TOWNSHIP OF MARLBORO

SWIM COMPLEX

60 MASEPE TRAIL
MARLBORO, NJ 07746

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:	Jersey Central Power & Light
Electric Utility Rate Structure:	General Service Secondary 3 Phase
Third Party Supplier:	N/A

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

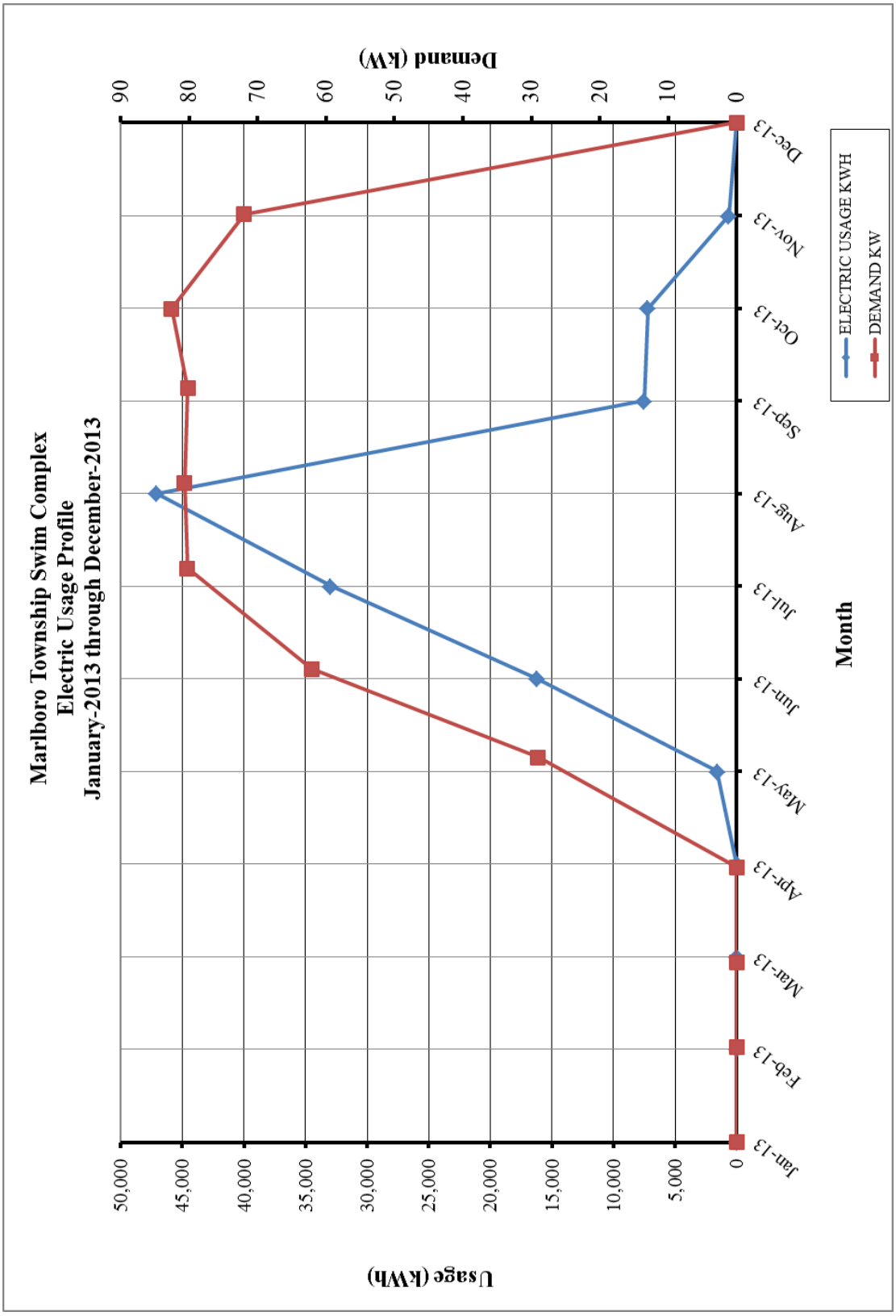
ELECTRIC USAGE SUMMARY

Utility Provider: Jersey Central Power & Light
Rate: General Service Secondary 3 Phase
Meter No: G23543379 / G23543379
Account No: 100 103 019 699 / 100 103 019 699
Third Party Utility Provider: -
TPS Meter / Acct No: -

MONTH OF USE	CONSUMPTION KWH	DEMAND KW	TOTAL BILL
Jan-13	0	0.0	$0
Feb-13	0	0.0	$0
Mar-13	0	0.0	$0
Apr-13	0	0.0	$0
May-13	1,600	29.0	$370
Jun-13	16,200	62.1	$2,373
Jul-13	32,960	80.3	$4,454
Aug-13	47,080	80.7	$6,155
Sep-13	7,520	80.2	$1,444
Oct-13	7,200	82.6	$1,389
Nov-13	640	72.0	$536
Dec-13	0	0.0	$0
Totals	**113,200**	**82.6 Max**	**$16,721**

AVERAGE DEMAND **40.6 KW average**
AVERAGE RATE **$0.148** **$/kWh**

Figure 1
Electricity Usage Profile



II. FACILITY DESCRIPTION

The Marlboro Swim Club is located at 60 Masepe Trail in Marlboro Township, New Jersey. This 3,528 SF facility was built in 1975 with a major facility improvement in 1991. The complex consists of several single-story buildings comprised of a pool filter/pumping room, storage room, restrooms, and mechanical room. The facility has four (4) pools (main, dive, intermediate and wading).

Occupancy Profile

The typical hours of operation for the facility are Monday through Sunday between 8:00 AM and 8:00 PM. The pool operates during the summer months only from June to August. There are approximately 25 employees that regularly occupy the facility.

Building Envelope

The buildings are wood-framed structures with pitched, asphalt, shingle roofs and split brick exterior walls over insulation board and vapor barriers. Typical windows are double pane, 1/4" with aluminum frames. The amount of insulation below the roofing could not be determined.

HVAC Systems

The Swim Complex is conditioned by two (2) packaged rooftop units with DX cooling only as follows:

Unit ID	Mfg.	Condenser Fan	Cooling Capacity	Efficiency
RTU-1	Aire Flow	1/5 HP	3.0-Tons	10.0 SEER
RTU-2	Lennox	¼ HP	5.0-Tons	13.5 SEER

Exhaust System

Toilet exhaust air and pool filter room ventilation air is relieved through various roof-mounted exhaust fans.

HVAC System Controls

The cooling is controlled by 7-day programmable thermostats that control temperature and turn off the units based on an occupancy schedule.

Domestic Hot Water

The domestic hot water is provided by an electric RHEEM Model 81V-30D tank water heater with a capacity of 30 gallons and rated at 4.5 kW located in the mechanical room.

Pool Filtering Equipment

The pool filter room consists of the dive pool filter, main pool filter, intermediate pool filter and the wading pool filter. The water is pumped to/from the pools by the following pump/motor units:

Unit ID	Mfg.	Pump	Motor HP	Motor Eff.
Intermediate/Wading Pool	Peerless	120 GPM	3	80%
Main Pool	Peerless	340 GPM	15	91%
Diving Pool	Peerless	360 GPM	15	89.5%

The pool water quality is controlled by various flow switches, flowcells, pH sensors, electro-chlorination, etc. The Strantrol controller with remote touch screen has the ability to control the chemical and filter functions for all of the filters and manage the backwash cycles.

Lighting

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	$7,780	$1,044	7.5	101.3%
ECM #2	Premium Efficient Motor Replacement	$4,200	$164	25.6	-29.7%
ECM #3	Split System Replacement	$6,974	$260	26.8	-44.1%
ECM #4	Domestic Hot Water Heater Upgrade	$6,500	$92	70.7	-83.0%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	31.44 kW PV System	$123,180	$13,583	9.1	65.4%

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)**	**NATURAL GAS (THERMS)**
ECM #1	Lighting Upgrade - General	3.8	7,054	0
ECM #2	Premium Efficient Motor Replacement	0.6	1,108	0
ECM #3	Split System Replacement	1.6	1,760	0
ECM #4	Domestic Hot Water Heater Upgrade	0.0	624	0
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	**DESCRIPTION**	**ANNUAL UTILITY REDUCTION**		
		ELECTRIC DEMAND (KW)	**ELECTRIC CONSUMPTION (KWH)**	**NATURAL GAS (THERMS)**
REM #1	31.44 kW PV System	31.4	40,059	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	10,722	20	46
ECM #2	Premium Efficient Motor Replacement	1,684	3	7
ECM #3	Split System Replacement	2,675	5	11
ECM #4	Domestic Hot Water Heater Upgrade	948	2	4

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	$1,044	$7,780	$0	$7,780	7.5
Premium Efficient Motor Replacement	$164	$4,200	$0	$4,200	25.6
Split System Replacement	$260	$7,250	$276	$6,974	26.8
Domestic Hot Water Heater Upgrade	$92	$7,000	$500	$6,500	70.7
Total Project	**$1,560**	**$26,230**	**$776**	**$25,454**	**16.3**

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.

This project does not qualify for additional incentives through the Pay for Performance Program; please see the Installation Funding Options section for additional program options.

ECM #1: Lighting Upgrade – General

Description:

The majority of the interior lighting throughout the Swim Complex is provided with fluorescent fixtures with older generation, 32W T8 lamps and electronic ballasts. Additionally, there are several areas that still contain T12 fixtures with magnetic ballasts. These fixtures can be replaced and retrofit with new LED type fixtures and lamps.

This ECM includes replacing and retrofitting the interior lighting with new LED type lamps and fixtures. It is recommended the Township consult with a professional engineer prior to retrofitting or replacing fixtures to ensure code required minimum light levels will be met.

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.

LIGHTING UPGRADE SAVINGS SUMMARY	
DESCRIPTION	**SAVINGS**
Electric Demand Savings (kW)	3.8
Electric Usage Savings (kWh)	7,054
Electric Cost Savings ($)	$1,044

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$7,780
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$7,780
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,044
Total Yearly Savings ($/Yr):	$1,044
Estimated ECM Lifetime (Yr):	15
Simple Payback	7.5
Simple Lifetime ROI	101.3%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$15,659
Internal Rate of Return (IRR)	10%
Net Present Value (NPV)	$4,682.76

ECM #2: 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 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.

IMPLEMENTATION SUMMARY					
EQMT ID	**FUNCTION**	**MOTOR HP**	**HOURS OF OPERATION**	**EXISTING EFFICIENCY**	**NEMA PREMIUM EFFICIENCY**
P-1	Main Pool Pump	15	2,000	91.0%	93.0%
P-2	Dive Pump	15	2,000	89.5%	93.0%

Energy Savings Calculations:

$$\text{Electric Usage, kWh} = \frac{\text{HP} \times \text{LF} \times 0.746 \times \text{Hours of Operation}}{\text{Motor Efficiency}}$$

where, HP = Motor Nameplate Horsepower Rating

$LF = Load\ Factor$ Motor Efficiency = Motor Nameplate Efficiency

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

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

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

PREMIUM EFFICIENCY MOTOR CALCULATIONS								
EQMT ID	QTY	MOTOR HP	LOAD FACTOR	EXISTING EFFICIENCY	PROPOSED EFFICIENCY	POWER SAVINGS kW	ENERGY SAVINGS kWH	COST SAVINGS
P-1	1	15	75%	91.0%	93.0%	0.20	399	$59
P-2	1	15	75%	89.5%	93.0%	0.35	710	$105
TOTAL						**0.6**	**1,108**	**$164**

There are no longer incentives available through NJ Smart Start for premium efficiency motors.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$4,200
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$4,200
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$164
Total Yearly Savings ($/Yr):	$164
Estimated ECM Lifetime (Yr):	18
Simple Payback	25.6
Simple Lifetime ROI	-29.7%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$2,952
Internal Rate of Return (IRR)	-3%
Net Present Value (NPV)	($1,944.42)

ECM #3: Replace Split System Units with High Efficiency Units

Description:

The Swim Complex has one (1) split system air conditioning only unit which serves interior office space. The unit is 17 years old and has surpassed its ASHRAE service life expectancy. Replacing the unit with a newer more efficient unit could result in significant energy savings.

The unit currently installed is lower efficiency compared to modern units. The unit can be replaced with new high-efficiency unit. New units provide higher full load and part load efficiencies due to advances in inverter motor technologies, higher efficiency refrigerants such as R410A which would be used in place of R22 that is currently used in the existing unit.

This ECM includes one-for-one replacement of the one (1) older split system unit with new higher efficiency systems as well as replacing the indoor coil. It is recommended to fully evaluate the capacity needed for all new systems prior to moving forward with this ECM. A summary of the unit replacement for this ECM can be found in the table below:

IMPLEMENTATION SUMMARY					
ECM INPUTS	**SERVICE FOR**	**NUMBER OF UNITS**	**COOLING CAPACITY, BTU/HR**	**TOTAL CAPACITY, TONS**	**REPLACE UNIT WITH**
SS	Split System	1	36,000	3.0	York CZH and Indoor Coil or Equivalent
Total		**1**	**36,000**	**3.00**	

The manufacturer used as the basis for the calculation is York. The unit pricing and install cost were estimated based on current rates quotes and labor rates. The payback may change based on actual unit pricing and install costs if the ECM is implemented.

Energy Savings Calculations:

Cooling Energy Savings:

Seasonal energy consumption of the air conditioners at the cooling mode is calculated with the equation below:

$$\text{Energy Savings, kWh} = \text{Cooling Capacity,} \frac{\text{BTU}}{\text{Hr}} \times \left(\frac{1}{\text{SEER}_{\text{Old}}} - \frac{1}{\text{SEER}_{\text{New}}} \right) \times \frac{\text{Operation Hours}}{1000 \frac{\text{W}}{\text{kWh}}}$$

$$\text{Demand Savings, kW} = \frac{\text{Energy Savings (kWh)}}{\text{Hours of Cooling}}$$

$$\text{Cooling Cost Savings} = \text{Energy Savings, kWh} \times \text{Cost of Electricity} \left(\frac{\$}{\text{kWh}} \right)$$

ENERGY SAVINGS CALCULATIONS							
ECM INPUTS	**COOLING CAPACITY, BTU/Hr**	**ANNUAL COOLING HOURS**	**EXISTING UNITS EER**	**NEW UNITS EER**	**# OF UNITS**	**ENERGY SAVINGS kWh**	**DEMAND SAVINGS kW**
SS	36,000	1,100	10 SEER	18 SEER	1	1,760	1.6
Total					1	1,760	1.6

Project Cost, Incentives and Maintenance Savings

From the NJ Smart Start® Program appendix, the replacement of split system AC units and unitary systems with high efficiency AC systems falls under the category "Unitary HVAC Split System" and warrants an incentive based on efficiency (EER/SEER). The program incentives are calculated as follows:

$$\text{Smart Start® Incentive} = (\text{Cooling Tons} \times \ \$/\text{Ton Incentive})$$

AC UNITS REBATE SUMMARY				
UNIT DESCRIPTION	**UNIT EFFICIENCY**	**REBATE $/TON**	**PROPOSED CAPACITY TONS**	**TOTAL REBATE $**
5.4 tons or less Unitary AC and Split System	≥14 SEER	$92	3.0	$276
TOTAL			**3**	**$276**

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$7,250
NJ Smart Start Equipment Incentive ($):	$276
Net Installation Cost ($):	$6,974
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$260
Total Yearly Savings ($/Yr):	$260
Estimated ECM Lifetime (Yr):	15
Simple Payback	26.8
Simple Lifetime ROI	-44.1%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$3,900
Internal Rate of Return (IRR)	-7%
Net Present Value (NPV)	($3,870.14)

ECM #4: Domestic Hot Water Heater Upgrade

Description:

The domestic water for this facility is produced by a Rheem Water Heater Model 81V-30DA electric storage tank water heater with a capacity of 30 gallons and an input capacity of 4.5 kW. Maintaining an electric hot water heater for a building this size is not cost effective and upgrading to a hybrid electric unit may incur significant cost savings.

This ECM will replace this electric domestic water heater with a hybrid 2.40 energy factor General Electric Geospring Series water heater or equivalent. This unit will be replaced with a 4.5 kW, 50 gallon tank water heater. (Before proceeding with installation of aforementioned system, Concord Engineering suggests consulting a mechanical engineer to evaluate the system fully.)

Energy Savings Calculations:

DOM. HOT WATER HEATER CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Electric Hot Water Heaters	Hybrid Electric Hot Water Heater	
Building Type	Public Assembly		
Building Square-foot	3,528	3,528	
Domestic Water Usage, kBtu	3,175.20	3,175.20	
DHW Heating Fuel Type	Electric	Electric	
Energy Factor	0.92	2.40	148%
Total Usage (kBTU)	3,451	1,323	2,128
Electric Cost ($/kWh)	$ 0.148	$ 0.148	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Electric Usage (kWh)	1,011	388	624
Energy Cost ($)	$150	$57	$92
COMMENTS:	Savings are based on Energy Information Administration Commercial Building Energy Consumption Survey 2003 Information		

Energy Density for "Public Assembly" type building = 0.9 kBtu / SF / year

$$DHW\ Heat\ Usage = Energy\ Density\left(\frac{kBtu\ yr}{SF}\right) \times Building\ Square\ Footage\ (SF)$$

$$DHW\ Total\ Usage = \frac{Dom\ HW\ Heat\ Cons.(Btu)}{Heating\ Eff.(\%) \times Fuel\ Heat\ Value\left(\frac{BTU}{Fuel\ Unit}\right)}$$

$$Energy\ Cost = Heating\ Fuel\ Usage(Fuel\ Units) \times Ave\ Fuel\ Cost\left(\frac{\$}{Fuel\ Unit}\right)$$

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$7,000
NJ Smart Start Equipment Incentive ($):	$500
Net Installation Cost ($):	$6,500
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$92
Total Yearly Savings ($/Yr):	$92
Estimated ECM Lifetime (Yr):	12
Simple Payback	70.7
Simple Lifetime ROI	-83.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$1,104
Internal Rate of Return (IRR)	-20%
Net Present Value (NPV)	($5,584.23)

REM #1: 31.44 kW Solar System

Description:

The Swim Complex has available ground mount space that could accommodate solar arrays. Based on the available area a 31.44 kilowatt solar array could be installed. The array will produce approximately 40,059 kilowatt-hours annually that will reduce the overall electric usage of the facility by 35.39%. Ground mount solar is typically the least expensive option for owners to implement, and in this situation while ground area is likely used for recreational space we recommend the owner consider innovative approaches to incorporating solar on the ground area, such as installing a covered picnic canopy with solar located on the roof.

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	
Installation Cost ($):	$123,180
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$123,180
Maintenance Savings ($/Yr):	$7,655
Energy Savings ($/Yr):	$5,929
Total Yearly Savings ($/Yr):	$13,583
Estimated ECM Lifetime (Yr):	15
Simple Payback	9.1
Simple Lifetime ROI	65.4%
Simple Lifetime Maintenance Savings	$114,820
Simple Lifetime Savings	$203,751
Internal Rate of Return (IRR)	7.1%
Net Present Value (NPV)	$38,977.22

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

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

F. Replace any old CRT Monitors with LED/LCD Type Monitors, which can draw as much as a quarter the power of an equivalent CRT monitor.

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

APPENDIX A

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Marlboro Township - Swim Complex

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	$5,210	$2,570	$0	$7,780	$1,044	$0	$1,044	15	$15,659	$0	101.3%	7.5	10.36%	$4,682.76
ECM #2	Premium Efficient Motor Replacement	$3,200	$1,000	$0	$4,200	$164	$0	$164	18	$2,952	$0	-29.7%	25.6	-3.47%	($1,944.42)
ECM #3	Split System Replacement	$3,750	$3,500	$276	$6,974	$260	$0	$260	15	$3,900	$0	-44.1%	26.8	-6.52%	($3,870.14)
ECM #4	Domestic Hot Water Heater Upgrade	$4,000	$3,000	$500	$6,500	$92	$0	$92	12	$1,104	$0	-83.0%	70.7	-20.37%	($5,584.23)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	31.44 kW PV System	$123,180	$0	$0	$123,180	$5,929	$7,655	$13,583	15	$203,751	$114,820	65.4%	9.1	7.07%	$38,977.22

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.

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SmartStart Building Incentives

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

Swim Club

Primary Property Function: Swimming Pool
Gross Floor Area (ft²): 2,700
Built: 1985

For Year Ending: December 31, 2013
Date Generated: July 11, 2014

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
Swim Club 60 Masepe Trail Marlboro, New Jersey 07746	Marlboro Township 1979 Township Drive Marlboro, NJ 07446 (____)____-_____	Jonathan Capp 1979 Township Drive Marlboro, NJ 07446 732-536-0200 jcapp@marlboro-nj.gov

Property ID: 4091295

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
143.1 kBtu/ft²

Source EUI
449.2 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	386,238 (100%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	30.8
National Median Source EUI (kBtu/ft²)	96.8
% Diff from National Median Source EUI	364%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	49

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

____ _____
,
(____)____-_____
_____

Professional Engineer Stamp (if applicable)

APPENDIX D

MAJOR EQUIPMENT LIST

Concord Engineering Group

Swim Complex

Split System Units

Tag			
Unit Type	Split System Condensing Unit	Split System Condensing Unit	
Qty	1	1	
Location	Roof of Office Area	Roof of Office Area	
Area Served	Offices	Offices	
Manufacturer	International Comfort Products	Lennox	
Model #	CA5536VHD3 / CBA036HB3	13ACD-060-230-15	
Serial #	L9743 47888	1911D20891	
Cooling Type	DX, R-22	DX, R-22	
Cooling Capacity (Tons)	3 Tons	5 Tons	
Cooling Efficiency (SEER/EER)	10 SEER	13.5 SEER / 11 EER	
Heating Type	N/A	N/A	
Heating Input (MBH)	N/A	N/A	
Efficiency	N/A	N/A	
Fuel	N/A	N/A	
Approx Age	17	3	
ASHRAE Service Life	15	15	
Remaining Life	(2)	12	
Comments			

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

Swim Complex

Domestic Water Heaters

Tag			
Unit Type	Tank Hot Water Heater		
Qty	1		
Location	Janitor Closet in Lifeguard prep area		
Area Served	Restrooms		
Manufacturer	Rheem		
Model #	81V-30D A		
Serial #	R029310130B		
Size (Gallons)	30		
Input Capacity (MBH/KW)	4.5 kW		
Recovery (Gal/Hr)	-		
Efficiency %	98%		
Fuel	Electric		
Approx Age	21		
ASHRAE Service Life	12		
Remaining Life	(9)		
Comments			

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

Swim Complex

Pumps

Tag			
Unit Type	Base Mount End Suction	Base Mount End Suction	
Qty	1	1	
Location	Pump Room	Pump Room	
Area Served	Main Pool	Dive Pool	
Manufacturer	Peerless Pump	Peerless Pump	
Model #	C1040AM-BE	C1030AM-BE	
Serial #	469045	468965	
Horse Power	15.0	15.0	
Flow	-	-	
Motor Info	Century II	US Electric Motor	
Electrical Power	230/460/3/60	230/460/3/60	
RPM	1750	1765	
Motor Efficiency %	91.0%	89.5%	
Approx Age	15	15	
ASHRAE Service Life	20	20	
Remaining Life	5	5	
Comments			

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

Swim Complex

Motors

Tag			
Unit Type	Motor	Motor	Motor
Qty	1	1	1
Location	Pump Room	Pump Room	Pump Room
Area Served	Pool Pumps	Main Pool	Dive Pump
Manufacturer	Baldor	Century II	US Electric
Catalog #	JMM3158T	-	B089A/U01T298R041F
Horse Power	3.0	15.0	15.0
Enclosure Type	OPSB	TEFC	-
Electrical Power	208-230/460/3/60	230/460/3/60	230/460/3/60
RPM	3450	1750	1765
Efficiency %	80.0%	91.0%	89.5%
Approx Age	9	15	15
ASHRAE Service Life	18	18	18
Remaining Life	9	3	3
Comments			

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

APPENDIX E

CEG Project #: 1C13521
Facility Name: Swim Complex
Address: 60 Masepe Trail
City, State, Zip Marlboro, NJ 07746

			EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT							RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS					
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, $
1	Pump Room	2000	8' Channel, 2 Lamp, 60w T12, Mag. Ballast, Surface Mnt., No Lens	2	115.2	2	0.23	461	Replace Fixture	1x4 Surface LED 48w	1	48	2	0.10	192	0.13	269	$40	0	No New Controls	0	0.0%	0	$0
2		2000	8' Channel, 2 Lamp, 75w T12, Mag. Ballast, Surface Mnt., No Lens	2	141.5	1	0.14	283	Replace Fixture	1x4 Surface LED 48w	1	48	1	0.05	96	0.09	187	$28	0	No New Controls	0	0.0%	0	$0
3		2000	8' Channel, 2 Lamp, 110w T12, Mag. Ballast, Surface Mnt., No Lens	2	230	2	0.46	920	Replace Fixture	1x4 Surface LED 48w	1	48	2	0.10	192	0.36	728	$108	0	No New Controls	0	0.0%	0	$0
4	Office	1800	2x4 4 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic	4	112	4	0.45	806	Bypass Ballast, Relamp	4' Alledra 18w LED; LLT-X-T8-Y-SW-120-Z-S-N	4	72	4	0.29	518	0.16	288	$43	0	No New Controls	0	0.0%	0	$0
4	Bathroom	1800	2x4 4 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic	4	112	1	0.11	202	Bypass Ballast, Relamp	4' Alledra 18w LED; LLT-X-T8-Y-SW-120-Z-S-N	4	72	1	0.07	130	0.04	72	$11	0	No New Controls	0	0.0%	0	$0
4	Entrance	1800	2x4 4 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic	4	112	4	0.45	806	Bypass Ballast, Relamp	4' Alledra 18w LED; LLT-X-T8-Y-SW-120-Z-S-N	4	72	4	0.29	518	0.16	288	$43	0	No New Controls	0	0.0%	0	$0
5	Mens Restroom/Changing Room	1800	1x4 2-Lamp 32w T8 Surface Mount, Prismatic Lens	2	62	3	0.19	335	Bypass Ballast, Relamp	4' Alledra 18w LED; LLT-X-T8-Y-SW-120-Z-S-N	2	36	3	0.11	194	0.08	140	$21	0	No New Controls	0	0.0%	0	$0
6		1800	175w MH Pendant Mount	1	195	9	1.76	3,159	Re-lamp & Bypass ballast	40w LED Par 56 Self-ballast Mogul Base Lamp	1	41	9	0.37	664	1.39	2,495	$369	0	No New Controls	0	0.0%	0	$0
5	Womens Restroom/ Changing Room	1800	1x4 2-Lamp 32w T8 Surface Mount, Prismatic Lens	2	62	3	0.19	335	Bypass Ballast, Relamp	4' Alledra 18w LED; LLT-X-T8-Y-SW-120-Z-S-N	2	36	3	0.11	194	0.08	140	$21	0	No New Controls	0	0.0%	0	$0
6		1800	175w MH Pendant Mount	1	195	8	1.56	2,808	Re-lamp & Bypass ballast	40w LED Par 56 Self-ballast Mogul Base Lamp	1	41	8	0.33	590	1.23	2,218	$328	0	No New Controls	0	0.0%	0	$0
7	Storage	2600	1x4 2-Lamp 32w T8 Surface Mount, No Lens	2	62	2	0.12	322	Bypass Ballast, Relamp	4' Alledra 18w LED; LLT-X-T8-Y-SW-120-Z-S-N	2	36	2	0.07	187	0.05	135	$20	0	No New Controls	0	0.0%	0	$0
7	Life Guard Prep Room	1800	1x4 2-Lamp 32w T8 Surface Mount, No Lens	2	62	2	0.12	223	Bypass Ballast, Relamp	4' Alledra 18w LED; LLT-X-T8-Y-SW-120-Z-S-N	2	36	2	0.07	130	0.05	94	$14	0	No New Controls	0	0.0%	0	$0
	TOTAL					**41**	**6**	**10,660**					**41**	**2**	**3,607**	**4**	**7,054**	**$1,044**			**0**	**0**	**0**	**$0**

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
Swim Complex	4300	SHARP ND-240QCJ	131	17.5	2,298	31.44	40,059	25.5	5,489	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 - Swim Complex**
Location: **Marlboro, NJ**
Description: **Photovoltaic System 100% Financing - 15 year**

Simple Payback Analysis

	Photovoltaic System 100% Financing - 15 year
Total Construction Cost	$123,180
Annual kWh Production	40,059
Annual Energy Cost Reduction	$5,929
Average Annual SREC Revenue	$7,655

Simple Payback: **9.07** 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	40,059	$5,929	$0	$10,015	$7,249	$5,225	$3,470	$3,470
2	$0	39,859	$6,107	$0	$9,965	$6,926	$5,547	$3,598	$7,068
3	$0	39,659	$6,290	$0	$9,915	$6,584	$5,889	$3,731	$10,799
4	$0	39,461	$6,478	$0	$9,865	$6,221	$6,253	$3,870	$14,669
5	$0	39,264	$6,673	$404	$9,816	$5,835	$6,638	$3,611	$18,280
6	$0	39,067	$6,873	$402	$7,813	$5,426	$7,048	$1,811	$20,090
7	$0	38,872	$7,079	$400	$7,774	$4,991	$7,482	$1,980	$22,070
8	$0	38,678	$7,292	$398	$7,736	$4,530	$7,944	$2,155	$24,225
9	$0	38,484	$7,510	$396	$7,697	$4,040	$8,434	$2,337	$26,562
10	$0	38,292	$7,736	$394	$5,744	$3,520	$8,954	$611	$27,174
11	$0	38,101	$7,968	$392	$5,715	$2,967	$9,506	$817	$27,990
12	$0	37,910	$8,207	$390	$5,687	$2,381	$10,092	$1,029	$29,020
13	$0	37,720	$8,453	$389	$5,658	$1,759	$10,715	$1,249	$30,268
14	$0	37,532	$8,707	$387	$3,753	$1,098	$11,376	($400)	$29,868
15	$0	37,344	$8,968	$385	$3,734	$396	$12,077	($156)	$29,712
	Totals:	580,303	$110,268	$4,339	$110,887	$63,924	$123,180	$29,712	$321,264

Net Present Value (NPV) **$24,144**