that Alternative No. 1 is considered since this alternative has a significantly lower initial capital cost with a smaller simple payback period when compared to Alternative No. 2. Additionally, the existing blowers have adequate capacity without the installation of a fine bubble diffuser system.

4.1.4 Oxidation Ditches

The existing facility has two oxidation ditches that typically receive approximately 57 percent of the flow from the primary settling tanks. The oxidation ditches are aerated by two single-speed aerators (one in each ditch).

Alternative 1 consists of providing new motors (inverter duty) and variable frequency drives (VFDs) for the existing aerators as well as a DO instrumentation system consisting of a probe and transmitter in each oxidation ditch. The DO system will monitor the DO concentration in the oxidation ditch and vary the speed of the aerators to meet the desired DO concentration set-point. Implementation of Alternative 1 would result in an annual energy savings of approximately 398,943 kW-hrs.

Alternative 2 consists of providing new aerators with VFDs as well as a DO probe and transmitter in the lagoon. Alternative 2 would result in an annual energy savings of approximately 501,321 kW-hrs.

Alternative 3 consists of providing new two-speed aerators as well as a DO probe and transmitter in the lagoon. Construction of the improvements required for Alternative 3 would result in an annual energy savings of approximately 330,911 kW-hrs.

Table 4.1-9 presents a summary of the simple payback analyses for the three different options. Refer to Appendix G for the Engineer's Opinion of Probable Cost.

Table 4.1-9
Oxidation Ditch System Improvements

	Alt. 1 – New Motors & VFDs on Existing Aerators	Alt. 2 – New Aerators with VFDs	Alt. 3 - New Two-Speed Aerators
Installation Cost	$384,000	$631,000	$445,000
New Jersey SmartStart Rebate	$540	$0	$0
Total Cost	$383,460	$631,000	$445,000
Annual Energy Savings	$60,400	$75,900	$50,100
Annual Maintenance Cost Savings	($4,000)	($4,000)	($4,000)
Simple Payback Period, years	6.8	8.8	9.7
Lifetime, years	20	20	20
Internal Rate of Return (IRR)	14.7%	10.4%	9.4%
Net Present Value (NPV)	$515,000	$498,000	$300,000

Based on the above analysis, it is recommended that MCJM consider Alternative 1 as long as the existing aerators are in good working condition and not near the end of their useful life.

4.1.5 Stabilization Pond

The existing facility has a lagoon/post aeration system to ensure that the effluent leaving the facility meets the effluent dissolved oxygen (DO) weekly minimum permit limit concentration of 6.0 mg/L.

The lagoon currently is equipped with four AIRE-02 Aerators installed on floatation assemblies as manufactured by Aeration Industries International, Inc. The aerators are each operated with 10 hp constant speed motors. Typically, three of the aerators are operated 24 hours per day, 7 days per week with the fourth aerator being utilized as a standby unit.

Various alternatives were considered in order to reduce energy costs and consumption associated with the post aeration system.

The following alternative analysis assumed that the post aeration system operates 24 hours per day. Since DO concentration data for the post aeration influent wastewater was not available, it was conservatively assumed that the starting DO concentration was 0 mg/L.

Alternative 1 consists of providing new motors and variable frequency drives (VFDs) for the existing post aeration mixers as well as a DO instrumentation system consisting of a probe and transmitter in the lagoon. The DO system will monitor the DO concentration in the lagoon and vary the speed of the aerators to meet the desired DO concentration set-point. Implementation of the improvements required for Alternative 1 would result in an annual energy savings of approximately 38,309 kW-hrs.

Alternative 2 consists of providing new constant speed aerators to replace the four existing aerators. Since the same size aerators as the existing are recommended for the lagoon size, the potential energy savings is minimal for this alternative. Alternative 2 would result in an annual energy savings of approximately 23,778 kW-hrs.

Alternative 3 consists of providing new aerators with VFDs, as well as a DO instrumentation system in the lagoon. Construction of the improvements required for Alternative 2 would result in an annual energy savings of approximately 66,710 kW-hrs.

Alternative 4 consists of providing two new solar-powered aerators in the lagoon. Aerators manufactured by SolarBee can be provided to circulate 7 million gallons of lagoon water per day. Each machine runs day and night on a brushless low-voltage motor that is entirely powered by solar energy. The aerators circulate water by bringing water from below and sending it out across the top in a thin layer causing a mixing effect. Solar panels provide power to the onboard battery which energized the drive system's controls and motor – excess energy is stored during the day allowing the units to operate night and day. The existing aerators would remain in the lagoons and would require new motors (inverter duty) and VFDs. A new DO instrumentation system in the lagoon would also be installed. The existing aerators would be required to run at a low power when the lagoon is iced over and/or if the battery backup system on the solar units was empty. Implementation of Alternative No. 2 would result in an annual energy savings of approximately 190,885 kW-hrs.

Table 4.1-10 presents a summary of the simple payback analyses for the two different options. Refer to Appendix G for the Engineer's Opinion of Probable Cost.

Table 4.1-10
Post Aeration System Improvements

	Alt. 1 – New Motors, VFDs & DO Control System	Alt. 2 – New Aerators	Alt. 3 – New Aerators, VFDs & DO Control System	Alt. 4 – New Solar Aerators & DO Control System
Installation Cost	$161,000	$113,000	$301,000	$355,134
New Jersey SmartStart Rebate	$360	$0	$0	$180
Total Cost	$160,640	$113,000	$301,000	$354,954
Annual Energy Savings	$5,800	$3,600	$10,100	$28,900
Annual Maintenance Cost Savings	($1,000)	$0	($1,000)	($2,650)
Simple Payback Period, years	33.5	31.4	33.1	13.5
Lifetime, years	20	20	20	20
Internal Rate of Return (IRR)	-2.9%	-4.0%	-3.5%	5.2%
Net Present Value (NPV)	-$74,000	-$59,000	-$151,000	$75,000

Alternative 4 results in the greatest annual energy savings with the least simple payback period.

4.1.6 Anaerobic Digestion System

As discussed in Section 2.1.10, a blend of primary sludge and thickened waste activated sludge from the Oxidation Ditches is currently conveyed to the primary digesters. Waste Activated Sludge (WAS) from the Aeration Basins is conveyed back to the Inlet Facilities. Although, not part of the current operational practice, there is the ability with existing piping to convey the WAS from the Aeration Basins to the gravity belt thickeners for thickening, prior to being added to the primary digesters.

Currently, approximately 40% of the total raw sludge flow to the digestion complex is conveyed to Primary Digester #1 and the remaining 60% of the total raw sludge flow is sent to Primary Digester #2. The raw sludge flow to the digesters is typically 2.5 to 3% solids.

Initially, both primary digesters were equipped with Perth gas mixing systems. The mixing system in Primary Digester #1 is being replaced with a mechanical draft tube mixer system. The contents of the secondary digester are not mixed.

Both primary digesters are heated. Heat from engine #1 is utilized to heat Primary Digester #1 and the heat from engine #2 is utilized to heat Primary Digester #2. The digester gas that is produced as a result of the anaerobic digestion process is utilized in the internal combustion engines that drive the Roots positive displacement blowers for the aeration system. Under normal operating conditions, there is not enough digester gas to run both engines. As such, the Primary Digester that is not being heated by the respective engine will be heated via a natural gas fueled boiler. It should be further noted that this boiler has a dual gas fuel train to enable digester gas to be utilized, as well.

CDM has evaluated the current operation of the anaerobic digestion process and has identified potential ECRMs to enhance the current sludge digestion process with the ultimate goal of improving digester gas production to further optimize the use as fuel in the existing internal combustion engines.

4.1.6.1 Current Mode of Operation

A summary of the total raw sludge flow to the primary digesters for the operational period spanning from January 2007 to December 2009 was tabulated and is presented in Appendix C. This data indicates that the maximum month average total raw sludge flow to the primary digesters was 20,124 gallons per day which occurred during February 2007. At the average percent solids concentration of 2.5 percent and a current percent volatile solid concentration of 0.81 lb-VSS/lb-TSS, the corresponding total solids loading and volatile solids loading are 4,196 pounds per day and 3,399 pounds per day, respectively.

Figure 4.1-1 illustrates the total sludge flow and resulting hydraulic detention time in each of the primary digesters. Sludge flow to the two (2) primary digesters is split such that 40% of the flow is sent to Primary Digester #1 and 60% of the flow to Primary Digester #2. From this, it can be determined that the sludge flow to Primary Digester #1 ranges from a minimum of 5,330 to a maximum of 8,030 gpd, with an average sludge flow of 6,826 gpd. The sludge flow to Primary Digester #2 ranges from a minimum of 7,994 to a maximum of 12,074,with an average sludge flow of 10,239 gpd. This corresponds to average hydraulic detention times of 45 and 48 days respectively.

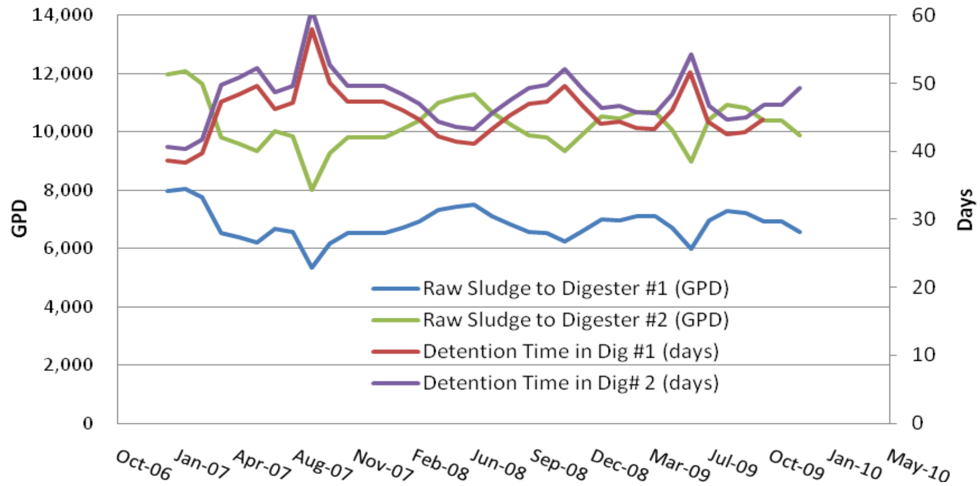


Figure 4.1-1: Sludge Flow & Detention Time in the Primary Digesters

The volatile solids loading to the primary digesters, as illustrated in Figure 4.1-2, ranges from 862 to 1,577 lbs VS/day to Primary Digester #1 and 1,293 to 2,365 lbs VS/day to Primary Digester #2. Based upon the digester volumes of 308,464 gallons (41,233 ft^3) and 486,497 gallons (65,031 ft^3), this loading corresponds to a volatile solids loading range of 0.02 to 0.04 lbs VS/ft^3-day. Typical design peak sustained volatile solids loading ranges from 0.1 to 0.2 lbs VS/ft^3-day and detention times between 10 and 20 days for high-rate anaerobic digesters.

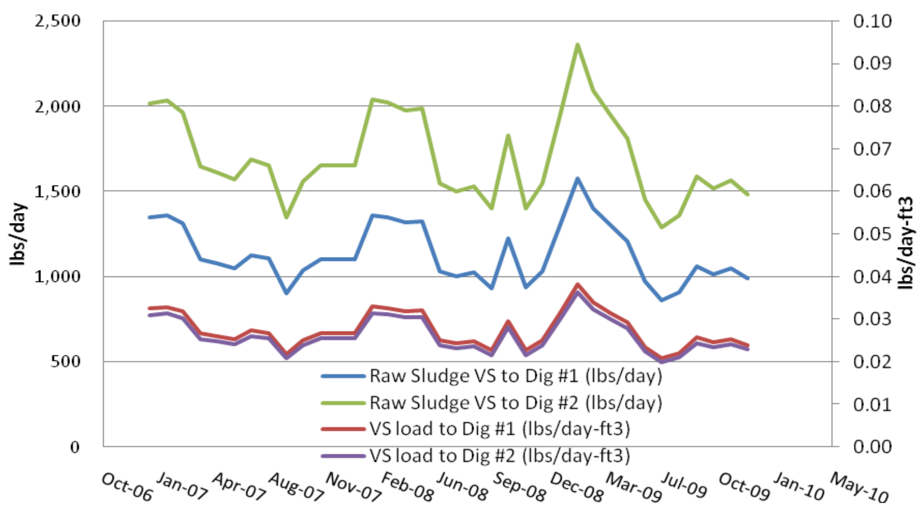


Figure 4.1-2: Volatile Solids (VS) Loading to Primary Digesters

A review of the facility's 2007-2009 digester gas production data, also presented in Appendix D, as measured from existing gas meters, indicates an average gas production rate of 22,410 ft^3/day. As shown in Figure 4.1-3, MCJM is currently utilizing 80-85% of the digester gas produced to fuel the existing internal combustion engines, which in turn powers one of the aeration blowers. On average, a digester gas fueled engine is run 16 hours a day, at 40% load. When the digester gas isn't being utilized in the engine, MJCM has the ability to use the digester gas to supplement the natural gas use in the boiler.

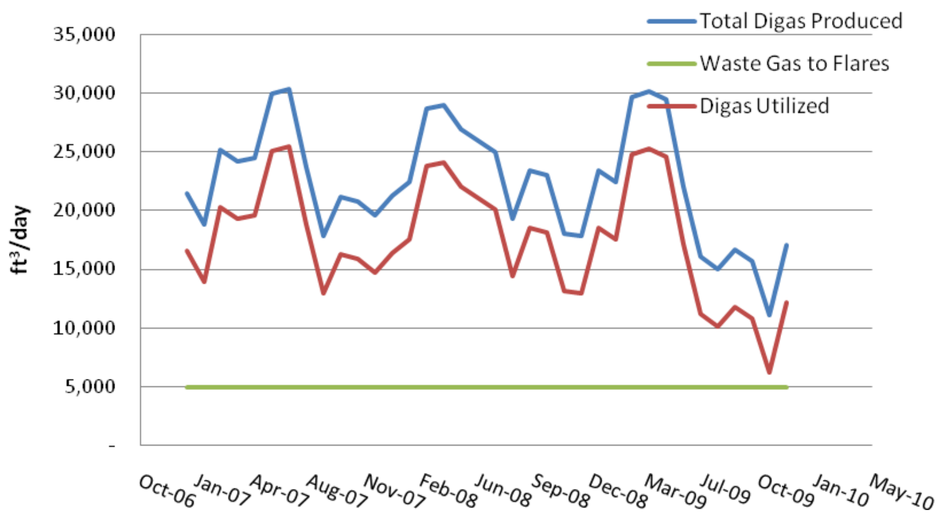


Figure 4.1-3: Digester Gas Production and Use

Table 4.1-11 summarizes the current operational parameters of the digestion system under minimum, average and maximum month conditions.

Table 4.1-11
Current Mode of Operation

	Sludge Flow to Dig#1 (gpd)	VS Loading of Dig #1 (lbs VS/ft^3-day)	Sludge Flow to Dig#2 (gpd)	VS Loading of Dig #2 (lbs VS/ft^3-day)	Biogas Production (ft^3/day)	Biogas Utilized (ft^3/day)
Min	5,330	0.02	7,994	0.02	11,086	6,186
Average	6,826	0.03	10,239	0.03	22,410	17,510
Max	8,050	0.04	12,074	0.04	30,351	25,451

At the average monthly volatile solids loading to both primary digesters of 2,842 lbs VS/day, using an average biogas production rate of 15 ft^3/lb-VS destroyed, and an average monthly digester gas production of 22,410 ft^3/day, the volatile solids destruction within the primary digester complex is calculated to be generally above 50%. This is well within the expected VS destruction of 40 – 60% for a high-rate digestion process.

The objective of CDM's analysis is to identify cost effective means to enhance the digester gas production and consequent use in the existing internal combustion engine system, through the optimization of volatile solids (VS) loading to the Primary Digesters.

4.1.6.2 Determination of the Maximum VS Loading to the Primary Digesters

To determine the maximum volatile solid loading to the primary digesters, an allowable volatile solids loading rate of 0.14 lbs/ft^3-day will be used.

Under the current maximum average month conditions, the volatile solids loading to Primary Digester #1 is 1,577 lbs/day and 2,365 lbs/day to Primary Digester #2, which equates to a volatile solids loading to both primary digesters of 0.04 lbs/ft^3-day. The corresponding digester detention times are computed to be 44 and 47 days. Detention times greater than 15 days are required to meet Class B pathogen reduction.

Based upon an allowable volatile solids loading rate of 0.14 lbs/ft^3-day, the maximum volatile solid loading that can be conveyed to Primary Digester #1 and #2 is 5,722 lbs/day and 9,104 lbs/day, respectively. With the current maximum total volatile solids loading of 3,942 pounds per day, the primary digesters can accept an additional volatile solid loading of 10,884 pounds per day. Additional volatile solids loading can be obtained by adding the thickened waste activated sludge (WAS) from the Aeration Basins or through the addition of fats, oils and grease (FOG).

By increasing the volatile solid loading to the primary digesters by 10,884 pounds per day, at a volatile solid destruction of 50 percent and at an average gas production rate of 15 ft^3/lb of volatile solid destroyed, the additional gas production is calculated to be 81,630 ft^3/day. This gas production value coupled with the average actual measured gas production of 22,410 ft^3/day yields an expected total gas production of 104,040 ft^3/day. This would increase the engine and associated blower run times.

Current Mode of Operation plus Thickened WAS from Aeration Basins

Upon review of the facility's process data, the WAS flow from the aeration basins was determined to range from 30,000 to 47,000 gallons per day. As discussed previously, although not part of the current operation, the ability does exist in the piping configuration to convey the WAS flow from the Aeration Basins to the Gravity Belt Thickeners prior to being added to the Primary Digesters.

There are two Gravity Belt Thickeners designed to process 4,852 lbs/day, on a 7 day per week schedule. At a 0.5% solids content, the WAS flow from the Aeration Basins ranges from 1,200 to 1,960 lbs/day. Based upon the current flows and loads, the total WAS production from both the Oxidation Ditches and the Aeration Basins is within the GBTs' design capacity.

Based on the average WAS production of 1,731 lbs/day from the Aeration Basins, at a capture rate of 95% across the GBTs and an average volatile solids content of 81%, adding thickened WAS from the Aeration Basins results in an additional 1,330 lbs/day of volatile solids (6,380 gpd at 2.5% solids) that can be added to the Primary Digesters. This flow, in addition to the 17,065 gpd of primary sludge and WAS from the Oxidation Ditches, results in a detention time of 34 days. Since a new mixing system is currently being installed in Primary Digester #1, coupled with the cleaning of both Primary Digesters and the Secondary Digester that is also currently being performed, it is anticipated that the volatile solids destruction within the digesters will become more consistent with the expected performance. Therefore, it is assumed that a volatile destruction of approximately 55% will be achieved. At 55% destruction within the digesters and at an average digester gas production rate of 15 ft^3/lb VS destroyed, an additional 10,973 ft^3/day of digester gas production will be produced.

This potential option will be considered further, as the infrastructure already exists within the plant for thickening of this WAS flow and conveying this sludge flow to the primary digesters. It would be recommended that the existing piping be inspected and potentially lined or rehabilitated as required, prior to operating in this matter.

4.1.6.3 Addition of Fats, Oils and Grease (FOG)

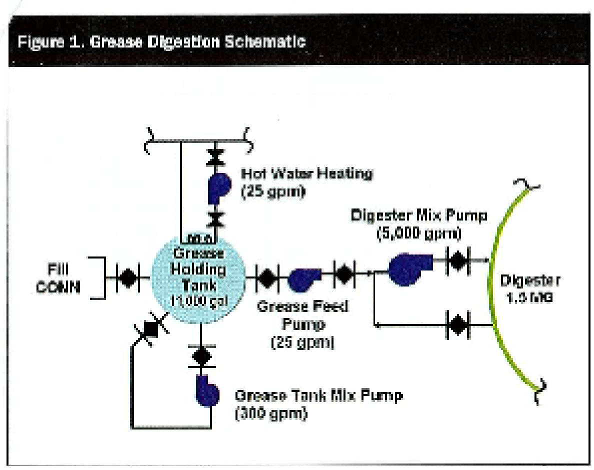
At a time when energy costs are rising, energy recovery is especially beneficial. One of the desirable characteristics of biodegradable fats, oil, and grease (FOG) is its high energy content. When digested under anaerobic conditions, FOG increases the digester methane yield and total quantity of gas produced.

Typically, FOG digestion is more difficult than digestion of primary and waste activated sludge for digesters whose diameter is approximately more than twice its depth. FOG tends to float, so the challenge is to break up the FOG by ensuring adequate digester mixing intensity. Heating of the FOG to more than 160 ºF prior to injection into the digester will liquefy the FOG, promoting better FOG digestion from enhanced mixing, as well as even distribution of FOG throughout the digester volume.

Since FOG is a high-energy material, slug loading the digester with FOG is not desirable, because it can lead to digester upsets or poor digestion of FOG. Therefore, a FOG holding tank large enough to enable FOG to be fed continuously to the digesters at a low rate is recommended.

A typical grease digestion system consists of a fiberglass-reinforced plastic or steel grease holding tank, tank mixing pump, grease feed pump, and tank heating system. Grease haulers can pump grease from their trucks into the grease holding tank. A typical FOG load is between 2,000 and 5,000 gallons and consists of 15 to 20 percent grease, with the balance being water. The grease holding tank mixing pump runs continuously, emulsifying the grease to the consistency of cottage cheese. Over time, grease is pumped into the primary digester. See Figure 4.1-4 for a typical grease digestion system.

Figure 4.1-4: Schematic of a Typical Grease Digestion System



Typically, the grease tank mixing pump is a chopper pump and the grease feed pump is a progressive-cavity pump. Care must be taken with regard to the selection of the material for the progressive-cavity pump's stator as significant wear can be expected as a result of conveying grit. The grease holding tank typically has a conical bottom to facilitate grit accumulation.

One issue with grease digestion is the timing of the grease deliveries and subsequent pumping into the digester. During periods of high deliveries, the grease feed rate to the digester must be increased to make room in the grease holding tank.

The most important design consideration is the increase in solids loading on the primary digester from the grease. Achieving a significant increase in digester gas production requires a significant increase in volatile solids loading. For example, for the City of Watsonville, California wastewater treatment plant, the average grease delivery was 6,100 gallons per day, which increased their volatile solids loading by 0.03 lb/day- ft^3 or approximately 20 percent.

Other important design considerations include adequate digester mixing, grease holding tank volume, mixing rate, and grease feed pump flow. Because gas production will increase, the digester gas handling system should be checked for adequate capacity, including the gas pipe sizing and equipment capacities, such as pressure relief valves, flame arrestors, condensate tanks, and waste gas flares.

Adding grease to anaerobic digesters is relatively inexpensive and a potential source of income; however, an evaluation should be performed before beginning design of the digestion system. The evaluation should consider the following elements:

- Estimate potential grease volume;
- Evaluate digester grease-digestion capacity;
- Evaluate additional heating requirements for heating the grease within the grease holding tank;
- Estimate increased digester gas production with the assumption that grease is 100 percent volatile solids and digests 100 percent;
- Review existing gas handling capacity;
- Review existing gas utilization capacity;
- Determine size and location of grease receiving station;

- Estimate construction cost;
- Estimate increased gas production value;
- Estimate revenue from accepting grease;
- Perform an economic evaluation.

For the purposes of this analysis, it has been assumed that FOG loading will occur in addition to conveying thickened WAS from the Aeration Basins to the Primary Digesters. Therefore, based upon a target additional total volatile solids loading of 10,884 pounds per day as previously discussed and following the addition of 1,330 lbs VS/day of thickened WAS, there is the potential to add 9,554 lbs/day of volatile solids from FOG. At a solid content of FOG of 15 percent as indicated in design literature, approximately 7,635 gallons per day of FOG can be added to the primary digesters.

Based on previous experience and the variability of FOG characteristics, foaming and initial spikes in digester gas production will likely occur. In recent work, FOG addition has successfully attributed to 40-50% of the total VS loading. However, it is recommended that FOG addition be piloted or 'stress-tested' to determine the optimal loading, by adding small amounts of FOG and measuring the performance. Digesters may become unstable is FOG comprises more than 30% of the VS loading.

For the purposes of this analysis, a 30% VS loading from FOG has been assumed. This results in a total VS loading of 0.07 lbs VS/ft^3-day or 7,531 lbs VS/day, which includes 2,259 lbs VS/day from FOG. At a solid content of FOG of 15 percent, this is an additional 1,805 gpd that can be added to the primary digesters. The detention time of the primary digesters when adding primary sludge & WAS under the current mode of operation at 17,065 gallons per day, thickened WAS from the aeration basins at 6,380 gpd and FOG at 1,805 gallons per day is calculated to be approximately 31 days. At a 60% VS destruction rate and a digester gas production rate of 15 ft^3/lb VS destroyed, this additional volatile solids load would result in a total average digester gas production of 67,779 ft^3/day.

Since the FOG will be heated to 160 ^{0}F, there will be no additional sludge heating load to convey the 1,805 gallons per day of FOG to the digesters.

For estimating purposes, assume a temperature loss from the primary digesters of approximately 1^{0}F per day, the estimated heat loss can be computed as follows:

$Q = (41{,}233 + 65{,}031)\ ft^3 \times 62.4\ lb/ft^3 \times 1^0F/day = 6{,}620{,}873\ Btu/day = 276{,}286\ Btu/hr.$

The total heat load requirement is calculated as follows:

Q_T = 366,621 Btu/hr + 276,286 Btu/hr = 642,907 Btu/hr which is less than the rated capacity of the existing boiler of 944,000 Btu/hr.

A conceptual design of the FOG system will consist of one (1) nominal capacity steel grease holding tank of 10,000 gallons with external jacketed heating coils, one (1) 350 gpm recirculation chopper pump, one (1) progressive cavity pump rated for 35 – 1600 gph with a variable frequency drive and inline grinder to be installed on the suction side of the progressive cavity pump. The FOG system will consist of PVC interconnecting piping. To achieve a 1,805 gallon per day FOG loading to the primary digesters and assuming a 5,000 gallon storage volume of FOG (typical volume capacity of a septage receiving truck), the frequency of FOG deliveries is estimated to be 2 times per week. The expected revenue from accepting FOG is $0.06/gallon. If MCJM accepts two (2) deliveries of 4,200 gallons per week this would result in an annual revenue of $26,208.

The governing heating requirement for the design of a FOG system must include the heating requirement for heating sludge to the primary digester and the heating requirement for raising the temperature of FOG within the FOG storage tank from 50 degrees F to 160 degrees F. Both of these heating requirements occur simultaneously until the FOG reaches the 160 degrees F. temperature. Therefore, based upon a 5,000 gallon storage volume of FOG and using a 10 degree temperature difference of FOG in the storage tank, the heating requirement to heat the grease within the storage tank is approximately 420,000 Btu/hr. Adding this heat transfer requirement to the sludge heat transfer requirement of 366,621 Btu/hr, the total heat transfer requirement is computed to be 786,621 Btu/hr.

The detailed analyses presented in Appendix E provides information on the available heat produced by the operation of the engines, based upon the projected gas production rates from different operating scenarios.

4.1.6.4 Addition of Peat Humic Substance (PHS)

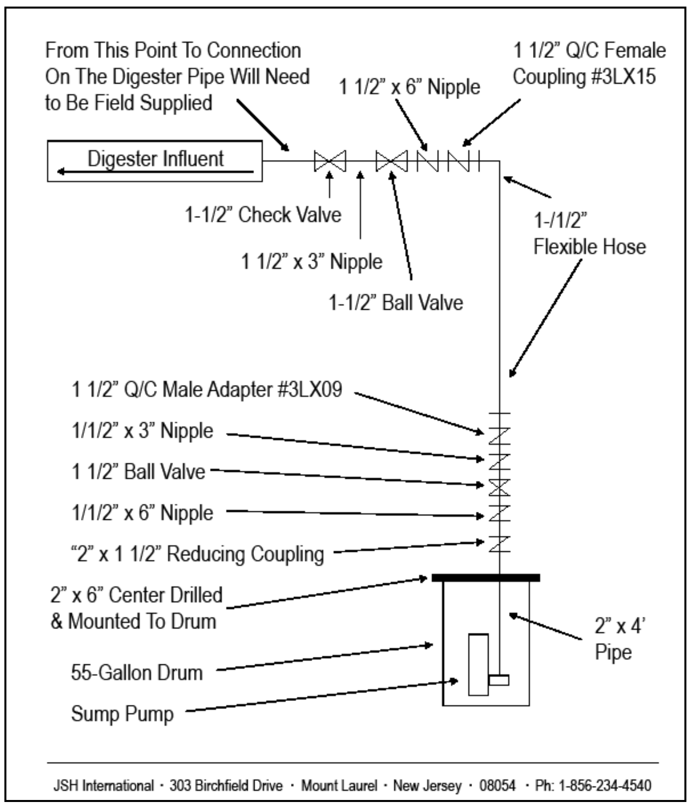
The various sludge processing options and the addition of FOG discussed thus far, result in an increase in VS loading to the digestion complex and resulting increase in digester gas production. Another alternative available is the addition of peat humic substance (PHS).

PHS does not increase the solids loading of the digester, but rather stimulates the activity of the micro-organisms that are destroying the volatile solids and releasing digester gas. Prodex, which is a division of JSH International, is a company in NJ that provides PHS. Prodex's PHS product is called BAE™ (Biological Activity Enhancer). BAE is an organic liquid bio-stimulant that is derived from highly humified peat sources that is blended through a stabilization and extraction process.

Based on the current average plant influent flows and sludge loading to the Primary Digesters, Prodex has recommended that 1 to 1.5 gallons of BAE per day be dosed to the suction side of the sludge feed pumps. At this dosing rate, it is anticipated that digester gas production will be increased by 20 – 30%.

The equipment necessary to dose BAE is a 55 gallon drum with a sump pump, check valves, isolation valves and piping or flexible tubing. The daily requirement of BAE and make-up water is added to the storage drum daily . As such, the storage drum would need to be located indoors to prevent from freezing. Figure 4.1-5 is a typical BAE dosing system schematic.

Figure 4.1-5: Schematic of a Typical BAE Dosing System



The capital investment associated with the addition of a BAE system is minimal, as Prodex will typically supply the equipment. However, location and digester gas collection system capacity would have to be evaluated. Additionally, it would be recommended that the addition of PHS is piloted and that the digesters be cleaned prior to testing the results of BAE addition. BAE costs are approximately $45 per gallon, which at an average dosing rate of 1.25 gallons per day, relates to an annual material cost of $20,532.

Table 4.1-12 summarizes the above analyses for the digester loading operational scenarios.

Table 4.1-12
Various Sludge Processing and Digester Loading Operational Scenarios

Sludge Processing	VS (lbs/day)	Digester Loading (lbs/day-ft^3)	Sludge Flow (gpd)	Detention Time (Days)	Gas Production (ft^3/day)	Heating Requirement (Btu/hr)
Current Operation (PSL & TWAS)	3,942	0.04	17,065	47	22,410	416,460
Current Operation + TWAS from Aeration Basins	5,272	0.05	23,445	34	33,383	416,460
Current Operation + TWAS from Aeration Basins + FOG	7,531	0.07	25,250	31	67,779	786,621
Current Operation + PHS	3,942	0.04	17,065	47	26,892[1]	416,460

PSL = Primary Sludge
TWAS = Thickened Waste Activated Sludge
FOG = Fats, Oils, and Grease
PHS = Peat, Humic Substance

1. It is recommended that the addition of PHS be piloted and the increase in digester gas production confirmed, as Prodex does not have experience with BAE addition to digesters with greater than 30 day detention times.

4.1.6.5 Economic Analysis

Appendix E includes detailed analyses for three (3) of the different operational schemes discussed herein: the addition of thickened WAS from the aeration basins, the addition of thickened WAS and FOG and the addition of PHS. These operational schemes have been evaluated in an effort to maximum the digester loading and the resulting digester gas production and use.

Table 4.1-13 summarizes the pertinent energy savings and energy production associated with the addition of thickened WAS from the Aeration Basins to the primary digesters.

Table 4.1-13: TWAS Addition Performance Summary

Table 4.1-13 TWAS Addition Performance Summary							
Annual Biogas Production (ft^3/day)	Annual Digester Heat Demand (Btu/hr)	Annual Biogas Utilized to run Blower (ft^3/day)	Annual Reclaimed Heat from Engine Operation (Btu/hr)	Avg. Annual Biogas Utilized in Boilers (ft^3/day)	Annual Heat Production from Boiler Operation on Biogas (Btu/hr)	Annual Available Heat for Building Heat Demand (Btu/hr)	Annual Thermal Energy Cost Savings at $1.07/ therm
465,320	5,223,723	281,600	3,353,333	183,720	3,368,200	1,497,811	$14,805

This operational scheme results in an increase in digester gas production, which can then be utilized to off-set the natural gas consumption to heat the building and the primary digesters and result in an annual thermal energy cost savings of $14,805.

Table 4.1-14 summarizes the pertinent energy savings and energy production associated with the addition of thickened WAS from the Aeration Basins and fats, oils and grease to the primary digesters.

Table 4.1-14 TWAS & FOG Addition Performance Summary								
Annual Biogas Production (ft^3/day)	Annual Digester Heat Demand (Btu/hr)	Annual Biogas Utilized to Run Blower (ft^3/day)	Annual Reclaimed Heat from Engine Operation (Btu/hr)	Avg. Annual Biogas Utilized in Boilers (ft^3/day)	Annual Heat Production from Boiler Operation on Biogas (Btu/hr)	Annual FOG System Heat Demand (Btu/hr)	Annual Available Heat for Building Heat Demand (Btu/hr)	Annual Thermal Energy Cost Savings at $1.07/ therm
878,072	5,223,723	281,600	3,353,333	596,472	10,935,320	4,399,452	4,665,479	$36,422

This operational scheme results in an increase in digester gas production, which can then be utilized to off-set the natural gas consumption to heat the building and the primary digesters and result in an annual thermal energy cost savings of $36,422. The thermal energy cost savings is less as a result of the FOG system heat demand. Additionally, if MCJM accepts two (2) deliveries of 4,200 gallons per week of FOG this would result in annual revenue of $26,208.

Table 4.1-15 summarizes the pertinent energy savings and energy production associated with the addition of peat, humic substance to the primary digesters.

Table 4.1-15: PHS Addition Performance Summary

Table 4.1-15 PHS Addition Performance Summary							
Annual Biogas Production (ft^3/day)	Annual Digester Heat Demand (Btu/hr)	Annual Biogas Utilized to Run Blower (ft^3/day)	Annual Reclaimed Heat from Engine Operation (Btu/hr)	Avg. Annual Biogas Utilized in Boilers (ft^3/day)	Annual Heat Production from Boiler Operation on Biogas (Btu/hr)	Annual Available Heat for Building Heat Demand (Btu/hr)	Annual Thermal Energy Cost Savings at $1.07/ therm
400,373	5,223,723	257,195	3,062,711	143,330	2,627,717	1,263,612	$9,865

This operational scheme results in an increase in digester gas production, which can then be utilized to off-set the natural gas consumption to heat the building and the primary digesters and result in an annual thermal energy cost savings of $9,865. Additionally, if MCJM doses 1.25 gallons per day of PHS, this relates to an annual material cost of $20,532.

As a result, the addition of PHS during the current operational practices is not recommended. The addition of PHS in addition to the addition of thickened WAS from the aeration basins would allow for the potential thermal cost savings to off-set the additional operational costs associated with accepting PHS and maintaining the system. This evaluation is presented in Table 4.1-16.

Table 4.1-16 summarizes the simple payback associated with the various digestion system optimization options.

Table 4.1-16
Digestion Optimization Alternatives

	Alt. 1 – Add TWAS from Aeration Basins	**Alt. 2 – TWAS and FOG Addition**	**Alt. 3 – TWAS and PHS Addition**
Engineers Opinion of Probable Construction Cost[1]	$15,600	$409,656	$15,600[4]
New Jersey SmartStart Rebate	$0	$0	$0
Total Cost	$15,600	$409,656	$15,600
Annual Thermal Energy Cost Savings	$14,805	$36,422	$24,670
Annual Maintenance Cost Savings (AMCS)	NA	($15,600)	($2,000)
Annual Revenue[2]	NA	$26,208	($20,532)
Simple Payback (years)	**1.1**	**8.7**	**7.3**
Annual Return on Investment (AROI)	90%	6.5%	8.7%
Lifetime Energy Savings [3]	$397,816	$978,673	$662,892
Internal Rate of Return (IRR)	98%	12%	30.2%
Net Present Value (NPV)	$271,876	$548,552	$128,210

1. The Engineer's Option of Construction Cost is based solely upon a conceptual engineering level of effort. A more detailed construction cost estimate should be prepared as design documents are progressed.
2. Annual revenue is calculated on the assumption that 2 FOG deliveries of 4,200 gallons per week would be accepted every week at a cost of $0.06/gallon.
3. 3% yearly inflation on natural gas costs. Assumption on equipment life is based on manufacturer information.
4. It would be recommended that the digesters be cleaned prior to testing the addition of PHS, however, this is included under the current digester gas mixing system contract.

Although the capital cost is significantly greater for Alternative 2 than 1, the addition of thickened WAS from the aeration basins plus FOG, the annual revenue and thermal energy cost savings makes this the most attractive alternative from a financial point of view and as such it is recommended that MCJM further investigate this option. As discussed previously a number of considerations, potential piloting and design work would be required to confirm a consistent supply of FOG.

In the mean time, modifying the current operation of the digestion system with the addition of thickened WAS from the aeration basins will improve digester gas production and create thermal energy savings with a minimal capital investment.

4.2 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 Belvidere, 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 facility. The electric usage for heating is extremely small when compared to the electric use that is process related. For this reason, modeling all of the buildings and calibrating to the entire plant's electric bill would not be beneficial for estimated electrical heating or energy savings.

There are two gas meters at the plant. One meter is for the 1990 upgrade, which includes the Sludge Handling Building and the Final Clarifier No. 3 &4 building. The other meter services the remaining four buildings that have gas fired equipment. The four buildings that are on meter 2808461 are the two Digester Buildings, the Blower Building, and the Administration Building. The digester building boilers provide process hot water for digesters heating, and can operate on either natural, or digester gas. Due to the boilers being used for purposes other than heating the buildings, the four buildings were not able to be calibrated to actual gas usage. The Blower Building was the only one of the four buildings that was modeled. The proportion of the total gas used through meter 2808461 that belongs to the blower building is unknown, so the model could not be calibrated. The two buildings that were a part of the 1990 upgrade 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 has 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 F.

4.2.1 Administration Building

The Administration Building office area is heated and cooled by a gas fired Trane rooftop unit. The rooftop unit was manufactured in 2006 and is not in need of replacement. The basement and electrical room are heated by gas fired unit heaters. The sulfur dioxide storage, chlorine room, and bi-sulfate room are all heated by electric unit heaters. There is an Emerson digital thermostat located next to the conference room. Staff mentioned that they currently have night setback incorporated. For a more detailed description of the heating ventilation and air conditioning see Section 2.2.2.

The HVAC equipment at the Administration 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.

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 4.2.1-1, 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 4.2.1-1
Administration Building HVAC Equipment Service Lives

Description	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
Forced Air Furnace with Cooling Rooftop Unit	Roof	Administration Building	Trane	YSC120A4EHA2R0 00000000000D	80%	4	15
Electric Unit Heater	Sulfur Dioxide Storage	Sulfur Dioxide Storage	Dayton	Unknown	100%	Unknown (good)	13
Electric Unit Heater	Chlorine Room	Chlorine Room	Trane	Unknown	100%	Unknown (good)	13
Electric Unit Heater	Bi-Sulfite Room	Bi-Sulfite Room	Dayton	Unknown	100%	Unknown (good)	13
Gas Fired Unit Heater	Electrical Room	Electrical Room	Airtherm	Unknown	80%	Unknown (old)	13
Gas Fired Unit Heater	Basement	Basement	Airtherm	Unknown	80%	Unknown (old)	13
Small Exhaust Fans (x3)	Roof	Offices	Penn Ventilator Co.	Unknown	Unknown	Unknown (old)	20
Large Exhaust Fan	Roof	Offices	Penn Ventilator Co.	33 Watt	Unknown	Unknown (old)	20
Exhaust Fan	Roof	Sulfur Dioxide Storage	Penn Ventilator Co.	FMX-18B	Unknown	Unknown (good)	20
Ventilator	Roof	Garage	Delhi Industries	B1-10CW UPN EIS	Unknown	11	20

Table 4.2.1-1
Administration Building HVAC Equipment Service Lives

Wall Exhaust Fan	Chlorine Room	Chlorine Room	Unknown	Unknown	Unknown	Unknown (good)	20
Wall Ventilation Fan	Southwest Wall	Laboratory	ILG	CWF-22	Unknown	Unknown (old)	20

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 4.2.1-2 below.

Table 4.2.1-2
Administration Building Domestic Water Heaters

Location	Make	Storage Capacity (Gallons)	Type	Heating Capacity	Estimated Age (Years)
Garage	Rheem	50	Electric	4500 Watts	Unknown (Good)

4.2.2 Grit Building

The Grit Building HVAC equipment consists of an explosion proof electric unit heater, and a roof mounted exhaust fan. The HVAC equipment at the Grit 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 4.2.2-1 below, along with estimated current ages and ASHRAE-expected service lives.

Table 4.2.2-1 Grit 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	Grit Building	Grit Building	Sentinel	XUHA05A73SP	100%	Unknown (old)	13
Exhaust Fan	Roof	Grit Building	Unknown	Unknown	Unknown	Unknown	20

4.2.3 Digester No. 1 Building

The Digester No. 1 Building's heating is provided by a Buderus cast-iron boiler. The boiler is 16 years old and has not exceeded half of its ASHRAE expected life. A replacement may be warranted when it approaches 35 years old. The boiler has two gas trains that are located on the side of the boiler. One of the gas trains is for natural gas, the other for digester gas. This boiler sends hot water to the sludge heat exchanger which allows for the heating of the digester. The hot water is also sent through a hot water unit heater in the boiler room, and hot water fin tube radiators. An exhaust fan exhausts air from the three floors of the building.

During the audit, CDM noted that there was a combustion air louver with dimensions of approximately 2′ x 3′ located in the boiler room. Outdoor combustion air should be provided to the boiler room according to Section 304 of the New Jersey Fuel Gas Code. Having the appropriate proportion of fuel and combustion air can increase the efficiency of the boiler and generate savings for the Madison-Chatham Joint Meeting.

The HVAC equipment at the Digester 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 4.2.3-1 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 4.2.3-1
Digester Building No. 1 HVAC Equipment Service Lives

Description	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
Gas Fired Cast Iron Boiler	Boiler Room	Digesters	Buderus	G 405/10	75%	16	35
Hot water Unit Heater	Boiler Room	Boiler Room	Modine	Unknown	Unknown	Unknown (old)	20
Hot Water Baseboard Heater	Engine Room	Engine Room	Unknown	Unknown	Unknown	Unknown	20
Exhaust Fan	Roof Between Digesters	Three Floors Below	Unknown	Unknown	Unknown	Unknown (old)	20

4.2.4 Digester No. 2 Building

The Digester No. 2 Building's heating is provided by a high efficiency Buderus cast-iron boiler. The boiler is 10 years old and has a thermal efficiency of about 93%. The boiler has two gas trains that are located on the side of the boiler. One of the gas trains is for natural gas, the other for digester gas. This boiler sends hot water to the sludge heat exchanger which allows for the heating of the digester. The hot water is also sent through hot water fin tube radiators. Three exhaust fan exhaust air from the building. For a more detailed description of the heating ventilation and air conditioning see Section 2.5.2.

During the audit, CDM noted that there was a combustion air louver with dimensions of approximately 3' x 3' located in the boiler room. Outdoor combustion air should be provided to the boiler room according to Section 304 of the New Jersey Fuel Gas Code. Having the appropriate proportion of fuel and combustion air can increase the efficiency of the boiler and generate savings for the Madison-Chatham Joint Meeting.

The HVAC equipment at the Digester 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 4.2.4-1 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 4.2.4-1
Digester Building No. 2 HVAC Equipment Service Lives

Description	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
Gas Fired Cast Iron Boiler	Boiler Room	Digesters and Bar Screen Building	Buderus	GE515/7	93%	10	35
Hot Water Baseboard Heater	Pump Recirculation Room	Pump Recirculation Room	Unknown	Unknown	Unknown	Unknown	20
Exhaust Fan (x3)	Roof	Bar Screen Building	Unknown	Unknown	Unknown	Unknown	20

4.2.5 Waste Oil Building

The Waste Oil Building HVAC equipment consists of a Qmark electric unit heater. The HVAC equipment at the Grit 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 4.2.5-1 below, along with estimated current ages and ASHRAE-expected service lives.

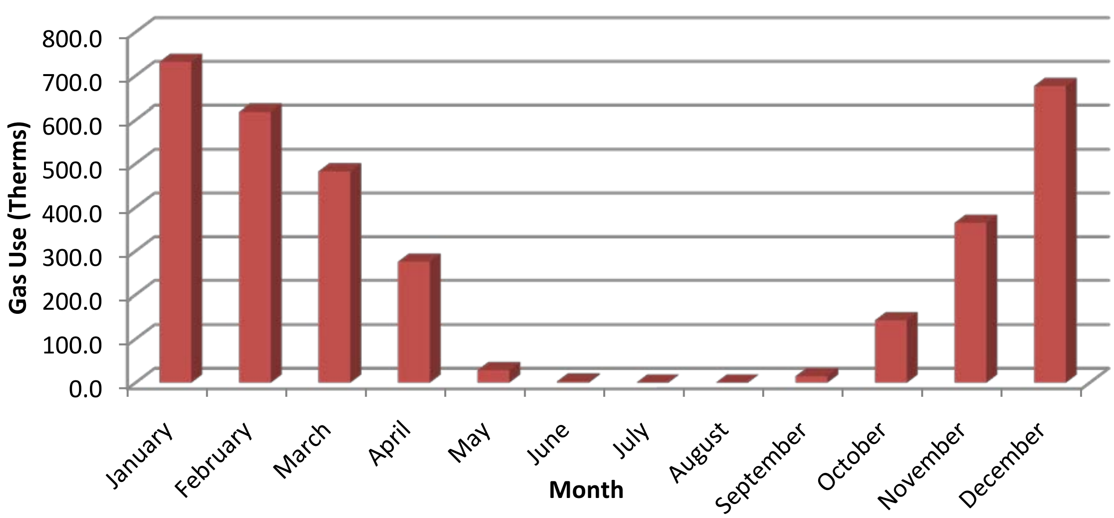
Table 4.2.5-1 Waste Oil Building HVAC Equipment Service Lives							
Description	**Unit Location**	**Service Location**	**Manufacturer**	**Model**	**Estimated Efficiency**	**Estimated Age (Years)**	**ASHRAE Expected Life (Years)**
Electric Unit Heater	First Floor	First Floor	Qmark	Unknown	100%	Unknown (good)	13

4.2.6 Blower Building

The Blower Building's heating is provided by a natural gas fired Utica steam boiler. The boiler is 11 years old and has not exceeded half of its ASHRAE expected life. The steam fills the American Radiator Co. radiators throughout the building. A Modine steam unit heater heats the basement. For a more detailed description of the heating ventilation and air conditioning see Section 2.7.2.

Figure 4.2.6-1 below displays the anticipated gas use at the Blower Building. As stated in Section 4.2.6, the anticipated gas use is based on building models, and could not be calibrated to actual gas use. Due to eQuest limitations, the building was modeled with a hydronic heating system. CDM is using the building model to estimate the savings that are discussed in this section.

Figure 4.2.6-1: Blower Building Natural Gas Usage



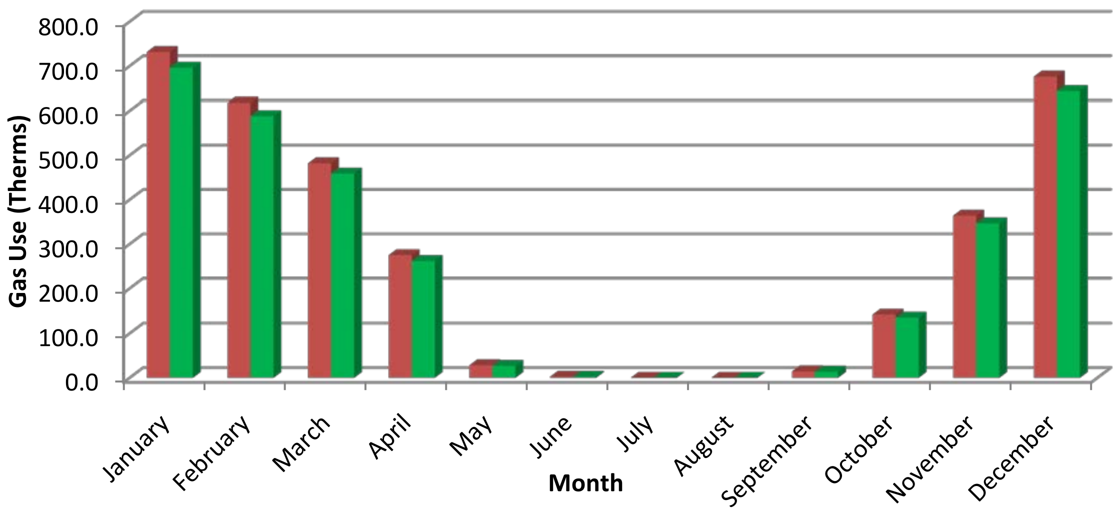
The current cast iron Utica boiler has an input rating of 300 MBH. A hot water gross I=B=R rating of 243 MBH gives this boiler a combustion efficiency of 81%.

CDM recommends replacing this boiler with a higher-efficiency steam boiler. Current steam boilers can provide combustion efficiencies of up to 86%.

CDM anticipates that one (1) 243 MBH output high-efficiency steam boiler is more has more than enough heating capacity to heat the Blower Building.

Figure 4.2.6-2 predicted gas usage with predicted gas usage resulting from a switch to a high-efficiency steam boiler. The replacement boiler is modeled with a full-load efficiency of 85% in mild weather.

Figure 4.2.6-2: Blower Building – Boiler Upgrade - Natural Gas Usage



Fiscal savings from such an upgrade are then identified in Table 4.2.6-1 below. Lifetime savings calculations for all ECRM's may be found in Appendix N. It's important to note that these are estimates based on building models, and further investigation is warranted before pursuing boiler replacements.

Table 4.2.6-1 **Blower Building Boiler Upgrade Payback**	
Predicted Annual Savings (Therms)	161
Total Annual Savings	$172
Initial Capital Cost of Upgrade	$15,071
Incentives**	$300

Table 4.2.6-1 Blower Building Boiler Upgrade Payback	
Cost of Upgrade	$15,071
Simple Payback	**87.6**
Lifetime Energy Savings (25 years)*	$5,509
Annual Maintenance Cost Savings (AMCS)	$0
Annual Return on Investment (AROI)	(2.86%)
Internal Rate of Return (IRR)	(5.38%)
Net Present Value (NPV)	($10,896)

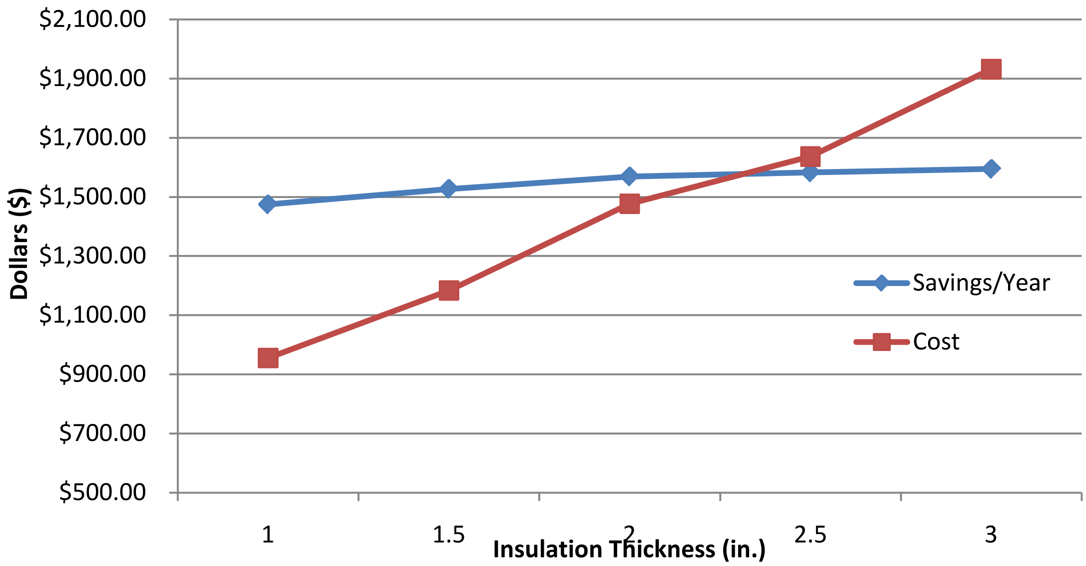
*Assumes 2% yearly inflation on natural gas costs
**Incentives, per New Jersey Clean Energy Program, are $300 per unit

Due to the long payback, CDM does not recommend this replacement. The current Utica boiler is only 11 years old, and boiler should be evaluated for replacement when it nears its expected life.

The steam piping that was seen in the Blower Building was bare with no insulation. Significant savings can be realized from insulating the steam piping. 3E Plus is an insulation thickness computer program and was used to estimate the savings. The steam is assumed to be maintained at 220 degrees F, and the ambient temperature surrounding the piping is assumed to be a conservative 80 degrees F. The existing pipe diameter of 1.5" was used for the calculation. The 5,000 operating hours per year was taken from the eQuest generated model. Mineral Fiber insulation with an all service jacket was the material input.

A series of insulation thicknesses between 1" to 3" were evaluated to find the shortest payback. Figure 4.2.6-3 shows the savings and cost associated with each insulation thickness.

Figure 4.2.6-3: Blower Building – Pipe Insulation Savings



Fiscal savings from the 1" insulation addition to the steam piping are then identified in Table 4.2.6-2 below. Lifetime savings calculations for all ECRM's may be found in Appendix N. It's important to note that these are estimates based on building models and simulation software. Further investigation of insulation material, thickness and savings is warranted before pursuing installation.

Table 4.2.6-2 Blower Building Pipe Insulation Payback	
Predicted Annual Savings (Therms)	1,379
Total Annual Savings	$1,475
Initial Capital Cost of Upgrade	$955
Incentives**	$0
Cost of Upgrade	$955
Simple Payback	**0.6**
Lifetime Energy Savings (24 years)*	$44,872
Annual Maintenance Cost Savings (AMCS)	$0
Annual Return on Investment (AROI)	150.28%

Table 4.2.6-2 Blower Building Pipe Insulation Payback	
Internal Rate of Return (IRR)	157.45%
Net Present Value (NPV)	$33,414

*Assumes 2% yearly inflation on natural gas costs

During the audit, CDM noted that there wasn't proper combustion air supplied to the boiler room. Outdoor combustion air should be provided to the boiler room according to Section 304 of the New Jersey Fuel Gas Code. Having the appropriate proportion of fuel and combustion air can increase the efficiency of the boiler and generate savings for the Madison-Chatham Joint Meeting.

All major equipment noted during CDM's on site audit is listed in Table 4.2.6-3 below, along with estimated current ages and ASHRAE-expected service lives.

Table 4.2.6-3
Blower 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	Basement	Basement	Modine	H 345	80%	Unknown (old)	13
Gas Fired Cast Iron Steam Boiler	Boiler Room Basement	Blower Building	Utica	PEG300CIDE	81%	11	30
Belt Driven Ventilation Fan	Blower Room First Floor	Blower Room First Floor	Unknown	Unknown	Unknown	Unknown	15

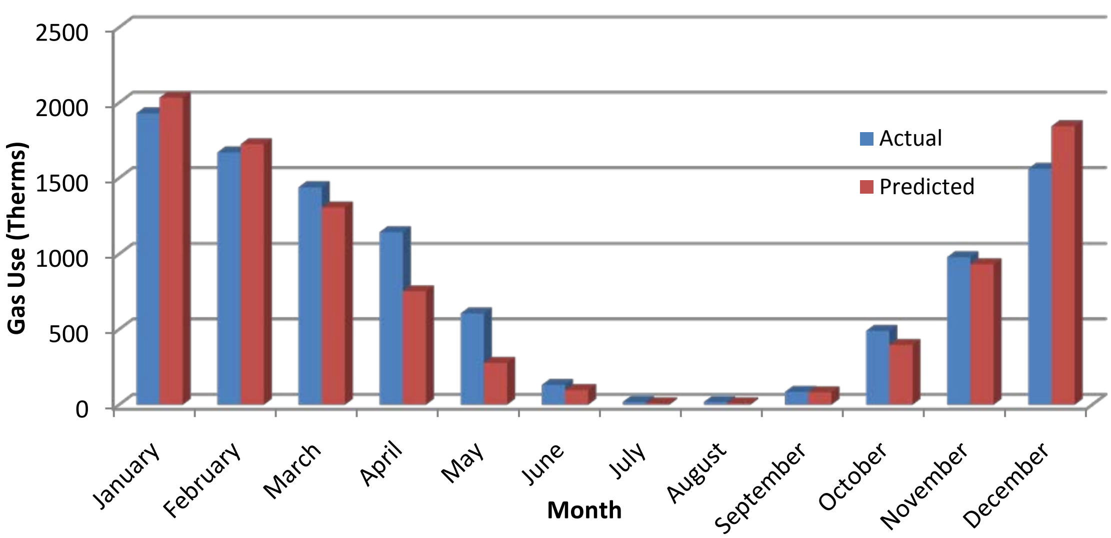
CDM also created an inventory of observed domestic water heaters. This will identify any water heaters that are in need of replacement. Domestic water heaters observed to be in poor or aging condition would warrant replacement, as they are likely not operating at peak efficiency. This domestic water heater inventory may be seen as Table 4.2.6-4 below.

Table 4.2.6-4 Blower Building Domestic Water Heaters					
Location	**Make**	**Storage Capacity (Gallons)**	**Type**	**Heating Capacity**	**Estimated Age (Years)**
Boiler Room Basement	Vanguard	30	Electric	4500 Watts	Unknown (Good)

4.2.7 Sludge Handling Building

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 two buildings on gas meter number 2414133 that can be calibrated. The Sludge Handling Building and the Final Clarifiers No. 3 & 4 Building were modeled and calibrated to match the actual gas usage for the plant. To calibrate the models, CDM used natural gas bills from December, 2007 through April, 2010. Figure 4.2.7-1 below compares actual monthly gas usages, with those predicted by the eQuest models for the two buildings. While some natural gas is used for domestic water heating, the boilers account for the majority of the natural gas usage at the school. The models combined are modeled within 7% of the actual usage.

Figure 4.2.7-1: Sludge Handling and Final Clarifiers No. 3&4 Buildings – Natural Gas Usage



The Sludge Handling Building is heated by hot water supplied by a Raypak modulating boiler. The boiler has an input rating of 1,250 MBH and a gross I=B=R output rating of 1,087 MBH. This boiler has a thermal efficiency of 87%. Unit heaters and heating and ventilating units are served by this boiler. This boiler also serves the H&V unit and unit heaters at the Final Clarifiers Building No. 3 & 4. Air cooled condensing units are located on the roof of the building. They provide cooling by means of ceiling mounted air handling units to the break and control room. For a more detailed description of the heating ventilation and air conditioning see Section 2.8.2.

There is a decommissioned heat recovery system that was used to serve the filter room. The superintendent has investigated the possibility of operating the system again. It was determined that the heat recovery system would be too costly to repair.

During the audit, CDM noted that there are four combustion air louvers with dimensions of approximately 2′ x 2′ at both high and low locations in the mechanical room. Outdoor combustion air should be provided to the boiler room according to Section 304 of the New Jersey Fuel Gas Code. Having the appropriate proportion of fuel and combustion air can increase the efficiency of the boiler and generate savings for the Madison-Chatham Joint Meeting.

The HVAC equipment at the Sludge Handling 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 4.2.7-1 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 4.2.7-1
Sludge Handling Building HVAC Equipment Service Lives

Description	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
Gas Fired Modulating Boiler	Boiler Room	Sludge Handling & Pump Station Buildings	Raypak	H7-1253	87%	6	35

Table 4.2.7-1
Sludge Handling Building HVAC Equipment Service Lives

Hot Water Unit Heater	Boiler Room	Boiler Room	Trane	UHSA-020W-2C-AAA	Unknown	Unknown	20
Hot Water Unit Heater	Electrical Room	Electrical Room	Trane	Unknown	Unknown	Unknown	20
Hot Water Unit Heater (x4)	Pump Room	Pump Room	Trane	Unknown	Unknown	Unknown	20
Belt Drive Ventilation Fans (x2)	Pump Room	Pump Room	Unknown	Unknown	Unknown	Unknown	15
Hot Water Unit Heater (x4)	Thickener Room	Thickener Room	Trane	Unknown	Unknown	Unknown	20
Hot Water Unit Heater (x2)	Mezzanine Level	Mezzanine Level	Trane	UHSA-020W-2C-AAA	Unknown	Unknown	20
Heating & Ventilation Unit (HV-2)	Mezzanine Level	Pump Room	Trane	TVDB06AG0FBARR02	Unknown	Unknown (old)	20
Heating & Ventilation Unit (HV-3)	Mezzanine Level	Janitors Closet, Restroom, Locker Room	Trane	TV0B03AGOFSALL02	Unknown	Unknown (old)	20
Air Handling Unit (AC-1)	Mezzanine Level	Control Room	Trane	TWEO18C14OBO	Unknown	6	15
Air Handling Unit (AC-2)	Ceiling	Break Room	Unknown	Unknown	Unknown	Unknown	15
Condensing Unit (ACC-1)	Roof	AC-1	Trane	TTB012C100A2	10 SEER	7	15

Table 4.2.7-1
Sludge Handling Building HVAC Equipment Service Lives

Condensing Unit (ACC-2)	Roof	AC-2	Trane	2TTB3018A1000AA	13.25 SEER	4	15
Heating and Ventilation Rooftop Unit (HV-1)	Roof	Filter Room, Sludge Handling Area	Trane	PCC-37EA	Unknown	Unknown	20
Roof Ventilator	Roof	Filter Room	Unknown	Unknown	Unknown	Unknown	20
Roof Ventilator	Roof	HV-3	Unknown	Unknown	Unknown	Unknown	20
Roof Ventilator	Roof	AC-1 & AC-2	Unknown	Unknown	Unknown	Unknown	20
Roof Ventilator	Roof	HV-2	Unknown	Unknown	Unknown	Unknown	20
Roof Ventilator	Roof	Electrical Room	Unknown	Unknown	Unknown	Unknown	20
Exhaust Fan	Roof	Locker Room, Restroom, Janitors Closet	Unknown	Unknown	Unknown	Unknown	20
Exhaust Fan	Roof	Locker Room, Restroom, Janitors Closet	Penn Ventilator	FMX-12B	Unknown	Unknown	20
Exhaust Fan	Roof	Electrical Room	Penn Ventilator	FMX-24B	Unknown	Unknown	20

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 4.2.7-2 below.

Table 4.2.7-2
Sludge Handling Building Domestic Water Heaters

Location	Make	Storage Capacity (Gallons)	Type	Heating Capacity	Estimated Age (Years)
Boiler Room	A.O. Smith	100	Gas	199 MBH	Unknown (good)

4.2.8 Final Clarifiers Building No. 1 & 2

The Final Clarifiers Building No. 1 & 2 HVAC equipment consists of a Dayton electric unit heater and a gravity ventilator. The HVAC equipment at the Final Clarifiers Building No. 1 & 2 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 4.2.8-1 below, along with estimated current ages and ASHRAE-expected service lives.

Table 4.2.8-1
Final Clarifiers Building No. 1 & 2 HVAC Equipment Service Lives

Description	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
Electric Unit Heater	Basement	Basement	Dayton	2YU56	100%	Unknown (good)	13
Exhaust Fan	Concrete Slab	Basement	Unknown	Unknown	Unknown	Unknown	20

4.2.9 Final Clarifiers Building No. 3 & 4

Final Clarifiers Building No. 3 & 4 is heated by the hot water boiler from the Sludge Handling Building. The hot water runs through a heating and ventilating unit that serves the basement. A Trane hot water unit heater provides additional heating to the basement. Hot water fin tube radiators also provide heating to the building. For a more detailed description of the heating ventilation and air conditioning see Section 2.10.2.

The HVAC equipment at the Final Clarifiers Building No. 3 & 4 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 4.2.9-1 below, along with estimated current ages and ASHRAE-expected service lives.

Table 4.2.9-1
Final Clarifier Building No. 3 & 4 HVAC Equipment Service Lives

Description	Unit Location	Service Location	Manufacturer	Model	Estimated Efficiency	Estimated Age (Years)	ASHRAE Expected Life (Years)
Heating & Ventilating Unit	Mechanical/ Electrical Room	Basement	Trane	TVDB03AGOFSNRRO2	Unknown	20	20
Hot Water Unit Heater	Basement	Basement	Trane	42-S	Unknown	20	20
Exhaust Fan	Roof	Mechanical/ Electrical Room	Unknown	1,200 CFM	Unknown	20	20
Exhaust Fan	Roof	Basement	Unknown	1,000-2,000 CFM	Unknown	20	20

Table 4.2.9-1 Final Clarifier Building No. 3 & 4 HVAC Equipment Service Lives							
Gravity Roof Vent	Roof	Mechanical/ Electrical Room	Unknown	Unknown	Unknown	20	20
Gravity Roof Vent	Roof	HV Unit	Unknown	Unknown	Unknown	20	20

4.3 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 I 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 Molitor Water Pollution Control Facility (MWPCF), 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 MWPCF plant could benefit from installation of occupancy sensors. Therefore, occupancy sensor installation has been recommended in this report. Refer to Appendix I 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.

4.3.1 Administration Building

It is recommended that the existing 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 I, involves replacing existing inefficient bulbs, and installing new energy-efficient luminaires to the existing lighting systems. Options for improving the interior and exterior lighting for the Administration Building are listed in Table 4.3-1.

Table 4.3-1
Administration Building Lighting System Improvements

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

The annual energy savings for these options are as follows:

Interior Lighting: 4.0kW, 9,045.0 kWh and $1,369.4
Exterior Lighting: 0.5kW, 2,168.1 kWh and $328.3

The following table, Table 4.3-2, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the Administration Building.

Table 4.3-2
Administration Building Lighting System Improvements***

	Interior Lighting	Exterior Lighting	Total
Engineer's Opinion of Probable Cost	$15,690.3	$116.4	$15,806.7
New Jersey SmartStart Rebate	-$1,075*	-$0****	-$1,075*
Total Cost	$14,615.3	$116.4	$14,731.8

Table 4.3-2 Administration Building Lighting System Improvements***			
	Interior Lighting	**Exterior Lighting**	**Total**
Annual Energy Savings	$1,369.4	$328.3	$1,697.7
Annual Maintenance Cost Savings (AMCS)	$260.5	-$1.6	$258.9
Simple Payback	**9.0 years**	**0.4 years**	**7.5 years**
Annual Return on Investment (AROI)	4.49%	274.01%	6.61%
Lifetime Energy Savings (15 years)**	$25,469.4	$6,106.0	$31,575.4
Internal Rate of Return (IRR)	9.98%	283.68%	12.95%
Net Present Value (NPV)	$9,121.3	$4,641.5	$13,762.7

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix H.
**3% yearly inflation on electricity costs. Total lifetime savings does not equal sum of combined savings.
***See Appendix G & N 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 I.

4.3.2 Grit Building

It is not recommended to upgrade the existing interior lighting at the Grit Building. Payback calculations yield an excessive simple payback to replace the four explosion proof interior lights. Additionally, these fixtures are turned off during non-work hours, and the building is limitedly occupied. No exterior fixtures exist.

Therefore, based upon the above, no recommendations to improve energy reduction are being made at this time.

Refer to Appendix Q for complete ECRM financial calculations.

4.3.3 Digester #1 Building

It is not recommended to upgrade either the existing interior or exterior lighting at the Digester #1 Building. Payback calculations yield an excessive simple payback to replace the nineteen explosion proof interior lights, and two explosion proof exterior lights.

Therefore, based upon the above, no recommendations to improve energy reduction are being made at this time.

Refer to Appendix Q for complete ECRM financial calculations.

4.3.4 Digester #2 Building

It is not recommended to upgrade either the existing interior or exterior lighting at the Digester #1 Building. The interior lighting simple payback calculation yields an excessive simple payback to replace the fourteen explosion proof lights, and energy efficient lights already exist on the exterior of the building.

Therefore, based upon the above, no recommendations to improve energy reduction are being made at this time.

Refer to Appendix Q for complete ECRM financial calculations.

4.3.5 Waste Oil Building

It is recommended that the existing lighting system at the Waste Oil Building be upgraded to high efficiency standards to reduce power consumption. In general, the recommended lighting upgrade, as presented in Appendix I, involves replacing existing inefficient bulbs, and installing new energy-efficient luminaires to the existing lighting systems. Options for improving the interior and exterior lighting for the Waste Oil Building are listed in Table 4.3-3.

Table 4.3-3
Waste Oil Building Lighting System Improvements

Interior Lighting	CFL Retrofit of Incandescent Fixture
Exterior Lighting	CFL Retrofit of Incandescent Fixture

The annual energy savings for these options are as follows:

Interior Lighting: 0.2kW, 332.8 kWh and $50.4
Exterior Lighting: 0.2kW, 700.8 kWh and $106.1

The following table, Table 4.3-4, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the Waste Oil Building.

Table 4.3-4
Waste Oil Building Lighting System Improvements***

	Interior Lighting	**Exterior Lighting**	**Total**
Engineer's Opinion of Probable Cost	$38.8	$38.8	$77.6
New Jersey SmartStart Rebate	-$0***	-$0***	-$0***
Total Cost	$38.8	$38.8	$77.6
Annual Energy Savings	$50.4	$106.1	$156.5
Annual Maintenance Cost Savings (AMCS)	$23.9	$23.9	$47.8
Simple Payback	**0.5 years**	**0.3 years**	**0.4 years**
Annual Return on Investment (AROI)	184.85%	328.41%	256.65%
Lifetime Energy Savings (15 years)*	$937.4	$1,973.3	$2,910.7
Internal Rate of Return (IRR)	194.52%	338.08%	266.31%
Net Present Value (NPV)	$1,043.4	$1,854.6	$2,898.1

*3% yearly inflation on electricity costs. Total lifetime savings does not equal sum of combined savings.
**See Appendix G & N 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 I.

4.3.6 Blower Building

It is recommended that the existing interior lighting system at the Blower Building be upgraded to high efficiency standards to reduce power consumption. In general, the recommended lighting upgrade, as presented in Appendix I, involves replacing existing inefficient bulbs, and installing new energy-efficient luminaires to the existing lighting systems. No exterior fixtures exist. Options for improving the interior and exterior lighting for the Blower Building are listed in Table 4.3-5.

Table 4.3-5
Blower Building Lighting System Improvements

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

The annual energy savings for these options are as follows:

Interior Lighting: 0.3kW, 891.0 kWh and $134.9

The following table, Table 4.3-6, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the Blower Building.

Table 4.3-6
Blower Building Lighting System Improvements***

	Interior Lighting
Engineer's Opinion of Probable Cost	$1,639.0
New Jersey SmartStart Rebate	-$100*
Total Cost	$1,539.0
Annual Energy Savings	$134.9
Annual Maintenance Cost Savings (AMCS)	$23.5
Simple Payback	**9.7 years**
Annual Return on Investment (AROI)	3.63%
Lifetime Energy Savings (15 years)**	$2,509.0
Internal Rate of Return (IRR)	8.71%

Table 4.3-6 **Blower Building Lighting System Improvements***	
	Interior Lighting
Net Present Value (NPV)	$767.94

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix H.
**3% yearly inflation on electricity costs. Total lifetime savings does not equal sum of combined savings.
***See Appendix G & N 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 I.

4.3.7 Sludge Handling Building

It is recommended that the existing lighting system at the Sludge Handling Building be upgraded to high efficiency standards to reduce power consumption. In general, the recommended lighting upgrade, as presented in Appendix I, involves replacing existing inefficient bulbs, and installing new energy-efficient luminaires to the existing lighting systems. Options for improving the interior and exterior lighting for the Sludge Handling Building are listed in Table 4.3-7.

Table 4.3-7 **Sludge Handling Building Lighting System Improvements**	
Interior Lighting	High Performance T8 Retrofit of T12 Fixtures
Exterior Lighting	Induction Lighting Replacement of Exterior Fixtures

The annual energy savings for these options are as follows:

Interior Lighting: 3.2kW, 6,442.6 kWh and $975.4
Exterior Lighting: 0.2kW, 805.9 kWh and $122.0

The following table, Table 4.3-8, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the Sludge Handling Building.

Table 4.3-8
Sludge Handling Building Lighting System Improvements***

	Interior Lighting	Exterior Lighting	Total
Engineer's Opinion of Probable Cost	$10,138.0	$2,972.8	$13,110.8
New Jersey SmartStart Rebate	-$760*	-$0****	-$760*
Total Cost	$9,378.0	$2,972.8	$12,350.8
Annual Energy Savings	$975.4	$122.0	$1,097.4
Annual Maintenance Cost Savings (AMCS)	$140.8	$1.5	$142.3
Simple Payback	**8.4 years**	**24.1 years**	**10.0 years**
Annual Return on Investment (AROI)	5.24%	-2.51%	3.37%
Lifetime Energy Savings (15 years)**	$18,141.4	$2,269.1	$20,410.5
Internal Rate of Return (IRR)	11.06%	-2.89%	8.32%
Net Present Value (NPV)	$6,877.6	-$1,174.8	$5,702.9

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix H.
**3% yearly inflation on electricity costs. Total lifetime savings does not equal sum of combined savings.
***See Appendix G & N 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 I.

4.3.8 Final Clarifier #1 & #2 Building

The Final Clarifier #1 & #2 Building lighting was analyzed for retrofit with high performance T8 fixtures, as shown in Table 4.3-9, but is not recommended due to a payback period of greater than twenty years. In general, the lighting upgrade, as presented in Appendix I, involves replacing existing inefficient bulbs, and installing new energy-efficient luminaires to the existing lighting systems. No exterior fixtures exist for this building.

Table 4.3-9 **Final Clarifier #1 & #2 Building Lighting System Improvements**	
Interior Lighting	High Performance T8 Retrofit of T12 Fixtures

The annual energy savings for these options are as follows:

Interior Lighting: 0.2kW, 107.0 kWh and $16.2

The following table, Table 4.3-10, summarizes a simple payback analysis for the lighting system improvements that were analyzed at the Final Clarifier #1 & #2 Building.

Table 4.3-10 **Final Clarifier #1 & #2 Building Lighting System Improvements***	
	Interior Lighting
Engineer's Opinion of Probable Cost	$756.4
New Jersey SmartStart Rebate	-$30*
Total Cost	$726.4
Annual Energy Savings	$16.2
Annual Maintenance Cost Savings (AMCS)	$6.1
Simple Payback	**32.5 years**
Annual Return on Investment (AROI)	-3.59%
Lifetime Energy Savings (15 years)**	$301.3
Internal Rate of Return (IRR)	-5.96%
Net Present Value (NPV)	$401.4

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix H.
**3% yearly inflation on electricity costs. Total lifetime savings does not equal sum of combined savings.
***See Appendix G & N 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 I.

4.3.9 Final Clarifier #3 & #4 Building

It is recommended that the existing lighting system at the Final Clarifier #3 & #4 Building be upgraded to high efficiency standards to reduce power consumption. In general, the recommended lighting upgrade, as presented in Appendix I, involves replacing existing inefficient bulbs, and installing new energy-efficient luminaires to the existing lighting systems. Options for improving the interior and exterior lighting for the Final Clarifier #3 & #4 Building are listed in Table 4.3-11.

Table 4.3-11
Final Clarifier #3 & #4 Building Lighting System Improvements

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

The annual energy savings for these options are as follows:

Interior Lighting: 0.5kW, 1,106.1 kWh and $167.5
Exterior Lighting: 0.1kW, 403.0 kWh and $61.0

The following table, Table 4.3-12, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the Final Clarifier #3 & #4 Building.

Table 4.3-12
Final Clarifier #3 & #4 Building Lighting System Improvements***

	Interior Lighting	Exterior Lighting	Total
Engineer's Opinion of Probable Cost	$3,201.3	$1,486.4	$4,687.7
New Jersey SmartStart Rebate	-$225*	-$0****	-$225*

Table 4.3-12 Final Clarifier #3 & #4 Building Lighting System Improvements***			
	Interior Lighting	**Exterior Lighting**	**Total**
Total Cost	$2,976.3	$1,486.4	$4,462.7
Annual Energy Savings	$167.5	$61.0	$228.5
Annual Maintenance Cost Savings (AMCS)	$39.8	$0.7	$40.53
Simple Payback	**14.4 years**	**24.1 years**	**16.6 years**
Annual Return on Investment (AROI)	0.30%	-2.51%	-0.64%
Lifetime Energy Savings (15 years)**	$3,115.3	$1,134.5	$4,249.9
Internal Rate of Return (IRR)	3.18%	-2.89%	1.37%
Net Present Value (NPV)	$42.6	-$587.4	-$544.8

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix H.
**3% yearly inflation on electricity costs. Total lifetime savings does not equal sum of combined savings.
***See Appendix G & N 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 I.

4.3.10 Roadway and Process Lighting

It is recommended that the existing roadway and process lighting system at the Molitor Water Pollution Control Facility be upgraded to high efficiency standards to reduce power consumption. In general, the recommended lighting upgrade, as presented in Appendix I, involves replacing existing inefficient bulbs, and installing new energy-efficient luminaires to the existing lighting systems. Options for improving the roadway and process lighting are listed in Table 4.3-13.

Table 4.3-13 **Roadway and Process Lighting System Improvements**	
Exterior Lighting	Induction Lighting Replacement of Exterior Fixtures

The annual energy savings for these options are as follows:

Exterior Lighting: 2.4KW, 10,533.9 kWh and $1,594.8

The following table, Table 4.3-14, summarizes a simple payback analysis assuming the implementation of all recommended lighting system improvements at the roadway and process lighting system at the Molitor Water Pollution Control Facility.

Table 4.3-14 **Roadway and Process Lighting System Improvements*** **	
	Exterior Lighting
Engineer's Opinion of Probable Cost	$16,762.7
New Jersey SmartStart Rebate	-$910****
Total Cost	$15,852.7
Annual Energy Savings	$1,594.8
Annual Maintenance Cost Savings (AMCS)	$15.2
Simple Payback	**9.8 years**
Annual Return on Investment (AROI)	3.49%
Lifetime Energy Savings (15 years)**	$29,661.6
Internal Rate of Return (IRR)	8.51%
Net Present Value (NPV)	$7,593.6

* Additional incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix H.
**3% yearly inflation on electricity costs. Total lifetime savings does not equal sum of combined savings.
***See Appendix G & N 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 I.

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 WPCP, 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, some of the motors surveyed had either unreadable or missing nameplate data. Therefore, CDM has assumed standard NEMA efficiencies for these motors for analysis. Refer to Appendix J for individual motor and VFD information.

Please note that not all of the motors present at the site have been analyzed in this report. Only motors that have been selected include the major process pumps. There are some buildings or areas not described within this section due to the fact the investigated pump(s) at the building do not present energy conservation measures related to upgrading.

4.4.1 Administration Building

It is not recommended to upgrade the existing motors at the Administration Building to high efficiency. This is primarily based on the 38.9 year payback period. It is recommended, however, to replace existing motors in the case of motor failure only. 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 H 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 Effluent Pump #1 Motor (Runs 2920 hours per year)
-Primary Effluent Pump #2 Motor (Runs 2920 hours per year)
-Primary Effluent Pump #3 Motor (Runs 2920 hours per year)
-Raw Sludge Pump #1 Motor (Runs 548 hours per year)
-Raw Sludge Pump #2 Motor (Runs 548 hours per year)

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

Motor Upgrades: 0.66kW, 1,473.27 kWh and $223.05

The following Table, Table 4.4-1, summarizes a simple payback analysis assuming the implementation of all recommended motor upgrade for the Administration Building. For more information about the upgrade and a complete breakdown of simple payback and savings per motor, refer to Appendix J.

Table 4.4-1 Administration Building Motor Upgrades*	
Engineer's Opinion of Probable Cost	$8,675.31
New Jersey SmartStart Rebate	-$0*
Total Cost	$8,675.31
Annual Energy Savings	$223.05
Simple Payback	**38.9 years**
Annual Return on Investment (AROI)	-4.10%
Lifetime Energy Savings (15 years)**	$4,148.49
Internal Rate of Return (IRR)	-7.65%
Net Present Value (NPV)	-$5,427.01

* Incentives based on eligibility, are available through the New Jersey SmartStart Program, see Appendix H.
**3% yearly inflation on electricity costs
***See Appendices J for Upgrade Analyses, & G & N 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 J.

4.4.2 Blower Building

It is not recommended to upgrade the existing motors at the Blower Building to high efficiency. This is primarily based on the 22.8 year payback period. It is recommended, however, to replace existing motors in the case of motor failure only. 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 H 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 Sludge Pump #3 Motor (Runs 1278 hours per year)

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

Motor Upgrades: 0.17kW, 216.76 kWh and $32.82

The following Table, Table 4.4-2, summarizes a simple payback analysis assuming the implementation of all recommended motor upgrade for the Blower Building. For more information about the upgrade and a complete breakdown of simple payback and savings per motor, refer to Appendix J.

Table 4.4-2 Blower Building Motor Upgrades*	
Engineer's Opinion of Probable Cost	$747.50
New Jersey SmartStart Rebate	-$0*
Total Cost	$747.50
Annual Energy Savings	$32.82
Simple Payback	**22.8 years**
Annual Return on Investment (AROI)	-2.28%
Lifetime Energy Savings (15 years)**	$610.42
Internal Rate of Return (IRR)	-2.29%
Net Present Value (NPV)	-$269.54

* Incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix H.
**3% yearly inflation on electricity costs
***See Appendices J for Upgrade Analyses, & G & N 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 J.

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:

-Blower #1 Motor
-Blower #2 Motor

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

4.4.3 Sludge Handling Building

It is not recommended to upgrade the existing motors at the Sludge Handling Building to high efficiency. This is primarily based on the 83.9 year payback period. It is recommended, however, to replace existing motors in the case of motor failure only. 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 H for NJPBU custom measures incentives worksheets. Should the pre-incentive cost option be pursued, the following piece of equipment is included in the analysis:

-Thick Sludge Pump #1 Motor (Runs 390 hours per year)
-Thick Sludge Pump #2 Motor (Runs 390 hours per year)
-Thick Feed Pump #1 Motor (Runs 390 hours per year)
-Thick Feed Pump #2 Motor (Runs 390 hours per year)
-BFP Pump #1 Motor (Runs 780 hours per year)
-BFP Pump #2 Motor (Runs 780 hours per year)
-Service Water Pump #1 Motor (Runs 910 hours per year)
-Service Water Pump #2 Motor (Runs 910 hours per year)
-Washwater Pump #1 Motor (Runs 390 hours per year)
-Washwater Pump #2 Motor (Runs 390 hours per year)
-Washwater Pump #3 Motor (Runs 780 hours per year)
-Washwater Pump #4 Motor (Runs 780 hours per year)
-Process Water Pump #1 Motor (Runs 260 hours per year)
-Process Water Pump #2 Motor (Runs 130 hours per year)

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

Motor Upgrades: 1.78kW, 1,078.14 kWh and $163.23

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

Table 4.4-3 **Sludge Handling Building Motor Upgrades***	
Engineer's Opinion of Probable Cost	$13,690.75
New Jersey SmartStart Rebate	-$0*

Total Cost	$13,690.75
Annual Energy Savings	$163.23
Simple Payback	**83.9 years**
Annual Return on Investment (AROI)	-5.47%
Lifetime Energy Savings (15 years)**	$3,035.90
Internal Rate of Return (IRR)	-14.16%
Net Present Value (NPV)	-$11,313.61

* Incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix H.
**3% yearly inflation on electricity costs
***See Appendices J for Upgrade Analyses, & G & N 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 J.

4.4.4 Final Clarifier #1 & #2 Building

It is recommended that the following existing motors at the Final Clarifier #1 & #2 Building be upgraded to high efficiency standards to create energy savings potential for the facility. The following pieces of equipment are included in the analysis:

-RAS Pump #1 Motor (Runs 4380 hours per year)(New VFD)
-RAS Pump #2 Motor (Runs 4380 hours per year)(New VFD)

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

Motor Upgrades: 4.34kW, 19,001.25 kWh and $2,876.79

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

The following Table, Table 4.4-4, summarizes a simple payback analysis assuming the implementation of all recommended motor upgrades and VFD additions for the Final Clarifier Building #1 & #2. For more information about the upgrades and a complete breakdown of simple payback and savings per motor, refer to Appendix J.

Table 4.4-4 Final Clarifier Building #1 & #2 Motor Upgrades and VFD Additions*	
Engineer's Opinion of Probable Cost	$8,765.88
New Jersey SmartStart Rebate	-$180*
Total Cost	$8,585.88
Annual Energy Savings	$2,876.79
Simple Payback	**3.0 years**
Annual Return on Investment (AROI)	26.84%
Lifetime Energy Savings (15 years)**	$53,505.17
Internal Rate of Return (IRR)	35.99%
Net Present Value (NPV)	$33,309.12

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

It should be noted that this analysis does not include all motors in the Final Clarifier Building #1 & #2. The following existing motors either are not in use or are already highly efficient with no VFD's required:

-WAS Pump

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

4.4.5 Final Clarifier #3 & #4 Building

It is recommended that the following existing motors at the Final Clarifier #3 & #4 Building be upgraded to high efficiency standards to create energy savings potential for the facility. The following pieces of equipment are included in the analysis:

-RAS Pump #1 Motor (Runs 2920 hours per year)(New VFD)
-RAS Pump #2 Motor (Runs 2920 hours per year)(New VFD)
-RAS Pump #3 Motor (Runs 2920 hours per year)(New VFD)
-WAS Pump #1 Motor (Runs 4380 hours per year)(New VFD)
-WAS Pump #2 Motor (Runs 4380 hours per year)(New VFD)

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

Motor Upgrades: 7.70kW, 26,096.03 kWh and $3,950.94

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

The following Table, Table 4.4-5, summarizes a simple payback analysis assuming the implementation of all recommended motor upgrades and VFD additions for the Final Clarifier Building #3 & #4. For more information about the upgrades and a complete breakdown of simple payback and savings per motor, refer to Appendix J.

Table 4.4-5 **Final Clarifier Building #3 & #4 Motor Upgrades and VFD Additions*** **	
Engineer's Opinion of Probable Cost	$18,122.56
New Jersey SmartStart Rebate	-$351*
Total Cost	$17,771.56
Annual Energy Savings	$3,950.94
Simple Payback	**4.5 years**
Annual Return on Investment (AROI)	15.57%
Lifetime Energy Savings (15 years)**	$73,483.19
Internal Rate of Return (IRR)	23.83%
Net Present Value (NPV)	$39,766.40

* Incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix H.
**3% yearly inflation on electricity costs
***See Appendices J for Upgrade Analyses, & G & N 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 J.

4.4.6 Outdoor Process Pumps

It is recommended that the following existing motors for Outdoor Process be upgraded to high efficiency standards to create energy savings potential for the facility. The following pieces of equipment are included in the analysis:

-Gas Mixer #1 Motor (Runs 2920 hours per year)
-Gas Mixer #2 Motor (Runs 2920 hours per year)
-Ejector Pump #1 Motor (Runs 4380 hours per year)
-Ejector Pump #2 Motor (Runs 4380 hours per year)
-Dewatering Pump #1 Motor (Runs 4380 hours per year)(New VFD)
-Dewatering Pump #2 Motor (Runs 4380 hours per year)(New VFD)
-Pond Boat Winch Pump (Runs 50 hours per year)

Pond Aerator Pump #4 has been included in the above list to be upgraded to high efficiency standards because it is a standby pump used for either maximum day demands or pump failure. Its inclusion has an almost negligible effect on the overall motor replacement payback.

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

Motor Upgrades: 5.64kW, 23,213 kWh and $3,514.5

Refer to Appendix J 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 and VFD additions for Outdoor Process. For more information about the upgrades and a complete breakdown of simple payback and savings per motor, refer to Appendix J.

Table 4.4-6 Outdoor Process Motor Upgrades and VFD Additions***	
Engineer's Opinion of Probable Cost	$13,326
New Jersey SmartStart Rebate	-$459*
Total Cost	$12,866.6
Annual Energy Savings	$3,514.5
Simple Payback	**3.7 years**
Annual Return on Investment (AROI)	20.65%
Lifetime Energy Savings (15 years)**	$65,365.9

Internal Rate of Return (IRR)	29.43%
Net Present Value (NPV)	$38,315.4

* Incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix H.
**3% yearly inflation on electricity costs
***See Appendices J for Upgrade Analyses, & G & N 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 J.

4.4.7 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 Molitor Water Pollution Control Facility could be upgraded to high efficiency standards to create energy savings potential for the Facility.

The annual energy savings for this option is as follows:

All Motor Upgrades: 20.29kW, 71,078.9 kWh and $10,761.4

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

The following Table, Table 4.4-7, summarizes a simple payback analysis assuming the implementation of all recommended motor upgrades and VFD additions for the Facility. For more information about the upgrades and VFD additions and a complete breakdown of simple payback per motor, refer to Appendix J.

Table 4.4-7 All Combined Motor Upgrades and VFD Additions*	
Engineer's Opinion of Probable Cost	$63,327.6
New Jersey SmartStart Rebate	-$1,395*
Total Cost	$61,932.6
Annual Energy Savings	$10,761.4
Simple Payback	**5.8 years**
Annual Return on Investment (AROI)	10.33%

Lifetime Energy Savings (15 years)**	$200,150.4
Internal Rate of Return (IRR)	17.69%
Net Present Value (NPV)	$93,392

* Incentives, based on eligibility, are available through the New Jersey SmartStart Program, see Appendix H.
**3% yearly inflation on electricity costs
***See Appendices J for Upgrade Analyses, & G & N 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 J.

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 one system, with a total rating of approximately 1,344 kW (dc) will be appropriate for the fields outside of the Molitor Water Pollution Control Facility.

As part of this energy audit, a preliminary engineering feasibility study of the Facility 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 WPCP 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 buildings was performed on May 27th, 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 Molitor Water Pollution Control Facility

Some land clearing and grubbing will be necessary to install a PV array system in the adjoining fields of the Facility. Shading, also, may have a very limited impact on the PV solar array depending on the design and layout of the system along the edges of the property. 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 1,344 kW (dc) is feasible.

Electrical Service

The electrical service size of the Facility is 1600 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. In the case of this Facility, the main circuit breaker is in an exterior enclosure. 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 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, average aggregate electrical rate, 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)
Molitor Water Pollution Control Facility	134,433	1,601,345	$242,443.6	$677,369	$8,839,315.3	2.0%	-$1,674,030	1.8%

*3% yearly inflation on electricity costs

**See Appendices P & Q for ECRM Financial Analyses

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 K).

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

Engineer's Opinion of Probable Cost	$15,248,668

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 Madison-Chatham Joint Meeting 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 Madison-Chatham Joint Meeting to further investigate the installation of a solar energy system at the Facility. This is primarily based on the initial upfront capital investment required for a solar energy system installation and the 16.6 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.

Table 4.5-3 includes the total simple payback analysis for the installation of a solar energy system at the Molitor Water Pollution Control Facility. Refer to Appendix K 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)
Molitor Water Pollution Control Facility	$15,248,668	$677,369	$242,443.6	**16.6**

Refer to Section 7 for discussion on Solar Renewable Energy Certificates and other financing options for solar projects. The financial model in Appendix K 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 Madison-Chatham Joint Meeting to install a wind turbine energy system on the grounds of the Molitor Water Pollution Control Facility. For the purpose of this feasibility analysis, CDM is recommending 1-10KW wind turbine. Depending on area available, and funding, the Madison-Chatham Joint Meeting 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 plant ranged from 8.5 mph to 12.4 mph, or 3.8m/s to 5.5m/s. In general, around 9 mph 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 L 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 M). By installing the proposed wind turbine, the Facility will offset between $861.00 and $2,444.20 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 Madison-Chatham Joint Meeting 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 plant 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 Molitor Water Pollution Control grounds. Refer to Appendix M 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 (Average Site Wind Speed – 10.56 mph)*	Wind Turbine (Maximum Site Wind Speed – 12.35 mph)*
Engineer's Opinion of Probable Cost	$68,489.69	$68,489.69	$68,489.69
Renewable Energy Incentive Program**	-$18,198.00	-$33,978	-$51,661.00
Total Cost	$50,291.69	$34,511.69	$16,282.69
1st Year Production	5,687 kWh	10,618 kWh	16,144 kWh
Annual Estimated Electric Savings	$861.0	$1,607.6	$2,444.2
Annual Estimated REC Revenue	$142.00	$265.00	$407.00
Project Simple Payback	**50.1 Years**	**18.4 Years**	**5.9 Years**
Annual Return On Investment (AROI)	-2.0%	1.4%	12.9%
Lifetime Energy Savings (25 years)**	$31,391.43	$58,611.91	$89,113.73
Internal Rate of Return (IRR)	-2.9%	4.5%	18.6%
Net Present Value (NPV)	-$28,250	$6,642	$45,742

*Refer to Appendix L for Wind Cad Modeling

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

***See Appendix G & N for ECRM Financial Analyses

Based on the simple payback model, summarized in Table 4.5-4, it would benefit the Madison-Chatham Joint Meeting to further investigate the installation of a wind energy system for the Facility. This is primarily based on the initial upfront capital investment required for a wind turbine energy system installation and the 18.4 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 Facility 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 Madison-Chatham Joint Meeting 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 WPCP currently utilizes two (2) digester gas fueled internal combustion engines for heating of the Primary Digesters. Additionally, each engine also drives one (1) blower for the Aeration System. As such, the potential to increase the digester gas production for purposes of increasing the fuel source for the engines and boiler were previously discussed under Section 4.1.6 – Anaerobic Digestion System of this Report.

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.

Jersey Central Power and Lighting (JCP&L) is currently the supplier and First Energy Corp. is the supplier of energy for the Joint Meeting.

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 (JCP&L) 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 JCP&L 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

5.2 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 (ECRMs)

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 ECRMs 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 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 is Section 3, aggregate unit costs for electrical energy delivery and usage, which accounts for all demand and tariff charges, at each facility 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:

- Water Pollution Control Plant;
- Building HVAC Components;
- Building Lighting Systems;
- Motors Upgrades & VFD Additions
- Solar
- Wind

6.1.1 Water Pollution Control Plant

At the WPCP, wastewater unit process such as the aeration basins, oxidation ditches, stabilization pond, and the anaerobic digestion system were evaluated as potential ECRMs.

Table 6.1-1 includes the recommended ECRM for the Aeration Basins, which includes the installation of a fine bubble diffuser system throughout the nine (9) active aeration bays. A detailed discussion of this alternative is included in Section 4.1.1.

Table 6.1-1
Ranking of Energy Savings Measures – Aeration Basins

Recommendation	Total Cost(1)	Annual Energy Savings (KW-hrs)	Annual Fiscal Savings(2)	Simple Payback (Years)
Installation of Premium Eff. Motors and VFDs on Aerators	$85,076	134,036	$15,293	**5.6**

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

Table 6.1-2 includes the recommended ECRM for the Oxidation Ditches, which includes the installation of new motors and VFDs for the existing aerators as long as the existing aerators are in good working condition and not near the end of their useful life. A detailed discussion of this alternative is included in Section 4.1.4.

Table 6.1-2
Ranking of Energy Savings Measures – Oxidation Ditches

Recommendation	Total Cost(1)	Annual Energy Savings (KW-hrs)	Annual Fiscal Savings(2)	Simple Payback (Years)
Installation of Motors and VFDs	$383,460	398,943	$56,400	**6.8**

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

Table 6.1-3 includes the recommended ECRM for the Stabilization Pond, which includes the installation of new solar-powered aerators with a DO control system. A detailed discussion of this alternative is included in Section 4.1.5.

Table 6.1-3
Ranking of Energy Savings Measures – Stabilization Pond

Recommendation	Total Cost(1)	Annual Energy Savings (KW-hrs)	Annual Fiscal Savings(2)	Simple Payback (Years)
Installation of Motors and VFDs	$354,954	190,885	$28,900	**13.5**

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

Table 6.1-4 includes the recommended ECRM to provide energy cost savings associated with the Anaerobic Digestion System, which includes the addition of the Aeration Basins WAS load to the Primary Digesters, in addition to FOG. A detailed discussion on these alternatives is presented in Section 4.1.6.

Table 6.1-4
Ranking of Energy Savings Measures – Anaerobic Digestion System

Recommendation	Total Cost(1)	Annual Energy Savings (Therms)	Annual Fiscal Savings(2)	Simple Payback (Years)
Addition of Aeration Basin WAS and FOG	$409,656	34,039	$47,030	**8.7**

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

6.1.2 Building HVAC Components

Table 6.1-5 includes the recommended ECRM to provide energy savings for building HVAC systems, which provide a simple payback of less than 20 years. A detailed discussion on building HVAC systems is presented in Section 4.2.

Table 6.1-5
Ranking of Energy Savings Measures - HVAC

Recommendation	Total Cost(1)	Annual Natural Gas Savings (Therms)	Annual Fiscal Savings(2)	Simple Payback (Years)
Blower Building – Steam Pipe Insulation	$955	1,379	$1,475	**0.6**

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

6.1.3 Building Lighting Systems

Table 6.1-6 includes rankings of all 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 4.3. Refer to Appendix I for a more detailed lighting financing spreadsheet.

Table 6.1-6 Ranking of Energy Savings Measures - Electrical Lighting[1]				
Recommendation	**Total Cost[2]**	**Annual Energy Savings (kW-hrs)**	**Annual Fiscal Savings[3]**	**Simple Payback (Years)**
Waste Oil Building – Total Lighting	$77.6	1,033.6	$204.3	**0.4**
Administration Building – Total Lighting	$14,731.8	11,213.1	$1,956.6	**7.5**
Blower Building – Interior Lighting	$1,539.0	891.0	$158.4	**9.7**
Roadway and Process – Exterior Lighting	$15,852.7	10,533.9	$1,610.0	**9.8**
Sludge Handling Building – Total Lighting	$12,350.8	7,248.5	$1,239.7	**10.0**
Clarifier #3 & #4 Building – Total Lighting	$4,462.7	1,509.1	$269.03	**16.6**

1. Buildings recommended with total lighting upgrades represents payback for the combined interior and exterior lighting upgrade which may represent an interior or exterior payback that exceeds 20 years. The facility may reduce the simple payback further by only upgrading that portion of lighting that has a payback less than 20 years. See Section 4.4 for more detail.
2. 'Total Cost' takes into account any applicable rebates.
3. 'Annual Fiscal Savings' takes into account maintenance cost savings.

6.1.4 Motors

Table 6.1-7 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 6.1-7 Ranking of Energy Savings Measures - Electrical Motors				
Recommendation	**Total Cost[1]**	**Annual Energy Savings (kW-hrs)**	**Annual Energy Savings**	**Simple Payback (Years)**
Final Clarifier Building #1 & #2 – Motor & VFD Upgrades	$8,585.88	19,001.25	$2,876.79	**3.0**
Outdoor Process – Motor & VFD Upgrades[2]	$12,866.6	23,213.5	$3,514.5	**3.7**
Final Clarifier Building #3 & #4 – Motor & VFD Upgrades	$17,771.56	26,096.03	$3,950.94	**4.5**

1. 'Total Cost' takes into account any applicable rebates.
2. Does not include capital cost and energy savings associated with the motors for the Aeration Basins, Oxidation Ditches, and Stabilization Pond.

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 Madison-Chatham Joint Meeting. Based on the simple payback modeling performed, it would benefit the

Joint Meeting to further investigate installing the solar energy system at the Molitor Water Pollution Control Facility. This is primarily based on the initial upfront capital investment required for a solar energy system installation and the 16.6 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 6.1-8 includes a simple payback analysis for the installation of solar energy systems at Molitor Water Pollution Control Facility. Refer to Appendix K for a more detailed solar financing spreadsheet.

Table 6.1-8
Ranking of Energy Savings Measures Summary – Solar Energy Systems

Parameter	Solar
Engineer's Opinion of Probable Cost	$15,248,668
1st Year Production	1,601,345 kWh
Annual Electric Savings	$242,443.6
Annual Estimated SREC Revenue	$677,369
Project Simple Payback	**16.6 Years**

6.1.6 Wind Power Generation

Implementation of a new on-site wind energy system has been evaluated to determine the economic feasibility for furnishing and installing such systems for the Madison-Chatham Joint Meeting. Based on the simple payback modeling performed, it would benefit the Joint Meeting to further investigate installing the on-site wind energy system at the Molitor Water Pollution Control Facility. This is primarily based on the initial upfront capital investment required for a wind energy system installation and an acceptable payback period.

Three major factors influencing the project financial evaluation is the variance of the prevailing energy market conditions, Renewable Energy Certificate (REC) rates and the Renewable Energy Incentive Program, with the largest impact to the simple payback model being the REIP incentive. Refer to Appendix M for a more detailed wind financing spreadsheet.

Table 6.1-9, includes a summary of the wind energy ECRM for the Molitor Water Pollution Control Facility.

Table 6.1-9
Ranking of Energy Savings Measures Summary – 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**	-$18,198.00	-$51,661.00	-$33,978
Total Cost	$50,291.69	$16,282.69	$34,511.69
1st Year Production	5,687 kWh	16,144 kWh	10,618 kWh
Annual Estimated Electric Savings	$861.0	$2,444.2	$1,607.6
Annual Estimated REC Revenue	$142.00	$407.00	$265.00
Project Simple Payback	**50.1 Years**	**5.9 Years**	**18.4 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, contact CESCI@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. For more information on REIP, please see www.njcleanenergy.com.

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 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.

7.1.8 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.

7.1.9 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.

7.1.10 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.

7.1.11 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.

7.1.12 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.

7.1.13 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 H.

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.

The ERP presented herein for the MCJM WPCP results in an electrical and thermal energy savings of 15% or more. The following table summarizes the current annual energy use and the energy savings presented herein from the implementation of all ECRMs.

Table 7.2-1 Pay for Performance ERP			
	Current Annual Electrical Energy Use (kWh)	**Current Annual Fuel Use (therms)**	**Projected Annual Energy Savings from All ECRMs**
WPCP	2,213,387	77,163	1,695,828 kWh 35,418 Therms

The following table summarizes the maximum potential incentives available through participation in the Pay for Performance Program.

Table 7.2-2 Pay for Performance Incentive Summary	
	MCJM WPCP
Incentive #1: *Energy Reduction Plan*	$2,549 ($0.10 per square foot, Cap – 50% of annual energy expense)
Incentive #2: *Installation of Recommended ECRMs*	$452,624 (Cap – 30% of total project cost)
Incentive #3: *Post-Construction Benchmarking Report*	$301,749 (Cap – 20% of total project cost)
Total Incentives (Maximum)	**$756,922**

7.2.4 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.

MCJM's WPCP is not eligible for the Direct Install Program.

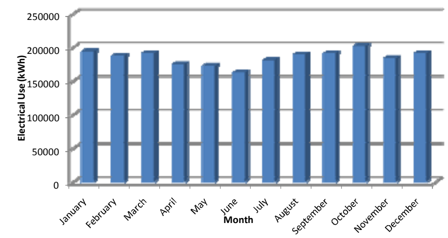
APPENDIX A

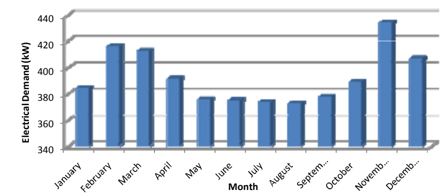
HISTORICAL DATA ANALYSIS

Electric Bills for Plots - Molitor Water Pollution Control Facility

Comments	Month	Year	JCP&L Charges Ac # 10-00-05-6066-2-7 Meter # G15164052	FirstEnergy Supply Charges Ac # 11013155	Total Electric Charges	On Peak KWH	Off Peak KWH	Total KWH	Measured Demand	Cost Per kWh
	January	2007	$ -	$ -	$ -	-	-	0	0.0	#DIV/0!
	February	2007	$ -	$ -	$ -	-	-	0	0.0	#DIV/0!
	March	2007	$ -	$ -	$ -	-	-	0	0.0	#DIV/0!
	April	2007	$ -	$ -	$ -	-	-	0	0.0	#DIV/0!
	May	2007	$ -	$ -	$ -	-	-	0	0.0	#DIV/0!
	June	2007	$ -	$ -	$ -	-	-	0	0.0	#DIV/0!
	July	2007	$ -	$ -	$ -	-	-	0	0.0	#DIV/0!
	August	2007	$ -	$ -	$ -	-	-	0	0.0	#DIV/0!
	September	2007	$ -	$ -	$ -	-	-	0	0.0	#DIV/0!
	October	2007	$ -	$ -	$ -	-	-	0	0.0	#DIV/0!
	November	2007	$ -	$ -	$ -	-	-	0	0.0	#DIV/0!
	December	2007	$ 25,683.36	$ -	$ 25,683.36	-	-	173564	400.3	$ 0.15
	January	2008	$ 27,787.56	$ -	$ 27,787.56	-	-	187909	384.5	$ 0.15
	February	2008	$ 27,912.94	$ -	$ 27,912.94	-	-	191687	418.4	$ 0.15
	March	2008	$ 26,586.17	$ -	$ 26,586.17	-	-	188032	417.6	$ 0.14
	April	2008	$ 23,749.23	$ -	$ 23,749.23	-	-	168098	417.9	$ 0.14
	May	2008	$ 26,658.91	$ -	$ 26,658.91	-	-	166603	373.3	$ 0.16
	June	2008	$ 27,771.83	$ -	$ 27,771.83	-	-	160042	373.3	$ 0.17
	July	2008	$ 33,553.06	$ -	$ 33,553.06	-	-	192666	371.8	$ 0.17
	August	2008	$ 35,271.93	$ -	$ 35,271.93	-	-	204444	369.9	$ 0.17
	September	2008	$ 30,208.29	$ -	$ 30,208.29	-	-	199473	369.9	$ 0.15
	October	2008	$ 30,287.20	$ -	$ 30,287.20	-	-	204201	389.0	$ 0.15
	November	2008	$ 28,423.83	$ -	$ 28,423.83	-	-	188023	405.8	$ 0.15
	December	2008	$ 31,754.98	$ -	$ 31,754.98	-	-	203477	410.4	$ 0.16
	January	2009	$ 31,142.80	$ -	$ 31,142.80	-	-	196980	384.5	$ 0.16
	February	2009	$ 11,641.90	$ 15,466.36	$ 27,108.26	-	-	177625	404.6	$ 0.15
	March	2009	$ 8,637.10	$ 19,844.25	$ 28,481.35	-	-	187564	383.0	$ 0.15
	April	2009	$ 7,749.64	$ 18,461.00	$ 26,210.63	-	-	172371	380.3	$ 0.15
	May	2009	$ 8,212.25	$ 19,229.95	$ 27,442.20	-	-	179031	378.4	$ 0.15
	June	2009	$ 7,600.67	$ 17,111.16	$ 24,711.83	-	-	165293	377.0	$ 0.15
	July	2009	$ 7,972.29	$ 17,835.45	$ 25,807.74	-	-	169860	375.8	$ 0.15
	August	2009	$ 8,052.59	$ 18,474.37	$ 26,526.96	-	-	174616	375.8	$ 0.15
	September	2009	$ 8,277.88	$ 19,301.86	$ 27,579.74	-	-	182437	385.9	$ 0.15
	October	2009	$ 8,702.39	$ 21,196.46	$ 29,898.85	-	-	200345	389.0	$ 0.15
	November	2009	$ 8,429.88	$ 19,134.80	$ 27,564.67	-	-	180858	461.9	$ 0.15
	December	2009	$ 9,024.40	$ 20,916.24	$ 29,940.63	-	-	197696	410.4	$ 0.15
	January	2010	$ 8,742.55	$ 20,903.02	$ 29,645.57	-	-	197571	384.5	$ 0.15
	February	2010	$ 8,617.47	$ 20,513.72	$ 29,131.19	-	-	193892	425.4	$ 0.15
	March	2010	$ 9,183.75	$ 21,098.36	$ 30,282.11	-	-	199417	438.2	$ 0.15
	April	2010	$ 8,456.78	$ 19,524.75	$ 27,981.53	-	-	184544	377.0	$ 0.15
	May	2010	$ 1,681.13	$ 3,910.37	$ 5,591.50	-	-	36960	0.0	$ 0.15
Not Consecutive	June	2010	$ -	$ -	$ -	-	-	0	0.0	#DIV/0!
	July	2010	$ -	$ -	$ -	-	-	0	0.0	#DIV/0!
	August	2010	$ -	$ -	$ -	-	-	0	0.0	#DIV/0!
	September	2010	$ -	$ -	$ -	-	-	0	0.0	#DIV/0!
	October	2010	$ -	$ -	$ -	-	-	0	0.0	#DIV/0!
	November	2010	$ -	$ -	$ -	-	-	0	0.0	#DIV/0!
	December	2010	$ -	$ -	$ -	-	-	0	0.0	#DIV/0!

Month	Combined (KWH)	Demand (KW)
January	194153	385
February	187734	416
March	191671	413
April	175004	392
May	172817	376
June	162667	375
July	181263	374
August	189530	373
September	190955	378
October	202273	389
November	184441	434
December	191579	407
Total	**2224089**	**4711**





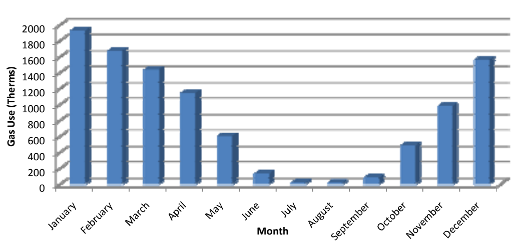
Gas Bills for Plots - WWTP

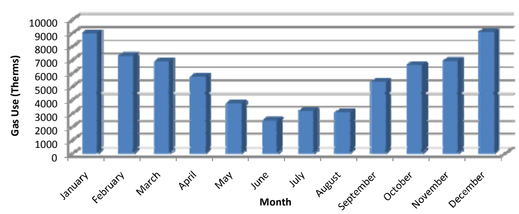
Comments	Month	Year	PSE & G Delivery Charges Ac. # 65 669 384 00 Meter # 2808461	PSE & G Delivery Charges Ac. # 65 669 384 00 Meter # 2414133	Gateway Energy Supply Charges	Total Gas Charges	PSE & G Therms Meter # 2808461	PSE & G Therms Meter # 2414133	Total Therms	Cost Per Therm
	January	2007	$ -	$ -	$ -	$ -			-	
	February	2007	$ -	$ -	$ -	$ -			-	
	March	2007	$ -	$ -	$ -	$ -			-	
	April	2007	$ -	$ -	$ -	$ -			-	
	May	2007	$ -	$ -	$ -	$ -			-	
	June	2007	$ -	$ -	$ -	$ -			-	
	July	2007	$ -	$ -	$ -	$ -			-	
	August	2007	$ -	$ -	$ -	$ -			-	
	September	2007	$ -	$ -	$ -	$ -			-	
	October	2007	$ -	$ -	$ -	$ -			-	
	November	2007	$ -	$ -	$ -	$ -			-	
Econnergy Supply	~~December~~	~~2007~~	~~$ 970.86~~	~~$ 360.21~~	~~$ 4,108.97~~	~~$ -~~	~~3,437~~	~~825~~	~~4,262~~	~~$ -~~
Econnergy Supply	January	2008	$ 2,128.44	$ 757.17	$ 9,201.89	$ 12,087.50	7,408	1,920	9,327	$ 1.30
Econnergy Supply	February	2008	$ 1,884.12	$ 630.06	$ 8,659.21	$ 11,173.38	6,406	1,733	8,139	$ 1.37
Econnergy Supply	March	2008	$ 1,371.33	$ 471.55	$ 9,245.20	$ 11,088.08	6,289	1,648	7,937	$ 1.40
Act. # 1243145013 and up	April	2008	$ 592.78	$ 223.51	$ 8,926.55	$ 9,742.84	5,729	1,287	7,016	$ 1.39
Act. # 12 431 450 13	May	2008	$ 389.60	$ 148.22	$ 5,176.19	$ 5,714.01	3,290	502	3,792	$ 1.51
Act. # 12 431 450 13	June	2008	$ 163.99	$ 93.51	$ 1,134.10	$ 1,391.59	715	44	760	$ 1.83
Act. # 12 431 450 13	July	2008	$ 151.01	$ 96.78	$ 794.47	$ 1,042.26	514	18	532	$ 1.96
Act. # 12 431 450 13	August	2008	$ 152.28	$ 95.28	$ 743.83	$ 991.39	558	18	576	$ 1.72
Act. # 12 431 450 13	September	2008	$ 613.00	$ 94.16	$ 6,440.97	$ 7,148.12	6,077	21	6,097	$ 1.17
Act. # 12 431 450 13	October	2008	$ 1,253.21	$ 302.51	$ 7,252.02	$ 8,807.74	6,698	392	7,090	$ 1.24
Act. # 12 431 450 13	November	2008	$ 1,736.16	$ 507.51	$ 5,032.25	$ 7,275.92	4,725	1,025	5,750	$ 1.27
Act. # 12 431 450 13	December	2008	$ 2,343.45	$ 613.41	$ 8,912.49	$ 11,869.35	6,127	1,523	7,650	$ 1.55
Act. # 12 431 450 13	January	2009	$ 2,107.42	$ 707.97	$ 7,628.95	$ 10,444.33	5,398	1,912	7,310	$ 1.43
Act. # 12 431 450 13	February	2009	$ 1,811.34	$ 689.01	$ 4,822.94	$ 7,323.28	4,880	1,741	6,621	$ 1.11
Act. # 12 431 450 13	March	2009	$ 820.41	$ 333.30	$ 3,878.19	$ 5,031.90	4,620	1,390	6,010	$ 0.84
	April	2009	$ 428.89	$ 198.42	$ 2,650.58	$ 3,277.88	3,467	1,002	4,469	$ 0.73
	May	2009	$ 383.19	$ 173.94	$ 2,068.38	$ 2,625.52	2,991	709	3,700	$ 0.71
	June	2009	$ 476.95	$ 110.91	$ 2,419.57	$ 3,007.42	3,938	216	4,154	$ 0.72
	July	2009	$ 674.77	$ 95.30	$ 3,378.02	$ 4,148.09	5,797	19	5,817	$ 0.71
	August	2009	$ 653.61	$ 96.75	$ 3,003.80	$ 3,754.16	5,504	17	5,521	$ 0.68
	September	2009	$ 550.03	$ 110.81	$ 2,390.25	$ 3,051.09	4,417	149	4,566	$ 0.67
	October	2009	$ 1,195.85	$ 341.41	$ 3,669.85	$ 5,207.11	5,561	587	6,147	$ 0.85
	November	2009	$ 1,832.58	$ 486.92	$ 5,345.33	$ 7,664.84	7,165	932	8,098	$ 0.95
	December	2009	$ 2,346.86	$ 628.46	$ 7,679.97	$ 10,655.28	8,937	1,600	10,537	$ 1.01
	January	2010	$ 2,392.53	$ 706.91	$ 8,061.75	$ 11,161.18	8,344	1,956	10,300	$ 1.08
	February	2010	$ 1,877.92	$ 610.89	$ 5,649.54	$ 8,138.36	5,614	1,536	7,150	$ 1.14
	March	2010	$ 1,346.58	$ 449.34	$ 4,863.39	$ 6,659.31	5,427	1,277	6,704	$ 0.99
	~~April~~	~~2010~~	~~$ 305.72~~	~~$ 107.56~~	~~$ 2,201.02~~	~~$ 2,614.30~~	~~2,678~~	~~512~~	~~3,190~~	~~$ -~~
	May	2010	$ -	$ -	$ -	$ -			-	
	June	2010	$ -	$ -	$ -	$ -			-	
	July	2010	$ -	$ -	$ -	$ -			-	
	August	2010	$ -	$ -	$ -	$ -			-	
	September	2010	$ -	$ -	$ -	$ -			-	
	October	2010	$ -	$ -	$ -	$ -			-	
	November	2010	$ -	$ -	$ -	$ -			-	
	December	2010								

Meter 2808461 All bldgs n/i 10 & 12	
Month	(Therms)
January	7050
February	5634
March	5445
April	4598
May	3140
June	2327
July	3156
August	3031
September	5247
October	6129
November	5945
December	7532
Total	**59235**

Meter 2414133 Bldg 10 & 12	
Month	(Therms)
January	1929
February	1670
March	1438
April	1145
May	606
June	130
July	18
August	18
September	85
October	489
November	979
December	1561
Total	**10068**

Total	
Month	Combined (Therms)
January	8979
February	7303
March	6884
April	5743
May	3746
June	2457
July	3174
August	3048
September	5332
October	6619
November	6924
December	9094
Total	**69303**





APPENDIX B

STATEMENT OF ENERGY PERFORMANCE

PORTFOLIO MANAGER REFERENCE SHEET

STATEMENT OF ENERGY PERFORMANCE
Molitor Water Pollution Control Facility

Building ID: 2385133
For 12-month Period Ending: May 31, 2010[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: July 21, 2010

Facility
Molitor Water Pollution Control Facility
214 North Passaic Avenue
Chatham Borough, NJ 07928

Facility Owner
Madison Chatham Joint Meeting
214 North Passaic Ave
Chatham, NJ 07928

Primary Contact for this Facility
N/A

Year Built: 1952
Energy Performance Rating[2] (1-100) 33

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	7,588,619
Natural Gas (kBtu)[4]	6,930,200
Total Energy (kBtu)	14,518,819

Energy Intensity[5]	
Site (kBtu/gpd)	6
Source (kBtu/gpd)	14

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	1,524

Electric Distribution Utility
FirstEnergy - Jersey Central Power & Lt Co

National Average Comparison	
National Average Site EUI	5
National Average Source EUI	11
% Difference from National Average Source EUI	19%
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
N/A

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

ENERGY STAR® Data Checklist for Commercial Buildings

In order for a building to qualify for the ENERGY STAR, a Professional Engineer (PE) or a Registered Architect (RA) 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 or RA 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	Molitor Water Pollution Control Facility	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	214 North Passaic Avenue, Chatham Borough, NJ 07928	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		☐
Molitor Water Pollution Control Facility (Municipal Wastewater Treatment Plant)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	
Average Influent Biological Demand (BOD5) Concentration	163 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	3 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	4 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: FirstEnergy - Jersey Central Power & Lt Co

Fuel Type: Electricity		
Meter: Molitor Water Pollution Control Facility (kWh (thousand Watt-hours)) **Space(s):** Entire Facility **Generation Method:** Grid Purchase		
Start Date	**End Date**	**Energy Use (kWh (thousand Watt-hours))**
05/01/2010	05/31/2010	172,817.00
04/01/2010	04/30/2010	175,004.00
03/01/2010	03/31/2010	191,671.00
02/01/2010	02/28/2010	187,734.00
01/01/2010	01/31/2010	194,153.00
12/01/2009	12/31/2009	191,579.00
11/01/2009	11/30/2009	184,441.00
10/01/2009	10/31/2009	202,273.00
09/01/2009	09/30/2009	190,955.00
08/01/2009	08/31/2009	189,530.00
07/01/2009	07/31/2009	181,263.00
06/01/2009	06/30/2009	162,677.00
Molitor Water Pollution Control Facility Consumption (kWh (thousand Watt-hours))		**2,224,097.00**
Molitor Water Pollution Control Facility Consumption (kBtu (thousand Btu))		**7,588,618.96**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**7,588,618.96**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas		
Meter: Meter 2808461 (therms) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (therms)**
05/01/2010	05/31/2010	3,140.00
04/01/2010	04/30/2010	4,598.00
03/01/2010	03/31/2010	5,445.00
02/01/2010	02/28/2010	5,634.00
01/01/2010	01/31/2010	7,050.00
12/01/2009	12/31/2009	7,532.00
11/01/2009	11/30/2009	5,945.00
10/01/2009	10/31/2009	6,129.00
09/01/2009	09/30/2009	5,247.00
08/01/2009	08/31/2009	3,031.00

07/01/2009	07/31/2009	3,156.00
06/01/2009	06/30/2009	2,327.00
Meter 2808461 Consumption (therms)		**59,234.00**
Meter 2808461 Consumption (kBtu (thousand Btu))		**5,923,400.00**

Meter: Meter 24114133 (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
05/01/2010	05/31/2010	606.00
04/01/2010	04/30/2010	1,145.00
03/01/2010	03/31/2010	1,438.00
02/01/2010	02/28/2010	1,670.00
01/01/2010	01/31/2010	1,929.00
12/01/2009	12/31/2009	1,561.00
11/01/2009	11/30/2009	979.00
10/01/2009	10/31/2009	489.00
09/01/2009	09/30/2009	85.00
08/01/2009	08/31/2009	18.00
07/01/2009	07/31/2009	18.00
06/01/2009	06/30/2009	130.00
Meter 24114133 Consumption (therms)		**10,068.00**
Meter 24114133 Consumption (kBtu (thousand Btu))		**1,006,800.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**6,930,200.00**
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)
05/01/2010	05/31/2010	2.41
04/01/2010	04/30/2010	2.50
03/01/2010	03/31/2010	2.10
02/01/2010	02/28/2010	2.38
01/01/2010	01/31/2010	2.69
12/01/2009	12/31/2009	2.95
11/01/2009	11/30/2009	2.17
10/01/2009	10/31/2009	2.36
09/01/2009	09/30/2009	2.17

08/01/2009	08/31/2009	2.39
07/01/2009	07/31/2009	2.15
06/01/2009	06/30/2009	2.69
Average Influent Flow Meter (kWh)		**28.96**

Certifying Professional

(When applying for the ENERGY STAR, the Certifying Professional must be the same PE or RA 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:

Molitor Water Pollution Control Facility	
Year Built	1952
For 12-month Evaluation Period Ending Date:	May 31, 2010

Facility Space Use Summary

Molitor Water Pollution Control Facility	
Space Type	Municipal Wastewater Treatment Plant
Average Influent Biological Demand (BOD5) Concentration	163
Average Effluent Biological Demand (BOD5) Concentration	3
Plant Design Flow Rate	4
Fixed Film Trickle Filtration Process	No
Nutrient Removal	Yes

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date: 05/31/2010)	**Baseline** (Ending Date: 05/31/2010)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	**33**	**33**	75	N/A	50
Energy Intensity					
Site (kBtu/gpd)	6	6	N/A	N/A	5
Source (kBtu/gpd)	14	14	N/A	N/A	11
Energy Cost					
$/year	N/A	N/A	N/A	N/A	N/A
$/mgpd/year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
$MtCO_2e$/year	1,524	1,524	N/A	N/A	1,278
$kgCO_2e/ft^2$/year	N/A	N/A	N/A	N/A	N/A

Statement of Energy Performance

2010

Molitor Water Pollution Control Facility
214 North Passaic Avenue
Chatham Borough, NJ 07928

Portfolio Manager Building ID: 2385133

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's score

1	50	100
Least Efficient	Average	Most Efficient

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

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

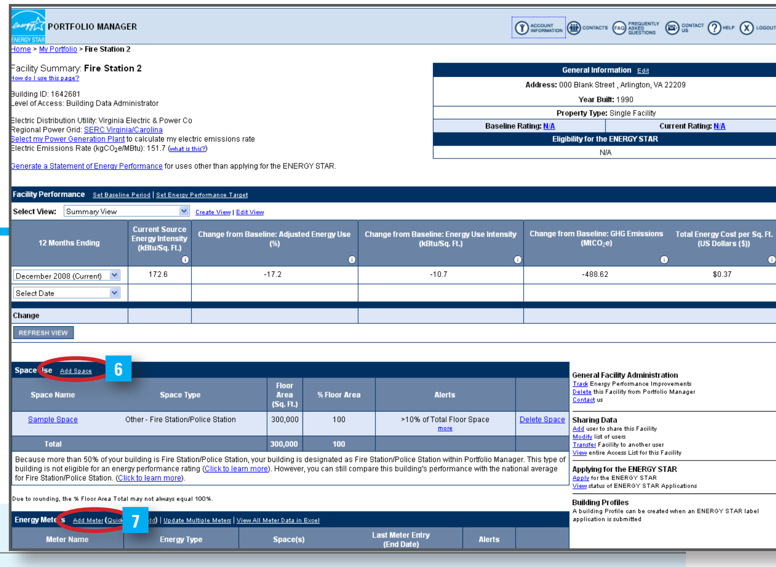
Date of certification

Date Generated: 07/21/2010

PORTFOLIO MANAGER QUICK REFERENCE GUIDE

ENERGY STAR

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.

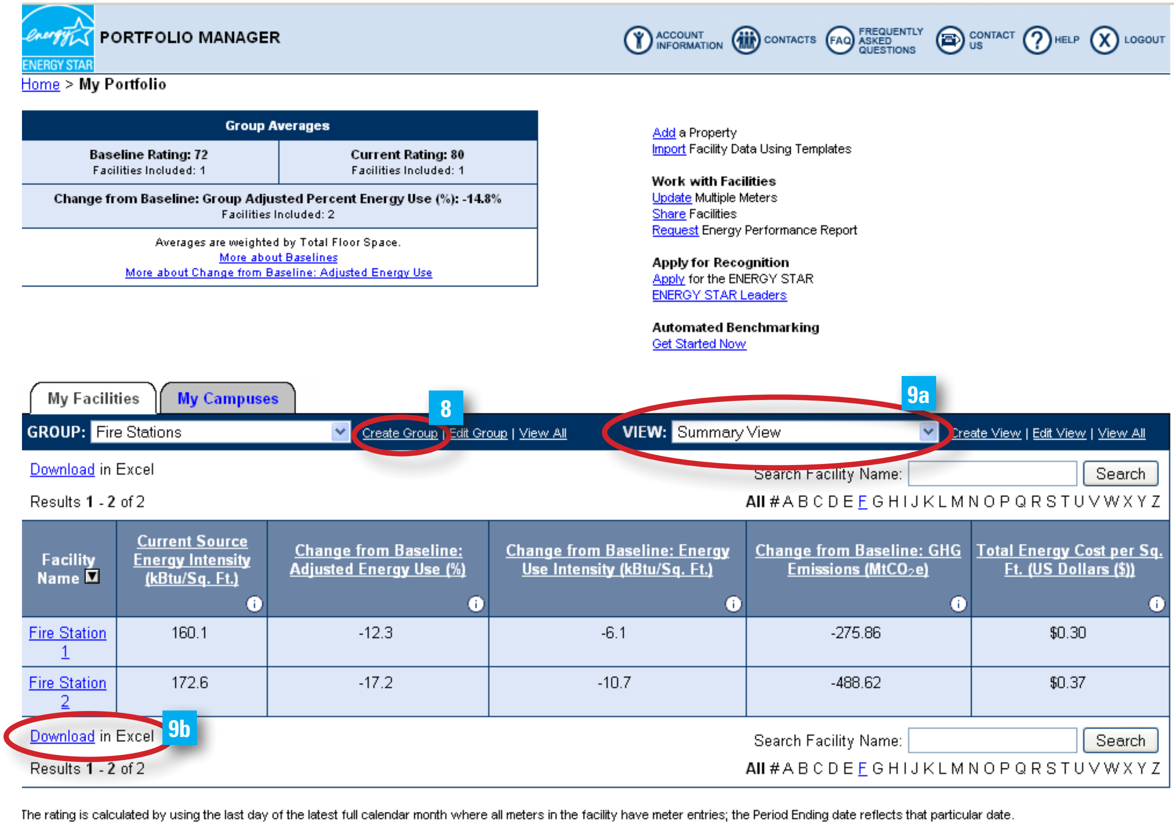


IDENTIFY ENERGY EFFICIENCY PROJECTS

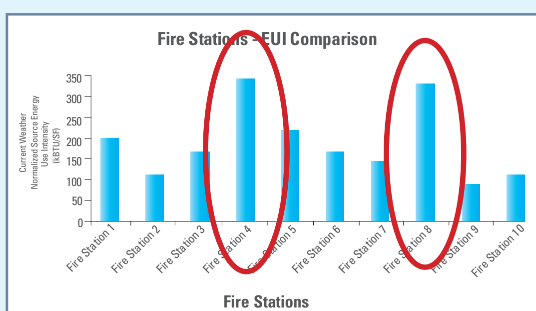
Use Portfolio Manager to identify under-performing buildings to target for energy efficiency improvements and establish baselines for setting and measuring progress for energy efficiency improvement projects over time.

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 efficiency improvements.



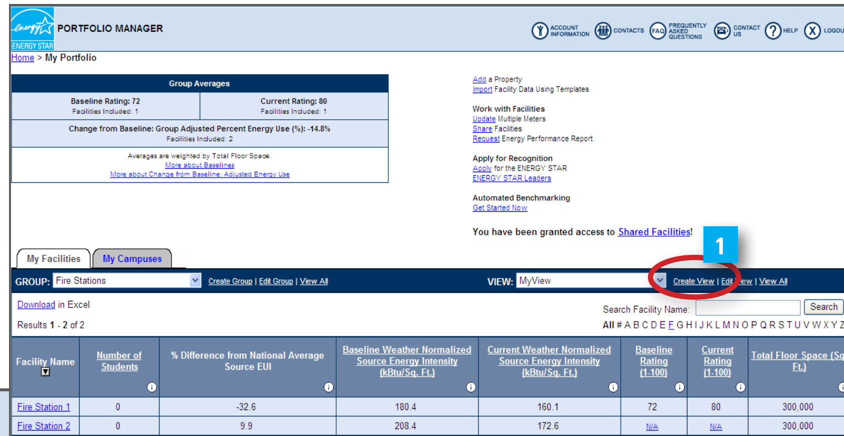
www.energystar.gov/benchmark

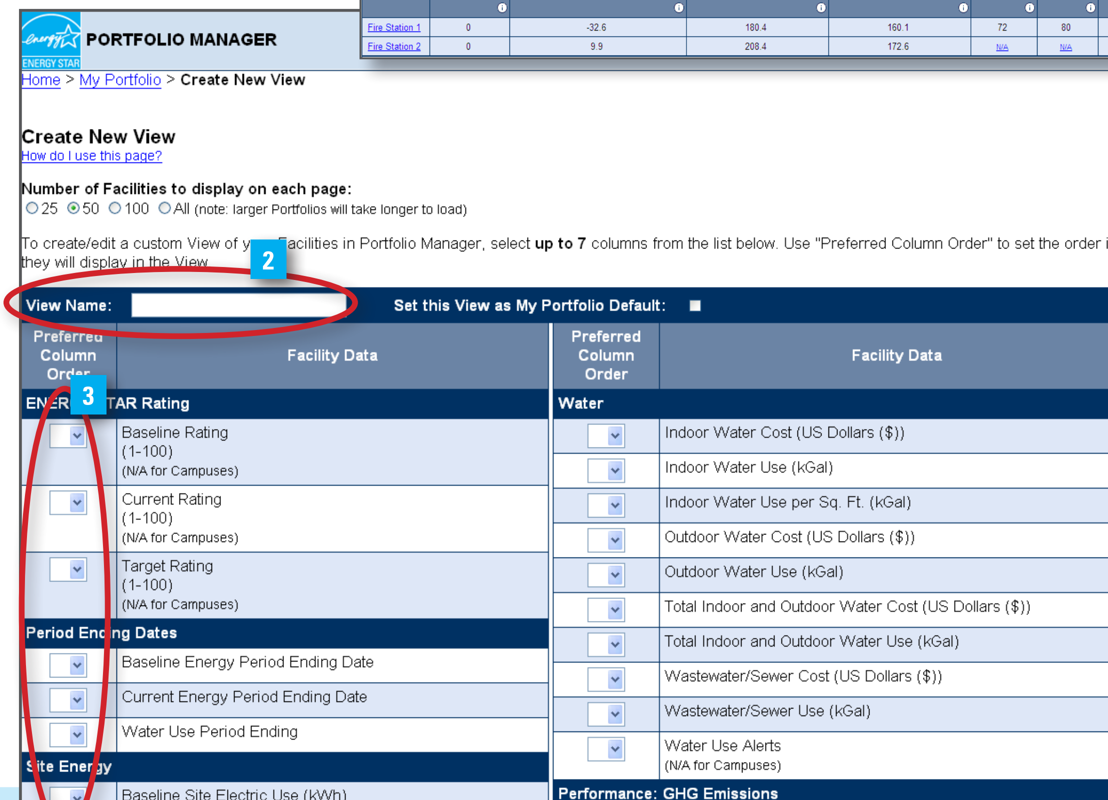
TRACK PROGRESS OVER TIME

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

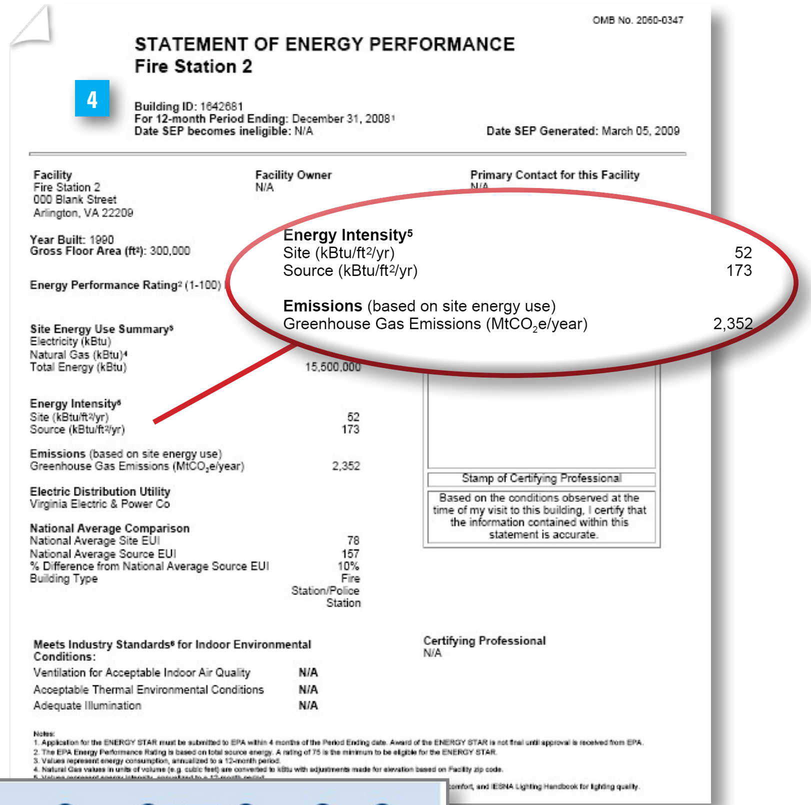
Use Portfolio Manager to quickly and accurately document reductions in energy use, greenhouse gas emissions, water use, and energy costs for an individual building or an entire portfolio. This valuable information can be used to provide a level of transparency and accountability to help demonstrate strategic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

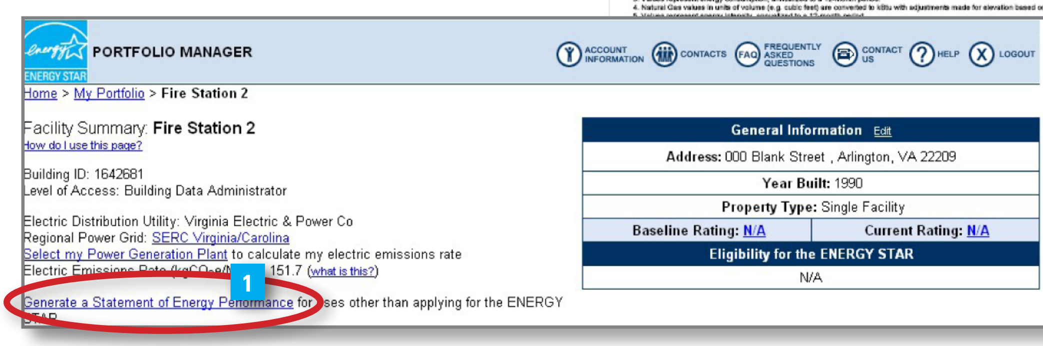
Generate a Statement of Energy Performance that includes valuable information about your building's performance, including:

- 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

DIGESTER SYSTEM DATA

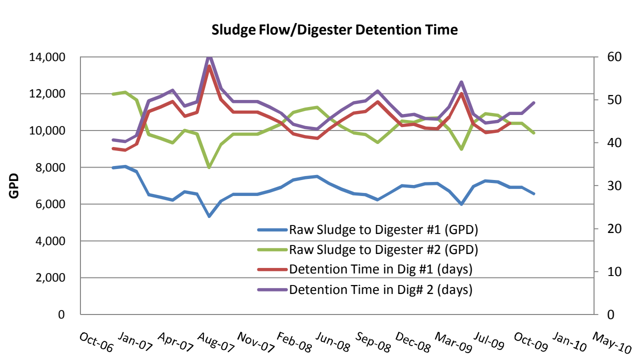
MCJM Digestion System Operation

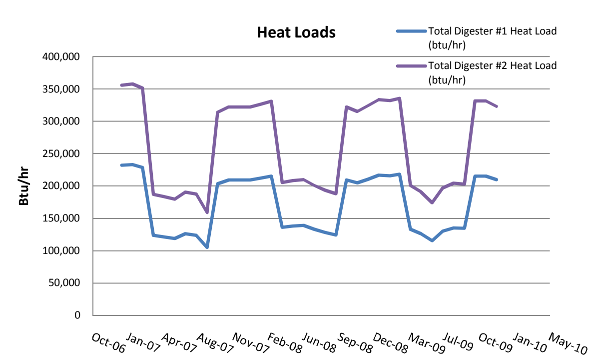
Digester #1 Useable Volume:	308,464	gal	41,233	ft^3
Digester #2 Useable Volume:	486,497	gal	65,031	ft^3
Heat Loss (Oct - March):	1	°F		
Heat Loss (April - Sept):	0.2	°F		
Digester Gas Production:	15	ft^3/lb VS destroyed		
Heat Content of Digas:	550	Btu/ft^3		
Boiler Rating:	994,000	BTU/hr		
Boiler Efficiency:	80	%		

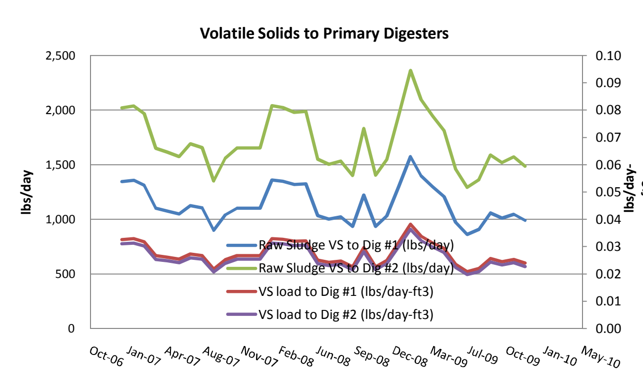
	Raw Sludge (%TS)	Total Raw Sludge Flow (GPD)	Primary Digester #1: Raw Sludge to Digester #1 (GPD)	Detention Time in Dig #1 (days)	TS to Dig #1 (lbs/day)	Raw Sludge (%VSS)	Raw Sludge VS to Dig #1 (lbs/day)	VS load to Dig #1 (lbs/day-ft^3)	Primary Digester #2: Raw Sludge to Digester #2 (GPD)	Detention Time in Dig# 2 (days)	TS (lbs/day)	Raw Sludge (%VSS)	Raw Sludge VS to Dig #2 (lbs/day)	VS load to Dig #2 (lbs/day-ft^3)	Current VS Destruction (%)
Jan-07	2.5	19,938	7,975	39	1,663	81	1,347	0.03	11,963	41	2,494	81	2,020	0.03	42%
Feb-07	2.5	20,124	8,050	38	1,678	81	1,359	0.03	12,074	40	2,518	81	2,039	0.03	37%
Mar-07	2.5	19,426	7,770	40	1,620	81	1,312	0.03	11,656	42	2,430	81	1,968	0.03	51%
Apr-07	2.5	16,309	6,524	47	1,360	81	1,102	0.03	9,785	50	2,040	81	1,653	0.03	59%
May-07	2.5	15,951	6,380	48	1,330	81	1,078	0.03	9,571	51	1,995	81	1,616	0.02	61%
Jun-07	2.5	15,539	6,216	50	1,296	81	1,050	0.03	9,323	52	1,944	81	1,575	0.02	76%
Jul-07	2.5	16,693	6,677	46	1,392	81	1,128	0.03	10,016	49	2,088	81	1,692	0.03	72%
Aug-07	2.5	16,368	6,547	47	1,365	81	1,106	0.03	9,821	50	2,048	81	1,659	0.03	57%
Sep-07	2.5	13,324	5,330	58	1,111	81	900	0.02	7,994	61	1,667	81	1,350	0.02	53%
Oct-07	2.5	15,404	6,162	50	1,285	81	1,041	0.03	9,242	53	1,927	81	1,561	0.02	54%
Nov-07	2.5	16,337	6,535	47	1,363	81	1,104	0.03	9,802	50	2,044	81	1,655	0.03	50%
Dec-07	2.5	16,336	6,534	47	1,362	81	1,104	0.03	9,802	50	2,044	81	1,655	0.03	47%
Jan-08	2.5	16,336	6,534	47	1,362	81	1,104	0.03	9,802	50	2,044	81	1,655	0.03	51%
Feb-08	3.0	16,785	6,714	46	1,680	81	1,361	0.03	10,071	48	2,520	81	2,041	0.03	44%
Mar-08	2.9	17,273	6,909	45	1,665	81	1,349	0.03	10,364	47	2,498	81	2,023	0.03	57%
Apr-08	2.7	18,304	7,322	42	1,630	81	1,321	0.03	10,982	44	2,446	81	1,981	0.03	59%
May-08	2.6	18,596	7,438	41	1,638	81	1,327	0.03	11,158	44	2,457	81	1,990	0.03	54%
Jun-08	2.1	18,771	7,508	41	1,284	81	1,035	0.03	11,263	43	1,926	81	1,552	0.02	67%
Jul-08	2.1	17,806	7,122	43	1,265	79	1,002	0.02	10,684	46	1,898	79	1,503	0.02	66%
Aug-08	2.2	17,042	6,817	45	1,273	80	1,023	0.02	10,225	48	1,910	80	1,535	0.02	50%
Sep-08	2.1	16,436	6,574	47	1,168	80	935	0.02	9,862	49	1,752	80	1,402	0.02	67%
Oct-08	2.7	16,303	6,521	47	1,468	83	1,223	0.03	9,782	50	2,203	83	1,834	0.03	50%
Nov-08	2.3	15,571	6,228	50	1,190	79	936	0.02	9,343	52	1,784	79	1,404	0.02	51%
Dec-08	2.4	16,511	6,604	47	1,322	78	1,033	0.03	9,907	49	1,983	78	1,549	0.02	46%
Jan-09	2.8	17,522	7,009	44	1,634	80	1,301	0.03	10,513	46	2,451	80	1,951	0.03	48%
Feb-09	3.2	17,391	6,956	44	1,857	85	1,577	0.04	10,435	47	2,785	85	2,365	0.04	38%
Mar-09	2.8	17,758	7,103	43	1,671	84	1,399	0.03	10,655	46	2,506	84	2,099	0.03	57%
Apr-09	2.6	17,805	7,122	43	1,550	84	1,299	0.03	10,683	46	2,325	84	1,948	0.03	62%
May-09	2.6	16,756	6,702	46	1,437	84	1,208	0.03	10,054	48	2,155	84	1,812	0.03	65%
Jun-09	2.4	14,973	5,989	52	1,214	80	973	0.02	8,984	54	1,821	80	1,459	0.02	60%
Jul-09	2.0	17,370	6,948	44	1,142	76	862	0.02	10,422	47	1,712	76	1,293	0.02	50%
Aug-09	1.9	18,177	7,271	42	1,122	81	909	0.02	10,906	45	1,683	81	1,363	0.02	44%
Sep-09	2.2	18,038	7,215	43	1,309	81	1,060	0.03	10,823	45	1,963	81	1,590	0.02	42%
Oct-09	2.2	17,306	6,922	45	1,251	81	1,013	0.02	10,384	47	1,877	81	1,520	0.02	41%
Nov-09	2.2	17,305	6,922	45	1,293	81	1,047	0.03	10,383	47	1,940	81	1,571	0.02	28%
Dec-09	2.2	16,439	6,576	47	1,223	81	991	0.02	9,863	49	1,834	81	1,486	0.02	46%
Min:	1.9	13,324	5,330	38	1,111	76	862	0.02	7,994	40	1,667	76	1,293	0.02	28%
Average:	2.5	17,065	6,826	45	1,402	81	1,137	0.03	10,239	48	2,103	81	1,705	0.03	53%
Max:	3.2	20,124	8,050	58	1,857	85	1,577	0.04	12,074	61	2,785	85	2,365	0.04	76%

	Digester #1 Sludge Heat Load (btu/hr)	Digester #1 Heat Loss (btu/hr)	Total Digester #1 Heat Load (btu/hr)	Digester #2 Sludge Heat Load (btu/hr)	Digester #2 Heat Loss (btu/hr)	Total Digester #2 Heat Load (btu/hr)	Heat Output from Engine (btu/hr)	Supplemental Heat Required from Boiler to heat Digester #1 (btu/hr)	Supplemental Heat Required from Boiler to heat Digester #2 (btu/hr)
Jan-07	124,712	107,206	231,918	187,068	169,081	356,149	185,250	402,817	170,899
Feb-07	125,876	107,206	233,081	188,813	169,081	357,894	156,094	76,988	201,800
Mar-07	121,510	107,206	228,715	182,264	169,081	351,345	227,177	1,539	124,169
Apr-07	102,013	21,441	123,454	153,019	33,816	186,835	216,474	(93,020)	(29,638)
May-07	99,774	21,441	121,215	149,660	33,816	183,476	219,832	(98,617)	(36,356)
Jun-07	97,196	21,441	118,638	145,795	33,816	179,611	281,347	(162,709)	(101,736)
Jul-07	104,415	21,441	125,856	156,622	33,816	190,438	285,556	(159,700)	(95,118)
Aug-07	102,382	21,441	123,823	153,573	33,816	187,389	210,731	(86,908)	(23,342)
Sep-07	83,342	21,441	104,783	125,012	33,816	158,829	145,369	(40,586)	13,460
Oct-07	96,352	107,206	203,558	144,528	169,081	313,609	182,645	20,913	130,964
Nov-07	102,188	107,206	209,394	153,282	169,081	322,363	177,943	31,451	144,420
Dec-07	102,182	107,206	209,387	153,273	169,081	322,353	165,014	44,373	157,339
Jan-08	102,182	107,206	209,387	153,273	169,081	322,353	183,220	26,167	139,133
Feb-08	104,990	107,206	212,196	157,485	169,081	326,566	197,064	15,132	129,502
Mar-08	108,043	107,206	215,248	162,064	169,081	331,145	266,693	(51,444)	64,452
Apr-08	114,492	21,441	135,933	171,737	33,816	205,553	270,306	(134,373)	(64,752)
May-08	116,318	21,441	137,759	174,477	33,816	208,293	247,280	(109,521)	(38,987)
Jun-08	117,413	21,441	138,854	176,119	33,816	209,935	235,658	(96,804)	(25,723)
Jul-08	111,377	21,441	132,818	167,065	33,816	200,881	224,719	(91,901)	(23,838)
Aug-08	106,598	21,441	128,039	159,897	33,816	193,713	161,456	(33,418)	32,256
Sep-08	102,807	21,441	124,248	154,211	33,816	188,027	207,254	(83,006)	(19,227)
Oct-08	101,975	107,206	209,181	152,963	169,081	322,043	203,434	5,747	118,609
Nov-08	97,397	107,206	204,602	146,095	169,081	315,176	146,841	57,761	168,334
Dec-08	103,276	107,206	210,482	154,914	169,081	323,995	145,502	64,980	178,493
Jan-09	109,600	107,206	216,806	164,400	169,081	333,481	207,173	9,633	126,308
Feb-09	108,781	107,206	215,987	163,171	169,081	332,252	196,249	19,738	136,003
Mar-09	111,076	107,206	218,282	166,614	169,081	335,695	278,293	(60,010)	57,403
Apr-09	111,370	21,441	132,811	167,055	33,816	200,872	282,943	(150,131)	(82,071)
May-09	104,809	21,441	126,250	157,213	33,816	191,029	276,041	(149,791)	(85,012)
Jun-09	93,656	21,441	115,097	140,484	33,816	174,300	192,484	(77,387)	(18,184)
Jul-09	108,649	21,441	130,091	162,974	33,816	196,790	125,461	4,629	71,329
Aug-09	113,697	21,441	135,138	170,546	33,816	204,362	113,393	21,746	90,969
Sep-09	112,828	21,441	134,269	169,242	33,816	203,058	131,403	2,866	71,654
Oct-09	108,249	107,206	215,455	162,374	169,081	331,454	120,442	95,013	211,012
Nov-09	108,243	107,206	215,449	162,364	169,081	331,445	69,400	146,049	262,045
Dec-09	102,826	107,206	210,032	154,239	169,081	323,320	136,238	73,794	187,082

Calculated Values







APPENDIX D

DIGESTER GAS PRODUCTION AND USE ANALYSIS

MCJM DIGESTER GAS USAGE SUMMARY

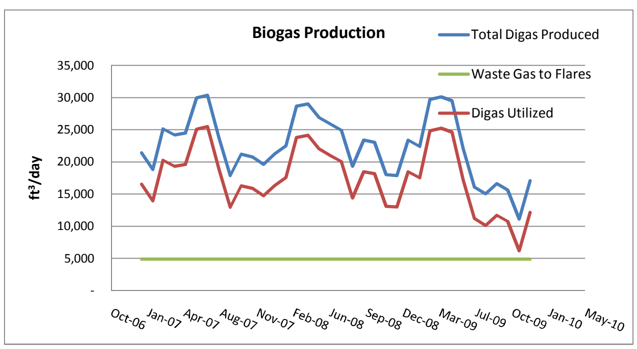
Engine Performance Data (with 0.8 PF)[2]:

100% Load:	135	kW	Fuel Consumption:	1,760	ft^3/hr
75% Load:	101	kW	Fuel Consumption:	1,402	ft^3/hr
50% Load:	68	kW	Fuel Consumption:	1,012	ft^3/hr
25% Load:	34	kW	Fuel Consumption:	593	ft^3/hr

	Waste Gas Flow (ft^3/day)	Total Biogas Produced (ft^3)	Total Biogas Produced (ft^3/day)	Total Biogas Utilized (ft^3/day)	Fuel flow to One Engine (ft^3/hr)	Percent Engine Load (%)	Engine Output (hp)	Associated Blower Output (as a check) (scfm)	Heat Output from Engine (btu/hr)[1]
Jan-07	4,900	650,900	21,411	16,511	688	37%	67	2,193	185,250
Feb-07	4,900	571,900	18,813	13,913	580	31%	56	1,848	156,094
Mar-07	4,900	764,500	25,148	20,248	844	45%	82	2,689	227,177
Apr-07	4,900	735,500	24,194	19,294	804	43%	78	2,562	216,474
May-07	4,900	744,600	24,493	19,593	816	44%	79	2,602	219,832
Jun-07	4,900	911,275	29,976	25,076	1,045	56%	101	3,330	281,347
Jul-07	4,900	922,680	30,351	25,451	1,060	57%	103	3,380	285,556
Aug-07	4,900	719,940	23,682	18,782	783	42%	76	2,494	210,731
Sep-07	4,900	542,840	17,857	12,957	540	29%	52	1,721	145,369
Oct-07	4,900	643,840	21,179	16,279	678	36%	66	2,162	182,645
Nov-07	4,900	631,100	20,760	15,860	661	35%	64	2,106	177,943
Dec-07	4,900	596,070	19,608	14,708	613	33%	59	1,953	165,014
Jan-08	4,900	645,400	21,230	16,330	680	36%	66	2,169	183,220
Feb-08	4,900	682,910	22,464	17,564	732	39%	71	2,333	197,064
Mar-08	4,900	871,570	28,670	23,770	990	53%	96	3,157	266,693
Apr-08	4,900	881,360	28,992	24,092	1,004	54%	97	3,200	270,306
May-08	4,900	818,970	26,940	22,040	918	49%	89	2,927	247,280
Jun-08	4,900	787,480	25,904	21,004	875	47%	85	2,790	235,658
Jul-08	4,900	757,840	24,929	20,029	835	45%	81	2,660	224,719
Aug-08	4,900	586,430	19,290	14,390	600	32%	58	1,911	161,456
Sep-08	4,900	710,520	23,372	18,472	770	41%	75	2,453	207,254
Oct-08	4,900	700,170	23,032	18,132	755	40%	73	2,408	203,434
Nov-08	4,900	546,830	17,988	13,088	545	29%	53	1,738	146,841
Dec-08	4,900	543,200	17,868	12,968	540	29%	52	1,722	145,502
Jan-09	4,900	710,300	23,365	18,465	769	41%	74	2,452	207,173
Feb-09	4,900	680,700	22,391	17,491	729	39%	71	2,323	196,249
Mar-09	4,900	903,000	29,704	24,804	1,033	55%	100	3,294	278,293
Apr-09	4,900	915,600	30,118	25,218	1,051	56%	102	3,349	282,943
May-09	4,900	896,900	29,503	24,603	1,025	55%	99	3,268	276,041
Jun-09	4,900	670,500	22,056	17,156	715	38%	69	2,278	192,484
Jul-09	4,900	488,900	16,082	11,182	466	25%	45	1,485	125,461
Aug-09	4,900	456,200	15,007	10,107	421	23%	41	1,342	113,393
Sep-09	4,900	505,000	16,612	11,712	488	26%	47	1,555	131,403
Oct-09	4,900	475,300	15,635	10,735	447	24%	43	1,426	120,442
Nov-09	4,900	337,000	11,086	6,186	258	14%	25	822	69,400
Dec-09	4,900	518,100	17,043	12,143	506	27%	49	1,613	136,238

Min:	**337,000**	**11,086**	**6,186**
Avg:	**681,259**	**22,410**	**17,510**
Max:	**922,680**	**30,351**	**25,451**

1. Assuming a 52% thermal efficiency.
2. Performance curves on page 12 of O&M manual.



APPENDIX E

ANALYSIS OF VARIOUS SLUDGE PROCESSING ALTERNATIVES

MCJM - DIGESTION SYSTEM OPERATION WITH THE ADDITION OF THICKENED WAS FROM THE AERATION BASINS

Engine Size	135	kW
Fuel Required	42,240	ft^3/day/engine @ full load
Thermal Output	503,000	Btu/hour/engine
Elec. Energy Cost	$0.15	$/kWh
Thermal Energy Cost	$1.07	$/therm
Caloric Value of Biogas	550	Btu/ft^3
Rated Capacity of Digester Building Boiler	944,000	Btu/hr
Efficiency of Boiler	80%	
Rated Capacity of Bar Screen Boiler	1,100,000	Btu/hr
Efficiency of Boiler	80%	

Prepared By: M.Messmann Date: 8/17/2010
Checked By: MH Date: 9/16/2010

				Electrical & Thermal Energy Produced if all Biogas was utilized in the engines							Electrical & Thermal Energy Produced when Biogas runs blower and boiler							
Month/Year	Total Biogas Produced (ft^3/day)	Projected Biogas Production with TWS (ft^3/day)	Primary Digesters 1&2 Heat Load (Btu/hr)	# of Engines in Operation	% Load	Elec. Energy Ouput (kW)	Parasitic Energy Consumption (kW)[1]	Total Energy Produced (kW)	Total Energy Produced (kWh-Month)[2]	Total Available Heat (Btu/hr)	Blower Power Requirement (100 hp avg day) (kW)	Required Biogas Flow (ft^3/day)	% Load	Available Reject Heat from Engine (Btu/hr)	Remaining Biogas to Boiler (ft^3/day)	Available Heat from Boiler Operation (Btu/hr)	Available Heat for Building Demand (Btu/hr)	Thermal Energy Cost Savings
Jan-09	34,719	45,692	550,287	2	54%	146	8	138	87,989	544,107	75	23,467	56%	279,444	22,225	407,464	136,622	$1,067
Feb-09	35,431	46,404	548,238	2	55%	148	8	140	89,441	552,586	75	23,467	56%	279,444	22,937	420,518	151,724	$1,184
Mar-09	37,302	48,275	553,977	2	57%	154	8	146	93,259	574,866	75	23,467	56%	279,444	24,808	454,819	180,287	$1,407
Apr-09	36,842	47,815	333,683	2	57%	153	8	145	92,320	569,388	75	23,467	56%	279,444	24,348	446,386	392,148	$3,061
May-09	34,532	45,505	317,279	2	54%	145	8	137	87,607	541,880	75	23,467	56%	279,444	22,038	404,036	366,201	$2,859
Jun-09	22,427	33,400	289,398	1	79%	107	8	99	62,909	397,732	75	23,467	56%	279,444	9,933	182,111	172,158	$1,344
Jul-09	32,502	43,475	326,881	2	51%	139	8	131	83,465	517,707	75	23,467	56%	279,444	20,008	366,819	319,383	$2,493
Aug-09	19,315	30,288	339,500	1	72%	97	8	89	56,559	360,674	75	23,467	56%	279,444	6,821	125,058	65,002	$507
Sep-09	21,807	32,780	337,327	1	78%	105	8	97	61,644	390,349	75	23,467	56%	279,444	9,313	170,744	112,862	$881
Oct-09	17,032	28,005	546,909	1	66%	90	8	81	51,901	333,488	75	23,467	56%	279,444	4,538	83,203	(184,262)	$0
Nov-09	19,429	30,402	546,893	1	72%	97	8	89	56,792	362,031	75	23,467	56%	279,444	6,935	127,148	(140,301)	$0
Dec-09	22,306	33,279	533,351	1	79%	106	8	98	62,662	396,291	75	23,467	56%	279,444	9,812	179,893	(74,014)	$0
	Annual Total:	**465,320**	**5,223,723**									**281,600**		**3,353,333**	**183,720**	**3,368,200**	**1,497,811**	**$14,805**

1. Analysis includes the assumption of a 6 hp motors associated with the operation of the GBTs and 5 hp motor for WAS transfer to the GBTs.
2. Analysis assumes an average engine run-time of 21 hours per day to account for downtime for maintenance and varying gas production.

MCJM - DIGESTION SYSTEM OPERATION WITH THE ADDITION OF THICKENED WAS FROM THE AERATION BASINS AND FOG

Prepared By: M.Messmann Date: 8/17/2010
Checked By: MH Date: 9/16/2010

Engine Size	135 kW
Fuel Required	42,240 ft^3/day/engine @ full load
Thermal Output	503,000 Btu/hour/engine
Elec. Energy Cost	$0.15 $/kWh
Thermal Energy Cost	$1.07 $/therm
Caloric Value of Biogas	550 Btu/ft^3
Rated Capacity of Digester Building Boiler	944,000 Btu/hr
Efficiency of Boiler	80%
Rated Capacity of Bar Screen Boiler	1,100,000 Btu/hr
Efficiency of Boiler	80%

					Electrical & Thermal Energy Produced if all Biogas was utilized in the engines								Electrical & Thermal Energy Produced when Biogas runs blower and dual fuel boilers								
Month/Year	Total Biogas Produced (ft^3/day)	Projected Biogas Production with TWS (ft^3/day)	Project Biogas Production with TWS and FOG (ft^3/day)	Primary Digesters 1&2 Heat Load (Btu/hr)	# of Engines in Operation	Engine % Load	Elec. Energy Ouput (kW)	Parasitic Energy Consumption (kW)[1]	Total Energy Produced (kW)	Total Energy Produced (kWh-Month)[2]	Total Available Heat (Btu/hr)	Waste Gas Flow (ft^3/day)	Blower Power Requirement (100 hp avg day) (kW)	Required Biogas Flow (ft^3/day)	Engine % Load	Available Reject Heat from Engine (Btu/hr)	Remaining Biogas to Boiler (ft^3/day)	Available Heat from Boiler Operation (Btu/hr)	FOG System Heat Demand (Btu/hr)	Available Heat for Building Heat Demand (Btu/hr)	Thermal Energy Cost Savings
Jan-09	34,719	45,692	80,088	550,287	2	100%	270	8	262	167,129	1,006,000	0	75	23,467	56%	279,444	56,621	1,038,058	366,621	400,595	$3,127
Feb-09	35,431	46,404	80,800	548,238	2	100%	270	8	262	167,129	1,006,000	0	75	23,467	56%	279,444	57,333	1,051,111	366,621	415,696	$3,245
Mar-09	37,302	48,275	82,671	553,977	2	100%	270	8	262	167,129	1,006,000	0	75	23,467	56%	279,444	59,204	1,085,413	366,621	444,259	$3,468
Apr-09	36,842	47,815	82,211	333,683	2	100%	270	8	262	167,129	1,006,000	0	75	23,467	56%	279,444	58,744	1,076,979	366,621	656,120	$5,122
May-09	34,532	45,505	79,901	317,279	2	100%	270	8	262	167,129	1,006,000	0	75	23,467	56%	279,444	56,434	1,034,629	366,621	630,174	$4,920
Jun-09	22,427	33,400	67,796	289,398	2	100%	270	8	262	167,129	1,006,000	0	75	23,467	56%	279,444	44,329	812,704	366,621	436,130	$3,405
Jul-09	32,502	43,475	77,871	326,881	2	100%	270	8	262	167,129	1,006,000	0	75	23,467	56%	279,444	54,404	997,413	366,621	583,356	$4,554
Aug-09	19,315	30,288	64,684	339,500	2	100%	270	8	262	167,129	1,006,000	0	75	23,467	56%	279,444	41,217	755,651	366,621	328,974	$2,568
Sep-09	21,807	32,780	67,176	337,327	2	100%	270	8	262	167,129	1,006,000	0	75	23,467	56%	279,444	43,709	801,338	366,621	376,835	$2,942
Oct-09	17,032	28,005	62,401	546,909	2	74%	199	8	191	122,081	743,080	0	75	23,467	56%	279,444	38,934	713,796	366,621	79,711	$622
Nov-09	19,429	30,402	64,798	546,893	2	100%	270	8	262	167,129	1,006,000	0	75	23,467	56%	279,444	41,331	757,741	366,621	123,671	$965
Dec-09	22,306	33,279	67,675	533,351	2	100%	270	8	262	167,129	1,006,000	0	75	23,467	56%	279,444	44,208	810,486	366,621	189,958	$1,483
		Annual Total:	**878,072**	**5,223,723**										**281,600**		**3,353,333**	**596,472**	**10,935,320**	**4,399,452**	**4,665,479**	**$36,422**

1. Analysis includes the assumption of a 6 hp motors associated with the operation of the GBTs and 5 hp motor for WAS transfer to the GBTs.
2. Analysis assumes an average engine run-time of 21 hours per day to account for downtime for maintenance and varying gas production.

MCJM - DIGESTION SYSTEM OPERATION WITH THE ADDITION OF PHS

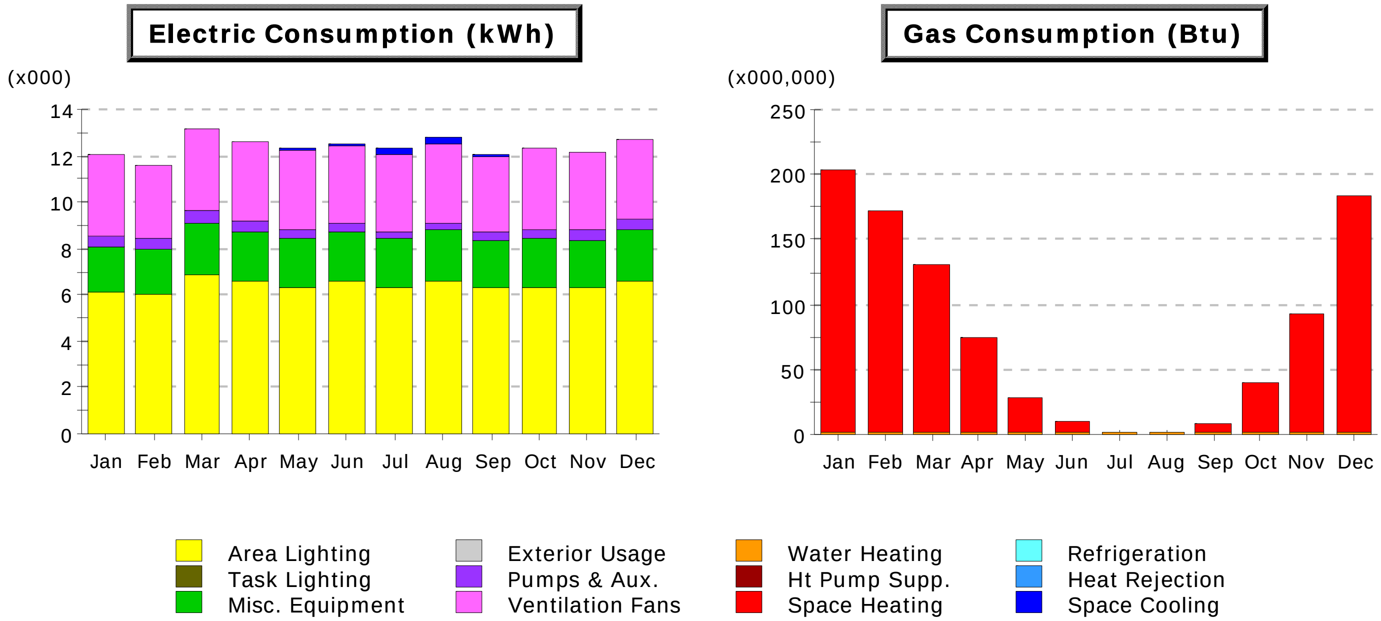
Engine Size	135	kW		Prepared By: M.Messmann	Date: 8/17/2010
Fuel Required	42,240	ft^3/day/engine @ full load		Checked By: MH	Date: 9/16/2010
Thermal Output	503,000	Btu/hour/engine			
Elec. Energy Cost	$0.15	$/kWh			
Thermal Energy Cost	$1.07	$/therm			
Caloric Value of Biogas	550	Btu/ft^3			
Rated Capacity of Digester Building Boiler	944,000	Btu/hr			
Efficiency of Boiler	80%				
Rated Capacity of Bar Screen Boiler	1,100,000	Btu/hr			
Efficiency of Boiler	80%				

				Electrical & Thermal Energy Produced if all Biogas was utilized in the engines							Electrical & Thermal Energy Produced when Biogas runs blower and boiler							
Month/Year	Total Biogas Produced (ft^3/day)	Projected Biogas Production with PHS Addition (ft^3/day)	Primary Digesters 1&2 Heat Load (Btu/hr)	# of Engines in Operation	% Load	Elec. Energy Ouput (kW)	Parasitic Energy Consumption (kW)[1]	Total Energy Produced (kW)	Total Energy Produced (kWh-Month)[2]	Total Available Heat (Btu/hr)	Blower Power Requirement (83 hp avg day summer, 100 hp avg day winter) (kW)	Required Biogas Flow (ft^3/day)	% Load	Available Reject Heat from Engine (Btu/hr)	Remaining Biogas to Boiler (ft^3/day)	Available Heat from Boiler Operation (Btu/hr)	Available Heat for Building Demand (Btu/hr)	Thermal Energy Cost Savings
Jan-09	34,719	41,663	550,287	1	99%	133	8	125	79,768	496,127	75	23,467	56%	279,444	18,196	333,596	62,754	$490
Feb-09	35,431	42,517	548,238	2	50%	136	8	128	81,511	506,301	75	23,467	56%	279,444	19,051	349,260	80,466	$628
Mar-09	37,302	44,762	553,977	2	53%	143	8	135	86,092	533,037	75	23,467	56%	279,444	21,296	390,422	115,889	$905
Apr-09	36,842	44,210	333,683	2	52%	141	8	133	84,966	526,464	75	23,467	56%	279,444	20,744	380,302	326,063	$2,545
May-09	34,532	41,438	317,279	1	98%	132	8	124	79,310	493,454	62	19,399	46%	231,007	22,039	404,054	317,782	$2,481
Jun-09	22,427	26,912	289,398	1	64%	86	8	78	49,672	320,477	62	19,399	46%	231,007	7,513	137,744	79,353	$619
Jul-09	32,502	39,002	326,881	1	92%	125	8	116	74,339	464,446	62	19,399	46%	231,007	19,603	359,394	263,520	$2,057
Aug-09	19,315	23,178	339,500	1	55%	74	8	66	42,052	276,007	62	19,399	46%	231,007	3,779	69,280	0	$0
Sep-09	21,807	26,168	337,327	1	62%	84	8	75	48,154	311,617	62	19,399	46%	231,007	6,769	124,104	17,785	$139
Oct-09	17,032	20,438	546,909	1	48%	65	8	57	36,463	243,383	62	19,399	46%	231,007	1,039	19,054	0	$0
Nov-09	19,429	23,315	546,893	1	55%	75	8	66	42,331	277,636	75	23,467	56%	279,444	0	0	0	$0
Dec-09	22,306	26,767	533,351	1	63%	86	8	77	49,376	318,748	75	23,467	56%	279,444	3,301	60,510	0	$0
Annual Total:		**400,373**	**5,223,723**									**257,195**		**3,062,711**	**143,330**	**2,627,717**	**1,263,612**	**$9,865**

1. Analysis includes the assumption of a 6 hp motors associated with the operation of the GBTs and 5 hp motor for WAS transfer to the GBTs.
2. Analysis assumes an average engine run-time of 21 hours per day to account for downtime for maintenance and varying gas production.

APPENDIX F

eQUEST MODEL RESULTS

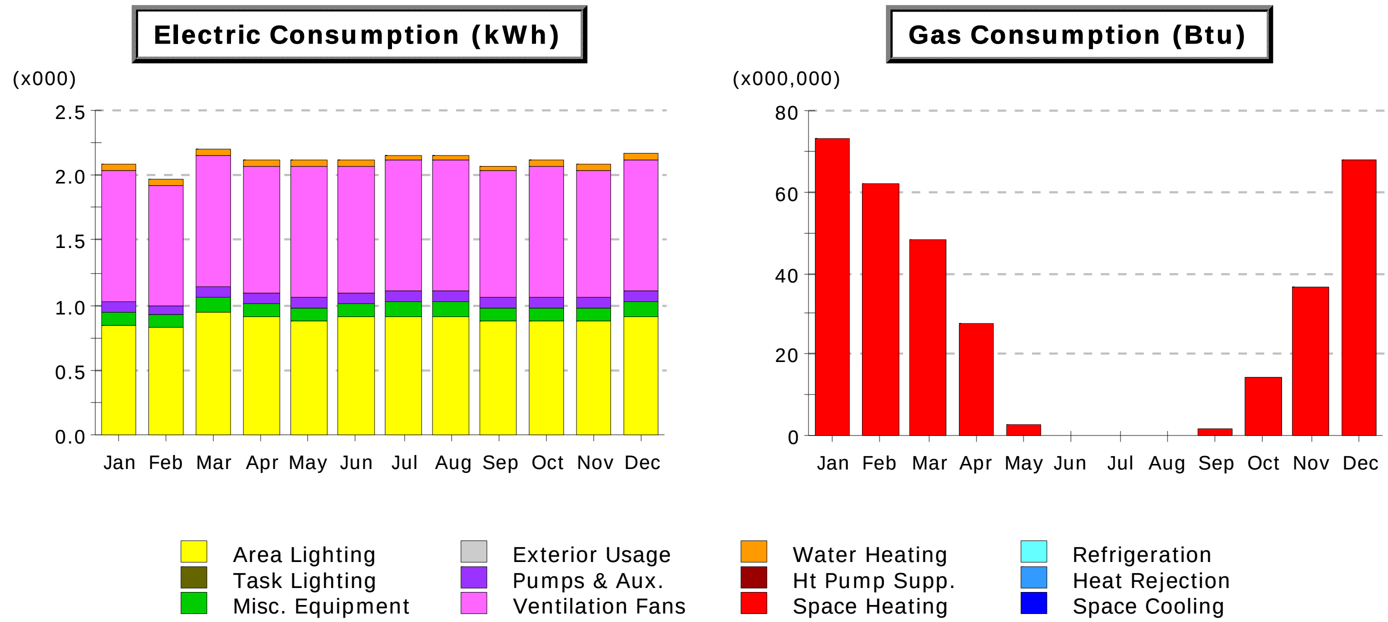


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	0.01	0.08	0.15	0.28	0.24	0.09	0.01	0.01	-	0.86
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.50	3.21	3.52	3.38	3.45	3.33	3.33	3.44	3.22	3.46	3.29	3.46	40.59
Pumps & Aux.	0.50	0.45	0.50	0.46	0.40	0.34	0.33	0.33	0.34	0.43	0.46	0.50	5.05
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	1.98	1.96	2.25	2.16	2.07	2.16	2.07	2.16	2.06	2.07	2.06	2.16	25.17
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	6.08	6.00	6.86	6.57	6.34	6.57	6.34	6.60	6.31	6.34	6.31	6.60	76.94
Total	12.05	11.62	13.13	12.58	12.35	12.55	12.35	12.78	12.03	12.31	12.13	12.72	148.61

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	202.16	171.21	129.08	74.02	26.60	8.71	-	-	7.28	38.64	92.12	183.16	933.00
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	1.12	1.11	1.26	1.18	1.05	1.00	0.90	0.91	0.89	0.96	1.02	1.14	12.55
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	203.28	172.32	130.35	75.21	27.66	9.71	0.90	0.91	8.18	39.61	93.15	184.30	945.55

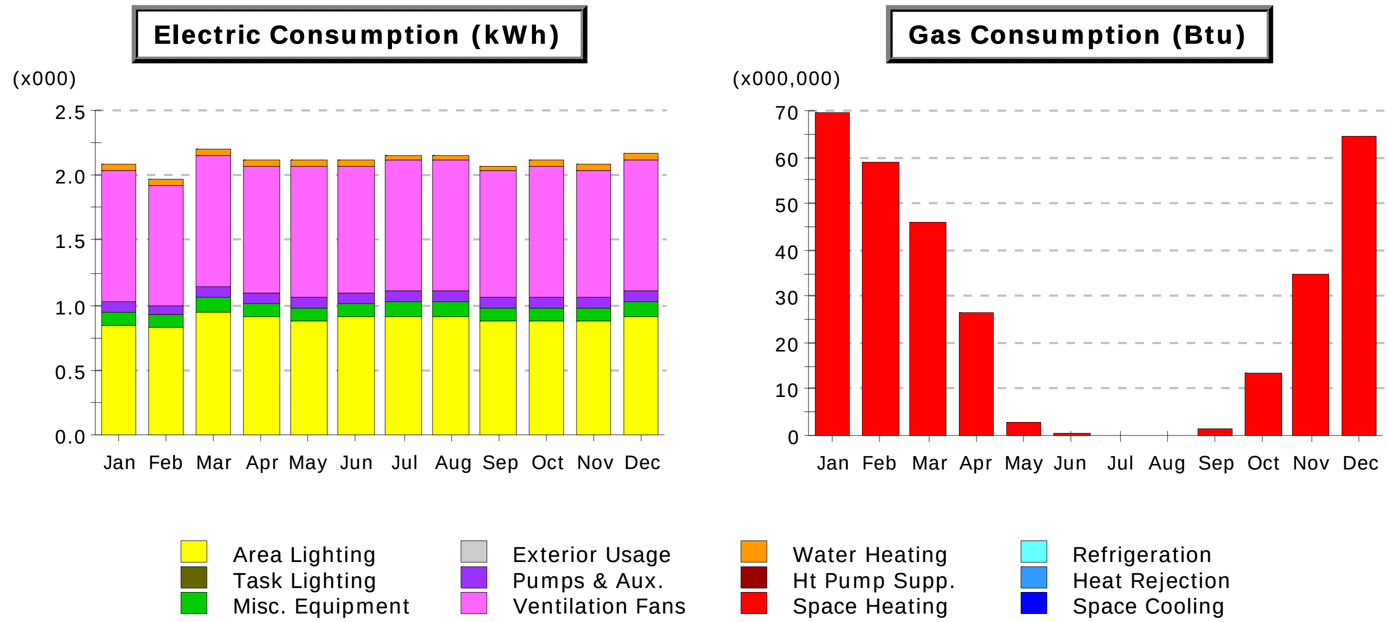


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.05	0.05	0.06	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.56
Vent. Fans	1.01	0.91	1.01	0.98	1.01	0.98	1.01	1.01	0.98	1.01	0.98	1.01	11.90
Pumps & Aux.	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.99
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.09	0.09	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	1.19
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.85	0.83	0.95	0.91	0.88	0.91	0.92	0.92	0.88	0.88	0.88	0.92	10.72
Total	2.09	1.96	2.21	2.12	2.12	2.12	2.15	2.15	2.07	2.12	2.08	2.17	25.36

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	73.15	61.79	48.22	27.53	2.84	0.25	-	-	1.46	14.27	36.42	67.62	333.57
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	73.15	61.79	48.22	27.53	2.84	0.25	-	-	1.46	14.27	36.42	67.62	333.57



Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.05	0.05	0.06	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.56
Vent. Fans	1.01	0.91	1.01	0.98	1.01	0.98	1.01	1.01	0.98	1.01	0.98	1.01	11.90
Pumps & Aux.	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.99
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.09	0.09	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	1.19
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.85	0.83	0.95	0.91	0.88	0.91	0.92	0.92	0.88	0.88	0.88	0.92	10.72
Total	2.09	1.96	2.21	2.12	2.12	2.12	2.15	2.15	2.07	2.12	2.08	2.17	25.36

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	69.62	58.81	45.90	26.20	2.70	0.24	-	-	1.39	13.58	34.67	64.36	317.47
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	69.62	58.81	45.90	26.20	2.70	0.24	-	-	1.39	13.58	34.67	64.36	317.47

APPENDIX G

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

The Engineer's Opinion of Probable Construction Cost Estimates presented in this Appendix is an Opinion of Probable Construction Cost only. CDM has no control over the cost of labor, materials, equipment, or services furnished, over schedules, over contractor's methods of determining prices, competitive bidding, market conditions or negotiating terms. CDM does not guarantee that this opinion will not vary from actual cost, or contractor's bids. There are not any costs provided for: Change Orders, Design Engineering, Construction Oversight, Client Costs, Finance or Funding Costs, Legal Fees, Land Acquisition or temporary/permanent Easements, Operations, or any other costs associated with this project that are not specifically part of the bidding contractor's proposed scope.

CDM

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

100 Crossways Park West, Suite 415
Woodbury, NY 11797
Phone (516) 496-8400
Fax (516) 4968864

Location: MCJM
ITEM **Option 1: Installation of Premium Efficiency Motors & VFDs on Mechanical Aerators**
Estimate by: MM
Checked by: MH

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	Premium Efficiency Motors & VFDs	3	ea.	$ 2,600.00	$ 7,800.00	3	ea.	$ 1,312.00	$ 3,936.00	$ 11,736.00
2	Electrical Work	3	ea.	$ 5,000.00	$ 15,000.00	3	ea.	$ 6,000.00	$ 18,000.00	$ 33,000.00
3	Modification to Existing Aeration Blower	1	ls.	$ 5,000.00	$ 5,000.00	1	ls	$ 5,000.00	$ 5,000.00	$ 10,000.00
	Subtotal				27,800.00				26,936.00	

SUBTOTAL =	$	54,736.00
OH&P 20 % =	$	0.20
MARKUP =	$	10,947.20
SUB-TOTAL w/ OH & P =	$	65,683.20
CONTINGENCY % =		0.30
CONTINGENCY =	$	19,704.96
BUDGET COST ESTIMATE =	$	85,388.16

CDM

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

100 Crossways Park West, Suite 415
Woodbury, NY 11797
Phone (516) 496-8400
Fax (516) 4968864

Location: MCJM
ITEM **Option 2: Installation of Fine Bubble Aeration System**

Estimate by: MM
Checked by: MH

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	Fine Bubble Aeration System[1]	1	ea.	$ 70,000.00	$ 70,000.00	1	ea.	$ 600,000.00	$ 600,000.00	$ 670,000.00
2	Aeration System Controls	1	ea.	$ 200,000.00	$ 200,000.00					$ 200,000.00
	Subtotal				270,000.00				600,000.00	

SUBTOTAL =	$	870,000.00
OH&P 20 % =	$	0.20
MARKUP =	$	174,000.00
SUB-TOTAL w/ OH & P =	$	1,044,000.00
CONTINGENCY % =		0.30
CONTINGENCY =	$	313,200.00
BUDGET COST ESTIMATE =	$	1,357,200.00

1. Material quote based on Sanitaire's standard PVC and 304SS components.
2. Labor cost is based on contractor's bids for similar installations. The labor cost is a lump sum for all work, including electrical, instrucmentation, start up and testing of the system.

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: MCJM
ITEM Option 1: VFDs on Existing Aerators
Estimate by: Christie Arlotta
Checked by:

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	VFDs	2	ea.	$ 81,500.00	$ 163,000.00	32	hrs	$ 70.00	$ 2,240.00	$ 165,240.00
2	DO Control System	1	ea.	$ 10,000.00	$ 10,000.00	40	hrs	$ 70.00	$ 2,800.00	$ 12,800.00
3	Electrical Work	2	l.s.	$ 10,000.00	$ 20,000.00	120	hrs	$ 70.00	$ 8,400.00	$ 28,400.00
4	System Testing	1	l.s.	$ 5,000.00	$ 5,000.00	32	hrs	$ 70.00	$ 2,240.00	$ 7,240.00
5	Motors	2	ea.	$ 15,000.00	$ 30,000.00	32	hrs	$ 70.00	$ 2,240.00	$ 32,240.00
					$ -				$ -	$ -
					$ -				$ -	$ -
	Subtotal				228,000.00				17,920.00	

SUBTOTAL =	$ 245,920.00
MARKUP % =	$ 0.20
MARKUP =	$ 49,184.00
SUB-TOTAL w/ OH & P =	$ 295,104.00
CONTINGENCY % =	0.30
CONTINGENCY =	$ 88,531.20
BUDGET COST ESTIMATE =	$ 383,635.20

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: MCJM
ITEM Option 2: New Aerators with VFDs
Estimate by: Christie Arlotta
Checked by:

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	Aerators	2	ea.	$ 93,000.00	$ 186,000.00	32	hrs	$ 70.00	$ 2,240.00	$ 188,240.00
2	VFDs	2	ea.	$ 81,500.00	$ 163,000.00	40	hrs	$ 70.00	$ 2,800.00	$ 165,800.00
3	DO Control System	1	ea.	$ 10,000.00	$ 10,000.00	32	hrs	$ 70.00	$ 2,240.00	$ 12,240.00
4	Electrical Work	2	l.s.	$ 10,000.00	$ 20,000.00	160	hrs	$ 70.00	$ 11,200.00	$ 31,200.00
5	System Testing	1	l.s.	$ 5,000.00	$ 5,000.00	32	hrs	$ 70.00	$ 2,240.00	$ 7,240.00
					$ -				$ -	$ -
					$ -				$ -	$ -
					$ -				$ -	$ -
	Subtotal				384,000.00				20,720.00	

SUBTOTAL =	$ 404,720.00
MARKUP % =	$ 0.20
MARKUP =	$ 80,944.00
SUB-TOTAL w/ OH & P =	$ 485,664.00
CONTINGENCY % =	0.30
CONTINGENCY =	$ 145,699.20
BUDGET COST ESTIMATE =	$ 631,363.20

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: MCJM
ITEM Option 3: New Two-Speed Aerators
Estimate by: Christie Arlotta
Checked by:

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	Aerators - Two-speed	2	ea.	$ 120,000.00	$ 240,000.00	32	hrs	$ 70.00	$ 2,240.00	$ 242,240.00
2	VFDs	0	ea.	$ 83,500.00	$ -	0	hrs	$ 70.00	$ -	$ -
3	DO Control System	1	ea.	$ 10,000.00	$ 10,000.00	32	hrs	$ 70.00	$ 2,240.00	$ 12,240.00
4	Electrical Work	2	l.s.	$ 10,000.00	$ 20,000.00	120	hrs	$ 70.00	$ 8,400.00	$ 28,400.00
5	System Testing	1	l.s.	$ -	$ -	32	hrs	$ 70.00	$ 2,240.00	$ 2,240.00
					$ -				$ -	$ -
					$ -				$ -	$ -
					$ -				$ -	$ -
	Subtotal				270,000.00				15,120.00	

SUBTOTAL =	$ 285,120.00
MARKUP % =	$ 0.20
MARKUP =	$ 57,024.00
SUB-TOTAL w/ OH & P =	$ 342,144.00
CONTINGENCY % =	0.30
CONTINGENCY =	$ 102,643.20
BUDGET COST ESTIMATE =	$ 444,787.20

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: MCJM
ITEM Option 1: New Motors, VFDs & DO Controls
Estimate by: Christie Arlotta
Checked by:

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	VFDs	4	ea.	$ 1,525.00	$ 6,100.00	45	hrs	$ 70.00	$ 3,150.00	$ 9,250.00
2	Premium Efficiency Motors	4	ea.	$ 620.00	$ 2,480.00	8	hrs	$ 70.00	$ 560.00	$ 3,040.00
3	DO Control System	1	ea.	$ 50,000.00	$ 50,000.00	120	hrs	$ 70.00	$ 8,400.00	$ 58,400.00
4	Electrical Work	4	l.s.	$ 5,000.00	$ 20,000.00	120	hrs	$ 70.00	$ 8,400.00	$ 28,400.00
5	System Testing	1	l.s.	$ 3,000.00	$ 3,000.00	16	hrs	$ 70.00	$ 1,120.00	$ 4,120.00
					$ -				$ -	$ -
					$ -				$ -	$ -
					$ -				$ -	$ -
	Subtotal				81,580.00				21,630.00	

SUBTOTAL =	$ 103,210.00
MARKUP % =	$ 0.20
MARKUP =	$ 20,642.00
SUB-TOTAL w/ OH & P =	$ 123,852.00
CONTINGENCY % =	0.30
CONTINGENCY =	$ 37,155.60
BUDGET COST ESTIMATE =	$ 161,007.60

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: MCJM
ITEM Option 2: New Aerators
Estimate by: Christie Arlotta
Checked by:

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	Aerators	4	ea.	$ 10,000.00	$ 40,000.00	0	hrs	$ 70.00	$ -	$ 40,000.00
2	VFDs	0	ea.	$ 1,525.00	$ -	0	hrs	$ 70.00	$ -	$ -
3	DO Control System	0	ea.	$ 10,000.00	$ -	0	hrs	$ 70.00	$ -	$ -
4	Electrical Work	4	l.s.	$ 5,000.00	$ 20,000.00	120	hrs	$ 70.00	$ 8,400.00	$ 28,400.00
5	System Testing	1	l.s.	$ 3,000.00	$ 3,000.00	16	hrs	$ 70.00	$ 1,120.00	$ 4,120.00
					$ -				$ -	$ -
					$ -				$ -	$ -
					$ -				$ -	$ -
	Subtotal				63,000.00				9,520.00	

SUBTOTAL =	$ 72,520.00
MARKUP % =	$ 0.20
MARKUP =	$ 14,504.00
SUB-TOTAL w/ OH & P =	$ 87,024.00
CONTINGENCY % =	0.30
CONTINGENCY =	$ 26,107.20
BUDGET COST ESTIMATE =	$ 113,131.20

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: MCJM
ITEM Option 3: New Aerators, VFDs & DO Control
Estimate by: Christie Arlotta
Checked by:

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	Aerators	4	ea.	$ 10,000.00	$ 40,000.00	64	hrs	$ 70.00	$ 4,480.00	$ 44,480.00
2	VFDs	4	ea.	$ 1,525.00	$ 6,100.00	45	hrs	$ 70.00	$ 3,150.00	$ 9,250.00
3	DO Control System	1	ea.	$ 100,000.00	$ 100,000.00	16	hrs	$ 70.00	$ 1,120.00	$ 101,120.00
4	Electrical Work	4	l.s.	$ 5,000.00	$ 20,000.00	160	hrs	$ 70.00	$ 11,200.00	$ 31,200.00
5	System Testing	1	l.s.	$ 6,000.00	$ 6,000.00	16	hrs	$ 70.00	$ 1,120.00	$ 7,120.00
					$ -				$ -	$ -
					$ -				$ -	$ -
					$ -				$ -	$ -
	Subtotal				172,100.00				21,070.00	

SUBTOTAL =	$ 193,170.00
MARKUP % =	$ 0.20
MARKUP =	$ 38,634.00
SUB-TOTAL w/ OH & P =	$ 231,804.00
CONTINGENCY % =	0.30
CONTINGENCY =	$ 69,541.20
BUDGET COST ESTIMATE =	$ 301,345.20

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: MCJM
ITEM Option 4: New Solar Aerators & DO Control
Estimate by: Christie Arlotta
Checked by:

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	Solar Aerators	2	ea.	$ 40,000.00	$ 80,000.00	32	hrs	$ 70.00	$ 2,240.00	$ 82,240.00
2	New Motors & VFDs - only on 2 existing machines	2	ea.	$ 2,145.00	$ 4,290.00	24	hrs	$ 70.00	$ 1,680.00	$ 5,970.00
3	DO Control System	1	ea.	$ 100,000.00	$ 100,000.00	16	hrs	$ 70.00	$ 1,120.00	$ 101,120.00
4	Electrical Work	4	l.s.	$ 5,000.00	$ 20,000.00	160	hrs	$ 70.00	$ 11,200.00	$ 31,200.00
5	System Testing	1	l.s.	$ 6,000.00	$ 6,000.00	16	hrs	$ 70.00	$ 1,120.00	$ 7,120.00
					$ -				$ -	$ -
					$ -				$ -	$ -
					$ -				$ -	$ -
	Subtotal				210,290.00				17,360.00	

SUBTOTAL =	$ 227,650.00
MARKUP % =	$ 0.20
MARKUP =	$ 45,530.00
SUB-TOTAL w/ OH & P =	$ 273,180.00
CONTINGENCY % =	0.30
CONTINGENCY =	$ 81,954.00
BUDGET COST ESTIMATE =	$ 355,134.00

CDM

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

100 Crossways Park West, Suite 415
Woodbury, NY 11797
Phone (516) 496-8400
Fax (516) 4968864

Location: MCJM
ITEM **Option 1: Current Operation of Digestion System plus TWAS Addition**
Estimate by: MM
Checked by: MH

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	Inspection of Existing Digester Piping System	1	ls	$ 5,000.00	$ 5,000.00	1	ls	$ 5,000.00	$ 5,000.00	$ 10,000.00
	Subtotal				5,000.00				5,000.00	

SUBTOTAL =	$	10,000.00
OH&P 20 % =	$	0.20
MARKUP =	$	2,000.00
SUB-TOTAL w/ OH & P =	$	12,000.00
CONTINGENCY % =		0.30
CONTINGENCY =	$	3,600.00
BUDGET COST ESTIMATE =	$	15,600.00

CDM

100 Crossways Park West, Suite 415
Woodbury, NY 11797
Phone (516) 496-8400
Fax (516) 4968864

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Location: MCJM
ITEM **Option 2: Current Operation of Digestion System, plus TWAS and FOG Addition**
Estimate by: MM
Checked by: MH

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	10,000 gallon fiberglass aboveground storage tank	1	ea.	$ 38,900.00	$ 38,900.00	1	ea.	$ 13,300.00	$ 13,300.00	$ 52,200.00
2	Chopper Pump	1	ea.	$ 10,000.00	$ 10,000.00	1	ea.	$ 1,000.00	$ 1,000.00	$ 11,000.00
3	Hot Water Circulating Pump	1	ea.	$1,000	$ 1,000.00	1	ea.	$500	$ 500.00	$ 1,500.00
4	Progressive Cavity Pump	1	ea.	$ 15,000.00	$ 15,000.00	1	ea.	$ 1,000.00	$ 1,000.00	$ 16,000.00
5	Inline Grinder	1	ea.	$ 20,000.00	$ 20,000.00	1	ea.	$ 2,500.00	$ 2,500.00	$ 22,500.00
6	Heating coils for storage tank	1	ls.	$ 10,000.00	$ 10,000.00	1	ea.	$ 4,000.00	$ 4,000.00	$ 14,000.00
7	Electrical upgrade	1	ls.	$ 50,000.00	$ 50,000.00	-	-	-	-	-
8	Civil Site Work (pavement, curbing)	1	ls.	$ 10,000.00	$ 10,000.00	-	-	-	-	-
9	Structural - Concrete Pads	1	ls.	$ 5,000.00	$ 5,000.00	-	-	-	-	-
10	Plant Water Upgrades	1	ls.	$ 15,000.00	$ 15,000.00	-	-	-	-	-
11	Piping (Sch 40 PVC)	300	lf	$ 55.00	$ 16,500.00	300	lf	$ 43.00	$ 12,900.00	$ 29,400.00
12	Fittings	1	ls.	$ 1,000.00	$ 1,000.00	-	-	-	-	-
13	Heat trace and insulate	300	lf	$ 4.50	$ 1,350.00	300	lf	$ 15.50	$ 4,650.00	$ 6,000.00
14	Misc Eqpt (crane, etc)	1	ls.	$ 10,000.00	$ 10,000.00	-	-	-	-	-
15	FOG System Controls	1	ls	$10,000	$ 10,000.00					$ 10,000.00
16	Modification to Existing Digester Piping System	1	ls	$60,000	$ 60,000.00	1	ls	$30,000	$30,000	$ 90,000.00
17	Start up and testing	1	ls.	$ 10,000.00	$ 10,000.00	-	-	-	-	-
18	Inspection of Existing Digester Piping System	1	ls	$ 5,000.00	$ 5,000.00	1	ls	$ 5,000.00	$ 5,000.00	$ 10,000.00
	Subtotal				288,750.00				69,850.00	

SUBTOTAL =	$ 262,600.00
OH&P 20 % =	$ 0.20
MARKUP =	$ 52,520.00
SUB-TOTAL w/ OH & P =	$ 315,120.00
CONTINGENCY % =	0.30
CONTINGENCY =	$ 94,536.00
BUDGET COST ESTIMATE =	$ 409,656.00

1. RS Means 2010 was utilized, for material and labor costs associated with FOG system.

CDM

11 British American Blvd
Latham, NY 12110
Phone (518) 782-4500
Fax (518) 786-3810

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Location: Madison-Chatham
Estimate by: MJR
Checked by: MG

ITEM	DESCRIPTION	QTY	UNIT	*MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	*LABOR COST	LABOR SUBTOTAL	TOTAL
	Blower Building									
1	Boiler, Gas-Fired, Steam, 243 MBH output	1	ea.	$ 8,293.00	$ 8,293.00	1	ea.	$ 2,191.00	$ 2,191.00	$ 10,484.00
	Subtotal				8,293.00				2,191.00	

*Pricing per RS Means 2010

SUBTOTAL =	$ 10,484.00
MARKUP % =	$ 0.15
MARKUP =	$ 1,572.60
SUB-TOTAL w/ OH & P =	$ 12,056.60
CONTINGENCY % =	0.25
CONTINGENCY =	$ 3,014.15
BUDGET COST ESTIMATE =	$ 15,070.75

CDM

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

11 British American Blvd
Latham, NY 12110
Phone (518) 782-4500
Fax (518) 786-3810

Location: Madison-Chatham
Estimate by: MJR
Checked by: MG

ITEM	DESCRIPTION	QTY	UNIT	*MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	**LABOR COST	LABOR SUBTOTAL	TOTAL
	Blower Building									
1	1" Thick Pipe Insulation, 850F Mineral Fiber for 1.5" Pipe with All Service Jacket	1	ea.	$ 196.50	$ 196.50	1	ea.	$ 468.00	$ 468.00	$ 664.50
	Subtotal				196.50				468.00	

*Pricing per RS Means 2010

SUBTOTAL =	$	664.50
MARKUP % =	$	0.15
MARKUP =	$	99.68
SUB-TOTAL w/ OH & P =	$	764.18
CONTINGENCY % =		0.25
CONTINGENCY =	$	191.04
BUDGET COST ESTIMATE =	$	955.22

CDM

11 British American Blvd
Latham, NY 12110
Phone (518) 782-4500
Fax (518) 786-3810

ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Molitor Water Pollution Control Facility
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Administration Building									
1	Lighting Upgrades - Interior	1	ls.		$ 6,774.00	1	ls.	$ 4,141.00	$ 4,141.00	$ 10,915.00
	Subtotal				6,774.00				4,141.00	

SUBTOTAL =	$	10,915.00
MARKUP % =	$	0.15
MARKUP =	$	1,637.25
SUB-TOTAL w/ OH & P =	$	12,552.25
CONTINGENCY % =		0.25
CONTINGENCY =	$	3,138.06
BUDGET COST ESTIMATE =	$	15,690.31

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Grit Building									
1	Lighting Upgrades - Interior	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 =	$	-

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Digester #1 Building									
1	Lighting Upgrades - Interior	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 =	$	-

CDM
11 British American Blvd
Latham, NY 12110
Phone (518) 782-4500
Fax (518) 786-3810

ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Molitor Water Pollution Control Facility
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Digester #2 Building									
1	Lighting Upgrades - Interior	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 =	$ -

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Waste Oil Building									
1	Lighting Upgrades - Interior	1	ls.		$ 7.00	1	ls.	$ 20.00	$ 20.00	$ 27.00
	Subtotal				7.00				20.00	

SUBTOTAL =	$ 27.00
MARKUP % =	$ 0.15
MARKUP =	$ 4.05
SUB-TOTAL w/ OH & P =	$ 31.05
CONTINGENCY % =	0.25
CONTINGENCY =	$ 7.76
BUDGET COST ESTIMATE =	$ 38.81

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Blower Building									
1	Lighting Upgrades - Interior	1	ls.		$ 655.20	1	ls.	$ 485.00	$ 485.00	$ 1,140.20
	Subtotal				655.20				485.00	

SUBTOTAL =	$ 1,140.20
MARKUP % =	$ 0.15
MARKUP =	$ 171.03
SUB-TOTAL w/ OH & P =	$ 1,311.23
CONTINGENCY % =	0.25
CONTINGENCY =	$ 327.81
BUDGET COST ESTIMATE =	$ 1,639.04

CDM

11 British American Blvd
Latham, NY 12110
Phone (518) 782-4500
Fax (518) 786-3810

ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Molitor Water Pollution Control Facility
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Sludge Handling Building** Lighting Upgrades - Interior	1	ls.		$ 3,967.50	1	ls.	$ 3,085.00	$ 3,085.00	$ 7,052.50
	Subtotal				3,967.50				3,085.00	

SUBTOTAL =	$ 7,052.50
MARKUP % =	$ 0.15
MARKUP =	$ 1,057.88
SUB-TOTAL w/ OH & P =	$ 8,110.38
CONTINGENCY % =	0.25
CONTINGENCY =	$ 2,027.59
BUDGET COST ESTIMATE =	$ 10,137.97

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Clarifier #1 & #2 Building** Lighting Upgrades - Interior	1	ls.		$ 340.20	1	ls.	$ 186.00	$ 186.00	$ 526.20
	Subtotal				340.20				186.00	

SUBTOTAL =	$ 526.20
MARKUP % =	$ 0.15
MARKUP =	$ 78.93
SUB-TOTAL w/ OH & P =	$ 605.13
CONTINGENCY % =	0.25
CONTINGENCY =	$ 151.28
BUDGET COST ESTIMATE =	$ 756.41

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Clarifier #3 & #4 Building** Lighting Upgrades - Interior	1	ls.		$ 1,193.00	1	ls.	$ 1,034.00	$ 1,034.00	$ 2,227.00
	Subtotal				1,193.00				1,034.00	

SUBTOTAL =	$ 2,227.00
MARKUP % =	$ 0.15
MARKUP =	$ 334.05
SUB-TOTAL w/ OH & P =	$ 2,561.05
CONTINGENCY % =	0.25
CONTINGENCY =	$ 640.26
BUDGET COST ESTIMATE =	$ 3,201.31

CDM

11 British American Blvd
Latham, NY 12110
Phone (518) 782-4500
Fax (518) 786-3810

ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Molitor Water Pollution Control Facility
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Administration Building									
1	Lighting Upgrades - Exterior	1	ls.		$ 21.00	1	ls.	$ 60.00	$ 60.00	$ 81.00
	Subtotal				21.00				60.00	

SUBTOTAL =	$ 81.00
MARKUP % =	$ 0.15
MARKUP =	$ 12.15
SUB-TOTAL w/ OH & P =	$ 93.15
CONTINGENCY % =	0.25
CONTINGENCY =	$ 23.29
BUDGET COST ESTIMATE =	$ 116.44

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Grit Building									
1	Lighting Upgrades - Exterior	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 =	$ -

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Digester #1 Building									
1	Lighting Upgrades - Exterior	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 =	$ -

CDM

11 British American Blvd
Latham, NY 12110
Phone (518) 782-4500
Fax (518) 786-3810

ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Molitor Water Pollution Control Facility
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Digester #2 Building** Lighting Upgrades - Exterior	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 =	$ -

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Waste Oil Building** Lighting Upgrades - Exterior	1	ls.		$ 7.00	1	ls.	$ 20.00	$ 20.00	$ 27.00
	Subtotal				7.00				20.00	
									SUBTOTAL =	$ 27.00
									MARKUP % =	$ 0.15
									MARKUP =	$ 4.05
									SUB-TOTAL w/ OH & P =	$ 31.05
									CONTINGENCY % =	0.25
									CONTINGENCY =	$ 7.76
									BUDGET COST ESTIMATE =	$ 38.81

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Blower Building** Lighting Upgrades - Exterior	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 =	$ -

CDM

11 British American Blvd
Latham, NY 12110
Phone (518) 782-4500
Fax (518) 786-3810

ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Molitor Water Pollution Control Facility
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Sludge Handling Building									
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
	Clarifier Building #1 & #2									
1	Lighting Upgrades - Exterior	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 =	$ -

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Clarifier Building #3 & #4									
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

CDM

11 British American Blvd
Latham, NY 12110
Phone (518) 782-4500
Fax (518) 786-3810

ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Molitor Water Pollution Control Facility
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Roadway & Process Lighting									
1	Lighting Upgrades - Exterior	1	ls.		$ 9,880.00	1	ls.	$ 1,781.00	$ 1,781.00	$ 11,661.00
	Subtotal				9,880.00				1,781.00	

SUBTOTAL =	$ 11,661.00
MARKUP % =	$ 0.15
MARKUP =	$ 1,749.15
SUB-TOTAL w/ OH & P =	$ 13,410.15
CONTINGENCY % =	0.25
CONTINGENCY =	$ 3,352.54
BUDGET COST ESTIMATE =	$ 16,762.69

CDM

11 British American Blvd
Latham, NY 12110
Phone (518) 782-4500
Fax (518) 786-3810

ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Molitor Water Pollution Control Facility
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Administration Building									
1	Lighting Upgrades - Interior & Exterior	1	ls.		$ 6,795.00	1	ls.	$ 4,201.00	$ 4,201.00	$ 10,996.00
	Subtotal				6,795.00				4,201.00	

SUBTOTAL =	$	10,996.00
MARKUP % =	$	0.15
MARKUP =	$	1,649.40
SUB-TOTAL w/ OH & P =	$	12,645.40
CONTINGENCY % =		0.25
CONTINGENCY =	$	3,161.35
BUDGET COST ESTIMATE =	$	15,806.75

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Grit Building									
1	Lighting Upgrades - Interior & Exterior	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 =	$	-

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Digester #1 Building									
1	Lighting Upgrades - Interior & Exterior	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 =	$	-

CDM

11 British American Blvd
Latham, NY 12110
Phone (518) 782-4500
Fax (518) 786-3810

ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Molitor Water Pollution Control Facility
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Digester #2 Building									
1	Lighting Upgrades - Interior & Exterior	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 =	$ -

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Waste Oil Building									
1	Lighting Upgrades - Interior & 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

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Blower Building									
1	Lighting Upgrades - Interior & Exterior	1	ls.		$ 655.20	1	ls.	$ 485.00	$ 485.00	$ 1,140.20
	Subtotal				655.20				485.00	
									SUBTOTAL =	$ 1,140.20
									MARKUP % =	$ 0.15
									MARKUP =	$ 171.03
									SUB-TOTAL w/ OH & P =	$ 1,311.23
									CONTINGENCY % =	0.25
									CONTINGENCY =	$ 327.81
									BUDGET COST ESTIMATE =	$ 1,639.04

CDM

11 British American Blvd
Latham, NY 12110
Phone (518) 782-4500
Fax (518) 786-3810

ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Molitor Water Pollution Control Facility
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Sludge Handling Building									
1	Lighting Upgrades - Interior & Exterior	1	ls.		$ 5,487.50	1	ls.	$ 3,633.00	$ 3,633.00	$ 9,120.50
	Subtotal				5,487.50				3,633.00	

SUBTOTAL =	$	9,120.50
MARKUP % =	$	0.15
MARKUP =	$	1,368.08
SUB-TOTAL w/ OH & P =	$	10,488.58
CONTINGENCY % =		0.25
CONTINGENCY =	$	2,622.14
BUDGET COST ESTIMATE =	$	13,110.72

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Clarifier Building #1 & #2									
1	Lighting Upgrades - Interior & Exterior	1	ls.		$ 340.20	1	ls.	$ 186.00	$ 186.00	$ 526.20
	Subtotal				340.20				186.00	

SUBTOTAL =	$	526.20
MARKUP % =	$	0.15
MARKUP =	$	78.93
SUB-TOTAL w/ OH & P =	$	605.13
CONTINGENCY % =		0.25
CONTINGENCY =	$	151.28
BUDGET COST ESTIMATE =	$	756.41

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Clarifier Building #3 & #4									
1	Lighting Upgrades - Interior & Exterior	1	ls.		$ 1,953.00	1	ls.	$ 1,308.00	$ 1,308.00	$ 3,261.00
	Subtotal				1,953.00				1,308.00	

SUBTOTAL =	$	3,261.00
MARKUP % =	$	0.15
MARKUP =	$	489.15
SUB-TOTAL w/ OH & P =	$	3,750.15
CONTINGENCY % =		0.25
CONTINGENCY =	$	937.54
BUDGET COST ESTIMATE =	$	4,687.69

CDM

11 British American Blvd
Latham, NY 12110
Phone (518) 782-4500
Fax (518) 786-3810

ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Molitor Water Pollution Control Facility
Estimate by: AJF
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Administration Building									
1	Motor Upgrades	1	ls.		$ 5,160.00	1	ls.	$ 875.00	$ 875.00	$ 6,035.00
	Subtotal				5,160.00				875.00	

SUBTOTAL =	$ 6,035.00
MARKUP % =	$ 0.15
MARKUP =	$ 905.25
SUB-TOTAL w/ OH & P =	$ 6,940.25
CONTINGENCY % =	0.25
CONTINGENCY =	$ 1,735.06
BUDGET COST ESTIMATE =	$ 8,675.31

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Blower Building									
1	Motor Upgrades	1	ls.		$ 405.00	1	ls.	$ 115.00	$ 115.00	$ 520.00
	Subtotal				405.00				115.00	

SUBTOTAL =	$ 520.00
MARKUP % =	$ 0.15
MARKUP =	$ 78.00
SUB-TOTAL w/ OH & P =	$ 598.00
CONTINGENCY % =	0.25
CONTINGENCY =	$ 149.50
BUDGET COST ESTIMATE =	$ 747.50

CDM

11 British American Blvd
Latham, NY 12110
Phone (518) 782-4500
Fax (518) 786-3810

ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Molitor Water Pollution Control Facility
Estimate by: AJF
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Sludge Handling Building									
1	Motor Upgrades	1	ls.		$ 7,720.00	1	ls.	$ 1,804.00	$ 1,804.00	$ 9,524.00
	Subtotal				7,720.00				1,804.00	

SUBTOTAL =	$	9,524.00
MARKUP % =	$	0.15
MARKUP =	$	1,428.60
SUB-TOTAL w/ OH & P =	$	10,952.60
CONTINGENCY % =		0.25
CONTINGENCY =	$	2,738.15
BUDGET COST ESTIMATE =	$	13,690.75

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Final Clarifier #1 & #2 Building									
1	Motor Upgrades	1	ls.		$ 1,240.00	1	ls.	$ 258.00	$ 258.00	$ 1,498.00
2	VFD Upgrades	1	ls.		$ 3,050.00	1	ls.	$ 1,550.00	$ 1,550.00	$ 4,600.00
	Subtotal				4,290.00				1,808.00	

SUBTOTAL =	$	6,098.00
MARKUP % =	$	0.15
MARKUP =	$	914.70
SUB-TOTAL w/ OH & P =	$	7,012.70
CONTINGENCY % =		0.25
CONTINGENCY =	$	1,753.18
BUDGET COST ESTIMATE =	$	8,765.88

CDM

11 British American Blvd
Latham, NY 12110
Phone (518) 782-4500
Fax (518) 786-3810

ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Molitor Water Pollution Control Facility
Estimate by: AJF
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Final Clarifier #3 & #4 Building									
1	Motor Upgrades	1	ls.		$ 2,340.00	1	ls.	$ 602.00	$ 602.00	$ 2,942.00
2	VFD Upgrades	1	ls.		$ 6,050.00	1	ls.	$ 3,615.00	$ 3,615.00	$ 9,665.00
	Subtotal				8,390.00				4,217.00	

SUBTOTAL =	$ 12,607.00
MARKUP % =	$ 0.15
MARKUP =	$ 1,891.05
SUB-TOTAL w/ OH & P =	$ 14,498.05
CONTINGENCY % =	0.25
CONTINGENCY =	$ 3,624.51
BUDGET COST ESTIMATE =	$ 18,122.56

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
	Outdoor Process									
1	Motor Upgrades	1	ls.		$ 3,800.00	1	ls.	$ 870.00	$ 870.00	$ 4,670.00
2	VFD Upgrades	1	ls.		$ 3,050.00	1	ls.	$ 1,550.00	$ 1,550.00	$ 4,600.00
	Subtotal				6,850.00				2,420.00	

SUBTOTAL =	$ 9,270.00
MARKUP % =	$ 0.15
MARKUP =	$ 1,390.50
SUB-TOTAL w/ OH & P =	$ 10,660.50
CONTINGENCY % =	0.25
CONTINGENCY =	$ 2,665.13
BUDGET COST ESTIMATE =	$ 13,325.63

CDM

11 British American Blvd
Latham, NY 12110
Phone (518) 782-4500
Fax (518) 786-3810

ENGINEER'S OPINION OF CONSTRUCTION COST ESTIMATE

Location: Molitor Water Pollution Control Facility
Estimate by: PS
Checked by: JTM

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Molitor Water Pollution Control Facility** Solary PV Array System	1	ls.		$ 8,539,254.00	1	ls.	$ 3,659,680.00	$ 3,659,680.00	$ 12,198,934.00
	Subtotal				8,539,254.00				3,659,680.00	

SUBTOTAL =	$ 12,198,934.00
CONTINGENCY % =	0.25
CONTINGENCY =	$ 3,049,733.50
BUDGET COST ESTIMATE =	$ 15,248,667.50

ITEM	DESCRIPTION	QTY	UNIT	MATERIAL UNIT COST	MATERIAL SUBTOTAL	QTY	UNIT	LABOR COST	LABOR SUBTOTAL	TOTAL
1	**Molitor Water Pollution Control Facility** 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

APPENDIX H

NJ SMARTSTART INCENTIVES INFORMATION AND WORKSHEETS

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

New Jersey SmartStart BUILDINGS®

New Jersey BPU Board of Public Utilities

2010 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	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)

Email Address

Company	Contact Name	Incorporated? Yes No	Federal Tax ID#

Street Address	City	State	Zip	Telephone No. ( )	Fax No. ( )

Contractor/Vendor Information (if different from Payee)

Email Address

Company	Contact Name	Incorporated? ❑ Yes ❑ No	Federal Tax ID#

Street Address	City	State	Zip	Telephone No. ( )	Fax No. ( )

Building Type (circle one)

Education-Primary School; Education-Community College; Education-University; Grocery; Medical-Hospital; Medical-Clinic; Lodging Hotel(Guest Rooms); Lodging Motel; Manufacturing-Light Industrial; Office-Large; Office-Small; Restaurant-Sit Down; Restaurant-Fast Food; Retail-3 Story Large; Retail- Single Story Large; Retail-Small; Storage Conditioned; Storage Unconditioned; Warehouse; Other

Prescriptive Lighting Incentive

$__________ Total Incentive (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 fixture installation – minimum of 1 yr.

5.1 Screw-in PAR 38 or 30 Compact Fluorescent Lamps (CFL) with Aluminum Reflectors replacing existing incandescent fixtures.
   - The lamp must be warranted by the manufacturer for 8,000 hours
   - Total Harmonic Distortion must not exceed 33%
   - Power factor of the ballast must be ≥90%

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 Incentives for delamped T-8 lamps with new reflectors are available only for fixtures with a Total Harmonic Distortion of ≤20%. Electronic ballast replacement required for all eligible delamped fixtures. Eligible delamping can include reduction in linear lamp feet from existing conditions. For example, 1-8' linear fluorescent lamp can be considered as 2-4' linear lamps. U-bend lamps 4' in total length can be considered as 2-F17/T8 lamps.

7.4 Electronic ballast replacement is necessary for all eligible delamped fixtures.

7.5 Reduced wattage T8 (28W/25W 4') (1-4 lamps) retrofit requires lamp and ballast replacement.

8. LED Refridgerated/Freezer Case Lighting must meet NEEP Design Lights Consortium Standards or be on an ENERGY STAR or a SSL Qualified Product list. For new door installations on existing open cases, indicate the number of LED fixtures to be installed. Also indicate "New Door" in the Fixture Type column on the Prescriptive Lighting Worksheet (ie. New Door 5' LED).

Application Checklist (Before submitting your application, please make sure you have signed in the space below and completed the following items.)

❑ Payee Information is filled out and a W-9 form of the payee is included

❑ Manufacturer's specification sheets for proposed technology are included

❑ A copy (all pages) of a recent month's utility bill is included

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
Screw-in PAR 38 or PAR 30 (CFL) as per 5.1 above	$7 per lamp replaced
High-Efficiency Fluorescent Fixtures: **For retrofit of T-12 fixtures to T-5 or T-8 with electronic ballasts**	$15 per fixture (1-4 lamps retrofits)
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

Type of Fixture	Incentive
For retrofit of T-8 fixtures by permanent delamping & new reflectors are available only for fixtures with a total Harmonic Distortion of ≤20%. Electronic ballast replacement required for all eligible delamped fixtures.	$20 per fixture
New Construction & Complete Renovation	Performance based only
LED Exit Signs (new fixtures only): For existing facilities with connected load <75 kW For existing facilities with connected load ≥ 75 kW	 $20 per fixture $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. Electronic ballast replacement is necessary for all eligible delamped fixtures.	$30 per fixture
Retrofit of existing 32 watt T-8 system to Reduced Wattage (28W/25W 4')	$10 per fixture (1-4 lamps)
LED Refrigerated/Freezer Case Lighting: Incentive for replacement of fluorescent lighting systems in medium or low temperature display cases	$42 per 5' LED fixture $65 per 6' LED fixture
Induction Lighting Fixtures Retrofit of HID	$50 per HID (≥100W) fixture retrofitted with induction lamp, power coupler and generator. Replacement unit must use 30% less wattage per fixture than existing HID system
Replacement of HID	$70 per HID (≥100W) fixture with a new induction 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: NJCleanEnergy.com/ssb

*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.

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 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 incentive to the sales vendor. This application package must be received by the Market Manager on or before December 31, 2010 in order to be eligible for 2010 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's Clean Energy Program™
Your Power to Save
njcleanenergy.com

New Jersey SmartStart Buildings®

New Jersey BPU Board of Public Utilities

2010 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**	**Permanent Delamp w/ New Reflector** (Y/N)	**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	N	Office	40	$15	8	$15 x 8 = $120
R	2x2 2L T-8	2x2 2L T-12	N	Office	34	$15	10	$15 x 10 = $150
R	28w CFL	100w Incan	N	Supply Room	100	$25	3	$25 x 3 = $75
R	250w Pulse Start Metal Halide	400w Mercury Vapor	N	Warehouse	450	$25	3	$25 x 3 = $75
N	New Doors 5' LED	1L T-8 5'	N	Dairy Case #5	38	$42	25	$42 x 25=$1,050
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 fixture installation – minimum of 1 yr.

5.1 Screw-in PAR 38 or 30 Compact Fluorescent Lamps (CFL) with Aluminum Reflectors replacing existing incandescent fixtures.
   - The lamp must be warranted by the manufacturer for 8,000 hours
   - Total Harmonic Distortion must not exceed 33%
   - Power factor of the ballast must be ≥90%

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 Incentives for delamped T-8 lamps with new reflectors are available only for fixtures with a total Harmonic Distortion of ≤20%. Electronic ballast replacement required for all eligible delamped fixtures. Eligible delamping can include reduction in linear lamp feet from existing conditions. For example, 1-8' linear fluorescent lamp can be considered as 2-4' linear lamps. U-bend lamps 4' in total length can be considered as 2-F17/T8 lamps.

7.4 Electronic ballast replacement is necessary for all eligible delamped fixtures.

7.5 Reduced wattage T8 (28W/25W 4') (1-4 lamps) retrofit requires lamp and ballast replacement.

8. LED Refridgerated/Freezer Case Lighting must meet NEEP Design Lights Consortium Standards or be on an ENERGY STAR or a SSL Qualified Product list. For new door installations on existing open cases, indicate the number of LED fixtures to be installed. Also indicate "New Door" in the Fixture Type column on the Prescriptive Lighting Worksheet (ie. New Door 5' LED).

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
Screw-in PAR 38 or PAR 30 (CFL) as per 5.1 above	$7 per lamp replaced
High-Efficiency Fluorescent Fixtures: **For retrofit of T-12 fixtures to T-5 or T-8 with electronic ballasts**	$15 per fixture (1-4 lamps retrofits)
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 are available only for fixtures with a total Harmonic Distortion of ≤20%. Electronic ballast replacement required for all eligible delamped fixtures.	$20 per fixture
New Construction & Complete Renovation	Performance based only
LED Exit Signs (new fixtures only): For existing facilities with connected load <75 kW For existing facilities with connected load ≥ 75 kW	 $20 per fixture $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. Electronic ballast replacement is necessary for all eligible delamped fixtures.	$30 per fixture
Retrofit of existing 32 watt T-8 system to Reduced Wattage (28W/25W 4')	$10 per fixture (1-4 lamps)
LED Refrigerated/Freezer Case Lighting: Incentive for replacement of fluorescent lighting systems in medium or low temperature display cases	$42 per 5' LED Fixture $65 per 6' LED Fixture
Induction Lighting Fixtures Retrofit of HID	 $50 per HID (≥100W) fixture retrofitted with induction lamp, power coupler and generator. Replacement unit must use 30% less wattage per fixture than existing HID system
Replacement of HID	$70 per HID (≥100W) fixture with a new induction 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: NJCleanEnergy.com/ssb

*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.

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 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 incentive to the sales vendor. This application package must be received by the Market Manager on or before December 31, 2010 in order to be eligible for 2010 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's Clean Energy PROGRAM™ Your Power to Save njcleanenergy.com

New Jersey SmartStart BUILDINGS®

New Jersey BPU Board of Public Utilities

2010 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	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. ( )	Fax 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. ( )	Fax No. ( )

Building Type (circle one)

Education-Primary School; Education-Community College; Education-University; Grocery; Medical-Hospital; Medical-Clinic; Lodging Hotel(Guest Rooms); Lodging Motel; Manufacturing-Light Industrial; Office-Large; Office-Small; Restaurant-Sit Down; Restaurant-Fast Food; Retail-3 Story Large; Retail- Single Story Large; Retail-Small; Storage Conditioned; Storage Unconditioned; Warehouse; Other

Lighting Control Incentive

$__________ Total Incentive (per attached worksheet calculations)

Note: Lighting Controls Incentive 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, 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 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.

Application Checklist (Before submitting your application, please make sure you have signed in the space below and completed the following items.)

- ❑ Payee Information is filled out and a W-9 form of the payee is included
- ❑ Manufacturer's specification sheets for proposed technology are included
- ❑ A copy (all pages) of a recent month's utility bill is included

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).

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
DLD – Fluorescent Daylight Dimming (Office Applications)	$50 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

*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.

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 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 incentive to the sales vendor. This application package must be received by the Market Manager on or before December 31, 2010 in order to be eligible for 2010 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's Clean Energy PROGRAM™
Your Power to Save
njcleanenergy.com

New Jersey SmartStart BUILDINGS®

2010 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)
Office 101	(Examples) N	OSW	4-lamp, T8	220	2	4	$20	4 x $20 = $80
Conference Room A	N	OSR	2-lamp, T8	330	6	2	$35	2 x $35 = $70
Large Office 400	N	DLD	2-lamp, T8	275	N/A	6	$50	6 x $50 = $300
Warehouse A	N	OHLF	4-lamp, T8	140	N/A	12	$25	12 x $25 = $300
Warehouse B	N	OSRH	4-lamp, T5	234	1	5	$35	5 x $35 = $175
*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 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
DLD – Fluorescent Daylight Dimming (Office Applications)	$50 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

*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.

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 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 incentive to the sales vendor. This application package must be received by the Market Manager on or before December 31, 2010 in order to be eligible for 2010 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 do not perform Energy Efficiency Audit

b. 0 to 10,000 Watts x $1.55/Watt = $__________________+

d. Total Rebate Calculation: $_________________________

Commercial, Farm, Public and Non-Profit

0 to 50,000 Watts x $1.00/Watt = $____________________+

Large PV Project Applications

> 50,000 Watts = $____Not eligible for rebates____________

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

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

New Jersey SmartStart BUILDINGS®

New Jersey BPU Board of Public Utilities

Incentive Structure for NJ Pay For Performance Program

Incentive #1: Energy Reduction Plan

Incentive Amount:......................................$0.10 per sq ft
Minimum Incentive:...................................$5,000
Maximum Incentive:: ....$50,000 or 50% of facility annual energy cost

This incentive will be developed to offset the cost of services associated with the development of the Energy Reduction Plan. Projects must identify efficiency improvements that meet the minimum performance level in order to become eligible for Incentive #1. Incentive amount will be based on the square footage of the building.

Incentive #2: Installation of Recommended Measures

Minimum Performance Target:...........................15%

Electric Incentives

Base Incentive based on 15% savings:......$0.11 per projected kWh saved
For each % over 15% add:.........................$0.005 per projected kWh saved
Maximum Incentive:.................................$0.13 per projected kWh saved

Gas Incentives

Base Incentive base on 15% savings:........$1.10 per projected Therm saved
For each % over 15% add:.........................$0.05 per projected Therm saved
Maximum Incentive:.................................$1.45 per projected Therm saved

Incentive Cap: ....30% of total project cost

This incentive will be based on projected energy savings and designed to pay approximately 60% of the total performance-based incentive. Savings projections will be calculated using calibrated energy simulation and rounded to the nearest percent. Incentive #2 may not exceed 30% of the total project cost.

Incentive #3: Post-Construction Benchmarking Report

Minimum Performance Target:...........................15%

Electric Incentives

Base Incentive based on 15% savings:......$0.07 per projected kWh saved
For each % over 15% add:.........................$0.005 per projected kWh saved
Maximum Incentive:.................................$0.09 per projected kWh saved

Gas Incentives

Base Incentive base on 15% savings:........$0.70 per projected Therm saved
For each % over 15% add:.........................$0.05 per projected Therm saved
Maximum Incentive:.................................$1.05 per projected Therm saved

Incentive Cap: ....20% of total project cost

This incentive will be released upon submittal of a Post-Construction Benchmarking Report that verifies that the level of savings actually achieved by the installed measures meets or exceeds the minimum performance threshold. To validate the savings and achievement of the Energy Target, the EPA Portfolio Manager shall be used. Savings should be rounded to the nearest percent. Total value of Incentive #2 and Incentive #3 may not exceed 50% of the total project cost. This incentive will "true up" proposed savings and the related payment for Incentive #2 so that the total incentive is based on actual savings. For buildings not covered by EPA, the process used by LEED EB shall be followed.

Advanced Measure Incentive: Combined Heat and Power

Eligible Technology	Incentive (per Watt) Max: $1 Million	Maximum % of Project Cost
Level 1:		
Fuel cells not fueled by Class I renewable fuel	$4.00	60%
Level 2:		
Microturbines Internal Combustion Engines Combustion Turbines	$1.00	30%(1)
Level 3:		
Heat Recovery or other Mechanical Recovery from Existing Equipment	$0.50	30%

(1) The maximum % of project cost will go to 40% where a cooling application is used or included with the CHP system.
Note: Incentives for renewable fueled projects (Class 1) are currently being developed. This document will be updated when the incentive levels are finalized.

New Jersey SmartStart BUILDINGS

WHAT IS DIRECT INSTALL?

Designed for small to medium-sized facilities, Direct Install, by New Jersey's Clean Energy Program, cuts energy costs by replacing eligible lighting, HVAC, motors, natural gas, refrigeration and other equipment with higher efficiency alternatives. The program pays up to 80% of retrofit costs, dramatically lowering your upfront costs and improving your payback on the project. Services are provided by a network of Participating Contractors who perform Energy Assessments to identify eligible alternatives and then install the qualifying measures.

WHO'S ELIGIBLE?

Owners of existing small buildings 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.

WHAT TO EXPECT?

- **The program is completely turnkey!**
  Participating Contractors are approved to perform Energy Assessments and install the energy efficient equipment in your building.

- **Costs to you are minimal!**
  Your share of the project's cost will be approximately 20%, New Jersey's Clean Energy Program pays the remaining 80%. With incentives so dramatic, your payback can be less than 2 years.

- **Turnaround time is quick!**
  Direct Install is designed to fast-track project implementation so your business can begin saving on energy costs sooner rather than later. Participating Contractors will perform the Energy Assessments and implement the recommended efficiency measures quickly.

Contact us today at 866-NJSMART and get started on a path to savings.

New Jersey SmartStart BUILDINGS®

New Jersey BPU Board of Public Utilities | New Jersey's Clean Energy PROGRAM™ Your Power to Save

APPENDIX I

LIGHTING UPGRADES SPREADSHEET

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	Qty 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	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	4	342.4	0.3424	2080	712.192	$107.8	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	4	194.4	0.1944	2080	2080	404.352	404.352	None Proposed	0	0.148	307.84	46.6	$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	File/Storage Area	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	4	342.4	0.3424	2080	712.192	$107.8	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	4	194.4	0.1944	2080	2080	404.352	404.352	None Proposed	0	0.148	307.84	46.6	$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	Men's Bathroom	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	4	342.4	0.3424	2080	712.192	$107.8	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	4	194.4	0.1944	2080	1456	404.352	283.0464	Ceiling Mounted Occupancy Sensor	1	0.148	429.1456	65.0	$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	Men's Shower	65W Incandescent Fixture	1	65	0.065	500	32.5	$4.9	Replace 65W Incandescent Fixture with 13W CFL	1	13	0.013	500	500	6.5	6.5	None Proposed	0	0.052	26	3.9	$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	Women's Bathroom	65W Incandescent Fixture	1	65	0.065	2080	135.2	$20.5	Replace 65W Incandescent Fixture with 13W CFL	1	13	0.013	2080	1456	27.04	18.928	Ceiling Mounted Occupancy Sensor	1	0.052	116.272	17.6	$0.0	$5.0	$20.0	$103.0	$73.5	$20.0	$5.0	$25.0	$93.5	$108.0	$201.5
Administration Building- Interior	001	Secretary's Office	2x4 Fixtures w/ 4-T12 Lamp Fixture w/ Magnetic Ballast	4	684.8	0.6848	2080	1424.384	$215.7	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	4	389.2	0.3892	2080	1456	809.536	566.6752	Ceiling Mounted Occupancy Sensor	1	0.2956	857.7088	129.9	$105.0	$20.0	$65.0	$103.0	$73.5	$65.0	$125.0	$190.0	$333.5	$603.0	$936.5
Administration Building- Interior	001	Lab	2x4 Fixtures w/ 4-T12 Lamp Fixture w/ Magnetic Ballast	5	856	0.856	2080	1780.48	$269.6	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	5	486.5	0.4865	2080	1456	1011.92	708.344	Ceiling Mounted Occupancy Sensor	1	0.3695	1072.136	162.3	$105.0	$20.0	$65.0	$103.0	$73.5	$65.0	$125.0	$190.0	$398.5	$728.0	$1,126.5
Administration Building- Interior	001	Superintendant Office	2x4 Fixtures w/ 4-T12 Lamp Fixture w/ Magnetic Ballast	2	342.4	0.3424	2080	712.192	$107.8	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	194.6	0.1946	2080	1456	404.768	283.3376	Ceiling Mounted Occupancy Sensor	1	0.1478	428.8544	64.9	$105.0	$20.0	$65.0	$103.0	$73.5	$65.0	$125.0	$190.0	$203.5	$353.0	$556.5
Administration Building- Interior	001	Conference Room	2x4 Fixtures w/ 4-T12 Lamp Fixture w/ Magnetic Ballast	12	2054.4	2.0544	2080	4273.152	$647.0	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	12	1167.6	1.1676	2080	1456	2428.608	1700.0256	Ceiling Mounted Occupancy Sensor	1	0.8868	2573.1264	389.6	$105.0	$20.0	$65.0	$103.0	$73.5	$65.0	$125.0	$190.0	$853.5	$1,603.0	$2,456.5
Administration Building- Interior	001	Garage	8' T12 Fixture w/ 4-T12 Lamps	3	1362	1.362	2080	2832.96	$428.9	Replace 8' T12 Fixture with 1 Tandem Double-Length 4-T8 Lamp Fixture	3	720	0.72	2080	2080	1497.6	1497.6	None Proposed	0	0.642	1335.36	202.2	$65.1	$105.0	$93.0	$0.0	$0.0	$93.0	$170.1	$263.1	$279.0	$510.3	$789.3
Administration Building- Interior	001	Garage	8' T12 Fixture w/ 2-T12 Lamps	4	908	0.908	2080	1888.64	$285.9	Replace 8' T12 Fixture with 1 Tandem Double-Length 2-T8 Lamp Fixture	4	480	0.48	2080	2080	998.4	998.4	None Proposed	0	0.428	890.24	134.8	$65.1	$105.0	$93.0	$0.0	$0.0	$93.0	$170.1	$263.1	$372.0	$680.4	$1,052.4
Administration Building- Interior	001	Electrical Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	6	513.6	0.5136	2080	1068.288	$161.7	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	6	291.6	0.2916	2080	2080	606.528	606.528	None Proposed	0	0.222	461.76	69.9	$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	Hypochloride Room	200W Incandescent Explosionproof Fixture	4	800	0.8	500	400	$60.6	None Proposed	4	800	0.8	500	500	400	400	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Administration Building- Interior	001	Bisulfite Room	200W Incandescent Explosionproof Fixture	1	200	0.2	500	100	$15.1	None Proposed	1	200	0.2	500	500	100	100	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Administration Building- Interior	001	Analyzer Room	75W Incandescent Explosionproof Fixture	3	225	0.225	500	112.5	$17.0	None Proposed	3	225	0.225	500	500	112.5	112.5	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Administration Building- Interior	000	Basement	8' T12 Fixture w/ 2-T12 Lamps	3	681	0.681	500	340.5	$51.6	Replace 8' T12 Fixture with 1 Tandem Double-Length 2-T8 Lamp Fixture	3	360	0.36	500	500	180	180	None Proposed	0	0.321	160.5	24.3	$65.1	$105.0	$93.0	$0.0	$0.0	$93.0	$170.1	$263.1	$279.0	$510.3	$789.3
Administration Building- Interior	000	Basement	175W Self Ballasted Mercury Vapor Fixture	1	205	0.205	500	102.5	$15.5	Replace MV Fixture with Flourescent Fixture with 2-High Perf. T8 Bulbs, and Ballast	1	48.6	0.0486	500	500	24.3	24.3	None Proposed	0	0.1564	78.2	11.8	$120.0	$10.0	$65.0	$0.0	$0.0	$65.0	$130.0	$195.0	$65.0	$130.0	$195.0
Administration Building- Exterior	-	Garage	175W Self Ballasted Mercury Vapor Fixture (Assumed)	3	615	0.615	4380	2693.7	$407.8	Replace 175W Self Ballasted Mercury Vapor Fixture with 40W CFL	3	120	0.12	4380	4380	525.6	525.6	None Proposed	0	0.495	2168.1	328.3	$0.0	$7.0	$20.0	$0.0	$0.0	$20.0	$7.0	$27.0	$60.0	$21.0	$81.0
Administration Building- Exterior	-	Entrance	26W CFL Fixture	2	52	0.052	4380	227.76	$34.5	None Proposed	2	52	0.052	4380	4380	227.76	227.76	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Administration Building- Exterior	-	Canopy	26W CFL Fixture	2	52	0.052	4380	227.76	$34.5	None Proposed	2	52	0.052	4380	4380	227.76	227.76	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Grit Building - Interior	000	Grit Room	200W Incandescent Explosionproof Fixture	4	800	0.8	500	400	$60.6	None Proposed	4	800	0.8	500	500	400	400	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Digester #1 Building - Interior	001	Entrance	100W Incandescent Explosionproof Fixture	3	300	0.3	2080	624	$94.5	None Proposed	3	300	0.3	2080	2080	624	624	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Digester #1 Building - Interior	001	Boiler Room	200W Incandescent Explosionproof Fixture	2	400	0.4	2080	832	$126.0	None Proposed	2	400	0.4	2080	2080	832	832	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Digester #1 Building - Interior	000	Recirculator Room	200W Incandescent Explosionproof Fixture	6	1200	1.2	2080	2496	$377.9	None Proposed	6	1200	1.2	2080	2080	2496	2496	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Digester #1 Building - Interior	000	Cat. Room	200W Incandescent Explosionproof Fixture	5	1000	1	2080	2080	$314.9	None Proposed	5	1000	1	2080	2080	2080	2080	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Digester #1 Building - Interior	-001	Digester Pump Room	200W Incandescent Explosionproof Fixture	6	1200	1.2	2080	2496	$377.9	None Proposed	6	1200	1.2	2080	2080	2496	2496	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Digester #1 Building - Exterior	-	Exterior	100W Incandescent Explosionproof Fixture	2	200	0.2	4380	876	$132.6	None Proposed	2	200	0.2	4380	4380	876	876	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Digester #2 Building - Interior	001	Boiler Room	175W Mercury Vapor Explosionproof Fixture	2	410	0.41	2080	852.8	$129.1	None Proposed	2	410	0.41	2080	2080	852.8	852.8	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Digester #2 Building - Interior	001	Cat. Room	175W Mercury Vapor Explosionproof Fixture	6	1230	1.23	2080	2558.4	$387.3	None Proposed	6	1230	1.23	2080	2080	2558.4	2558.4	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Digester #2 Building - Interior	001	Storage	175W Mercury Vapor Explosionproof Fixture	2	410	0.41	500	205	$31.0	None Proposed	2	410	0.41	500	500	205	205	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Digester #2 Building - Interior	001	Recirculator Room	200W Incandescent Explosionproof Fixture	4	800	0.8	2080	1664	$251.9	None Proposed	4	800	0.8	2080	2080	1664	1664	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Digester #2 Building - Exterior	-	Exterior	26W CFL Fixture	5	130	0.13	4380	569.4	$86.2	None Proposed	5	130	0.13	4380	4380	569.4	569.4	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Waste Oil Building - Interior	001	Inerior Area	200W Incandescent Fixture	1	200	0.2	2080	416	$63.0	Replace 200W Incandescent Fixture with 40W CFL	1	40	0.04	2080	2080	83.2	83.2	None Proposed	0	0.16	332.8	50.4	$0.0	$7.0	$20.0	$0.0	$0.0	$20.0	$7.0	$27.0	$20.0	$7.0	$27.0
Waste Oil Building - Exterior	-	Entrance	200W Incandescent Fixture	1	200	0.2	4380	876	$132.6	Replace 200W Incandescent Fixture with 40W CFL	1	40	0.04	4380	4380	175.2	175.2	None Proposed	0	0.16	700.8	106.1	$0.0	$7.0	$20.0	$0.0	$0.0	$20.0	$7.0	$27.0	$20.0	$7.0	$27.0
Blower Building - Interior	001	Foyer	26W CFL Fixture	2	52	0.052	2080	108.16	$16.4	None Proposed	2	52	0.052	2080	2080	108.16	108.16	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Blower Building - Interior	001	Blower Room	26W CFL Fixture	5	130	0.13	2080	270.4	$40.9	None Proposed	5	130	0.13	2080	2080	270.4	270.4	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Blower Building - Interior	001	Blower Room	1X4 Fixtures w/ 1-T8 Lamps w/ Electronic Ballasts	1	25.4	0.0254	2080	52.832	$8.0	None Proposed	1	25.4	0.0254	2080	2080	52.832	52.832	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Blower Building - Interior	001	Office	26W CFL Fixture	2	52	0.052	2080	108.16	$16.4	None Proposed	2	52	0.052	2080	1456	108.16	75.712	Automatic Wall Switch Occupancy Sensor	1	0	32.448	4.9	$0.0	$0.0	$0.0	$63.5	$45.0	$0.0	$0.0	$0.0	$45.0	$63.5	$108.5
Blower Building - Interior	001	Office	8' T12 Fixture w/ 2-T12 Lamps	1	227	0.227	2080	472.16	$71.5	Replace 8' T12 Fixture with 1 Tandem Double-Length 2-T8 Lamp Fixture	1	120	0.12	2080	2080	249.6	249.6	None Proposed	0	0.107	222.56	33.7	$65.1	$105.0	$93.0	$0.0	$0.0	$93.0	$170.1	$263.1	$93.0	$170.1	$263.1
Blower Building - Interior	001	Office Bathroom	26W CFL Fixture	1	26	0.026	2080	54.08	$8.2	None Proposed	1	26	0.026	2080	1456	54.08	37.856	Automatic Wall Switch Occupancy Sensor	1	0	16.224	2.5	$0.0	$0.0	$0.0	$63.5	$45.0	$0.0	$0.0	$0.0	$45.0	$63.5	$108.5
Blower Building - Interior	000	Basement	26W CFL Fixture	5	130	0.13	2080	270.4	$40.9	None Proposed	5	130	0.13	2080	2080	270.4	270.4	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Blower Building - Interior	000	Basement	8' T12 Fixture w/ 2-T12 Lamps	1	227	0.227	2080	472.16	$71.5	Replace 8' T12 Fixture with 1 Tandem Double-Length 2-T8 Lamp Fixture	1	120	0.12	2080	2080	249.6	249.6	None Proposed	0	0.107	222.56	33.7	$65.1	$105.0	$93.0	$0.0	$0.0	$93.0	$170.1	$263.1	$93.0	$170.1	$263.1
Blower Building - Interior	000	Basement	65W Incandescent Fixture	1	65	0.065	2080	135.2	$20.5	Replace 65W Incandescent Fixture with 13W CFL	1	13	0.013	2080	2080	27.04	27.04	None Proposed	0	0.052	108.16	16.4	$0.0	$5.0	$20.0	$0.0	$0.0	$20.0	$5.0	$25.0	$20.0	$5.0	$25.0
Blower Building - Interior	000	Storage	26W CFL Fixture	2	52	0.052	500	26	$3.9	None Proposed	2	52	0.052	500	500	26	26	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Blower Building - Interior	-	Exit Signs	Incandescent Exit Sign	3	48	0.048	8760	420.48	$63.7	Replace Incandescent Exit Sign with LED Exit Sign	3	15	0.015	8760	8760	131.4	131.4	None Proposed	0	0.033	289.08	43.8	$0.0	$61.0	$63.0	$0.0	$0.0	$63.0	$61.0	$124.0	$189.0	$183.0	$372.0
Sludge Handling Building - Interior	001	Boiler Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	3	256.8	0.2568	2080	534.144	$80.9	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	3	145.8	0.1458	2080	2080	303.264	303.264	None Proposed	0	0.111	230.88	35.0	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$195.0	$240.0	$435.0
Sludge Handling Building - Interior	001	Electrical Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	4	342.4	0.3424	2080	712.192	$107.8	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	4	194.4	0.1944	2080	2080	404.352	404.352	None Proposed	0	0.148	307.84	46.6	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$260.0	$320.0	$580.0
Sludge Handling Building - Interior	001	Hallway	2X2 Troffers w/ 1-T12 Lamps w/ Magnetic Ballasts	2	110	0.11	2080	228.8	$34.6	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	70	0.07	2080	2080	145.6	145.6	None Proposed	0	0.04	83.2	12.6	$35.0	$5.0	$65.0	$0.0	$0.0	$65.0	$40.0	$105.0	$130.0	$80.0	$210.0
Sludge Handling Building - Interior	001	Hallway	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	3	256.8	0.2568	2080	534.144	$80.9	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	3	145.8	0.1458	2080	2080	303.264	303.264	None Proposed	0	0.111	230.88	35.0	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$195.0	$240.0	$435.0
Sludge Handling Building - Interior	001	Kitchen	2X2 Troffers w/ 1-T12 Lamps w/ Magnetic Ballasts	4	220	0.22	2080	457.6	$69.3	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	4	140	0.14	2080	1456	291.2	203.84	Automatic Wall Switch Occupancy Sensor	1	0.08	253.76	38.4	$35.0	$5.0	$65.0	$63.5	$45.0	$65.0	$40.0	$105.0	$305.0	$223.5	$528.5
Sludge Handling Building - Interior	001	Janitor's Closet	3' Fixture w/ 1-T12 Lamp and Magnetic Ballast	1	46	0.046	50	2.3	$0.3	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	1	24	0.024	50	50	1.2	1.2	None Proposed	0	0.022	1.1	0.2	$35.0	$5.0	$65.0	$0.0	$0.0	$65.0	$40.0	$105.0	$65.0	$40.0	$105.0
Sludge Handling Building - Interior	001	Bathroom	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	171.2	0.1712	2080	356.096	$53.9	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	97.2	0.0972	2080	1456	202.176	141.5232	Automatic Wall Switch Occupancy Sensor	1	0.074	214.5728	32.5	$70.0	$10.0	$65.0	$63.5	$45.0	$65.0	$80.0	$145.0	$175.0	$223.5	$398.5
Sludge Handling Building - Interior	001	Bathroom	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	4	342.4	0.3424	2080	712.192	$107.8	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	4	194.4	0.1944	2080	1456	404.352	283.0464	Automatic Wall Switch Occupancy Sensor	1	0.148	429.1456	65.0	$70.0	$10.0	$65.0	$63.5	$45.0	$65.0	$80.0	$145.0	$305.0	$383.5	$688.5
Sludge Handling Building - Interior	-	Stairwell	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	171.2	0.1712	2080	356.096	$53.9	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	97.2	0.0972	2080	2080	202.176	202.176	None Proposed	0	0.074	153.92	23.3	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$130.0	$160.0	$290.0
Sludge Handling Building - Interior	001	Bay Area	250W Self Ballasted Mercury Vapor Explosionproof Fixture	4	1160	1.16	2080	2412.8	$365.3	None Proposed	4	820	0.82	2080	2080	1705.6	1705.6	None Proposed	0	0.34	707.2	107.1	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Sludge Handling Building - Interior	001	Pump Room	175W Mercury Vapor Explosionproof Fixture	14	2870	2.87	2080	5969.6	$903.8	None Proposed	14	2870	2.87	2080	2080	5969.6	5969.6	None Proposed	0	0	0	0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Sludge Handling Building - Interior	002	Stairwell	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	171.2	0.1712	2080	356.096	$53.9	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	97.2	0.0972	2080	2080	202.176	202.176	None Proposed	0	0.074	153.92	23.3	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$130.0	$160.0	$290.0
Sludge Handling Building - Interior	002	Press Room	250W Self Ballasted Mercury Vapor Explosionproof Fixture	12	3480	3.48	2080	7238.4	$1,095.9	None Proposed	12	2460	2.46	2080	2080	5116.8	5116.8	None Proposed	0	1.02	2121.6	321.2	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Sludge Handling Building - Interior	002	Bathroom	2x4 Fixtures w/ 4-T12 Lamp Fixture w/ Magnetic Ballast	2	342.4	0.3424	2080	712.192	$107.8	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	194.6	0.1946	2080	1456	404.768	283.3376	Automatic Wall Switch Occupancy Sensor	1	0.1478	428.8544	64.9	$105.0	$20.0	$65.0	$63.5	$45.0	$65.0	$125.0	$190.0	$175.0	$313.5	$488.5
Sludge Handling Building - Interior	002	Janitor's Closet	1x4 Fixtures w/ 1-T12 Lamp Fixture w/ Magnetic Ballast	1	42.8	0.0428	500	21.4	$3.2	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	1	24.32	0.02432	500	500	12.16	12.16	None Proposed	0	0.01848	9.24	1.4	$35.0	$5.0	$65.0	$0.0	$0.0	$65.0	$40.0	$105.0	$65.0	$40.0	$105.0
Sludge Handling Building - Interior	002	Office	2x4 Fixtures w/ 4-T12 Lamp Fixture w/ Magnetic Ballast	4	684.8	0.6848	2080	1424.384	$215.7	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	4	389.2	0.3892	2080	1456	809.536	566.6752	Automatic Wall Switch Occupancy Sensor	1	0.2956	857.7088	129.9	$105.0	$20.0	$65.0	$63.5	$45.0	$65.0	$125.0	$190.0	$305.0	$563.5	$868.5
Sludge Handling Building - Interior	002	Storage	2x4 Fixtures w/ 4-T12 Lamp Fixture w/ Magnetic Ballast	2	342.4	0.3424	500	171.2	$25.9	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	194.6	0.1946	500	500	97.3	97.3	None Proposed	0	0.1478	73.9	11.2	$105.0	$20.0	$65.0	$0.0	$0.0	$65.0	$125.0	$190.0	$130.0	$250.0	$380.0
Sludge Handling Building - Interior	002	Storage	2x4 Fixtures w/ 4-T12 Lamp Fixture w/ Magnetic Ballast	2	342.4	0.3424	500	171.2	$25.9	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	194.6	0.1946	500	500	97.3	97.3	None Proposed	0	0.1478	73.9	11.2	$105.0	$20.0	$65.0	$0.0	$0.0	$65.0	$125.0	$190.0	$130.0	$250.0	$380.0
Sludge Handling Building - Interior	003	Mezzanine	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	6	513.6	0.5136	500	256.8	$38.9	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	6	291.6	0.2916	500	500	145.8	145.8	None Proposed	0	0.222	111	16.8	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$390.0	$480.0	$870.0
Sludge Handling Building - Exterior	-	Exterior Wallpacks	Exterior Wall Packs (Assume 70w)	4	360	0.36	4380	1576.8	$238.7	Replace 70W Fixture with Induction Light Fixture	4	176	0.176	4380	4380	770.88	770.88	None Proposed	0	0.184	805.92	122.0	$0.0	$380.0	$137.0	$0.0	$0.0	$137.0	$380.0	$517.0	$548.0	$1,520.0	$2,068.0
Clarifier #1, #2 Building - Interior	000	Pump Room	8' T12 Fixture w/ 2-T12 Lamps	2	454	0.454	500	227	$34.4	Replace 8' T12 Fixture with 1 Tandem Double-Length 2-T8 Lamp Fixture	2	240	0.24	500	500	120	120	None Proposed	0	0.214	107	16.2	$65.1	$105.0	$93.0	$0.0	$0.0	$93.0	$170.1	$263.1	$186.0	$340.2	$526.2
Clarifier #3, #4 Building - Interior	001	Electrical Room	2x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	171.2	0.1712	2080	356.096	$53.9	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	97.2	0.0972	2080	2080	202.176	202.176	None Proposed	0	0.074	153.92	23.3	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$130.0	$160.0	$290.0
Clarifier #3, #4 Building - Interior	001	Stairwell	2X2 Troffers w/ 2-T12 Lamps w/ Magnetic Ballasts	2	142	0.142	2080	295.36	$44.7	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	100	0.1	2080	2080	208	208	None Proposed	0	0.042	87.36	13.2	$55.0	$10.0	$65.0	$0.0	$0.0	$65.0	$65.0	$130.0	$130.0	$130.0	$260.0
Clarifier #3, #4 Building - Interior	001	Stairwell	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	1	85.6	0.0856	2080	178.048	$27.0	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	1	48.6	0.0486	2080	2080	101.088	101.088	None Proposed	0	0.037	76.96	11.7	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$65.0	$80.0	$145.0
Clarifier #3, #4 Building - Interior	001	Storage	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	2	171.2	0.1712	500	85.6	$13.0	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	2	97.2	0.0972	500	500	48.6	48.6	None Proposed	0	0.074	37	5.6	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$130.0	$160.0	$290.0
Clarifier #3, #4 Building - Interior	000	Pump Room	1x4 Fixtures w/ 2-T12 Lamp Fixture w/ Magnetic Ballast	6	513.6	0.5136	2080	1068.288	$161.7	Replace T12 Bulbs With High Perf. T8 Bulbs, Replace Ballast w/ High Perf., 0.78 Ballast Factor Ballast	6	291.6	0.2916	2080	2080	606.528	606.528	None Proposed	0	0.222	461.76	69.9	$70.0	$10.0	$65.0	$0.0	$0.0	$65.0	$80.0	$145.0	$390.0	$480.0	$870.0
Clarifier #3, #4 Building - Interior	-	Exit Signs	Incandescent Exit Sign	3	48	0.048	8760	420.48	$63.7	Replace Incandescent Exit Sign with LED Exit Sign	3	15	0.015	8760	8760	131.4	131.4	None Proposed	0	0.033	289.08	43.8	$0.0	$61.0	$63.0	$0.0	$0.0	$63.0	$61.0	$124.0	$189.0	$183.0	$372.0

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	Qty 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
Clarifier #3, #4 Building - Exterior	-	Exterior Wallpacks	Exterior Wall Packs (Assume 70w)	2	180	0.18	4380	788.4	$119.4	Replace 70W Fixture with Induction Light Fixture	2	88	0.088	4380	4380	385.44	385.44	None Proposed	0	0.092	402.96	61.0	$0.0	$380.0	$137.0	$0.0	$0.0	$137.0	$380.0	$517.0	$274.0	$760.0	$1,034.0
Roadway and Process Lighting - Exterior	-	Site Lighting	Pole Mounted Luminare - 1 Head (Assume 250W HPS)	11	3245	3.245	4380	14213.1	$2,151.9	Replace 250W Fixture with Induction Light Fixture	11	1210	1.21	4380	4380	5299.8	5299.8	None Proposed	0	2.035	8913.3	1,349.5	$0.0	$760.0	$137.0	$0.0	$0.0	$137.0	$760.0	$897.0	$1,507.0	$8,360.0	$9,867.0
Roadway and Process Lighting - Exterior	-	Oxidation Ditch	Pole Mounted Luminare - 1 Head (Assume 250W HPS)	2	590	0.59	4380	2584.2	$391.2	Replace 250W Fixture with Induction Light Fixture	2	220	0.22	4380	4380	963.6	963.6	None Proposed	0	0.37	1620.6	245.4	$0.0	$760.0	$137.0	$0.0	$0.0	$137.0	$760.0	$897.0	$274.0	$1,520.0	$1,794.0

APPENDIX J

MOTOR AND VFD UPGRADES ANALYSIS

Appendix J

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[2]**	**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	Blower Building	75	95.4					95.40		0.00	0.00	0.00	$0	$0.0	1093	58.65	64102.0	$9,705.0	58.65	64102.04	$9,705.05	$0.00	$0.00	N?A
Blower #2	Blower Building	75	95.4					95.40		0.00	0.00	0.00	$0	$0.0	1087	58.65	63750.2	$9,651.8	58.65	63750.16	$9,651.77	$0.00	$0.00	N/A
Raw Sludge Pump #3	Blower Building	5	86				$405.0	89.50	115.00	520.00	520.00	227.50	$748	$747.5	1278	4.34	5543.0	$839.2	4.17	5326.19	$806.39	$32.82	$0.00	22.78
Primary Effluent Pump #1	Administration Building	30	92.4				$1,450.0	93.00	215.00	1665.00	1665.00	728.44	$2,393	$2,393.4	2920	24.22	70724.7	$10,707.7	24.06	70268.39	$10,638.63	$69.08	$135.00	32.69
Primary Effluent Pump #2	Administration Building	30	92.4				$1,450.0	93.00	215.00	1665.00	1665.00	728.44	$2,393	$2,393.4	2920	24.22	70724.7	$10,707.7	24.06	70268.39	$10,638.63	$69.08	$135.00	32.69
Primary Effluent Pump #3	Administration Building	30	92.4				$1,450.0	93.00	215.00	1665.00	1665.00	728.44	$2,393	$2,393.4	2920	24.22	70724.7	$10,707.7	24.06	70268.39	$10,638.63	$69.08	$135.00	32.69
Raw Sludge Pump #1	Administration Building	5	87.5				$405.0	89.50	115.00	520.00	520.00	227.50	$748	$747.5	548	4.26	2336.0	$353.7	4.17	2283.84	$345.77	$7.90	$0.00	94.58
Raw Sludge Pump #2	Administration Building	5	87.5				$405.0	89.50	115.00	520.00	520.00	227.50	$748	$747.5	548	4.26	2336.0	$353.7	4.17	2283.84	$345.77	$7.90	$0.00	94.58
Thick Sludge Pump #1	Sludge Handling Building	7.5	89.5				$510.0	91.00	124.00	634.00	634.00	277.38	$911	$911.4	390	6.25	2438.0	$369.1	6.15	2397.86	$363.04	$6.08	$0.00	149.79
Thick Sludge Pump #2	Sludge Handling Building	7.5	89.5				$510.0	91.00	124.00	634.00	634.00	277.38	$911	$911.4	390	6.25	2438.0	$369.1	6.15	2397.86	$363.04	$6.08	$0.00	149.79
Thick Feed Pump #1	Sludge Handling Building	15	90.2				$795.0	91.70	162.00	957.00	957.00	418.69	$1,376	$1,375.7	390	12.41	4838.2	$732.5	12.20	4759.11	$720.53	$11.98	$0.00	114.81
Thick Feed Pump #2	Sludge Handling Building	15	90.2				$795.0	91.70	162.00	957.00	957.00	418.69	$1,376	$1,375.7	390	12.41	4838.2	$732.5	12.20	4759.11	$720.53	$11.98	$0.00	114.81
BFP Pump #1	Sludge Handling Building	5	87.5				$405.0	89.50	115.00	520.00	520.00	227.50	$748	$747.5	780	4.26	3325.0	$503.4	4.17	3250.73	$492.16	$11.25	$0.00	66.45
BPF Pump #2	Sludge Handling Building	5	87.5				$405.0	89.50	115.00	520.00	520.00	227.50	$748	$747.5	780	4.26	3325.0	$503.4	4.17	3250.73	$492.16	$11.25	$0.00	66.45
Service Water Pump #1	Sludge Handling Building	7.5	85.5				$510.0	88.50	124.00	634.00	634.00	277.38	$911	$911.4	910	6.54	5954.9	$901.6	6.32	5753.05	$871.01	$30.56	$0.00	29.82
Service Water Pump #2	Sludge Handling Building	7.5	85.5				$510.0	88.50	124.00	634.00	634.00	277.38	$911	$911.4	910	6.54	5954.9	$901.6	6.32	5753.05	$871.01	$30.56	$0.00	29.82
Washwater Pump #1	Sludge Handling Building	7.5	88.1				$510.0	88.50	124.00	634.00	634.00	277.38	$911	$911.4	390	6.35	2476.8	$375.0	6.32	2465.59	$373.29	$1.69	$0.00	537.73
Washwater Pump #2	Sludge Handling Building	7.5	88.1				$510.0	88.50	124.00	634.00	634.00	277.38	$911	$911.4	390	6.35	2476.8	$375.0	6.32	2465.59	$373.29	$1.69	$0.00	537.73
Washwater Pump #3	Sludge Handling Building	7.5	86.5				$510.0	88.50	124.00	634.00	634.00	277.38	$911	$911.4	780	6.47	5045.2	$763.8	6.32	4931.19	$746.58	$17.26	$0.00	52.80
Washwater Pump #4	Sludge Handling Building	7.5	86.5				$510.0	88.50	124.00	634.00	634.00	277.38	$911	$911.4	780	6.47	5045.2	$763.8	6.32	4931.19	$746.58	$17.26	$0.00	52.80
Process Water Pump #1	Sludge Handling Building	10	88.5				$620.0	89.50	129.00	749.00	749.00	327.69	$1,077	$1,076.7	260	8.43	2191.6	$331.8	8.34	2167.15	$328.11	$3.71	$0.00	290.41
Process Water Pump #2	Sludge Handling Building	10	88.5				$620.0	89.50	129.00	749.00	749.00	327.69	$1,077	$1,076.7	130	8.43	1095.8	$165.9	8.34	1083.58	$164.05	$1.85	$0.00	580.83
RAS Pump #1	Final Clarifier #1 & #2 Building	10	90.2	$1,525	$775	$2,300	$620.0	91.70	129.00	749.00	3049.00	1333.94	$4,383	$4,382.9	4380	8.27	36224.8	$5,484.4	6.10	26724.21	$4,046.05	$1,438.39	$90.00	2.98
RAS Pump #2	Final Clarifier #1 & #2 Building	10	90.2	$1,525	$775	$2,300	$620.0	91.70	129.00	749.00	3049.00	1333.94	$4,383	$4,382.9	4380	8.27	36224.8	$5,484.4	6.10	26724.21	$4,046.05	$1,438.39	$90.00	2.98
WAS Pump	Final Clarifier #1 & #2 Building	3	86.5					86.50		0.00	0.00	0.00	$0	$0.0	1095	2.59	2833.1	$428.9	2.59	2833.08	$428.93	$0.00	$0.00	N/A
RAS Pump #1	Final Clarifier #3 & #4 Building	7.5	87.5	$1,300	$775	$2,075	$510.0	90.20	124.00	634.00	2709.00	1185.19	$3,894	$3,894.2	2920	6.39	18671.3	$2,826.8	4.65	13584.31	$2,056.66	$770.17	$81.00	4.95
RAS Pump #2	Final Clarifier #3 & #4 Building	7.5	87.5	$1,300	$775	$2,075	$510.0	90.20	124.00	634.00	2709.00	1185.19	$3,894	$3,894.2	2920	6.39	18671.3	$2,826.8	4.65	13584.31	$2,056.66	$770.17	$81.00	4.95
RAS Pump #3	Final Clarifier #3 & #4 Building	7.5	87.5	$1,300	$775	$2,075	$510.0	90.20	124.00	634.00	2709.00	1185.19	$3,894	$3,894.2	2920	6.39	18671.3	$2,826.8	4.65	13584.31	$2,056.66	$770.17	$81.00	4.95
WAS Pump #1	Final Clarifier #3 & #4 Building	5	85.5	$1,075	$645	$1,720	$405.0	89.50	115.00	520.00	2240.00	980.00	$3,220	$3,220.0	4380	4.36	19108.1	$2,893.0	3.13	13690.56	$2,072.75	$820.21	$54.00	3.86
WAS Pump #2	Final Clarifier #3 & #4 Building	5	85.5	$1,075	$645	$1,720	$405.0	89.50	115.00	520.00	2240.00	980.00	$3,220	$3,220.0	4380	4.36	19108.1	$2,893.0	3.13	13690.56	$2,072.75	$820.21	$54.00	3.86
Gas Mixer #1	Outdoor Process	10	83.5				$620.0	89.50	129.00	749.00	749.00	327.69	$1,077	$1,076.7	2920	8.93	26087.7	$3,949.7	8.34	24338.77	$3,684.89	$264.78	$81.00	3.76
Gas Mixer #2	Outdoor Process	10	91				$620.0	91.70	129.00	749.00	749.00	327.69	$1,077	$1,076.7	2920	8.20	23937.6	$3,624.1	8.14	23754.85	$3,596.48	$27.67	$90.00	35.67
Ejector Pump #1	Outdoor Process	5	85.5				$405.0	89.50	115.00	520.00	520.00	227.50	$748	$747.5	4380	4.36	19108.1	$2,893.0	4.17	18254.08	$2,763.67	$129.29	$54.00	5.36
Ejector Pump #2	Outdoor Process	5	85.5				$405.0	89.50	115.00	520.00	520.00	227.50	$748	$747.5	4380	4.36	19108.1	$2,893.0	4.17	18254.08	$2,763.67	$129.29	$54.00	5.36
Dewatering Pump #1	Outdoor Process	10	89.5	$1,525	$775	$2,300	$620.0	91.70	129.00	749.00	3049.00	1333.94	$4,383	$4,382.9	4380	8.34	36508.2	$5,527.3	6.10	26724.21	$4,046.05	$1,481.29	$90.00	2.90
Dewatering Pump #2	Outdoor Process	10	89.5	$1,525	$775	$2,300	$620.0	91.70	129.00	749.00	3049.00	1333.94	$4,383	$4,382.9	4380	8.34	36508.2	$5,527.3	6.10	26724.21	$4,046.05	$1,481.29	$90.00	2.90
Pond Boat Winch Pump	Outdoor Process	7.5	88.5				$510.0	90.20	124.00	634.00	634.00	277.38	$911	$911.4	50	6.32	316.1	$47.9	6.20	310.14	$46.96	$0.90	$0.00	1010.42

Note:
1. VFD energy savings is attributed to a 6.25% reduction effective motor horsepower.
2. Markup amount includes 15% overhead & profit, and 25% contigency, see Appendix P for a complete breakdown.
3. Motor efficiencies marked in red were estimated with NEMA standard efficiency tables.

Madison-Chatham Plant Rate per kWh $0.1514

For All Motors Represented:

Material & Labor	$63,327.63
Total Incentives	$1,395.00
Savings	$10,761.35
Payback	**5.76**
Energy Savings (KW)	20.29
Energy Savings (kWh)	71,078.91

	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)**
Blower Building	$747.50	$405.00	$115.00	$0.00	$0.00	$32.82	$0.00	22.8	$747.50		216.76	0.17
Administration Building	$8,675.31	$5,160.00	$875.00	$0.00	$0.00	$223.05	$405.00	37.1	$8,270.31		1473.27	0.66
Sludge Handling Building	$13,690.75	$7,720.00	$1,804.00	$0.00	$0.00	$163.23	$0.00	83.9	$13,690.75		1078.14	1.78
Final Clarifier #1 & #2 Building	$8,765.88	$1,240.00	$258.00	$3,050.00	$1,550.00	$2,876.79	$180.00	3.0	$8,585.88		19001.25	4.34
Final Clarifier #3 & #4 Building	$18,122.56	$2,340.00	$602.00	$6,050.00	$3,615.00	$3,950.94	$351.00	4.5	$17,771.56		26096.03	7.70
Outdoor Process	$13,325.63	$3,800.00	$870.00	$3,050.00	$1,550.00	$3,514.52	$459.00	3.7	$12,866.63		23213.46	5.64
Total	**$63,327.63**	**$20,665.00**	**$4,524.00**	**$12,150.00**	**$6,715.00**	**$10,761.35**	**$1,395.00**	**5.8**	**$61,932.63**		**71078.91**	**20.29**

APPENDIX K

SOLAR PV SYSTEM FINANCIAL ANALYSIS

Molitor Water Pollution Control Facility
Design Goal: Provide
72% of average annual electricity

Existing Conditons

Average Annual Electrical Usage (kWh)	2,224,089
Current Utility Price ($/kWh)	$0.1514

Calculations

Solar Rating (Zip Code: 07928)	4.48 kWh/sq-m/day
Solar Capacity Required (kW)	1344
Ground Space Needed (sq-ft)	134,433
Annual Solar kWh (PV Watts)	1,601,345
Net System installation Cost ($9/kWh)	$12,098,934
Electrical Service Modification Cost	$100,000
Total System Installation Cost	**$12,198,934**
Materials	$8,539,254
Labor	$3,659,680
Engineer's Opinion of Probable Cost	$15,248,668

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	0.1514	1,601,345.0	$242,443.6	$677,369	($32,027)	$887,785.7	$887,785.7	$0.423	
2	0.1559	1,593,338.3	$248,468.4	$673,982	($31,867)	$890,583.7	$1,778,369.4	$0.423	
3	0.1606	1,585,371.6	$254,642.8	$670,612	($31,707)	$893,547.5	$2,671,916.9	$0.423	
4	0.1654	1,577,444.7	$260,970.7	$667,259	($31,549)	$896,680.9	$3,568,597.8	$0.423	
5	0.1704	1,569,557.5	$267,455.8	$663,923	($31,391)	$899,987.5	$4,468,585.3	$0.423	
6	0.1755	1,561,709.7	$274,102.1	$660,603	($31,234)	$903,471.1	$5,372,056.3	$0.423	
7	0.1808	1,553,901.2	$280,913.5	$657,300	($31,078)	$907,135.7	$6,279,192.0	$0.423	
8	0.1862	1,546,131.7	$287,894.2	$654,014	($30,923)	$910,985.3	$7,190,177.3	$0.423	
9	0.1918	1,538,401.0	$295,048.4	$650,744	($30,768)	$915,024.0	$8,105,201.2	$0.423	
10	0.1975	1,530,709.0	$302,380.3	$647,490	($30,614)	$919,256.1	$9,024,457.3	$0.423	
11	0.2035	1,523,055.5	$309,894.5	$644,252	($30,461)	$923,685.8	$9,948,143.1	$0.423	
12	0.2096	1,515,440.2	$317,595.4	$641,031	($30,309)	$928,317.7	$10,876,460.9	$0.423	
13	0.2159	1,507,863.0	$325,487.6	$637,826	($30,157)	$933,156.4	$11,809,617.3	$0.423	
14	0.2223	1,500,323.7	$333,576.0	$634,637	($30,006)	$938,206.4	$12,747,823.7	$0.423	
15	0.2290	1,492,822.0	$341,865.3	$631,464	($29,856)	$943,472.6	$13,691,296.3	$0.423	
16	0.2359	1,485,357.9	$350,360.7	$37,134	($29,707)	$357,787.5	$14,049,083.7		$0.025
17	0.2430	1,477,931.1	$359,067.1	$36,948	($29,559)	$366,456.8	$14,415,540.5		$0.025
18	0.2502	1,470,541.5	$367,990.0	$36,764	($29,411)	$375,342.7	$14,790,883.2		$0.025
19	0.2577	1,463,188.8	$377,134.5	$36,580	($29,264)	$384,450.5	$15,175,333.7		$0.025
20	0.2655	1,455,872.8	$386,506.3	$36,397	($29,117)	$393,785.7	$15,569,119.3		$0.025
21	0.2734	1,448,593.5	$396,111.0	$36,215	($28,972)	$403,354.0	$15,972,473.3		$0.025
22	0.2816	1,441,350.5	$405,954.3	$36,034	($28,827)	$413,161.1	$16,385,634.4		$0.025
23	0.2901	1,434,143.7	$416,042.3	$35,854	($28,683)	$423,213.0	$16,808,847.4		$0.025
24	0.2988	1,426,973.0	$426,381.0	$35,674	($28,539)	$433,515.8	$17,242,363.3		$0.025
25	0.3078	1,419,838.2	$436,976.5	$35,496	($28,397)	$444,075.7	$17,686,439.0		$0.025

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

APPENDIX L

WIND TURBINE ENERGY SYSTEM
WIND CAD ANALYSIS

WindCad Turbine Performance Model

BWC EXCEL-S, Grid - Intertie

Tier/neo-SH3055-23-BWC

Prepared For:	**Madison-Chatham Joint Meeting**
Site Location:	**214 North Passaic Avenue, Chatham, NJ**
Data Source:	**NASA**
Date:	**9/1/2010**

10 kW

Inputs:

Ave. Wind (m/s) =	4.72
Weibull K =	2
Site Altitude (m) =	106
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 =	-1%
Average Output Power (kW) =	1.21
Daily Energy Output (kWh) =	29.1
Annual Energy Output (kWh) =	**10,618**
Monthly Energy Output =	885
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%	0.020
4	0.40	16.10%	0.065
5	0.83	14.62%	0.121
6	1.42	11.86%	0.169
7	2.21	8.72%	0.193
8	3.23	5.84%	0.189
9	4.52	3.59%	0.162
10	6.04	2.03%	0.123
11	7.72	1.06%	0.082
12	9.43	0.51%	0.048
13	10.70	0.23%	0.024
14	11.06	0.09%	0.010
15	11.35	0.04%	0.004
16	11.42	0.01%	0.001
17	11.43	0.00%	0.000
18	11.38	0.00%	0.000
19	11.21	0.00%	0.000
20	10.76	0.00%	0.000
2008, BWC	Totals:	99.41%	1.212

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:	**Madison-Chatham Joint Meeting**
Site Location:	**214 North Passaic Avenue, Chatham, NJ**
Data Source:	**NASA**
Date:	**9/1/2010**

10 kW

Inputs:

Max. Wind (m/s) =	5.52
Weibull K =	2
Site Altitude (m) =	106
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 =	-1%
Average Output Power (kW) =	1.84
Daily Energy Output (kWh) =	44.2
Annual Energy Output (kWh) =	**16,144**
Monthly Energy Output =	1,345
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	0.40	13.72%	0.056
5	0.83	13.57%	0.112
6	1.42	12.24%	0.174
7	2.21	10.18%	0.225
8	3.23	7.88%	0.254
9	4.52	5.70%	0.257
10	6.04	3.86%	0.233
11	7.72	2.46%	0.190
12	9.43	1.48%	0.139
13	10.70	0.84%	0.089
14	11.06	0.45%	0.049
15	11.35	0.22%	0.026
16	11.42	0.11%	0.012
17	11.43	0.05%	0.006
18	11.38	0.02%	0.002
19	11.21	0.01%	0.001
20	10.76	0.00%	0.000
2008, BWC	Totals:	99.56%	1.843

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: **Madison-Chatham Joint Meeting**
Site Location: **214 North Passaic Avenue, Chatham, NJ**
Data Source: **NASA**
Date: **9/1/2010**

10 kW

Inputs:

Min. Wind (m/s) =	3.81
Weibull K =	2
Site Altitude (m) =	106
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 =	-1%
Average Output Power (kW) =	0.65
Daily Energy Output (kWh) =	15.6
Annual Energy Output (kWh) =	**5,687**
Monthly Energy Output =	474
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%	0.026
4	0.40	18.23%	0.074
5	0.83	13.95%	0.115
6	1.42	9.18%	0.130
7	2.21	5.27%	0.117
8	3.23	2.66%	0.086
9	4.52	1.18%	0.053
10	6.04	0.47%	0.028
11	7.72	0.16%	0.013
12	9.43	0.05%	0.005
13	10.70	0.01%	0.002
14	11.06	0.00%	0.000
15	11.35	0.00%	0.000
16	11.42	0.00%	0.000
17	11.43	0.00%	0.000
18	11.38	0.00%	0.000
19	11.21	0.00%	0.000
20	10.76	0.00%	0.000
2008, BWC	Totals:	99.09%	0.649

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 M

WIND TURBINE ENERGY SYSTEM
FINANCIAL ANALYSIS

Molitor Water Pollution Control Facility
(Average Site Wind Speed @30m - 10.56 mph)

Annual kWh	10,618
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	0.1514	10,618.0	$1,607.6	$265	$33,978	($212)	$1,660.7	$1,660.7
2	0.1559	10,564.9	$1,647.5	$264	$0	($211)	$1,700.3	$3,361.0
3	0.1606	10,512.1	$1,688.5	$263	$0	($210)	$1,741.0	$5,102.0
4	0.1654	10,459.5	$1,730.4	$261	$0	($209)	$1,782.7	$6,884.7
5	0.1704	10,407.2	$1,773.4	$260	$0	($208)	$1,825.4	$8,710.2
6	0.1755	10,355.2	$1,817.5	$259	$0	($207)	$1,869.3	$10,579.4
7	0.1808	10,303.4	$1,862.6	$258	$0	($206)	$1,914.2	$12,493.6
8	0.1862	10,251.9	$1,908.9	$256	$0	($205)	$1,960.2	$14,453.8
9	0.1918	10,200.6	$1,956.4	$255	$0	($204)	$2,007.4	$16,461.2
10	0.1975	10,149.6	$2,005.0	$254	$0	($203)	$2,055.7	$18,516.9
11	0.2035	10,098.9	$2,054.8	$252	$0	($202)	$2,105.3	$20,622.2
12	0.2096	10,048.4	$2,105.9	$251	$0	($201)	$2,156.1	$22,778.3
13	0.2159	9,998.2	$2,158.2	$250	$0	($200)	$2,208.2	$24,986.5
14	0.2223	9,948.2	$2,211.8	$249	$0	($199)	$2,261.6	$27,248.1
15	0.2290	9,898.4	$2,266.8	$247	$0	($198)	$2,316.3	$29,564.4
16	0.2359	9,848.9	$2,323.1	$246	$0	($197)	$2,372.4	$31,936.7
17	0.2430	9,799.7	$2,380.9	$245	$0	($196)	$2,429.9	$34,366.6
18	0.2502	9,750.7	$2,440.0	$244	$0	($195)	$2,488.8	$36,855.4
19	0.2577	9,701.9	$2,500.7	$243	$0	($194)	$2,549.2	$39,404.5
20	0.2655	9,653.4	$2,562.8	$241	$0	($193)	$2,611.1	$42,015.6
21	0.2734	9,605.2	$2,626.5	$240	$0	($192)	$2,674.5	$44,690.1
22	0.2816	9,557.1	$2,691.8	$239	$0	($191)	$2,739.5	$47,429.6
23	0.2901	9,509.3	$2,758.6	$238	$0	($190)	$2,806.2	$50,235.8
24	0.2988	9,461.8	$2,827.2	$237	$0	($189)	$2,874.5	$53,110.3
25	0.3078	9,414.5	$2,897.4	$235	$0	($188)	$2,944.5	$56,054.9

Molitor Water Pollution Control Facility
(Maximum Average Site Wind Speed @30m - 12.35 mph)

Annual kWh	16,144
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	0.1514	16,144.0	$2,444.2	$404	$51,661	($323)	$2,524.9	$2,524.9
2	0.1559	16,063.3	$2,504.9	$402	$0	($321)	$2,585.3	$5,110.2
3	0.1606	15,983.0	$2,567.2	$400	$0	($320)	$2,647.1	$7,757.3
4	0.1654	15,903.0	$2,631.0	$398	$0	($318)	$2,710.5	$10,467.8
5	0.1704	15,823.5	$2,696.4	$396	$0	($316)	$2,775.5	$13,243.3
6	0.1755	15,744.4	$2,763.4	$394	$0	($315)	$2,842.1	$16,085.3
7	0.1808	15,665.7	$2,832.0	$392	$0	($313)	$2,910.4	$18,995.7
8	0.1862	15,587.4	$2,902.4	$390	$0	($312)	$2,980.3	$21,976.1
9	0.1918	15,509.4	$2,974.5	$388	$0	($310)	$3,052.1	$25,028.1
10	0.1975	15,431.9	$3,048.5	$386	$0	($309)	$3,125.6	$28,153.8
11	0.2035	15,354.7	$3,124.2	$384	$0	($307)	$3,201.0	$31,354.7
12	0.2096	15,277.9	$3,201.8	$382	$0	($306)	$3,278.2	$34,633.0
13	0.2159	15,201.6	$3,281.4	$380	$0	($304)	$3,357.4	$37,990.4
14	0.2223	15,125.6	$3,363.0	$378	$0	($303)	$3,438.6	$41,429.0
15	0.2290	15,049.9	$3,446.5	$376	$0	($301)	$3,521.8	$44,950.8
16	0.2359	14,974.7	$3,532.2	$374	$0	($299)	$3,607.0	$48,557.8
17	0.2430	14,899.8	$3,619.9	$372	$0	($298)	$3,694.4	$52,252.2
18	0.2502	14,825.3	$3,709.9	$371	$0	($297)	$3,784.0	$56,036.3
19	0.2577	14,751.2	$3,802.1	$369	$0	($295)	$3,875.8	$59,912.1
20	0.2655	14,677.4	$3,896.6	$367	$0	($294)	$3,970.0	$63,882.1
21	0.2734	14,604.0	$3,993.4	$365	$0	($292)	$4,066.4	$67,948.5
22	0.2816	14,531.0	$4,092.6	$363	$0	($291)	$4,165.3	$72,113.8
23	0.2901	14,458.4	$4,194.3	$361	$0	($289)	$4,266.6	$76,380.4
24	0.2988	14,386.1	$4,298.6	$360	$0	($288)	$4,370.5	$80,750.9
25	0.3078	14,314.1	$4,405.4	$358	$0	($286)	$4,477.0	$85,227.9

Molitor Water Pollution Control Facility
(Minimum Average Site Wind Speed @30m – 8.52 mph)

Annual kWh	5,687
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	0.1514	5,687.0	$861.0	$142	$18,198	($114)	$889.4	$889.4
2	0.1559	5,658.6	$882.4	$141	$0	($113)	$910.7	$1,800.1
3	0.1606	5,630.3	$904.3	$141	$0	($113)	$932.5	$2,732.6
4	0.1654	5,602.1	$926.8	$140	$0	($112)	$954.8	$3,687.5
5	0.1704	5,574.1	$949.8	$139	$0	($111)	$977.7	$4,665.2
6	0.1755	5,546.2	$973.4	$139	$0	($111)	$1,001.2	$5,666.3
7	0.1808	5,518.5	$997.6	$138	$0	($110)	$1,025.2	$6,691.6
8	0.1862	5,490.9	$1,022.4	$137	$0	($110)	$1,049.9	$7,741.4
9	0.1918	5,463.5	$1,047.8	$137	$0	($109)	$1,075.1	$8,816.6
10	0.1975	5,436.1	$1,073.9	$136	$0	($109)	$1,101.1	$9,917.6
11	0.2035	5,409.0	$1,100.6	$135	$0	($108)	$1,127.6	$11,045.2
12	0.2096	5,381.9	$1,127.9	$135	$0	($108)	$1,154.8	$12,200.1
13	0.2159	5,355.0	$1,155.9	$134	$0	($107)	$1,182.7	$13,382.8
14	0.2223	5,328.2	$1,184.7	$133	$0	($107)	$1,211.3	$14,594.1
15	0.2290	5,301.6	$1,214.1	$133	$0	($106)	$1,240.6	$15,834.7
16	0.2359	5,275.1	$1,244.3	$132	$0	($106)	$1,270.6	$17,105.3
17	0.2430	5,248.7	$1,275.2	$131	$0	($105)	$1,301.4	$18,406.7
18	0.2502	5,222.5	$1,306.9	$131	$0	($104)	$1,333.0	$19,739.7
19	0.2577	5,196.4	$1,339.4	$130	$0	($104)	$1,365.3	$21,105.1
20	0.2655	5,170.4	$1,372.6	$129	$0	($103)	$1,398.5	$22,503.6
21	0.2734	5,144.5	$1,406.7	$129	$0	($103)	$1,432.5	$23,936.0
22	0.2816	5,118.8	$1,441.7	$128	$0	($102)	$1,467.3	$25,403.3
23	0.2901	5,093.2	$1,477.5	$127	$0	($102)	$1,503.0	$26,906.3
24	0.2988	5,067.7	$1,514.2	$127	$0	($101)	$1,539.6	$28,445.9
25	0.3078	5,042.4	$1,551.9	$126	$0	($101)	$1,577.1	$30,023.0

APPENDIX N

ECRM FINANCIAL ANALYSES

Lifetime Saving Analysis for Aeration System Alternatives

ECM	Option 1 - Premium Eff Motors and VFDs on Aerators	Option 2 - Fine Bubble System
Assumed Inflation (Gas)	2%	2%
Initial Yearly Savings (Gas)		
Assumed Inflation (Electricity)	3%	3%
Initial Yearly Savings (Electricity)	$20,293.00	$77,763.00
Assumed Average Useful Life (Years)	20	20
Lifetime Savings	**$545,280.51**	**$2,089,520.93**
Year	Annual Savings	Annual Savings
1	$20,293.00	$77,763.00
2	$20,901.79	$80,095.89
3	$21,528.84	$82,498.77
4	$22,174.71	$84,973.73
5	$22,839.95	$87,522.94
6	$23,525.15	$90,148.63
7	$24,230.90	$92,853.09
8	$24,957.83	$95,638.68
9	$25,706.57	$98,507.84
10	$26,477.76	$101,463.08
11	$27,272.10	$104,506.97
12	$28,090.26	$107,642.18
13	$28,932.97	$110,871.44
14	$29,800.95	$114,197.59
15	$30,694.98	$117,623.51
16	$31,615.83	$121,152.22
17	$32,564.31	$124,786.79
18	$33,541.24	$128,530.39
19	$34,547.47	$132,386.30
20	$35,583.90	$136,357.89

IRR, NPV, AROI - Aeration System ECRMs

Financial Calculations

Based on inflation of: 3%

Option 1			Option 2		
Premium Efficiency Motors and VFDs on Mechanical Aerators			Fine Bubble Diffuser System		
Year	Energy Savings	Cash Flow	Year	Energy Savings	Cash Flow
0		($85,076)	0		($1,357,000)
1	$20,293	$15,293	1	$77,763	$81,763
2	$20,902	$15,902	2	$80,096	$84,096
3	$21,529	$16,529	3	$82,499	$86,499
4	$22,175	$17,175	4	$84,974	$88,974
5	$22,840	$17,840	5	$87,523	$91,523
6	$23,525	$18,525	6	$90,149	$94,149
7	$24,231	$19,231	7	$92,853	$96,853
8	$24,958	$19,958	8	$95,639	$99,639
9	$25,707	$20,707	9	$98,508	$102,508
10	$26,478	$21,478	10	$101,463	$105,463
11	$27,272	$22,272	11	$104,507	$108,507
12	$28,090	$23,090	12	$107,642	$111,642
13	$28,933	$23,933	13	$110,871	$114,871
14	$29,801	$24,801	14	$114,198	$118,198
15	$30,695	$25,695	15	$117,624	$121,624
16	$31,616	$26,616	16	$121,152	$125,152
17	$32,564	$27,564	17	$124,787	$128,787
18	$33,541	$28,541	18	$128,530	$132,530
19	$34,547	$29,547	19	$132,386	$136,386
20	$35,584	$30,584	20	$136,358	$140,358
	IRR	20.97%		IRR	1.25%
	NPV	$234,575		NPV	$212,471.06
	AROI	12.98%		AROI	1.03%

Table 4.1-9 Oxidation Ditch System Improvements			
	Alt. 1 – VFDs on Existing Aerators	Alt. 2 – New Aerators with VFDs	Alt. 3 - New Two-Speed Aerators
Installation Cost	$384,000	$631,000	$445,000
New Jersey SmartStart Rebate	$540	$0	$0
Total Cost	$383,460	$631,000	$445,000
Annual Energy Savings	$60,400	$75,900	$50,100
Annual O&M Cost	$4,000	$4,000	$4,000
Simple Payback Period, years	6.8	8.8	9.7
Lifetime, years	20	20	20
Internal Rate of Return (IRR)	14.7%	10.4%	9.4%
Net Present Value (NPV)	$515,000	$498,000	$300,000

assume $2000/yr per unit

$0.1514 per kWh

Energy Savings Breakdown				
current estimated use	$168,600	$168,600	$168,600	**assumes avg hp now = 150 hp and 88% efficient motors**
future average HP use	105	90	115	**assumes avg flows/loads stay the same**
future	$108,200	$92,700	$118,500	**assumes 96% efficient motors (new)**
savings	$60,400	$75,900	$50,100	

Year			
0	($383,460)	($631,000)	($445,000)
1	$60,400	$75,900	$50,100
2	$60,400	$75,900	$50,100
3	$60,400	$75,900	$50,100
4	$60,400	$75,900	$50,100
5	$60,400	$75,900	$50,100
6	$60,400	$75,900	$50,100
7	$60,400	$75,900	$50,100
8	$60,400	$75,900	$50,100
9	$60,400	$75,900	$50,100
10	$60,400	$75,900	$50,100
11	$60,400	$75,900	$50,100
12	$60,400	$75,900	$50,100
13	$60,400	$75,900	$50,100
14	$60,400	$75,900	$50,100
15	$60,400	$75,900	$50,100
16	$60,400	$75,900	$50,100
17	$60,400	$75,900	$50,100
18	$60,400	$75,900	$50,100
19	$60,400	$75,900	$50,100
20	$60,400	$75,900	$50,100
IRR	15%	10%	9%
NPV	$515,139	$498,200	$300,361

Table 4.1-10 Post Aeration System Improvements				
	Alt. 1 – New Motors, VFDs & DO Control System	Alt. 2 – New Aerators	Alt. 3 – New Aerators, VFDs & DO Control System	Alt. 4 – New Solar Aerators & DO Control System
Installation Cost	$161,000	$113,000	$301,000	$355,134
New Jersey SmartStart Rebate	$360	$0	$0	$180
Total Cost	$160,640	$113,000	$301,000	$354,954
Annual Energy Savings	$5,800	$3,600	$10,100	$28,900
Annual O&M Cost	$1,000	$0	$1,000	$2,650
Simple Payback Period, years	33.5	31.4	33.1	13.5
Lifetime, years	20	20	20	20
Internal Rate of Return (IRR)	-2.9%	-4.0%	-3.5%	5.2%
Net Present Value (NPV)	-$74,000	-$59,000	-$151,000	$75,000

assume $500/yr for DO control system, $500/yr for VFDs, $750/yr for ea solar unit + $150/yr

$0.1514 per kWh

Energy Savings Breakdown

current estimated use	$36,000	$36,000	$36,000	$36,000	**assumes avg hp now = 30 hp and 82.5% motor efficiency**
future average HP use	28	30	24	20	**assumes avg flows/loads stay the same**
future	$30,200	$32,400	$25,900	$7,100	**assumes 91.7% motor efficiency**
savings	$5,800	$3,600	$10,100	$28,900	

Year				
0	($160,640)	($113,000)	($301,000)	($354,954)
1	$5,800	$3,600	$10,100	$28,900
2	$5,800	$3,600	$10,100	$28,900
3	$5,800	$3,600	$10,100	$28,900
4	$5,800	$3,600	$10,100	$28,900
5	$5,800	$3,600	$10,100	$28,900
6	$5,800	$3,600	$10,100	$28,900
7	$5,800	$3,600	$10,100	$28,900
8	$5,800	$3,600	$10,100	$28,900
9	$5,800	$3,600	$10,100	$28,900
10	$5,800	$3,600	$10,100	$28,900
11	$5,800	$3,600	$10,100	$28,900
12	$5,800	$3,600	$10,100	$28,900
13	$5,800	$3,600	$10,100	$28,900
14	$5,800	$3,600	$10,100	$28,900
15	$5,800	$3,600	$10,100	$28,900
16	$5,800	$3,600	$10,100	$28,900
17	$5,800	$3,600	$10,100	$28,900
18	$5,800	$3,600	$10,100	$28,900
19	$5,800	$3,600	$10,100	$28,900
20	$5,800	$3,600	$10,100	$28,900
IRR	-2.92%	-3.96%	-3.53%	5.17%
NPV	($74,351)	($59,441)	($150,738)	$75,005

Lifetime Savings Analysis for Sludge Processing Alternatives

ECM	Option 1 - TWAS Addition	Option 2 - TWAS & FOG Addition	Option 3 - TWAS & PHS Addition
Assumed Inflation (Gas)	3%	3%	3%
Initial Yearly Savings (Gas)	$14,805.00	$36,422.00	$24,670.00
Assumed Inflation (Electricity)	3%	3%	3%
Initial Yearly Savings (Electricity)			
Assumed Average Useful Life (Years)	20	20	20
Lifetime Savings	**$397,815.89**	**$978,672.78**	**$662,892.14**
Year	Annual Savings	Annual Savings	Annual Savings
1	$14,805.00	$36,422.00	$24,670.00
2	$15,249.15	$37,514.66	$25,410.10
3	$15,706.62	$38,640.10	$26,172.40
4	$16,177.82	$39,799.30	$26,957.58
5	$16,663.16	$40,993.28	$27,766.30
6	$17,163.05	$42,223.08	$28,599.29
7	$17,677.94	$43,489.77	$29,457.27
8	$18,208.28	$44,794.47	$30,340.99
9	$18,754.53	$46,138.30	$31,251.22
10	$19,317.17	$47,522.45	$32,188.75
11	$19,896.68	$48,948.12	$33,154.42
12	$20,493.58	$50,416.57	$34,149.05
13	$21,108.39	$51,929.06	$35,173.52
14	$21,741.64	$53,486.93	$36,228.73
15	$22,393.89	$55,091.54	$37,315.59
16	$23,065.71	$56,744.29	$38,435.06
17	$23,757.68	$58,446.62	$39,588.11
18	$24,470.41	$60,200.02	$40,775.75
19	$25,204.52	$62,006.02	$41,999.02
20	$25,960.66	$63,866.20	$43,258.99

IRR, NPV, AROI - Digestion System ECRMs

Financial Calculations

Based on inflation of: 3%

Option 1			Option 2			Option 3		
TWAS Addition			TWAS and FOG Addition			TWAS and PHS Addition		
Year	Energy Savings	Cash Flow	Year	Energy Savings	Cash Flow	Year	Energy Savings	Cash Flow
0		($15,600)	0		($409,656)	0		($15,600)
1	$14,805	$14,805	1	$36,422	$47,030	1	24,670	$2,138
2	$15,249	$15,249	2	$37,515	$48,123	2	25,410	$2,878
3	$15,707	$15,707	3	$38,640	$49,248	3	26,172	$3,640
4	$16,178	$16,178	4	$39,799	$50,407	4	26,958	$4,426
5	$16,663	$16,663	5	$40,993	$51,601	5	27,766	$5,234
6	$17,163	$17,163	6	$42,223	$52,831	6	28,599	$6,067
7	$17,678	$17,678	7	$43,490	$54,098	7	29,457	$6,925
8	$18,208	$18,208	8	$44,794	$55,402	8	30,341	$7,809
9	$18,755	$18,755	9	$46,138	$56,746	9	31,251	$8,719
10	$19,317	$19,317	10	$47,522	$58,130	10	32,189	$9,657
11	$19,897	$19,897	11	$48,948	$59,556	11	33,154	$10,622
12	$20,494	$20,494	12	$50,417	$61,025	12	34,149	$11,617
13	$21,108	$21,108	13	$51,929	$62,537	13	35,174	$12,642
14	$21,742	$21,742	14	$53,487	$64,095	14	36,229	$13,697
15	$22,394	$22,394	15	$55,092	$65,700	15	37,316	$14,784
16	$23,066	$23,066	16	$56,744	$67,352	16	38,435	$15,903
17	$23,758	$23,758	17	$58,447	$69,055	17	39,588	$17,056
18	$24,470	$24,470	18	$60,200	$70,808	18	40,776	$18,244
19	$25,205	$25,205	19	$62,006	$72,614	19	41,999	$19,467
20	$25,961	$25,961	20	$63,866	$74,474	20	43,259	$20,727
	IRR	97.90%		IRR	11.95%		IRR	30.24%
	NPV	$271,875.73		NPV	$455,387.55		NPV	$128,209.86
	AROI	89.90%		AROI	6.48%		AROI	8.71%

ECM	Blower Building - Boiler Upgrade	Blower Building - Pipe Insulation
Assumed Inflation (Gas)	2%	2%
Initial Yearly Savings (Gas)	$172.00	$1,475.00
Assumed Inflation (Electricity)	3%	3%
Initial Yearly Savings (Electricity)		
Assumed Average Useful Life (Years)	25	24
Lifetime Savings	**$5,509.21**	**$44,872.25**
Year	Annual Savings	Annual Savings
1	$172.00	$1,475.00
2	$175.44	$1,504.50
3	$178.95	$1,534.59
4	$182.53	$1,565.28
5	$186.18	$1,596.59
6	$189.90	$1,628.52
7	$193.70	$1,661.09
8	$197.57	$1,694.31
9	$201.53	$1,728.20
10	$205.56	$1,762.76
11	$209.67	$1,798.02
12	$213.86	$1,833.98
13	$218.14	$1,870.66
14	$222.50	$1,908.07
15	$226.95	$1,946.23
16	$231.49	$1,985.16
17	$236.12	$2,024.86
18	$240.84	$2,065.36
19	$245.66	$2,106.66
20	$250.57	$2,148.80
21	$255.58	$2,191.77
22	$260.69	$2,235.61
23	$265.91	$2,280.32
24	$271.23	$2,325.93
25	$276.65	

IRR, NPV, AROI - HVAC ECRMS

Boiler Upgrade Blower Building		Pipe Insulation Blower Building	
Year	Cash Flow	Year	Cash Flow
0	($15,071.00)	0	($955.00)
1	$172.00	1	$1,475.00
2	$177.16	2	$1,519.25
3	$182.47	3	$1,564.83
4	$187.95	4	$1,611.77
5	$193.59	5	$1,660.13
6	$199.40	6	$1,709.93
7	$205.38	7	$1,761.23
8	$211.54	8	$1,814.06
9	$217.88	9	$1,868.49
10	$224.42	10	$1,924.54
11	$231.15	11	$1,982.28
12	$238.09	12	$2,041.74
13	$245.23	13	$2,103.00
14	$252.59	14	$2,166.09
15	$260.17	15	$2,231.07
16	$267.97	16	$2,298.00
17	$276.01	17	$2,366.94
18	$284.29	18	$2,437.95
19	$292.82	19	$2,511.09
20	$301.60	20	$2,586.42
21	$310.65	21	$2,664.01
22	$319.97	22	$2,743.93
23	$329.57	23	$2,826.25
24	$339.46	24	$2,911.04
25	$349.64		
IRR	-5.38%	IRR	157.45%
NPV	($10,896.24)	NPV	$33,413.93
AROI	-2.86%	AROI	150.28%

IRR, NPV, AROI - PV Solar Energy System

Financial Calculations

Based on inflation of: 3%

O&M inflation: 3%

Molitor Water Pollution Control Facility

Year	Energy Savings	SREC Sales	Cash Flow
0			($15,248,668)
1	$242,443.6	$677,369	$919,813
2	$248,468.4	$673,982	$922,450
3	$254,642.8	$670,612	$925,255
4	$260,970.7	$667,259	$928,230
5	$267,455.8	$663,923	$931,379
6	$274,102.1	$660,603	$934,705
7	$280,913.5	$657,300	$938,214
8	$287,894.2	$654,014	$941,908
9	$295,048.4	$650,744	$945,792
10	$302,380.3	$647,490	$949,870
11	$309,894.5	$644,252	$954,147
12	$317,595.4	$641,031	$958,627
13	$325,487.6	$637,826	$963,314
14	$333,576.0	$634,637	$968,213
15	$341,865.3	$631,464	$973,329
16	$350,360.7	$37,134	$387,495
17	$359,067.1	$36,948	$396,015
18	$367,990.0	$36,764	$404,754
19	$377,134.5	$36,580	$413,714
20	$386,506.3	$36,397	$422,903
21	$396,111.0	$36,215	$432,326
22	$405,954.3	$36,034	$441,988
23	$416,042.3	$35,854	$451,896
24	$426,381.0	$35,674	$462,055
25	$436,976.5	$35,496	$472,472
		IRR	1.8%
		NPV	-$1,674,030
		AROI	2.0%

IRR, NPV, AROI - Wind Energy System
Molitor Water Pollution Control Facility

Financial Calculations

Based on inflation of: 3%

O&M inflation: 3%

Wind Turbine - Minimum Wind Speed

REIP Incentive: $18,198

Year	Energy Savings	REC Sales	Cash Flow
0			($50,291.69)
1	$861	$142	$1,003
2	$882	$141	$1,024
3	$904	$141	$1,045
4	$927	$140	$1,067
5	$950	$139	$1,089
6	$973	$139	$1,112
7	$998	$138	$1,136
8	$1,022	$137	$1,160
9	$1,048	$137	$1,184
10	$1,074	$136	$1,210
11	$1,101	$135	$1,236
12	$1,128	$135	$1,262
13	$1,156	$134	$1,290
14	$1,185	$133	$1,318
15	$1,214	$133	$1,347
16	$1,244	$132	$1,376
17	$1,275	$131	$1,406
18	$1,307	$131	$1,437
19	$1,339	$130	$1,469
20	$1,373	$129	$1,502
21	$1,407	$129	$1,535
22	$1,442	$128	$1,570
23	$1,478	$127	$1,605
24	$1,514	$127	$1,641
25	$1,552	$126	$1,678
		IRR	-2.9%
		NPV	-$28,250
		AROI	-2.0%

Wind Turbine - Maximum Wind Speed

REIP Incentive: $51,661

Year	Energy Savings	REC Sales	Cash Flow
0			($16,828.69)
1	$2,444	$404	$2,848
2	$2,505	$402	$2,907
3	$2,567	$400	$2,967
4	$2,631	$398	$3,029
5	$2,696	$396	$3,092
6	$2,763	$394	$3,157
7	$2,832	$392	$3,224
8	$2,902	$390	$3,292
9	$2,975	$388	$3,362
10	$3,048	$386	$3,434
11	$3,124	$384	$3,508
12	$3,202	$382	$3,584
13	$3,281	$380	$3,661
14	$3,363	$378	$3,741
15	$3,447	$376	$3,823
16	$3,532	$374	$3,907
17	$3,620	$372	$3,992
18	$3,710	$371	$4,081
19	$3,802	$369	$4,171
20	$3,897	$367	$4,264
21	$3,993	$365	$4,359
22	$4,093	$363	$4,456
23	$4,194	$361	$4,556
24	$4,299	$360	$4,658
25	$4,405	$358	$4,763
		IRR	18.6%
		NPV	$45,742
		AROI	12.9%

Wind Turbine - Average Wind Speed

REIP Incentive: $33,978

Year	Energy Savings	REC Sales	Cash Flow
0			($34,511.69)
1	$1,608	$265	$1,873
2	$1,648	$264	$1,912
3	$1,688	$263	$1,951
4	$1,730	$261	$1,992
5	$1,773	$260	$2,034
6	$1,817	$259	$2,076
7	$1,863	$258	$2,120
8	$1,909	$256	$2,165
9	$1,956	$255	$2,211
10	$2,005	$254	$2,259
11	$2,055	$252	$2,307
12	$2,106	$251	$2,357
13	$2,158	$250	$2,408
14	$2,212	$249	$2,461
15	$2,267	$247	$2,514
16	$2,323	$246	$2,569
17	$2,381	$245	$2,626
18	$2,440	$244	$2,684
19	$2,501	$243	$2,743
20	$2,563	$241	$2,804
21	$2,626	$240	$2,867
22	$2,692	$239	$2,931
23	$2,759	$238	$2,996
24	$2,827	$237	$3,064
25	$2,897	$235	$3,133
		IRR	4.5%
		NPV	$6,642
		AROI	1.4%

ECM	Molitor Water Pollution Treatment Plant - Solar PV System
Assumed Inflation (Gas)	
Initial Yearly Savings (Gas)	
Assumed Inflation (Electricity)	3%
Initial Yearly Savings (Electricity)	$242,443.60
Assumed Average Useful Life (Years)	25
Lifetime Savings	**$8,839,315.30**
Year	Annual Savings
1	$242,443.60
2	$249,716.91
3	$257,208.42
4	$264,924.67
5	$272,872.41
6	$281,058.58
7	$289,490.34
8	$298,175.05
9	$307,120.30
10	$316,333.91
11	$325,823.93
12	$335,598.64
13	$345,666.60
14	$356,036.60
15	$366,717.70
16	$377,719.23
17	$389,050.81
18	$400,722.33
19	$412,744.00
20	$425,126.32
21	$437,880.11
22	$451,016.51
23	$464,547.01
24	$478,483.42
25	$492,837.92

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)	$861.00	$2,444.20	$1,607.60
Assumed Average Useful Life (Years)	25	25	25
Lifetime Savings	**$31,391.43**	**$89,113.73**	**$58,611.91**
Year	Annual Savings	Annual Savings	Annual Savings
1	$861.00	$2,444.20	$1,607.60
2	$886.83	$2,517.53	$1,655.83
3	$913.43	$2,593.05	$1,705.50
4	$940.84	$2,670.84	$1,756.67
5	$969.06	$2,750.97	$1,809.37
6	$998.13	$2,833.50	$1,863.65
7	$1,028.08	$2,918.50	$1,919.56
8	$1,058.92	$3,006.06	$1,977.15
9	$1,090.69	$3,096.24	$2,036.46
10	$1,123.41	$3,189.13	$2,097.55
11	$1,157.11	$3,284.80	$2,160.48
12	$1,191.83	$3,383.34	$2,225.29
13	$1,227.58	$3,484.84	$2,292.05
14	$1,264.41	$3,589.39	$2,360.81
15	$1,302.34	$3,697.07	$2,431.64
16	$1,341.41	$3,807.98	$2,504.59
17	$1,381.65	$3,922.22	$2,579.73
18	$1,423.10	$4,039.89	$2,657.12
19	$1,465.79	$4,161.09	$2,736.83
20	$1,509.77	$4,285.92	$2,818.94
21	$1,555.06	$4,414.50	$2,903.50
22	$1,601.71	$4,546.93	$2,990.61
23	$1,649.77	$4,683.34	$3,080.33
24	$1,699.26	$4,823.84	$3,172.74
25	$1,750.24	$4,968.56	$3,267.92

ECM	Administration Building - Interior	Grit Building - Interior	Digester #1 Building - Interior	Digester #2 Building - Interior	Waste Oil Building - Interior	Blower Building - Interior	Sludge Handling Building - Interior	Final Clarifier #1 & #2 Building - Interior	Final Clarifier #3 & #4 Building - Interior
Assumed Inflation (Gas)									
Initial Yearly Savings (Gas)									
Assumed Inflation (Electricity)	3%	3%	3%	3%	3%	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$1,369.40	$0.00	$0.00	$0.00	$50.40	$134.90	$975.40	$16.20	$167.50
Assumed Average Useful Life (Years)	15	15	15	15	15	15	15	15	15
Lifetime Savings	**$25,469.35**	**$0.00**	**$0.00**	**$0.00**	**$937.39**	**$2,508.99**	**$18,141.38**	**$301.30**	**$3,115.32**
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$1,369.40	$0.00	$0.00	$0.00	$50.40	$134.90	$975.40	$16.20	$167.50
2	$1,410.48	$0.00	$0.00	$0.00	$51.91	$138.95	$1,004.66	$16.69	$172.53
3	$1,452.80	$0.00	$0.00	$0.00	$53.47	$143.12	$1,034.80	$17.19	$177.70
4	$1,496.38	$0.00	$0.00	$0.00	$55.07	$147.41	$1,065.85	$17.70	$183.03
5	$1,541.27	$0.00	$0.00	$0.00	$56.73	$151.83	$1,097.82	$18.23	$188.52
6	$1,587.51	$0.00	$0.00	$0.00	$58.43	$156.39	$1,130.76	$18.78	$194.18
7	$1,635.14	$0.00	$0.00	$0.00	$60.18	$161.08	$1,164.68	$19.34	$200.00
8	$1,684.19	$0.00	$0.00	$0.00	$61.99	$165.91	$1,199.62	$19.92	$206.00
9	$1,734.71	$0.00	$0.00	$0.00	$63.85	$170.89	$1,235.61	$20.52	$212.18
10	$1,786.76	$0.00	$0.00	$0.00	$65.76	$176.01	$1,272.68	$21.14	$218.55
11	$1,840.36	$0.00	$0.00	$0.00	$67.73	$181.29	$1,310.86	$21.77	$225.11
12	$1,895.57	$0.00	$0.00	$0.00	$69.77	$186.73	$1,350.18	$22.42	$231.86
13	$1,952.44	$0.00	$0.00	$0.00	$71.86	$192.34	$1,390.69	$23.10	$238.81
14	$2,011.01	$0.00	$0.00	$0.00	$74.01	$198.11	$1,432.41	$23.79	$245.98
15	$2,071.34	$0.00	$0.00	$0.00	$76.23	$204.05	$1,475.38	$24.50	$253.36

ECM	Administration Building - Exterior	Grit Building - Exterior	Digester #1 Building - Exterior	Digester #2 Building - Exterior	Waste Oil Building - Exterior	Blower Building - Exterior	Sludge Handling Building - Exterior	Final Clarifier #1 & #2 Building - Exterior	Final Clarifier #3 & #4 Building - Exterior	Roadway & Process Lighting- Exterior
Assumed Inflation (Gas)										
Initial Yearly Savings (Gas)										
Assumed Inflation (Electricity)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$328.30	$0.00	$0.00	$0.00	$106.10	$0.00	$122.00	$0.00	$61.00	$1,594.80
Assumed Average Useful Life (Years)	15	15	15	15	15	15	15	15	15	15
Lifetime Savings	**$6,106.02**	**$0.00**	**$0.00**	**$0.00**	**$1,973.34**	**$0.00**	**$2,269.07**	**$0.00**	**$1,134.53**	**$29,661.55**
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$328.30	$0.00	$0.00	$0.00	$106.10	$0.00	$122.00	$0.00	$61.00	$1,594.80
2	$338.15	$0.00	$0.00	$0.00	$109.28	$0.00	$125.66	$0.00	$62.83	$1,642.64
3	$348.29	$0.00	$0.00	$0.00	$112.56	$0.00	$129.43	$0.00	$64.71	$1,691.92
4	$358.74	$0.00	$0.00	$0.00	$115.94	$0.00	$133.31	$0.00	$66.66	$1,742.68
5	$369.50	$0.00	$0.00	$0.00	$119.42	$0.00	$137.31	$0.00	$68.66	$1,794.96
6	$380.59	$0.00	$0.00	$0.00	$123.00	$0.00	$141.43	$0.00	$70.72	$1,848.81
7	$392.01	$0.00	$0.00	$0.00	$126.69	$0.00	$145.67	$0.00	$72.84	$1,904.27
8	$403.77	$0.00	$0.00	$0.00	$130.49	$0.00	$150.04	$0.00	$75.02	$1,961.40
9	$415.88	$0.00	$0.00	$0.00	$134.40	$0.00	$154.55	$0.00	$77.27	$2,020.24
10	$428.36	$0.00	$0.00	$0.00	$138.44	$0.00	$159.18	$0.00	$79.59	$2,080.85
11	$441.21	$0.00	$0.00	$0.00	$142.59	$0.00	$163.96	$0.00	$81.98	$2,143.28
12	$454.44	$0.00	$0.00	$0.00	$146.87	$0.00	$168.88	$0.00	$84.44	$2,207.58
13	$468.08	$0.00	$0.00	$0.00	$151.27	$0.00	$173.94	$0.00	$86.97	$2,273.80
14	$482.12	$0.00	$0.00	$0.00	$155.81	$0.00	$179.16	$0.00	$89.58	$2,342.02
15	$496.58	$0.00	$0.00	$0.00	$160.49	$0.00	$184.54	$0.00	$92.27	$2,412.28

ECM	Administration Building - Interior & Exterior	Grit Building - Interior & Exterior	Digester #1 Building - Interior & Exterior	Digester #2 Building - Interior & Exterior	Waste Oil Building - Interior & Exterior	Blower Building - Interior & Exterior	Sludge Handling Building - Interior & Exterior	Final Clarifier #1 & #2 Building - Interior & Exterior	Final Clarifier #3 & #4 Building - Interior & Exterior
Assumed Inflation (Gas)									
Initial Yearly Savings (Gas)									
Assumed Inflation (Electricity)	3%	3%	3%	3%	3%	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$1,697.70	$0.00	$0.00	$0.00	$156.50	$134.90	$1,097.40	$16.20	$228.50
Assumed Average Useful Life (Years)	15	15	15	15	15	15	15	15	15
Lifetime Savings	**$31,575.38**	**$0.00**	**$0.00**	**$0.00**	**$2,910.73**	**$2,508.99**	**$20,410.45**	**$301.30**	**$4,249.85**
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$1,697.70	$0.00	$0.00	$0.00	$156.50	$134.90	$1,097.40	$16.20	$228.50
2	$1,748.63	$0.00	$0.00	$0.00	$161.20	$138.95	$1,130.32	$16.69	$235.36
3	$1,801.09	$0.00	$0.00	$0.00	$166.03	$143.12	$1,164.23	$17.19	$242.42
4	$1,855.12	$0.00	$0.00	$0.00	$171.01	$147.41	$1,199.16	$17.70	$249.69
5	$1,910.78	$0.00	$0.00	$0.00	$176.14	$151.83	$1,235.13	$18.23	$257.18
6	$1,968.10	$0.00	$0.00	$0.00	$181.43	$156.39	$1,272.19	$18.78	$264.89
7	$2,027.14	$0.00	$0.00	$0.00	$186.87	$161.08	$1,310.35	$19.34	$272.84
8	$2,087.96	$0.00	$0.00	$0.00	$192.48	$165.91	$1,349.66	$19.92	$281.03
9	$2,150.60	$0.00	$0.00	$0.00	$198.25	$170.89	$1,390.15	$20.52	$289.46
10	$2,215.11	$0.00	$0.00	$0.00	$204.20	$176.01	$1,431.86	$21.14	$298.14
11	$2,281.57	$0.00	$0.00	$0.00	$210.32	$181.29	$1,474.81	$21.77	$307.08
12	$2,350.01	$0.00	$0.00	$0.00	$216.63	$186.73	$1,519.06	$22.42	$316.30
13	$2,420.51	$0.00	$0.00	$0.00	$223.13	$192.34	$1,564.63	$23.10	$325.79
14	$2,493.13	$0.00	$0.00	$0.00	$229.83	$198.11	$1,611.57	$23.79	$335.56
15	$2,567.92	$0.00	$0.00	$0.00	$236.72	$204.05	$1,659.92	$24.50	$345.63

ECM	Motor Upgrades & VFD Additions - Administration Building	Motor Upgrades & VFD Additions - Blower Building	Motor Upgrades & VFD Additions - Sludge Handling Building	Motor Upgrades & VFD Additions - Final Clarifier #1 & #2 Building	Motor Upgrades & VFD Additions - Final Clarifier #3 & #4 Building	Motor Upgrades & VFD Additions - Outdoor Process	Motor Upgrades & VFD Additions - All Combined Motors
Assumed Inflation (Gas)							
Initial Yearly Savings (Gas)							
Assumed Inflation (Electricity)	3%	3%	3%	3%	3%	3%	3%
Initial Yearly Savings (Electricity)	$223.05	$32.82	$163.23	$2,876.79	$3,950.94	$3,514.50	$10,761.40
Assumed Average Useful Life (Years)	15	15	15	15	15	15	15
Lifetime Savings	**$4,148.49**	**$610.42**	**$3,035.90**	**$53,505.17**	**$73,483.19**	**$65,365.88**	**$200,150.35**
Year	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings	Annual Savings
1	$223.05	$32.82	$163.23	$2,876.79	$3,950.94	$3,514.50	$10,761.40
2	$229.74	$33.80	$168.13	$2,963.09	$4,069.47	$3,619.94	$11,084.24
3	$236.63	$34.82	$173.17	$3,051.99	$4,191.55	$3,728.53	$11,416.77
4	$243.73	$35.86	$178.37	$3,143.55	$4,317.30	$3,840.39	$11,759.27
5	$251.04	$36.94	$183.72	$3,237.85	$4,446.82	$3,955.60	$12,112.05
6	$258.58	$38.05	$189.23	$3,334.99	$4,580.22	$4,074.27	$12,475.41
7	$266.33	$39.19	$194.91	$3,435.04	$4,717.63	$4,196.50	$12,849.67
8	$274.32	$40.36	$200.75	$3,538.09	$4,859.16	$4,322.39	$13,235.16
9	$282.55	$41.58	$206.77	$3,644.23	$5,004.93	$4,452.06	$13,632.22
10	$291.03	$42.82	$212.98	$3,753.56	$5,155.08	$4,585.63	$14,041.19
11	$299.76	$44.11	$219.37	$3,866.17	$5,309.73	$4,723.19	$14,462.42
12	$308.75	$45.43	$225.95	$3,982.15	$5,469.02	$4,864.89	$14,896.29
13	$318.02	$46.79	$232.73	$4,101.61	$5,633.10	$5,010.84	$15,343.18
14	$327.56	$48.20	$239.71	$4,224.66	$5,802.09	$5,161.16	$15,803.48
15	$337.38	$49.64	$246.90	$4,351.40	$5,976.15	$5,316.00	$16,277.58

ECM	Molitor Water Pollution Treatment Plant - Solar PV System
Assumed Inflation (Gas)	
Initial Yearly Savings (Gas)	
Assumed Inflation (Electricity)	3%
Initial Yearly Savings (Electricity)	$242,443.60
Assumed Average Useful Life (Years)	25
Lifetime Savings	**$8,839,315.30**
Year	Annual Savings
1	$242,443.60
2	$249,716.91
3	$257,208.42
4	$264,924.67
5	$272,872.41
6	$281,058.58
7	$289,490.34
8	$298,175.05
9	$307,120.30
10	$316,333.91
11	$325,823.93
12	$335,598.64
13	$345,666.60
14	$356,036.60
15	$366,717.70
16	$377,719.23
17	$389,050.81
18	$400,722.33
19	$412,744.00
20	$425,126.32
21	$437,880.11
22	$451,016.51
23	$464,547.01
24	$478,483.42
25	$492,837.92

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)	$861.00	$2,444.20	$1,607.60
Assumed Average Useful Life (Years)	25	25	25
Lifetime Savings	**$31,391.43**	**$89,113.73**	**$58,611.91**
Year	Annual Savings	Annual Savings	Annual Savings
1	$861.00	$2,444.20	$1,607.60
2	$886.83	$2,517.53	$1,655.83
3	$913.43	$2,593.05	$1,705.50
4	$940.84	$2,670.84	$1,756.67
5	$969.06	$2,750.97	$1,809.37
6	$998.13	$2,833.50	$1,863.65
7	$1,028.08	$2,918.50	$1,919.56
8	$1,058.92	$3,006.06	$1,977.15
9	$1,090.69	$3,096.24	$2,036.46
10	$1,123.41	$3,189.13	$2,097.55
11	$1,157.11	$3,284.80	$2,160.48
12	$1,191.83	$3,383.34	$2,225.29
13	$1,227.58	$3,484.84	$2,292.05
14	$1,264.41	$3,589.39	$2,360.81
15	$1,302.34	$3,697.07	$2,431.64
16	$1,341.41	$3,807.98	$2,504.59
17	$1,381.65	$3,922.22	$2,579.73
18	$1,423.10	$4,039.89	$2,657.12
19	$1,465.79	$4,161.09	$2,736.83
20	$1,509.77	$4,285.92	$2,818.94
21	$1,555.06	$4,414.50	$2,903.50
22	$1,601.71	$4,546.93	$2,990.61
23	$1,649.77	$4,683.34	$3,080.33
24	$1,699.26	$4,823.84	$3,172.74
25	$1,750.24	$4,968.56	$3,267.92

Financial Calculations

Based on inflation of: 3%

Lighting - Interior		Lighting - Interior		Lighting - Interior		Lighting - Interior		Lighting - Interior		Lighting - Interior		Lighting - Interior		Lighting - Interior		Lighting - Interior	
Administration Building		Grit Building		Digester #1 Building		Digester #2 Building		Waste Oil Building		Blower Building		Sludge Handling Building		Final Clarifier #1 & #2 Building		Final Clarifier #3 & #4 Building	
Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**
Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow
0	($14,615.30)	0	$0.00	0	$0.00	0	$0.00	0	($38.80)	0	($1,539.00)	0	($9,378.00)	0	($726.40)	0	($2,976.30)
1	**$1,629.91**	1	**$0.00**	1	**$0.00**	1	**$0.00**	1	**$74.31**	1	**$158.41**	1	**$1,116.22**	1	**$22.32**	1	**$207.30**
2	$1,678.81	2	$0.00	2	$0.00	2	$0.00	2	$76.54	2	$163.16	2	$1,149.71	2	$22.99	2	$213.52
3	$1,729.17	3	$0.00	3	$0.00	3	$0.00	3	$78.84	3	$168.06	3	$1,184.20	3	$23.68	3	$219.92
4	$1,781.05	4	$0.00	4	$0.00	4	$0.00	4	$81.20	4	$173.10	4	$1,219.72	4	$24.39	4	$226.52
5	$1,834.48	5	$0.00	5	$0.00	5	$0.00	5	$83.64	5	$178.29	5	$1,256.32	5	$25.12	5	$233.32
6	$1,889.51	6	$0.00	6	$0.00	6	$0.00	6	$86.15	6	$183.64	6	$1,294.00	6	$25.87	6	$240.32
7	$1,946.20	7	$0.00	7	$0.00	7	$0.00	7	$88.73	7	$189.15	7	$1,332.83	7	$26.65	7	$247.53
8	$2,004.58	8	$0.00	8	$0.00	8	$0.00	8	$91.39	8	$194.82	8	$1,372.81	8	$27.45	8	$254.95
9	$2,064.72	9	$0.00	9	$0.00	9	$0.00	9	$94.13	9	$200.67	9	$1,413.99	9	$28.27	9	$262.60
10	$2,126.66	10	$0.00	10	$0.00	10	$0.00	10	$96.96	10	$206.69	10	$1,456.41	10	$29.12	10	$270.48
11	$2,190.46	11	$0.00	11	$0.00	11	$0.00	11	$99.87	11	$212.89	11	$1,500.11	11	$30.00	11	$278.59
12	$2,256.18	12	$0.00	12	$0.00	12	$0.00	12	$102.86	12	$219.28	12	$1,545.11	12	$30.90	12	$286.95
13	$2,323.86	13	$0.00	13	$0.00	13	$0.00	13	$105.95	13	$225.85	13	$1,591.46	13	$31.82	13	$295.56
14	$2,393.58	14	$0.00	14	$0.00	14	$0.00	14	$109.13	14	$232.63	14	$1,639.21	14	$32.78	14	$304.43
15	$2,465.39	15	$0.00	15	$0.00	15	$0.00	15	$112.40	15	$239.61	15	$1,688.38	15	$33.76	15	$313.56
IRR	9.98%	IRR	#NUM!	IRR	#NUM!	IRR	#NUM!	IRR	194.52%	IRR	8.71%	IRR	11.06%	IRR	-5.96%	IRR	3.18%
NPV	$9,121.25	NPV	$0.00	NPV	$0.00	NPV	$0.00	NPV	$1,043.38	NPV	$767.94	NPV	$6,877.63	NPV	($401.35)	NPV	$42.63
AROI	4.49%	AROI	#DIV/0!	AROI	#DIV/0!	AROI	#DIV/0!	AROI	184.85%	AROI	3.63%	AROI	5.24%	AROI	-3.59%	AROI	0.30%

Lighting - Exterior		Lighting - Exterior		Lighting - Exterior		Lighting - Exterior		Lighting - Exterior		Lighting - Exterior		Lighting - Exterior		Lighting - Exterior		Lighting - Exterior		Lighting - Exterior	
Administration Building		Grit Building		Digester #1 Building		Digester #2 Building		Waste Oil Building		Blower Building		Sludge Handling Building		Final Clarifier #1 & #2 Building		Final Clarifier #3 & #4 Building		Roadway & Process Lighting	
Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**
Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow
0	($116.40)	0	$0.00	0	$0.00	0	$0.00	0	($38.80)	0	$0.00	0	($2,972.80)	0	$0.00	0	($1,486.40)	0	($15,852.70)
1	**$326.71**	1	**$0.00**	1	**$0.00**	1	**$0.00**	1	**$130.01**	1	**$0.00**	1	**$123.46**	1	**$0.00**	1	**$61.73**	1	**$1,609.98**
2	$336.51	2	$0.00	2	$0.00	2	$0.00	2	$133.91	2	$0.00	2	$127.16	2	$0.00	2	$63.58	2	$1,658.28
3	$346.61	3	$0.00	3	$0.00	3	$0.00	3	$137.93	3	$0.00	3	$130.98	3	$0.00	3	$65.49	3	$1,708.03
4	$357.00	4	$0.00	4	$0.00	4	$0.00	4	$142.07	4	$0.00	4	$134.91	4	$0.00	4	$67.45	4	$1,759.27
5	$367.71	5	$0.00	5	$0.00	5	$0.00	5	$146.33	5	$0.00	5	$138.96	5	$0.00	5	$69.48	5	$1,812.05
6	$378.75	6	$0.00	6	$0.00	6	$0.00	6	$150.72	6	$0.00	6	$143.12	6	$0.00	6	$71.56	6	$1,866.41
7	$390.11	7	$0.00	7	$0.00	7	$0.00	7	$155.24	7	$0.00	7	$147.42	7	$0.00	7	$73.71	7	$1,922.40
8	$401.81	8	$0.00	8	$0.00	8	$0.00	8	$159.90	8	$0.00	8	$151.84	8	$0.00	8	$75.92	8	$1,980.07
9	$413.87	9	$0.00	9	$0.00	9	$0.00	9	$164.69	9	$0.00	9	$156.40	9	$0.00	9	$78.20	9	$2,039.47
10	$426.28	10	$0.00	10	$0.00	10	$0.00	10	$169.63	10	$0.00	10	$161.09	10	$0.00	10	$80.54	10	$2,100.66
11	$439.07	11	$0.00	11	$0.00	11	$0.00	11	$174.72	11	$0.00	11	$165.92	11	$0.00	11	$82.96	11	$2,163.68
12	$452.24	12	$0.00	12	$0.00	12	$0.00	12	$179.96	12	$0.00	12	$170.90	12	$0.00	12	$85.45	12	$2,228.59
13	$465.81	13	$0.00	13	$0.00	13	$0.00	13	$185.36	13	$0.00	13	$176.02	13	$0.00	13	$88.01	13	$2,295.45
14	$479.78	14	$0.00	14	$0.00	14	$0.00	14	$190.92	14	$0.00	14	$181.31	14	$0.00	14	$90.65	14	$2,364.31
15	$494.18	15	$0.00	15	$0.00	15	$0.00	15	$196.65	15	$0.00	15	$186.74	15	$0.00	15	$93.37	15	$2,435.24
IRR	283.68%	IRR	#NUM!	IRR	#NUM!	IRR	#NUM!	IRR	338.08%	IRR	#NUM!	IRR	-2.89%	IRR	#NUM!	IRR	-2.89%	IRR	8.51%
NPV	$4,641.51	NPV	$0.00	NPV	$0.00	NPV	$0.00	NPV	$1,854.55	NPV	$0.00	NPV	($1,174.84)	NPV	$0.00	NPV	($587.42)	NPV	$7,593.61
AROI	274.01%	AROI	#DIV/0!	AROI	#DIV/0!	AROI	#DIV/0!	AROI	328.41%	AROI	#DIV/0!	AROI	-2.51%	AROI	#DIV/0!	AROI	-2.51%	AROI	3.49%

Lighting - Interior & Exterior		Lighting - Interior & Exterior		Lighting - Interior & Exterior		Lighting - Interior & Exterior		Lighting - Interior & Exterior		Lighting - Interior & Exterior		Lighting - Interior & Exterior		Lighting - Interior & Exterior		Lighting - Interior & Exterior	
Administration Building		Grit Building		Digester #1 Building		Digester #2 Building		Waste Oil Building		Blower Building		Sludge Handling Building		Final Clarifier #1 & #2 Building		Final Clarifier #3 & #4 Building	
Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**	Life of ECRM (Yrs):	**15**
Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow	Year	Cash Flow
0	($14,731.80)	0	$0.00	0	$0.00	0	$0.00	0	($77.60)	0	($1,539.00)	0	($12,350.70)	0	($726.40)	0	($4,462.70)
1	**$1,956.62**	1	**$0.00**	1	**$0.00**	1	**$0.00**	1	**$204.33**	1	**$158.41**	1	**$1,239.68**	1	**$22.32**	1	**$269.03**
2	$2,015.32	2	$0.00	2	$0.00	2	$0.00	2	$210.46	2	$163.16	2	$1,276.87	2	$22.99	2	$277.10
3	$2,075.78	3	$0.00	3	$0.00	3	$0.00	3	$216.77	3	$168.06	3	$1,315.18	3	$23.68	3	$285.41
4	$2,138.05	4	$0.00	4	$0.00	4	$0.00	4	$223.28	4	$173.10	4	$1,354.63	4	$24.39	4	$293.98
5	$2,202.19	5	$0.00	5	$0.00	5	$0.00	5	$229.98	5	$178.29	5	$1,395.27	5	$25.12	5	$302.80
6	$2,268.26	6	$0.00	6	$0.00	6	$0.00	6	$236.87	6	$183.64	6	$1,437.13	6	$25.87	6	$311.88
7	$2,336.31	7	$0.00	7	$0.00	7	$0.00	7	$243.98	7	$189.15	7	$1,480.24	7	$26.65	7	$321.24
8	$2,406.40	8	$0.00	8	$0.00	8	$0.00	8	$251.30	8	$194.82	8	$1,524.65	8	$27.45	8	$330.87
9	$2,478.59	9	$0.00	9	$0.00	9	$0.00	9	$258.84	9	$200.67	9	$1,570.39	9	$28.27	9	$340.80
10	$2,552.95	10	$0.00	10	$0.00	10	$0.00	10	$266.60	10	$206.69	10	$1,617.50	10	$29.12	10	$351.02
11	$2,629.53	11	$0.00	11	$0.00	11	$0.00	11	$274.60	11	$212.89	11	$1,666.03	11	$30.00	11	$361.55
12	$2,708.42	12	$0.00	12	$0.00	12	$0.00	12	$282.84	12	$219.28	12	$1,716.01	12	$30.90	12	$372.40
13	$2,789.67	13	$0.00	13	$0.00	13	$0.00	13	$291.33	13	$225.85	13	$1,767.49	13	$31.82	13	$383.57
14	$2,873.36	14	$0.00	14	$0.00	14	$0.00	14	$300.07	14	$232.63	14	$1,820.51	14	$32.78	14	$395.08
15	$2,959.56	15	$0.00	15	$0.00	15	$0.00	15	$309.07	15	$239.61	15	$1,875.13	15	$33.76	15	$406.93
IRR	12.95%	IRR	#NUM!	IRR	#NUM!	IRR	#NUM!	IRR	266.31%	IRR	8.71%	IRR	8.32%	IRR	-5.96%	IRR	1.37%
NPV	$13,762.67	NPV	$0.00	NPV	$0.00	NPV	$0.00	NPV	$2,898.08	NPV	$767.94	NPV	$5,702.89	NPV	($401.35)	NPV	($544.79)
AROI	6.61%	AROI	#DIV/0!	AROI	#DIV/0!	AROI	#DIV/0!	AROI	256.65%	AROI	3.63%	AROI	3.37%	AROI	-3.59%	AROI	-0.64%

Motor Upgrades and VFD Additions Administration Building	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	($8,675.31)
1	**$223.05**
2	$229.74
3	$236.63
4	$243.73
5	$251.04
6	$258.58
7	$266.33
8	$274.32
9	$282.55
10	$291.03
11	$299.76
12	$308.75
13	$318.02
14	$327.56
15	$337.38
IRR	-7.65%
NPV	($5,427.01)
AROI	-4.10%

Motor Upgrades and VFD Additions Blower Building	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	($747.50)
1	**$32.82**
2	$33.80
3	$34.82
4	$35.86
5	$36.94
6	$38.05
7	$39.19
8	$40.36
9	$41.58
10	$42.82
11	$44.11
12	$45.43
13	$46.79
14	$48.20
15	$49.64
IRR	-2.29%
NPV	($269.54)
AROI	-2.28%

Motor Upgrades and VFD Additions Sludge Handling Building	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	($13,690.75)
1	**$163.23**
2	$168.13
3	$173.17
4	$178.37
5	$183.72
6	$189.23
7	$194.91
8	$200.75
9	$206.77
10	$212.98
11	$219.37
12	$225.95
13	$232.73
14	$239.71
15	$246.90
IRR	-14.16%
NPV	($11,313.61)
AROI	-5.47%

Motor Upgrades and VFD Additions Final Clarifier #1 & #2 Building	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	($8,585.88)
1	**$2,876.79**
2	$2,963.09
3	$3,051.99
4	$3,143.55
5	$3,237.85
6	$3,334.99
7	$3,435.04
8	$3,538.09
9	$3,644.23
10	$3,753.56
11	$3,866.17
12	$3,982.15
13	$4,101.61
14	$4,224.66
15	$4,351.40
IRR	35.99%
NPV	$33,309.12
AROI	26.84%

Motor Upgrades and VFD Additions Final Clarifier #3 & #4 Building	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	($17,771.56)
1	**$3,950.94**
2	$4,069.47
3	$4,191.55
4	$4,317.30
5	$4,446.82
6	$4,580.22
7	$4,717.63
8	$4,859.16
9	$5,004.93
10	$5,155.08
11	$5,309.73
12	$5,469.02
13	$5,633.10
14	$5,802.09
15	$5,976.15
IRR	23.83%
NPV	$39,766.40
AROI	15.57%

Motor Upgrades and VFD Additions Outdoor Process	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	($12,866.60)
1	**$3,514.50**
2	$3,619.94
3	$3,728.53
4	$3,840.39
5	$3,955.60
6	$4,074.27
7	$4,196.50
8	$4,322.39
9	$4,452.06
10	$4,585.63
11	$4,723.19
12	$4,864.89
13	$5,010.84
14	$5,161.16
15	$5,316.00
IRR	29.43%
NPV	$38,315.44
AROI	20.65%

Motor Upgrades and VFD Additions All Combined Motors	
Life of ECRM (Yrs):	**15**
Year	Cash Flow
0	($63,327.60)
1	**$10,761.40**
2	$11,084.24
3	$11,416.77
4	$11,759.27
5	$12,112.05
6	$12,475.41
7	$12,849.67
8	$13,235.16
9	$13,632.22
10	$14,041.19
11	$14,462.42
12	$14,896.29
13	$15,343.18
14	$15,803.48
15	$16,277.58
IRR	17.69%
NPV	$93,391.82
AROI	10.33%

APPENDIX O

FACILITY DATA FORMS

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 Madison-Chatham Joint Meeting - Digesters (#1)			
Street Address 214 N. Passaic Ave		**County** Morris	
City Chatham		**State** NJ	**Zip** 07928
Facility's Description Gas engines, gas boilers, pumps, motors, gas blowers, lights, heating			
Total Sq Ft 1800	**Year Built** 1950/1970	**Hours/Week Occupied** Intermittent	**Number of Employees**

Building Type (Check only one of the following):

☐	Emergency Services	☐	Garage
☐	Center/Meeting Hall/Library	☐	Offices
☐	Recreation/Entertainment/Parks	☐	Religious
☐	School	☐	School: College
☐	Water Treatment/Pumping	☑	Other: Wastewater Treatment

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: 12/09/08 to 12/09/09

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

ELECTRICITY

Electric Utility Name & Account Number(s)	
JCP&L Acct. #100005606627 AND First Energy Solutions Acct. # 11013155	
Annual kWh Use 2,211,680	**Annual Electricity Cost** $337,581.31
Max Summer kW 183,040	**Max Winter kW** 212,160

NATURAL GAS

Natural Gas Utility Name & Account Number(s)	
PSE&G Acct. #6566938400	
Annual Use in Therms 78,866.40	**Annual Natural Gas Cost** $62,644.46

FUEL OIL

Fuel Oil Utility Name & Account Number(s)	
N/A	
Annual Use in Gallons	**Annual Fuel Oil Cost**

PROPANE

Propane Utility Name & Account Number(s)	
N/A	
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:	
N/A	
Annual Energy Use (indicate units)	**Annual Energy Cost**

STAFF USE ONLY

[redacted]

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 Madison-Chatham Joint Meeting - Bar Screen (#2)			
Street Address 214 N. Passaic Ave		**County** Morris	
City Chatham		**State** NJ	**Zip** 07928
Facility's Description Bar screen motor, lighting, electric heater			
Total Sq Ft 158	**Year Built** 1992	**Hours/Week Occupied** Intermittent	**Number of Employees**

Building Type (Check only one of the following):

☐	Emergency Services	☐	Garage
☐	Center/Meeting Hall/Library	☐	Offices
☐	Recreation/Entertainment/Parks	☐	Religious
☐	School	☐	School: College
☐	Water Treatment/Pumping	☑	Other: Wastewater Treatment

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: 12/09/08 to 12/09/09

ELECTRICITY

Electric Utility Name & Account Number(s)	
Included on Digester Sheet	
Annual kWh Use	Annual Electricity Cost
Max Summer kW	Max Winter kW

NATURAL GAS

Natural Gas Utility Name & Account Number(s)	
Included on Digester sheet	
Annual Use in Therms	Annual Natural Gas Cost

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

[redacted]

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 Madison-Chatham Joint Meeting - Clarifiers (#3)			
Street Address 214 N. Passaic Ave		**County** Morris	
City Chatham		**State** NJ	**Zip** 07928
Facility's Description Motors, lighting, electric heaters			
Total Sq Ft 165	**Year Built** 1950/1970/1992	**Hours/Week Occupied** Intermittent	**Number of Employees**

Building Type (Check only one of the following):

☐	**Emergency Services**	☐	**Garage**
☐	**Center/Meeting Hall/Library**	☐	**Offices**
☐	**Recreation/Entertainment/Parks**	☐	**Religious**
☐	**School**	☐	**School: College**
☐	**Water Treatment/Pumping**	☑	**Other:** Wastewater Treatment

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: 12/09/08 to 12/09/09

ELECTRICITY

Electric Utility Name & Account Number(s)	
Included on Digester Sheet	
Annual kWh Use	**Annual Electricity Cost**
Max Summer kW	**Max Winter kW**

NATURAL GAS

Natural Gas Utility Name & Account Number(s)	
Included on Digester Sheet	
Annual Use in Therms	**Annual Natural Gas Cost**

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

[redacted]

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			
Madison-Chatham Joint Meeting - Administration (#4)			
Street Address: 214 N. Passaic Ave		**County:** Morris	
City: Chatham		**State:** NJ	**Zip:** 07928
Facility's Description: Lighting, gas heat, A/C, pumps, motors, VFDs, Computers, Phone system, lab equipment, sander, drill press, electric heat			
Total Sq Ft: 5,400	**Year Built:** 1950/1970	**Hours/Week Occupied:** Weekends - Intermittent; M-F / 8hrs/day	**Number of Employees:** Varies

Building Type (Check only one of the following):

☐	Emergency Services	☐	Garage
☐	Center/Meeting Hall/Library	☐	Offices
☐	Recreation/Entertainment/Parks	☐	Religious
☐	School	☐	School: College
☐	Water Treatment/Pumping	☑	Other: Wastewater Treatment

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: 12/09/08 to 12/09/09

ELECTRICITY

Electric Utility Name & Account Number(s) Included on Digester Sheet	
Annual kWh Use	**Annual Electricity Cost**
Max Summer kW	**Max Winter kW**

NATURAL GAS

Natural Gas Utility Name & Account Number(s) Included on Digester Sheet	
Annual Use in Therms	**Annual Natural Gas Cost**

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

[redacted]

New Jersey's Clean Energy Program
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 Madison-Chatham Joint Meeting - Site Lighting (#5)			
Street Address 214 N. Passaic Ave		**County** Morris	
City Chatham		**State** NJ	**Zip** 07936
Facility's Description HID & Mercury Vapor Lighting, lighting-bldg, electric heat			
Total Sq Ft 680	**Year Built** 1910 - 1990	**Hours/Week Occupied** Intermittent	**Number of Employees**

Building Type (Check only one of the following):

☐	**Emergency Services**	☐	**Garage**
☐	**Center/Meeting Hall/Library**	☐	**Offices**
☐	**Recreation/Entertainment/Parks**	☐	**Religious**
☐	**School**	☐	**School: College**
☐	**Water Treatment/Pumping**	☑	**Other:** Wastewater Treatment

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: 12/09/08 to 12/09/09

ELECTRICITY

Electric Utility Name & Account Number(s)	
Included on Digester Sheet	
Annual kWh Use	Annual Electricity Cost
Max Summer kW	Max Winter kW

NATURAL GAS

Natural Gas Utility Name & Account Number(s)	
Included on Digester Sheet	
Annual Use in Therms	Annual Natural Gas Cost

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

[redacted]

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 Madison-Chatham Joint Meeting - Blower Bldg (#6)			
Street Address 214 N. Passaic Ave		**County** Morris	
City Chatham		**State** NJ	**Zip** 07928
Facility's Description Electric blowers, VFDs, lighting, gas heat, motors, pumps.			
Total Sq Ft 3,600	**Year Built** 1910	**Hours/Week Occupied** Intermittent	**Number of Employees**

Building Type (Check only one of the following):

☐	**Emergency Services**	☐	**Garage**
☐	**Center/Meeting Hall/Library**	☐	**Offices**
☐	**Recreation/Entertainment/Parks**	☐	**Religious**
☐	**School**	☐	**School: College**
☐	**Water Treatment/Pumping**	☑	**Other:** Wastewater Treatment

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: 12/09/08 to 12/09/09

ELECTRICITY

Electric Utility Name & Account Number(s)	
Included on Digester Sheet	
Annual kWh Use	**Annual Electricity Cost**
Max Summer kW	**Max Winter kW**

NATURAL GAS

Natural Gas Utility Name & Account Number(s)	
Included on Digester Sheet	
Annual Use in Therms	**Annual Natural Gas Cost**

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

[redacted]

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: Madison-Chatham Joint Meeting - Fin. Clarifiers 1&2 (#7)			
Street Address: 214 N. Passaic Ave		County: Morris	
City: Chatham		State: NJ	Zip: 07928
Facility's Description: motors, pumps, lighting, electric heat			
Total Sq Ft: 390	Year Built: 1970	Hours/Week Occupied: Intermittent	Number of Employees

Building Type (Check only one of the following):

☐	Emergency Services	☐	Garage
☐	Center/Meeting Hall/Library	☐	Offices
☐	Recreation/Entertainment/Parks	☐	Religious
☐	School	☐	School: College
☐	Water Treatment/Pumping	☑	Other: Wastewater Treatment

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: 12/09/08 to 12/09/09

ELECTRICITY

Electric Utility Name & Account Number(s)	
Included on Digester Sheet	
Annual kWh Use	Annual Electricity Cost
Max Summer kW	Max Winter kW

NATURAL GAS

Natural Gas Utility Name & Account Number(s)	
Included on Digester Sheet	
Annual Use in Therms	Annual Natural Gas Cost

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

[redacted]

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 Madison-Chatham Joint Meeting-Fin.Clar. 3&4 (#8)			
Street Address 214 N. Passaic Ave		**County** Morris	
City Chatham		**State** NJ	**Zip** 07928
Facility's Description Motors, pumps, heat, lighting			
Total Sq Ft 1,500	**Year Built** 1990	**Hours/Week Occupied** Intermittent	**Number of Employees**

Building Type (Check only one of the following):

☐	**Emergency Services**	☐	**Garage**
☐	**Center/Meeting Hall/Library**	☐	**Offices**
☐	**Recreation/Entertainment/Parks**	☐	**Religious**
☐	**School**	☐	**School: College**
☐	**Water Treatment/Pumping**	☑	**Other:** Wastewater Treatment

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: 12/09/08 to 12/09/09

ELECTRICITY

Electric Utility Name & Account Number(s)	
Included on Digester Sheet	
Annual kWh Use	Annual Electricity Cost
Max Summer kW	Max Winter kW

NATURAL GAS

Natural Gas Utility Name & Account Number(s)	
Included on Digester Sheet	
Annual Use in Therms	Annual Natural Gas Cost

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

[redacted]

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 Madison-Chatham Joint Meeting - Sludge Bldg (#9)			
Street Address 214 N. Passaic Ave		**County** Morris	
City Chatham		**State** NJ	**Zip** 07928
Facility's Description pumps, motors, gas boilers, lighting (CFL & Hg Vapor) Belt Presses, microwave, refrig, electric heat			
Total Sq Ft 11,800	**Year Built** 1990	**Hours/Week Occupied** Intermittent	**Number of Employees**

Building Type (Check only one of the following):

☐	**Emergency Services**	☐	**Garage**
☐	**Center/Meeting Hall/Library**	☐	**Offices**
☐	**Recreation/Entertainment/Parks**	☐	**Religious**
☐	**School**	☐	**School: College**
☐	**Water Treatment/Pumping**	☑	**Other:** Wastewater Treatment

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: 12/09/08 to 12/09/09

New Jersey's Clean Energy Program

ELECTRICITY

Electric Utility Name & Account Number(s)	
Included on Digester Sheet	
Annual kWh Use	**Annual Electricity Cost**
Max Summer kW	**Max Winter kW**

NATURAL GAS

Natural Gas Utility Name & Account Number(s)	
Included on Digester Sheet	
Annual Use in Therms	**Annual Natural Gas Cost**

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

[redacted]