BURLINGTON TOWNSHIP
OXMEAD ROAD WATER PLANT

1106 OXMEAD ROAD
BURLINGTON, NJ 08016

FACILITY ENERGY REPORT

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I. HISTORIC ENERGY CONSUMPTION/COST

The energy usage for the facility has been tabulated and plotted in graph form as depicted within this section. Each energy source has been identified and monthly consumption and cost noted per the information provided by the Owner.

Electric Utility Provider:	Public Service Electric & Gas
Electric Utility Rate Structure:	General Lighting & Power (GLP), Large Power and Lighting (LPLS), Heating Service (HS)
Third Party Supplier:	Hess, Reliant

The electric usage profile represents the actual electrical usage for the facility. The electric utility measures consumption in kilowatt-hours (KWH) and maximum demand in kilowatts (KW). One KWH usage is equivalent to 1000 watts running for one hour. One KW of electric demand is equivalent to 1000 watts running at any given time. The basic usage charges are shown as generation service and delivery charges along with several non-utility generation charges. Rates used in this report reflect the historical data received for the facility.

Table 1
Electricity Billing Data

ELECTRIC USAGE SUMMARY

Utility Provider: PSEG
Rate: GLP, LPLS, HS
Meter No: 728004214, 778014025, 58688673
Account No: 42 002 271 18
Third Party Utility Provider: Hess / Reliant
TPS Meter / Acct No:

MONTH OF USE	CONSUMPTION KWH	DEMAND KW	TOTAL BILL
Sep-12	35,678	225.7	$6,832
Oct-12	41,624	184.1	$4,499
Nov-12	29,522	219.9	$4,825
Dec-12	36,015	226.2	$3,709
Jan-13	34,702	232.5	$4,315
Feb-13	36,783	230.2	$4,625
Mar-13	33,242	225.7	$4,390
Apr-13	30,388	221.7	$4,018
May-13	25,516	230.1	$6,051
Jun-13	24,063	188.8	$6,237
Jul-13	30,092	250.8	$6,224
Aug-13	27,149	227.5	$1,308
Totals	**384,774**	**250.8 Max**	**$57,033**

AVERAGE DEMAND **221.9 KW average**
AVERAGE RATE **$0.148** **$/kWh**

Figure 1
Electricity Usage Profile

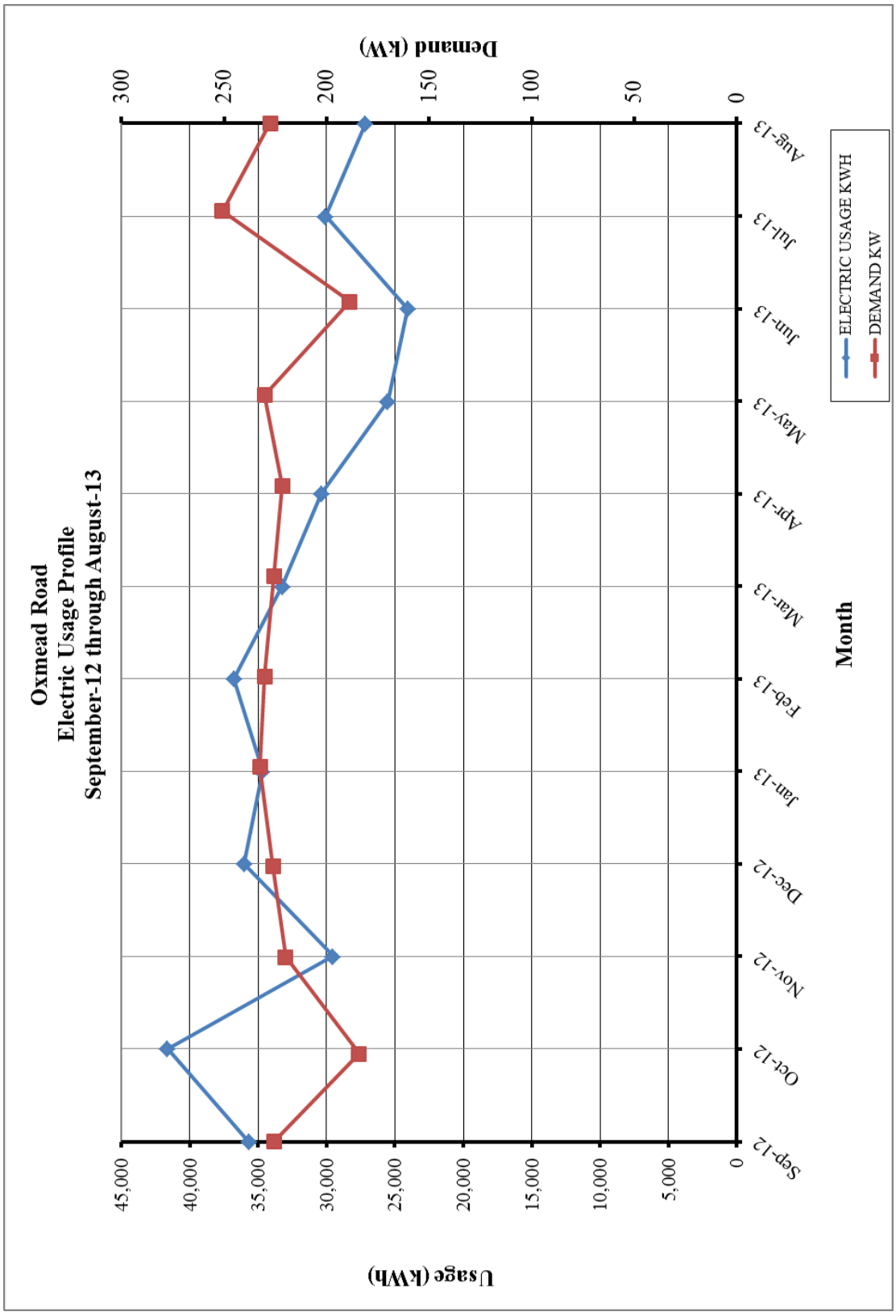
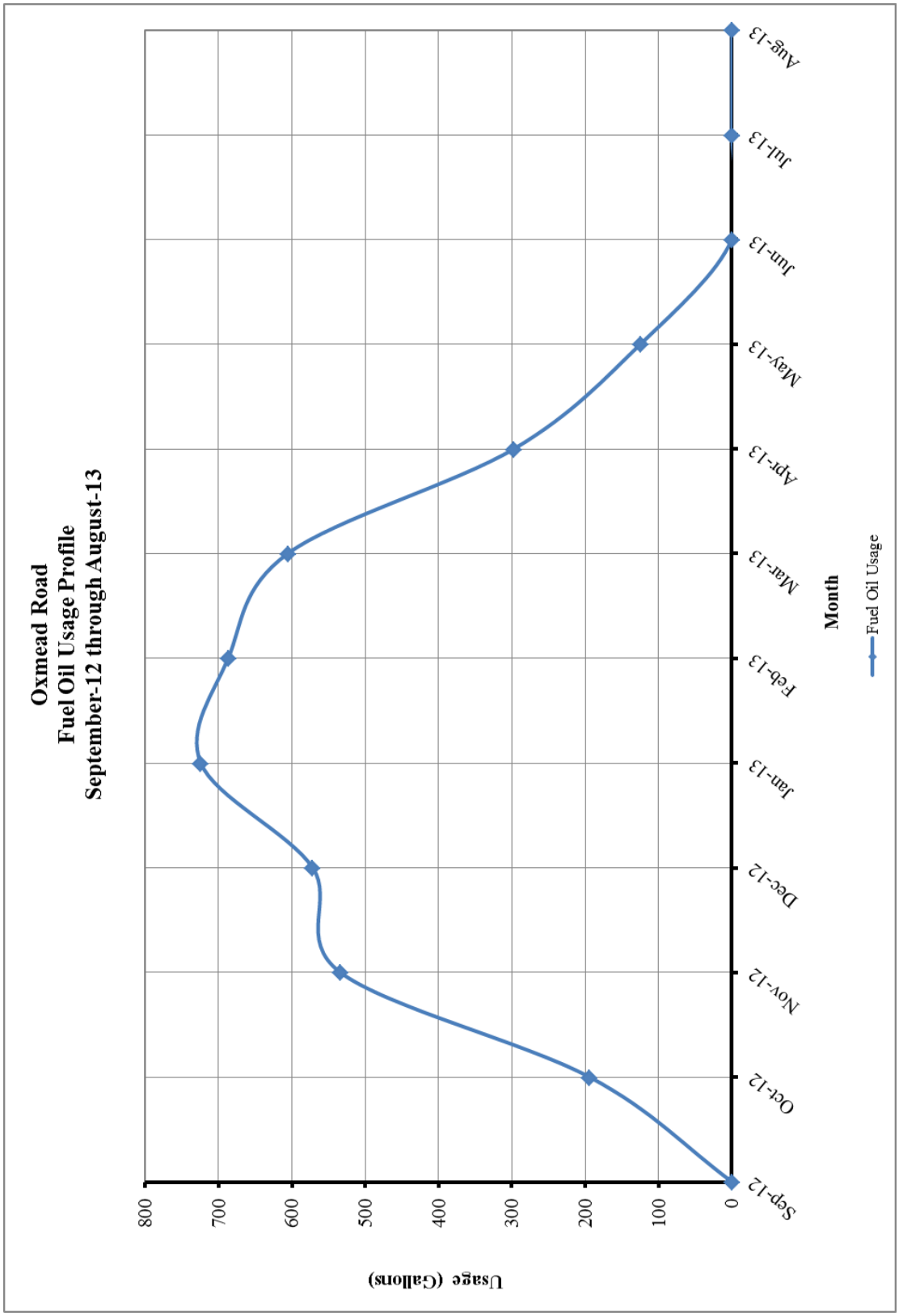


Table 2
Fuel Oil #2 Billing Data

FUEL OIL USAGE SUMMARY		
Utility Provider: Unknown Point of Delivery ID: Unknown Rate: Unknown		
MONTH OF USE	**CONSUMPTION (GALLONS)**	**TOTAL BILL**
Sep-12	0.00	$0.00
Oct-12	194.27	$631.39
Nov-12	534.25	$1,736.32
Dec-12	571.85	$1,858.52
Jan-13	724.61	$2,354.98
Feb-13	687.01	$2,232.77
Mar-13	605.54	$1,968.00
Apr-13	296.89	$964.90
May-13	124.55	$404.80
Jun-13	0.00	$0.00
Jul-13	0.00	$0.00
Aug-13	0.00	$0.00
TOTALS	**3,738.98**	**$12,151.68**
AVERAGE RATE:	**$3.25**	**$/Gallon**

(1) Fuel Oil Cost ($/Gallon) has been estimated based on regional data.
(2) Boiler oil consumption calculated using HDD method.

Figure 2
Fuel Oil #2 Usage Profile



II. FACILITY DESCRIPTION

The 18,200 SF Oxmead Road Water Plant is a single story facility that also includes a public works garage that is mostly used by the water department. The filtration plant serves to filtrate the water from four (4) wells, and pumps the treated water to two large water storage tanks (2 and 1 million gallon capacity) in the township. This single story structure is comprised of a filtration/pump room, chemical treatment room, small operator office, air compressor room, electrical room, locker, restrooms, employee lunch room, storage room, etc. The facility was built in 1974, operates 24 hours per day and does not shut down.

The public works garage (mostly used by the water department) consists of several high bays for equipment repair, storage mezzanine, electrical room, restrooms, and main offices.

Exterior walls are brick construction with minimum insulation typical of the time period. The amount of insulation within the walls is estimated to be 1-inch. The few windows throughout the filtration plant are in good condition and appear to be maintained. Typical windows throughout the facility are double pane, ¼-inch clear glass with vinyl frames. The roof is sloped, wooden A-frame roof and the amount of insulation below the roofing is unknown.

Process Equipment

The majority of the treatment plant is composed of the chemical treatment room and filtration room containing six filter tanks and several smaller circulation pumps along with a Munters dehumidifier to keep moisture from eroding the process equipment. The water leaving this plant is ready for distribution to the Township's potable water supply. The maximum capacity of the plant (with all wells and filters in operation) is 3,000 gallons per minute.

The following table summarizes the characteristics of the water supply wells:

Well No.	No. of Pumps	Motor HP	Premium Eff. Motor	Drive	Hours of Operation
1	1	60	Yes	Constant Speed	2,190/year
2	1	60	No	Constant Speed	2,190/year
3	1	100	No	Constant Speed	2,190/year
4	1	125	No	Constant Speed	2,190/year

HVAC Systems

The treatment plant is heated by electric unit heaters, electric baseboard heat, and there is no air conditioning. The public works high bay garage areas are heated by hot water unit heaters. The hot water is produced by a Weil-McLain oil-fired hot water boiler rated at 348 MBH and burns

3.4 gallons of #2 fuel oil per hour. The main offices are heated by hot water fin-tube radiators at the perimeter walls and cooled by a Rheem split air handling unit. Each of the pump houses has electric unit heaters that together with the heat from the large electric motors keep the water from freezing.

Exhaust System

Air is exhausted from the treatment building and the garages through sidewall and rooftop exhaust fans. The exhaust systems in the treatment building run 24/7.

HVAC System Controls

The HVAC systems within the facility are controlled via local thermostats.

Domestic Hot Water

A Bradford White electric water heater is located in the attic for the water treatment plant and several 3-gallon electric water heaters provide domestic hot water for the Public Works main offices.

Lighting

The lighting in the water treatment plant is primarily made up of fluorescent fixtures with T-8 lamps and electronic ballasts. There is a mixture of incandescent and compact fluorescent lamps in the air compressor room, well pump houses, chemical treatment room, lunch room, etc.

The lighting in the public works garage consists of 8-foot T-12 lamps with magnetic ballasts in the garages and storage mezzanine; incandescent and compact fluorescent lamps; and 2x4, 2x2, and 1x4 T-8 lay-ins in the main office spaces.

Exterior lighting at the various buildings and pump houses consists mostly of wall-mounted High Pressure Sodium (HPS) and Metal Halide (MH) fixtures controlled by photo sensors.

Approximately four (4) wall-mounted exterior fixtures were on during the site visits. The photo sensors need to be replaced so that these lamps are not on during the daylight hours.

Refer to the **Investment Grade Lighting Audit Appendix** for a detailed list of the lighting throughout the facility and estimated operating hours per space.

III. MAJOR EQUIPMENT LIST

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

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

IV. ENERGY CONSERVATION MEASURES

Energy Conservation Measures are developed specifically for this facility. The energy savings and calculations are highly dependent on the information received from the site survey and interviews with operations personnel. The assumptions and calculations should be reviewed by the owner to ensure accurate representation of this facility. The following ECMs were analyzed:

Table 1
ECM Financial Summary

ENERGY CONSERVATION MEASURES (ECM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST[A]**	**ANNUAL SAVINGS[B]**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
ECM #1	Lighting Upgrade - General	$13,120	$632	20.8	-27.7%
ECM #2	Lighting Upgrade - Exterior	$7,400	$2,233	3.3	352.6%
ECM #3	NEMA Premium Motor Replacements	$35,121	$1,455	24.1	-25.4%
ECM #4	VFD's for Well Pumps	$260,000	$12,602	20.6	-27.3%
ECM #5	Oil-Fired Boiler Replacement	$70,000	$2,261	31.0	-3.1%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	25.44 kW PV System	$121,470	$10,413	11.7	28.6%
Notes:	A. Cost takes into consideration applicable NJ Smart StartTM incentives.				
	B. Savings takes into consideration applicable maintenance savings.				

Table 2
ECM Energy Summary

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	OIL (GALLONS)
ECM #1	Lighting Upgrade - General	3.2	4,268	0
ECM #2	Lighting Upgrade - Exterior	3.3	15,087	0
ECM #3	NEMA Premium Motor Replacements	4.5	9,830	0
ECM #4	VFD's for Well Pumps	0.0	85,148	0
ECM #5	Oil-Fired Boiler Replacement	0.0	0	696
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	25.44 kW PV System	25.4	30,709	0

Table 3
ECM Emissions Summary

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	DESCRIPTION	GREENHOUSE GAS EMISSIONS REDUCTION		
		CO_2 EMISSIONS (LBS)	NO_X EMISSIONS (LBS)	SO_2 EMISSIONS (LBS)
ECM #1	Lighting Upgrade - General	6,487	12	28
ECM #2	Lighting Upgrade - Exterior	22,932	42	98
ECM #3	NEMA Premium Motor Replacements	14,942	28	64
ECM #4	VFD's for Well Pumps	129,425	238	553
ECM #5	Oil-Fired Boiler Replacement	8,143	6	0
Notes:	A. Emissions Reduction based on NJCEP published factors for electric & gas.			

Table 4
Facility Project Summary

FACILITY PROJECT SUMMARY TABLE					
ENERGY CONSERVATION MEASURES	**ANNUAL ENERGY SAVINGS ($)**	**PROJECT COST ($)**	**SMART START INCENTIVES**	**CUSTOMER COST**	**SIMPLE PAYBACK**
Lighting Upgrade - General	$632	$13,120	$0	$13,120	20.8
Lighting Upgrade - Exterior	$2,233	$7,940	$540	$7,400	3.3
~~NEMA Premium Motor Replacements~~	~~$1,455~~	~~$35,121~~	~~$0~~	~~$35,121~~	~~24.1~~
~~VFD's for Well Pumps~~	~~$12,602~~	~~$260,000~~	~~$0~~	~~$260,000~~	~~20.6~~
Oil-Fired Boiler Replacement	$2,261	$70,000	$0	$70,000	31.0
Total Project	**$5,126**	**$91,060**	**$540**	**$90,520**	**17.7**

Note the measure totals in this table do not take into account interactive effects of measures; see Method of Analysis Section III in Executive Report for further explanation.

Energy Conservation Measures

ECM #1: Lighting Upgrade – General

Description:

The majority of the interior lighting throughout Oxmead Road Water Plant and Public Works is provided with fluorescent fixtures with older generation, 700 series and 741/ECO 32W T8 lamps and electronic ballasts as well as T12 fixtures with magnetic ballasts. There are also several incandescent and compact fluorescent fixtures throughout the facility.

This ECM replaces all T12 fluorescent fixtures with newer 25 watt super T8 lamps and electronic ballasts. Additionally, the compact fluorescent and incandescent lamps are replaced with new LED lamps.

Energy Savings Calculations:

The **Investment Grade Lighting Audit Appendix** outlines the hours of operation, proposed retrofits, costs, savings, and payback periods for each set of fixtures in the each building.

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$13,120
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$13,120
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$632
Total Yearly Savings ($/Yr):	$632
Estimated ECM Lifetime (Yr):	15
Simple Payback	20.8
Simple Lifetime ROI	-27.7%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$9,480
Internal Rate of Return (IRR)	-4%
Net Present Value (NPV)	($5,575.23)

ECM #2: Lighting Upgrade – Exterior Lighting

Description:

The exterior lighting at Oxmead Water Plant and Public Works is currently lit via 150 watt high pressure sodium wall packs. The exterior would be better served with more efficient LED lighting system. Concord Engineering recommends upgrading the lighting to an energy-efficient LED lighting system that includes LED lamps for the existing 150 watt HPS wall packs on the exterior with LED fixtures.

Energy Savings Calculations:

A detailed Investment Grade Lighting Audit can be found in **Investment Grade Lighting Audit Appendix** that outlines the proposed retrofits, costs, savings, and payback periods.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$7,940
NJ Smart Start Equipment Incentive ($):	$540
Net Installation Cost ($):	$7,400
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,233
Total Yearly Savings ($/Yr):	$2,233
Estimated ECM Lifetime (Yr):	15
Simple Payback	3.3
Simple Lifetime ROI	352.6%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$33,495
Internal Rate of Return (IRR)	30%
Net Present Value (NPV)	$19,257.41

ECM #3: Install NEMA Premium® Efficiency Motors

Description:

The improved efficiency of the NEMA Premium® efficient motors is primarily due to better designs with use of better materials to reduce losses. Surprisingly, the electricity used to power a motor represents 95% of its total lifetime operating cost. Because many motors operate continuously 24 hours a day, even small increases in efficiency can yield substantial energy and dollar savings.

The electric motors driving the air handling units, hot water pumps and condensate return pumps are candidates for replacing with premium efficiency motors. These standard efficiency motors run considerable amount of time over a year.

This energy conservation measure replaces existing inefficient electric motors with NEMA Premium® efficiency motors. NEMA Premium® is the most efficient motor designation in the marketplace today. (Note: There are currently no NJ OCE incentives for premium efficiency motors.)

IMPLEMENTATION SUMMARY				
EQMT ID	**MOTOR HP**	**HOURS OF OPERATION**	**EXISTING EFFICIENCY**	**NEMA PREMIUM EFFICIENCY**
Well 2	60	2,190	91.0%	95.0%
Well 3	100	2,190	92.0%	95.4%

Energy Savings Calculations:
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$$\text{Electric usage, kWh} = \frac{\text{HP} \times \text{LF} \times 0.746 \times \text{Hours of Operation}}{\text{Motor Efficiency}}$$

where, HP = Motor Nameplate Horsepower Rating

LF = Load Factor Motor Efficiency = Motor Nameplate Efficiency

$$\text{Electric Usage Savings, kWh} = \text{Electric Usage}_{\text{Existing}} - \text{Electric Usage}_{\text{Proposed}}$$

$$\text{Electric Usage Savings, kWh} = \text{Electric Usage}_{\text{Existing}} - \text{Electric Usage}_{\text{Proposed}}$$

$$\text{Electric cost savings} = \text{Electric Usage Savings} \times \text{Electric Rate} \left(\frac{\$}{\text{kWh}}\right)$$

The calculations were carried out and the results are tabulated in the table below:

PREMIUM EFFICIENCY MOTOR CALCULATIONS							
EQMT ID	MOTOR HP	LOAD FACTOR	EXISTING EFFICIENCY	NEMA PREMIUM EFFICIENCY	POWER SAVINGS kW	ENERGY SAVINGS kWH	COST SAVINGS
Well 2	60	90%	91.0%	95.0%	1.86	4,104	$607
Well 3	100	90%	92.0%	95.4%	2.60	5,727	$848
TOTAL					**4.5**	**9,830**	**$1,455**

Equipment Cost

The following table outlines the summary of motor replacement costs:

MOTOR REPLACEMENT SUMMARY					
EQMT ID	MOTOR POWER HP	INSTALLED COST	NET COST	TOTAL SAVINGS	SIMPLE PAYBACK
Well 2	60	$14,721	$14,721	$607	24.2
Well 3	100	$20,400	$20,400	$848	24.1
TOTAL	**Totals:**	**$35,121**	**$35,121**	**$1,455**	**24.1**

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$35,121
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$35,121
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,455
Total Yearly Savings ($/Yr):	$1,455
Estimated ECM Lifetime (Yr):	18
Simple Payback	24.1
Simple Lifetime ROI	-25.4%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$26,190
Internal Rate of Return (IRR)	-3%
Net Present Value (NPV)	($15,109.64)

ECM #4: Install VFD's for Well Pumps

Description:

The Oxmead Road Water Plant and public works currently has four well pumps that operate at constant volume. There are two 60, one 100 and one 125 horsepower well pumps to distribute water to the town.

This ECM includes the installation of Variable Frequency Drives on the four existing well pumps. The variable frequency drives on these set of pumps will allow for soft starts for these large motors which will lower the spike demand which large pumps call for when they begin from hard start. Additionally, the overall load on the motors will be reduced due to the VFD's by reducing the amount of hours that the pumps are required to operate at full load.

The installation cost includes invertor duty premium efficiency motor replacement, variable speed controller, rigging, new couplings for the pump/motor shafts, electrical and VFD programming.

Energy Savings Calculations:

$$\text{Pump Power HP} = \frac{\text{Flow}_{\text{GPM}} \times \text{Head}_{\text{ft-hd.}}}{3650 \times \eta_{\text{Pump}} \times \eta_{\text{motor}}}$$

$$\text{Energy Consumption (kWh)} = \text{Motor HP} \times 0.746 \frac{\text{kW}}{\text{HP}} \times \text{Hours of operation (Hr)} \times \frac{1}{\eta_{\text{motor}}}$$

$$\text{Total Energy Consumption (kWh)} = \sum \text{Energy Consumption of Each Motor}$$

$$\text{Energy Cost (\$)} = \text{Total Comsumption(kWh)} \times \text{Average Cost of Electric} \left(\frac{\$}{\text{kWh}}\right)$$

Affinity Laws are used in order to calculate energy savings by calculating the reduced power consumption requirement based a reduction in flow. Affinity laws, are as following:

Q = Flow, n = RPM, p = total pressure

$$\frac{Q_2}{Q_1} = \frac{n_2}{n_1} \qquad \frac{p_2}{p_1} = \left(\frac{n_2}{n_1}\right)^2 \qquad \frac{HP_2}{HP_1} = \left(\frac{n_2}{n_1}\right)^3$$

Well 1 VFD Calculation:

WELL 1 VFD CALULATION			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	CV Pumps	VFD Pumps	
Flow Control	Throttle	VFD	-
Motor Nameplate HP	60.0	60.0	
Pump Efficiency (%)	75.0%	75.0%	-
Motor Efficiency (%)	95.0%	95.0%	0.0%
Operating Hrs	1000	1000	-
Estimated Power (HP)	53.2	53.2	0.00
Elec Cost ($/kWh)	0.148	0.148	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Electric Energy (kWh)	41,747	26,266	15,481
Electric Energy Cost ($)	$6,179	$3,887	$2,291
COMMENTS:			

Well 2 VFD Calculation:

WELL 2 VFD CALULATION			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	CV Pumps	VFD Pumps	
Flow Control	Throttle	VFD	-
Motor Nameplate HP	60.0	60.0	
Pump Efficiency (%)	75.0%	75.0%	-
Motor Efficiency (%)	91.0%	95.0%	4.0%
Operating Hrs	1000	1000	-
Estimated Power (HP)	55.5	53.2	2.34
Elec Cost ($/kWh)	0.148	0.148	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Electric Energy (kWh)	45,498	26,266	19,232
Electric Energy Cost ($)	$6,734	$3,887	$2,846
COMMENTS:			

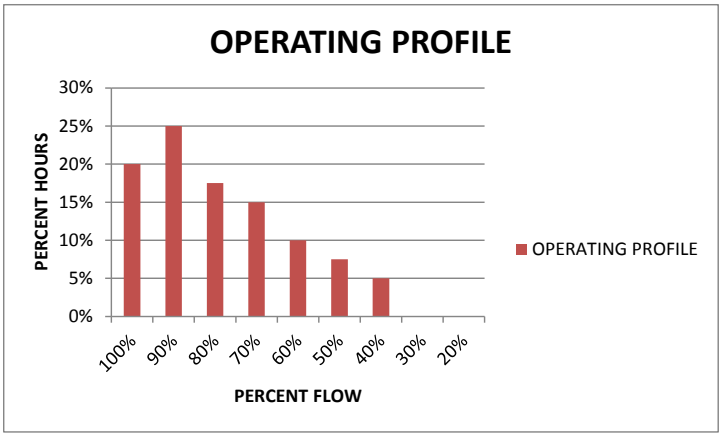
Well 3 VFD Calculation:

WELL 3 VFD CALULATION			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	CV Pumps	VFD Pumps	
Flow Control	Throttle	VFD	-
Motor Nameplate HP	100.0	100.0	
Pump Efficiency (%)	75.0%	75.0%	-
Motor Efficiency (%)	92.4%	95.4%	3.0%
Operating Hrs	1000	1000	-
Estimated Power (HP)	91.1	88.2	2.86
Elec Cost ($/kWh)	0.148	0.148	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Electric Energy (kWh)	73,549	43,593	29,956
Electric Energy Cost ($)	$10,885	$6,452	$4,434
COMMENTS:			

Well 4 VFD Calculation:

WELL 4 VFD CALULATION			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	CV Pumps	VFD Pumps	
Flow Control	Throttle	VFD	-
Motor Nameplate HP	125.0	125.0	
Pump Efficiency (%)	75.0%	75.0%	-
Motor Efficiency (%)	93.0%	93.0%	0.0%
Operating Hrs	600	600	-
Estimated Power (HP)	112.2	112.2	0.00
Elec Cost ($/kWh)	0.148	0.148	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Electric Energy (kWh)	54,017	33,538	20,478
Electric Energy Cost ($)	$7,994	$4,964	$3,031
COMMENTS:			

Estimated Operating Profile with VFD



Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$260,000
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$260,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$12,602
Total Yearly Savings ($/Yr):	$12,602
Estimated ECM Lifetime (Yr):	15
Simple Payback	20.6
Simple Lifetime ROI	-27.3%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$189,029
Internal Rate of Return (IRR)	-4%
Net Present Value (NPV)	($109,559.22)

ECM #5: Oil-Fired Boiler Replacement

Description:

There is one existing oil-fired cast iron sectional boiler which supplies hot water for the Oxmead Road Department of Public Works building. The existing boiler is past its life expectancy of a typical cast iron boiler. Based on the premise that a natural gas line cannot be provided for this facility, this ECM is valuable to the facility. With the increased efficiency of a new boiler, the savings becomes substantial. Even though the boiler would still be using fuel oil, the efficiency upgrade would substantiate cost savings gained by burning less fuel oil overall.

This ECM includes installation of one cast iron oil-fired boiler to replace the one cast iron oil-fired boiler. The basis for this ECM is Buderus Boilers oil boiler Model Number G315. The boiler installation is based on a one-for-one replacement based on capacity of the existing boiler.

Energy Savings Calculations:

$$Bldg\ Heat\ \mathrm{Re}quired = Existing\ Oil\ Use\ (Gal) \times Heating\ Eff.(\%) \times Fuel\ HeatValue\left(\frac{BTU}{Gallon}\right)$$

$$\mathrm{Pr}oposed\ Heating\ Usage = \frac{Bldg\ Heat\ \mathrm{Re}quired\ (BTU)}{Heating\ Eff.(\%) \times Fuel\ Heat\ Value\left(\frac{BTU}{Gal}\right)}$$

$$Energy\ Cost = Heating\ Oil\ Usage(Gallons) \times Ave\ Fuel\ Cost\left(\frac{\$}{Gal}\right)$$

Energy savings calculations are summarized in the table below:

BOILER CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Cast Iron Sectional Boiler	High Efficiency Oil Fired Boiler	
Total Hot Water Oil Usage per Utility Bills (Gallons) (2)	3,739	-	
Boiler Efficiency (%)	70%	86%	16%
Oil Heat Value (BTU/Gallon)	140,000	140,000	
Equivalent Building Heat Usage (MMBTUs)	366	366	
Fuel Oil Cost ($/Gallon) (1)	$3.25	$3.25	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Fuel Oil Usage (Gallons)	3,739	3,043	696
Energy Cost ($)	$12,152	$9,891	$2,261
COMMENTS:	(1) Fuel Oil Cost ($/Gallon) has been estimated based on regional data. (2) Boiler oil consumption calculated using HDD method.		

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$70,000
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$70,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,261
Total Yearly Savings ($/Yr):	$2,261
Estimated ECM Lifetime (Yr):	30
Simple Payback	31.0
Simple Lifetime ROI	-3.1%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$67,830
Internal Rate of Return (IRR)	0%
Net Present Value (NPV)	($25,683.40)

REM #1: 25.44 kW Solar System

Description:

The Oxmead Water Plant has available roof space that could accommodate a significant amount of solar generation. Based on the available areas a 25.44 kilowatt solar array could be installed. The array will produce approximately 30,709 kilowatt-hours annually that will reduce the overall electric usage of the facility by 7.98%.

Energy Savings Calculations:

See **Renewable / Distributed Energy Measures Calculations Appendix** for detailed financial summary and proposed solar layout areas. Financial results in table below are based on 100% financing of the system over a fifteen year period.

Energy Savings Summary:

REM #1 - ENERGY SAVINGS SUMMARY	
System Size (KW_{DC}):	25.44
Electric Generation (KWH/Yr):	30,709
Installation Cost ($):	$121,470
SREC Revenue ($/Yr):	$5,868
Energy Savings ($/Yr):	$4,545
Total Yearly Savings ($/Yr):	$10,413
ECM Analysis Period (Yr):	15
Simple Payback (Yrs):	11.7
Analysis Period Electric Savings ($):	$84,531
Analysis Period SREC Revenue ($):	$85,005
Net Present Value (NPV)	($12,300.69)

V. ADDITIONAL RECOMMENDATIONS

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

A. Chemically clean the condenser and evaporator coils periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.

B. Maintain all weather stripping on windows and doors.

C. Clean all light fixtures to maximize light output.

D. Turn off computers when not in use. Ensure computers are not running in screen saver mode.

E. Ensure outside air dampers are functioning properly and only open during occupied mode.

APPENDIX A

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Burlington Township - Oxmead Road Water Plant

ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY														
ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Svaing * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM #1	Lighting Upgrade - General	$5,920	$7,200	$0	$13,120	$632	$0	$632	15	$9,480	$0	-27.7%	20.8	-3.81%	($5,575.23)
ECM #2	Lighting Upgrade - Exterior	$4,720	$3,220	$540	$7,400	$2,233	$0	$2,233	15	$33,495	$0	352.6%	3.3	29.56%	$19,257.41
ECM #3	NEMA Premium Motor Replacements	$16,881	$18,240	$0	$35,121	$1,455	$0	$1,455	18	$26,190	$0	-25.4%	24.1	-2.92%	($15,109.64)
ECM #4	VFD's for Well Pumps	$110,000	$150,000	$0	$260,000	$12,602	$0	$12,602	15	$189,029	$0	-27.3%	20.6	-3.74%	($109,559.22)
ECM #5	Oil-Fired Boiler Replacement	$25,000	$45,000	$0	$70,000	$2,261	$0	$2,261	30	$67,830	$0	-3.1%	31.0	-0.20%	($25,683.40)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	25.44 kW PV System	$121,470	$0	$0	$121,470	$4,545	$5,868	$10,413	15	$156,194	$88,020	28.6%	11.7	3.32%	$2,838.69

Notes:

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

APPENDIX B

Concord Engineering Group, Inc.

520 BURNT MILL ROAD
VOORHEES, NEW JERSEY 08043
PHONE: (856) 427-0200
FAX: (856) 427-6508

SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives from July 1, 2013 to June 30, 2014:

Electric Chillers

Water-Cooled Chillers	$16 - $170 per ton
Air-Cooled Chillers	$8 - $52 per ton

Energy Efficiency must comply with ASHRAE 90.1-2007

Gas Cooling

Gas Absorption Chillers	$185 - $450 per ton
Gas Engine-Driven Chillers	Calculated through custom measure path)

Desiccant Systems

$1.00 per cfm – gas or electric

Electric Unitary HVAC

Unitary AC and Split Systems	$73 - $92 per ton
Air-to-Air Heat Pumps	$73 - $92 per ton
Water-Source Heat Pumps	$81 per ton
Packaged Terminal AC & HP	$65 per ton
Central DX AC Systems	$40- $72 per ton
Dual Enthalpy Economizer Controls	$250
Occupancy Controlled Thermostat (Hospitality & Institutional Facility)	$75 per thermostat
A/C Economizing Controls	≤ 5 tons $85/unit; >5 tons $170/unit

Energy Efficiency must comply with ASHRAE 90.1-2007

Gas Heating

Gas Fired Boilers < 300 MBH	$2.00 per MBH, but not less than $300 per unit
Gas Fired Boilers ≥ 300 - 1500 MBH	$1.75 per MBH
Gas Fired Boilers ≥1500 - ≤ 4000 MBH	$1.00 per MBH
Gas Fired Boilers > 4000 MBH	(Calculated through Custom Measure Path)
Gas Furnaces	$400 per unit, AFUE ≥ 95%
Boiler Economizing Controls	$1,200 - $2,700
Low Intensity Infrared Heating	$300 - $500 per unit

Ground Source Heat Pumps

Closed Loop	$450 per ton, EER ≥ 16 $600 per ton, EER ≥ 18 $750 per ton, EER ≥ 20

Energy Efficiency must comply with ASHRAE 90.1-2007

Variable Frequency Drives

Variable Air Volume	$65 - $155 per hp
Chilled-Water Pumps ≥ 20 hp	$60 per VFD rated hp
Rotary Screw Air Compressors ≥ 25 hp	$5,250 to $12,500 per drive
Cooling Towers ≥ 10 hp	$60 per VFD rated hp
Boiler Fans ≥ 5 HP	$65 to $155 per hp
Boiler Feed Water Pumps ≥ 5 HP	$60 to $155 per hp
Commercial Kitchen Hood up to 50 HP	Retrofit $55 – $300 per hp New Hood $55 - $250 per hp

Natural Gas Water Heating

Gas Water Heaters ≤ 50 gallons, 0.67 energy factor or better	$50 per unit
Gas-Fired Water Heaters > 50 gallons	$1.00 - $2.00 per MBH
Gas-Fired Booster Water Heaters	$17 - $35 per MBH
Gas Fired Tankless Water Heaters	$300 per unit

Prescriptive Lighting

T-8 reduced Wattage (28w/25w 4', 1-4 lamps) Lamp & ballast replacement	$10 per fixture
For retrofit of T-8 fixtures by permanent de-lamping & new reflectors (Electronic ballast replacement required)	$15 per fixture
T-5 and T-8 High Bay Fixtures	$16 - $200 per fixture
Metal Halide w/Pulse Start Including Parking Lot (For fixtures ≥ 150w)	$25 per fixture
HID ≥ 100w Replace with new induction fixture. (must be 30% less watts/fixture than HID system)	$70 per fixture
HID ≥ 100w Retrofit with induction lamp, power coupler and generator (must be 30% less watts/fixture than HID system)	$50 per fixture

Prescriptive Lighting - LED

LED Display Case Lighting	$30 per display case
LED Shelf-Mtd. Display & Task Lights	$15 per linear foot
LED Portable Desk Lamp	$20 per fixture
LED Wall-wash Lights	$30 per fixture
LED Recessed Down Lights	$35 per fixture
LED Outdoor Pole/Arm-Mounted Area and Roadway Luminaries	$175 per fixture
LED Outdoor Pole/Arm-Mounted Decorative Luminaries	$175 per fixture
LED Outdoor Wall-Mounted Area Luminaries	$100 per fixture
LED Parking Garage Luminaries	$100 per fixture
LED Track or Mono-Point Directional Lighting Fixtures	$50 per fixture
LED High-Bay and Low-Bay Fixtures for Commercial & Industrial Bldgs.	$150 per fixture
LED High-Bay-Aisle Lighting	$150 per fixture
LED Stairwell and Passageway Luminaires	$40 per fixture
LED Bollard Fixtures	$50 per fixture
Luminaires for Ambient Lighting of Interior Commercial Spaces (1x4, 2x2, 2x4)	$50 per fixture
LED Fuel Pump Canopy	$100 per fixture
LED Screw-based & Pin-based (PAR, MR, BR, R) Standards (A-Style) and Decorative Lamps	$10 per lamp for R/PAR20,MR/PAR16,Globe,Candelabra or Misc $20 per lamp for R/BR/PAR 30, R/BR/PAR 38-40, A-Lamp
LED Refrigerator/Freezer case lighting replacement of fluorescent in medium and low temperature display case	$30 per 4 foot $42 per 5 foot $65 per 6 foot
LED Retrofit Kits	To be evaluated through the customer measure path

Lighting Controls – Occupancy Sensors

Wall Mounted (Existing Facilities Only)	$20 per control
Remote Mounted (Existing Facilities Only)	$35 per control
Daylight Dimming Controls	$45 per fixture controlled
Occupancy Based hi-low Dimming Control	$35 per fixture controlled
Occupancy Sensor Remote Mounted	$35 per control

Refrigeration Doors/Covers

Energy-Efficient Doors/Covers for Installation on Open Refrigerated Cases	$100 per door
Aluminum Night Curtains for Installation on Open Refrigerated Cases	$3.50 per linear foot

Refrigeration Controls

Door Heater Controls	$50 per control
Electric Defrost Controls	$50 per control
Evaporator Fan Controls	$75 per control
Novelty Cooler Shutoff	$50 per control

Other Equipment Incentives

Performance Lighting	$1.00 per watt per SF below program incentive threshold, currently 5% more energy efficient than ASHRAE 90.1-2007 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive
Custom Measures	$0.16 KWh and $1.60/Therm of 1st year savings, or a buy down to a 1 year payback on estimated savings. Minimum required savings of 75,000 KWh or 1,500 Therms and an IRR of at least 10%.

APPENDIX C

ENERGY STAR® Statement of Energy Performance

N/A

ENERGY STAR® Score[1]

Oxmead Road Water Plant

Primary Property Function: Drinking Water Treatment & Distribution
Gross Floor Area (ft²): 18,200
Built: 1974

For Year Ending: August 31, 2013
Date Generated: December 23, 2013

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Oxmead Road Water Plant 1106 Oxmead Road Burlington Township, New Jersey 08016	Burlington Township 851 Old York Road P.O. Box 340 Burlington Township, NJ 08016 (____)____-_____	Jeffrey Taylor 851 Old York Road P.O. Box 340 Burlington Township, NJ 08016 6092395836 jtaylor@twp.burlington.nj.us

Property ID: 3690115

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
99 kBtu/ft²

Source EUI
250.5 kBtu/ft²

Annual Energy by Fuel	
Fuel Oil (No. 2) (kBtu)	515,978 (29%)
Electric - Grid (kBtu)	1,286,027 (71%)

National Median Comparison	
National Median Site EUI ()	N/A
National Median Source EUI ()	N/A
% Diff from National Median Source EUI	N/A%
Annual Emissions	
Greenhouse Gas Emissions (MtCO2e/year)	163

Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____Date: _____

Licensed Professional

Michael Fischette
520 South Burnt Mill Road
Voorhees, NJ 08043
856-427-0200
mfischette@concord-engineering.com

Professional Engineer Stamp (if applicable)

APPENDIX D

MAJOR EQUIPMENT LIST

Concord Engineering Group

Oxmead Road Water Plant

AHUs

Tag	AHU-1		
Unit Type	Split DX		
Qty	1		
Location	In Mechanical Closet		
Area Served	Offices		
Manufacturer	Rheem		
Model #	RHLA-HM4821AA		
Serial #	-		
Cooling Type	DX Coil		
Cooling Capacity (Tons)	4 Tons		
Cooling Efficiency (EER)	N/A		
Heating Type	N/A		
Heating Input (MBH)	N/A		
Volts / Phase / Hz	115V Single Phase		
Indoor Unit Fan (HP)	1/6		
Approx Age	4		
ASHRAE Service Life	20		
Remaining Life	16		
Comments			

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Oxmead Road Water Plant

Condensing Units

Tag	CU-1	
Unit Type	Split DX	
Qty	1	
Location	Outdoor on Pad	
Area Served	Offices	
Manufacturer	Rheem	
Model #	13AJA42A01	
Serial #	7656N350906839	
Refrigerant	R22	
Cooling Capacity (Tons)	3.5 Tons	
Cooling Efficiency	SEER=13	
Volts / Phase / Hz	115V Single Phase	
Outdoor Unit Fan Capacity	1/4	
Chilled Water GPM / ΔT	N/A	
Condenser Water GPM / ΔT	N/A	
Approx Age	4	
ASHRAE Service Life	20	
Remaining Life	16	
Comments		

Note:
"N/A" = Not Applicable. "-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Oxmead Road Water Plant

Domestic Water Heaters

Tag	DHW-1	
Unit Type	Electric Hot Water Heater	
Qty	1	
Location	Closet	
Area Served	Offices	
Manufacturer	Bradford White	
Model #		
Serial #	PE141224	
Size (Gallons)	0	
Input Capacity	1500 Watts	
Fuel	Electric Hot Water Heater	
Approx Age	8	
ASHRAE Service Life	12	
Remaining Life	4	
Comments		

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Oxmead Road Water Plant

Motors

Tag	Well #1	Well #2	Well #3
Unit Type	High Trust, P-Base Vertical Holloshaft Pump Motors	High Trust, P-Base Vertical Holloshaft Pump Motors	High Trust, P-Base Vertical Holloshaft Pump Motors
Qty	1	1	1
Location	Outdoors Near Pump House 1	Pump House 2	Pump House 3
Motor Manufacturer	US Motors	U S Electric Motors	U S Electric Motors
Model #	DT95	9308218 - E	C2943-02
Pump Manufacturer	Worthington	Worthington	Worthington
Horse Power	60	60	100
Motor Frame	364 TP	364 TP	404TPA
Flow	500 GPM	518 GPM	1000 GPM
Electrical Power	460V / 3 Phase	460V / 3 Phase	460V / 3 Phase
RPM	1785	1770	1775
Motor Efficiency %	95.0%	91.0%	92.0%
Approx Age	2	4	5
ASHRAE Service Life	20	20	20
Remaining Life	18	16	15
Comments	Premium Eff. and Invertor Duty		

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

Motors

Tag	Well #4	Sodium Hypo Pump	Brine Pump
Unit Type	High Trust, P-Base Vertical Holloshaft Pump Motors	Metering Pump	In-line Centrufigal
Qty	1	1	1
Location	Pump House 4	Chemical Treatment	Chemical Treatment
Motor Manufacturer	U S Electric Motors	IDEX	Emerson
Model #	B411	LPX5MA	BV22A
Pump Manufacturer	Worthington	N/A	N/A
Horse Power	125	0.8 Amps	1
Motor Frame	405 TP WP1	N/A	56J
Flow	1000 GPM	60 GPD	N/A
Electrical Power	460V / 3 Phase	115V / 1 Phase	208-230/460V /3 Phase
RPM	1780	1725	3450
Motor Efficiency %	93.0%	N/A	N/A
Approx Age	3	10	10
ASHRAE Service Life	20	20	20
Remaining Life	17	10	10
Comments	Premium Efficiency		

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

Motors

Tag	Brine Pump	CaOh	CaOH Mixer
Unit Type	In-line Centrufigal	Metering Pump	Agitator Motor
Qty	1	1	1
Location	Chemical Treatment	Chemical Treatment	Chemical Treatment
Motor Manufacturer	Emerson	Milton Roy	Dayton
Model #	P63FZL-4409	A79C8261N	6XJ08
Pump Manufacturer	N/A	Milton Roy	N/A
Horse Power	1	½	¼
Motor Frame	56J	ED56C	FR 48
Flow	N/A	57 GPH	N/A
Electrical Power	208-230/460V /3 Phase	208/230 V	208/230 V
RPM	3450	1725	1725
Motor Efficiency %	N/A	N/A	N/A
Approx Age	10	10	10
ASHRAE Service Life	20	20	20
Remaining Life	10	10	10
Comments			

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

Motors

Tag	CaOH Pump	CaOH Pump	
Unit Type	In-line Centrufigal	In-line Centrufigal	Vertical Centrifugal
Qty	1	1	1
Location	Chemical Treatment	Chemical Treatment	Chemical Treatment
Motor Manufacturer	MagneTek	Baldor	Reliance
Model #	B-142762-02	N/A	P56H1337
Pump Manufacturer	N/A	N/A	N/A
Horse Power	¼	¼	¾
Motor Frame	M48	FR 48	EC56C
Flow	N/A	N/A	N/A
Electrical Power	208/230 V	208/230 V	208/230V
RPM	1725	1725	1725
Motor Efficiency %	N/A	N/A	N/A
Approx Age	10	10	10
ASHRAE Service Life	20	20	20
Remaining Life	10	10	10
Comments			

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

Motors

Tag	Air Compressors	Munters Dehumidifier	Munters Dehumidifier
Unit Type	Mounted on Air Compressor Tanks	Fan Motor	Desssiccant Wheel Motor
Qty	2	1	1
Location	Air Compressor Room	Filter Tank Room	Filter Tank Room
Motor Manufacturer	Baldor	Munters	Munters
Model #	M3218T	FZ68478	HCD 600 EA-SF
Pump Manufacturer	Champion Air Compressors	N/A	N/A
Horse Power	5	2	1
Motor Frame	184T	145T	N/A
Flow	N/A	N/A	N/A
Electrical Power	208-230/460V /3 Phase	208-230/460V /3 Phase	208-230/460V /3 Phase
RPM	1750	3480	N/A
Motor Efficiency %	87.5%	84.0%	N/A
Approx Age	11	11	11
ASHRAE Service Life	20	20	20
Remaining Life	9	9	9
Comments			

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Oxmead Road Water Plant

Boilers

Tag	**B-1**	
Unit Type	Oil-Fired Modular Boiler	
Qty	1	
Location	Storage Mezz in Public Works Garage	
Area Served	Public Works Garage	
Manufacturer	Weil- McLain	
Series #	Series 78	
Model #	478	
Input Capacity	3.4 gallons/hour	
Output Capacity	400 MBH	
Approx. Efficiency %	70%	
Fuel	#2 Fuel Oil	
Approx Age	32	
ASHRAE Service Life	30	
Remaining Life	(2)	
Comments	Oil Leaks at Burner and Piping	

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

APPENDIX E

CEG Project #: 1C13166
Facility Name: Oxmead Road Water Plant
Address: 1106 Oxmead Road
City, State, Zip Burlington Twp, NJ 08016

			EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT						RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS						LIGHTING RETROFIT COSTS					LIGHTING CONTROLS COST				
Fixture Reference #	Location	Average Burn Hours	Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, $	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $	Material	Total Labor	Total All	Rebate Estimate	Simple Payback	Total Materials	Total Labor	Total All	Smart Start Incentive	Simple Payback
24	Chemical Treatment Room	400	26w CFL	1	26	6	0.16	62	Re-Lamp	8-Watt LED	1	8	6	0.05	19	0.11	43	$6	0	No New Controls	0	0.0%	0	$0	$360.00	$480.00	$840.00	$0.00	131.38	$0.00	$0.00	$0.00	FALSE	-
25	Air Compressor Room	400	60 Watt Incandescent	1	60	4	0.24	96	Re-Lamp	12-Watt LED	1	12	4	0.05	19	0.19	77	$11	0	No New Controls	0	0.0%	0	$0	$240.00	$320.00	$560.00	$0.00	49.27	$0.00	$0.00	$0.00	FALSE	-
24	Filter Tank Room	400	26w CFL	1	26	14	0.36	146	Re-Lamp	8-Watt LED	1	8	14	0.11	45	0.25	101	$15	0	No New Controls	0	0.0%	0	$0	$840.00	$1,120.00	$1,960.00	$0.00	131.38	$0.00	$0.00	$0.00	FALSE	-
24	Break Room	4300	26w CFL	1	26	4	0.10	447	Re-Lamp	8-Watt LED	1	8	4	0.03	138	0.07	310	$46	0	No New Controls	0	0.0%	0	$0	$240.00	$320.00	$560.00	$0.00	12.22	$0.00	$0.00	$0.00	FALSE	-
26	Lab	4300	2x2, 2-Lamp, 20w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	2	41.6	8	0.33	1,431	Re-Ballast & Re-Lamp	17w T8, Electronic Ballast	2	33	8	0.26	1,135	0.07	296	$44	0	No New Controls	0	0.0%	0	$0	$400.00	$640.00	$1,040.00	$0.00	23.75	$0.00	$0.00	$0.00	FALSE	-
27	Storage Room	400	1x4, 1 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	1	33.2	2	0.07	27	Existing to Remain	Existing to Remain	1	33.2	0	0.07	27	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-
28	Restroom	400	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	106.7	2	0.21	85	Existing to Remain	Existing to Remain	4	106.7	0	0.21	85	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-
29	Spervisor's Office	400	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	6	0.37	149	Existing to Remain	Existing to Remain	2	62	0	0.37	149	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-
29	Electrical Room	400	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	4	0.25	99	Existing to Remain	Existing to Remain	2	62	0	0.25	99	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-
30	Public Works Garage	1200	1x8, 2 Lamp, 75w T12, Mag. Ballast, Pendant Mnt., No Lens	2	141.5	32	4.53	5,434	Retrofit	(2) 8' Lamps to (4) 4' Lamps; 4 Lamp, 25w Super T8, Elect. Ballast; retrofit	4	79	32	2.53	3,034	2.00	2,400	$355	0	No New Controls	0	0.0%	0	$0	$2,560.00	$2,560.00	$5,120.00	$0.00	14.41	$0.00	$0.00	$0.00	FALSE	-
30	Garage Mezz.	1200	1x8, 2 Lamp, 75w T12, Mag. Ballast, Pendant Mnt., No Lens	2	141.5	6	0.85	1,019	Retrofit	(2) 8' Lamps to (4) 4' Lamps; 4 Lamp, 25w Super T8, Elect. Ballast; retrofit	4	79	6	0.47	569	0.38	450	$67	0	No New Controls	0	0.0%	0	$0	$480.00	$480.00	$960.00	$0.00	14.41	$0.00	$0.00	$0.00	FALSE	-
29	Public Works Offices	4300	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	8	0.50	2,133	Existing to Remain	Existing to Remain	2	62	0	0.50	2,133	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-
26	Main Offices	4300	2x2, 2-Lamp, 20w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	2	41.6	16	0.67	2,862	Re-Ballast & Re-Lamp	17w T8, Electronic Ballast	2	33	16	0.53	2,270	0.14	592	$88	0	No New Controls	0	0.0%	0	$0	$800.00	$1,280.00	$2,080.00	$0.00	23.75	$0.00	$0.00	$0.00	FALSE	-
29	Main Offices	4300	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	8	0.50	2,133	Existing to Remain	Existing to Remain	2	62	0	0.50	2,133	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-
29	Corridors	4300	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	6	0.37	1,600	Existing to Remain	Existing to Remain	2	62	0	0.37	1,600	0.00	0	$0	0	No New Controls	0	0.0%	0	$0	$0.00	$0.00	$0.00	$0.00	-	$0.00	$0.00	$0.00	FALSE	-
31	Exterior Bldg. Lights	4300	150 Watt HPS Wallpack w/Photo Sensor	1	188	18	3.38	14,551	Replace Fixture	RAB #WPLED13 13w LED Wall Pack	1	13	18	0.23	1,006	3.15	13,545	$2,005	0	No New Controls	0	0.0%	0	$0	$6,300.00	$4,500.00	$10,800.00	$540.00	5.12	$0.00	$0.00	$0.00	FALSE	-
32	Exterior Doors	8760	Flourescent Exit Sign	2	18	11	0.20	1,734	Replace	LED Exit Sign	1	2	11	0.02	193	0.18	1,542	$228	0	No New Controls	0	0.0%	0	$0	$220.00	$880.00	$1,100.00	$0.00	4.82	$0.00	$0.00	$0.00	FALSE	-
	TOTAL					**155**	**13**	**34,008**					**119**	**7**	**14,653**	**7**	**19,355**	**$2,864**			**0**		**0**	**$0**	**$12,440**	**$12,580**	**$25,020**	**$540**		**$0**	**$0**	**$0**	**$0.00**	-

APPENDIX F

Location Description	Area (Sq FT)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW_{DC}	Total Annual kWh	Total KW_{AC}	Panel Weight (41.9 lbs)	W/SQFT
Oxmead Road Water Plant	2335	SHARP ND-240QCJ	106	17.5	1,859	25.44	30,709	20.6	4,441	13.68

= Proposed PV Roof Layout
=Proposed PV Ground Mount Layout

Notes:

1. Estimated kWH based on the National Renewable Energy Laboratory PVWatts Version 1 Calculator Program.

Project Name: **LGEA Solar PV Project - Oxmead Road Water Plant**
Location: **Somers Point, NJ**
Description: **Photovoltaic System 100% Financing - 15 year**

Simple Payback Analysis

	Photovoltaic System 100% Financing - 15 year
Total Construction Cost	$121,470
Annual kWh Production	30,709
Annual Energy Cost Reduction	$4,545
Average Annual SREC Revenue	$5,868

Simple Payback: **11.67** Years

Life Cycle Cost Analysis

Analysis Period (years):	15	Financing %:	100%
Discount Rate:	3%	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.148**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	6.00%	Average SREC Value ($/kWh)	$0.191

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Interest Expense	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$0	0	0	0	$0	0	0	0	0
1	$0	30,709	$4,545	$0	$7,677	$7,148	$5,152	($78)	($78)
2	$0	30,555	$4,681	$0	$7,639	$6,830	$5,470	$20	($59)
3	$0	30,403	$4,822	$0	$7,601	$6,493	$5,808	$122	$63
4	$0	30,251	$4,966	$0	$7,563	$6,135	$6,166	$229	$292
5	$0	30,099	$5,115	$310	$7,525	$5,754	$6,546	$30	$322
6	$0	29,949	$5,269	$308	$5,990	$5,351	$6,950	($1,350)	($1,029)
7	$0	29,799	$5,427	$307	$5,960	$4,922	$7,378	($1,221)	($2,249)
8	$0	29,650	$5,590	$305	$5,930	$4,467	$7,834	($1,086)	($3,335)
9	$0	29,502	$5,757	$304	$5,900	$3,984	$8,317	($947)	($4,282)
10	$0	29,354	$5,930	$302	$4,403	$3,471	$8,830	($2,270)	($6,551)
11	$0	29,208	$6,108	$301	$4,381	$2,926	$9,374	($2,112)	($8,663)
12	$0	29,062	$6,291	$299	$4,359	$2,348	$9,952	($1,949)	($10,613)
13	$0	28,916	$6,480	$298	$4,337	$1,734	$10,566	($1,781)	($12,394)
14	$0	28,772	$6,674	$296	$2,877	$1,083	$11,218	($3,045)	($15,439)
15	$0	28,628	$6,875	$295	$2,863	$391	$11,910	($2,858)	($18,297)
	Totals:	444,857	$84,531	$3,326	$85,005	$63,036	$121,470	($18,297)	($82,311)

Net Present Value (NPV) **($12,301)**