



## **ENERGY AUDIT – FINAL REPORT**

### **BOROUGH OF OLD TAPPAN**

**POLICE HEADQUARTERS**

**247 OLD TAPPAN ROAD**

**OLD TAPPAN, NJ 07675**

**ATTN: MR. PATRICK O'BRIEN**

**CEG PROJECT No. 9C09017**

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## I. EXECUTIVE SUMMARY

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

Borough of Old Tappan  
Police Headquarters  
247 Old Tappan Road  
Old Tappan, NJ 07675

Municipal Contact Person: Patrick O'Brien

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

The annual energy costs at this facility are as follows:

Electricity	\$9,616
Natural Gas	\$2,559
Total	\$12,175

The potential annual energy cost savings are shown below in Table 1. Be aware that the measures' savings cannot be added because of the interrelation of several of the measures. The cost of each measure for this level of auditing is  $\pm 20\%$  until detailed engineering, specifications, and hard proposals are obtained.

**Table 1**  
**Energy Conservation Measures (ECM's)**

ECM NO.	DESCRIPTION	COST <sup>A</sup>	ANNUAL SAVINGS	SIMPLE PAYBACK (YEARS)	SIMPLE RETURN ON INVESTMENT
1	Lighting Upgrades	\$3,403	\$1,066	3.19	683 %
2	LED Exit Signs	\$300	\$1,332	0.23	11,000 %
3	Lighting Controls	\$825	\$160	5.2	190 %
4	Boiler Replacement	\$14,302	\$841	17.0	32.0 %
5	Install Programmable Thermostats	\$540	\$144	3.75	567 %
6	Split System A/C Upgrade- Downstairs	\$4,880	\$67	72.8	-79.4 %
7	Split System A/C Upgrade- Upstairs	\$6,180	\$110	56.2	-73.3 %

**Note A:** Includes applicable incentive savings.

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

**Table 2**  
**Estimated Energy Savings**

ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECT DEMAND (KW)	ELECT CONSUMPTION (KWH)	NAT GAS (THERMS)
1	Lighting Upgrades	3.33	6410	-
2	LED Exit Signs	-	219	-
3	Lighting Controls	-	998	-
4	Boiler Replacement	-	-	652.2
5	Install Programmable Thermostats	-	378.9	65.1
6	Split System A/C Upgrade- Downstairs	-	415	-
7	Split System A/C Upgrade- Upstairs	-	682	-

Recommendation:

Concord Engineering Group strongly recommends the implementation of all ECM's that provide a calculated simple payback at or under seven (7) years. The potential energy and cost savings from these ECM's are too great to pass upon. The following Energy Conservation Measures are recommended for Old Tappan's Storage Building:

- **ECM #1: Lighting Upgrades**
- **ECM #2: LED Exit Signs**
- **ECM #3: Lighting Controls**
- **ECM #5: Install Programmable Thermostats**

CEG also has a secondary recommendation that the owner review moving forward with the implementation of ECM #4 with a payback of 17.0. Although the payback for this ECM is extended, the existing boiler is at the end of its useful life and therefore replacement should provide an overall benefit to the facility operation.

## II. INTRODUCTION

This comprehensive energy audit covers the 2,400 square foot Police Station which is currently not being used. When the building was occupied, it was used as the Police Headquarters, located on the first floor, and a meeting room on the second floor. Future plans suggest the building may be converted into a Senior Citizens Center.

Electrical and natural gas utility information is collected and analyzed for one full year's energy use of the building. The utility information allows for analysis of the building's operational characteristics; calculating energy benchmarks for comparison to industry averages, estimating savings potential, and monitoring baseline usage/cost effectiveness of implemented measures. A computer spreadsheet is used to calculate benchmarks and to graph utility information (see Table 3 and Table 4).

The Energy Use Index (EUI) is established for the building. Energy Use Index (EUI) is expressed in British Thermal Units/square foot/year (BTU/ft<sup>2</sup>/yr), which is used to compare energy consumption to similar building types or to track consumption from year to year in the same building. The EUI is calculated by converting the annual consumption of all energy sources to BTU's and dividing by the area (gross square footage) of the building. Blueprints (where available) are utilized to verify the gross area of the facility. The EUI is a good indicator of the relative potential for energy savings. A low EUI indicates less potential for energy savings, while a high EUI indicates poor building performance and therefore a high potential for energy savings.

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

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

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

The building site visit is performed to survey all major building components and systems. The site visit includes detailed inspection of energy consuming components. Summary of building occupancy schedules, operating and maintenance practices, and energy management programs

provided by the building manager are collected along with the system and components to determine a more accurate impact on energy consumption.

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## METHOD OF ANALYSIS

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

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

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

Cost savings are calculated based on the actual historical energy costs for the facility. Installation costs include labor and equipment to estimate the full up-front investment required to implement a change. Costs are derived from Means Cost Data, industry publications, and local contractors and equipment suppliers. The NJ Smart Start Building® program incentives savings (where applicable) are included for the appropriate ECM's and subtracted from the installed cost. Maintenance savings are calculated where applicable and added to the energy savings for each ECM. The life-time for each ECM is estimated based on the typical life of the equipment being replaced or altered. The costs and savings are applied and a simple payback, simple lifetime savings, and simple return on investment are calculated. See below for calculation methods:

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

$$\text{Simple Lifetime Savings} = (\text{Yearly Savings} \times \text{ECM Lifetime})$$

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



### III. HISTORIC ENERGY CONSUMPTION/COST

#### A. Energy Usage / Tariffs

##### Electric

Table 3 and Figure 1 represent the electrical usage for the surveyed facility from June-08 to May-09. Rockland Electric Company provides electricity to the facility under the Electric Small C & I General Service Secondary rate. This electric rate has a component for consumption that is measured in kilowatt-hours (kWh). It is calculated by multiplying the wattage of the equipment times the hours that it operates. For example, a 1,000 Watt lamp operating for 5 hours would measure 5,000 Watt-hours. Since one kilowatt is equal to 1,000 Watts, the measured consumption would be 5 kWh. 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 most current rate structure available.

##### Natural Gas

Table 4 and Figure 2 show the natural gas energy usage for the surveyed facility from June-08 to May-09. Public Service Electric and Gas Company (PSE&G) supplies the natural gas commodity from the wellhead to the PSE&G pipelines. PSE&G charges a rate per therm for delivery of the natural gas via their pipelines to the burners under their Basic Gas Supply Service (BGSS) rate.

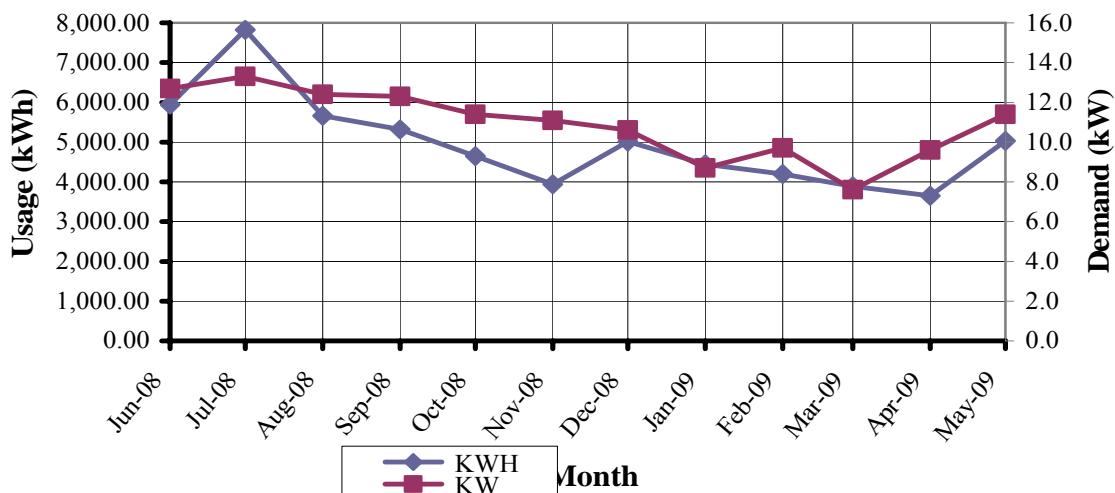
<u>Utility</u>	<u>Average Cost</u>
Electricity	16.1¢ /kWh
Natural Gas	\$1.29 /Therm

**Table 3**  
**Electricity Billing Data**

Rockland Electric Acct. No.: 58598-47005		Utility Rate: Electric Small C & I General Service Secondary	
MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
Jun-08	5,940	12.7	\$1,028.07
Jul-08	7,824	13.3	\$1,372.26
Aug-08	5,664	12.4	\$1,099.98
Sep-08	5,316	12.3	\$937.06
Oct-08	4,644	11.4	\$732.20
Nov-08	3,936	11.1	\$617.41
Dec-08	5,016	10.6	\$765.08
Jan-09	4,440	8.7	\$675.20
Feb-09	4,200	9.7	\$513.39
Mar-09	3,888	7.6	\$585.20
Apr-09	3,648	9.6	\$510.27
May-09	5,028	11.4	\$779.99
<b>Totals</b>	<b>59,544</b>	<b>13.3 Max</b>	<b>\$9,616.11</b>
<b>AVERAGE DEMAND 12.0 KW average</b> <b>AVERAGE RATE \$0.161 \$/kWh</b>			

**Figure 1**  
**Electricity Usage Profile**

**Old Police Station**  
**Electric Usage Profile**  
**June 2008 through May 2009**

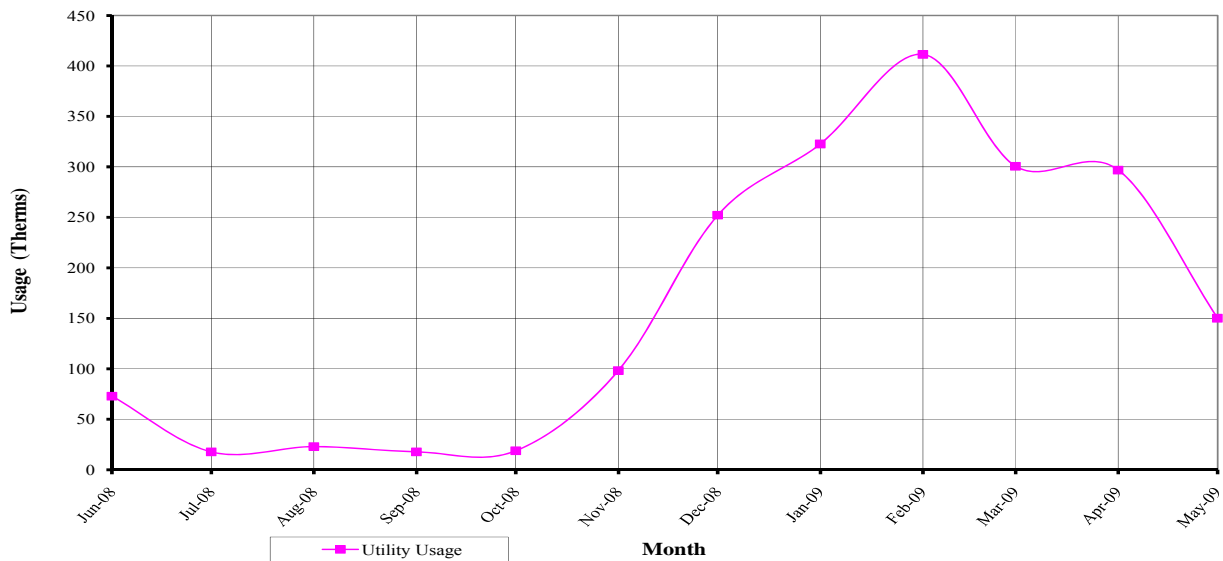


**Table 4**  
**Natural Gas Billing Data**

PSE&G Acct. No. 41 217 438 14	Meter No, 2677830	Tariff: GSGH
MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
Jun-08	72.97	\$138.19
Jul-08	17.74	\$42.74
Aug-08	23.02	\$52.23
Sep-08	17.82	\$36.36
Oct-08	18.84	\$36.22
Nov-08	98.27	\$143.71
Dec-08	252.18	\$342.27
Jan-09	322.72	\$445.69
Feb-09	411.49	\$535.01
Mar-09	300.61	\$343.56
Apr-09	296.89	\$298.08
May-09	150.25	\$145.44
<b>TOTALS</b>	<b>1982.78</b>	<b>\$2,559.50</b>
<b>AVERAGE RATE:</b>		<b>\$1.29 \$/THERM</b>

**Figure 2**  
**Natural Gas Usage Profile**

Old Police Station  
Gas Usage Profile  
June 2008 through May 2009



B. Energy Use Index (EUI)

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

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

The site and source EUI for this facility is calculated as follows. (See Table 5 for details):

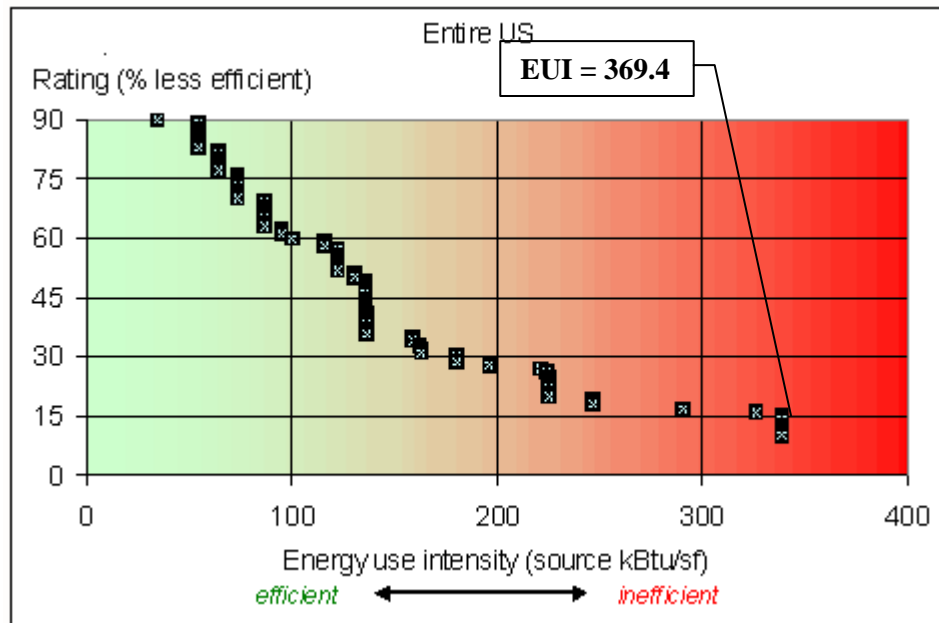
$$\text{Building Site EUI} = \frac{(\text{Electric Usage in kBtu} + \text{Gas Usage in kBtu})}{\text{Building Square Footage}}$$

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

**Table 5**  
**Oakes Park Field House EUI Calculations**

ENERGY TYPE	BUILDING USE			SITE ENERGY	SITE-SOURCE	SOURCE ENERGY
	kWh	Therms	Gallons	kBtu	RATIO	kBtu
ELECTRIC	59,544			203,283	3.340	678,966
NATURAL GAS		1,982.78		198,278	1.047	207,597
<b>TOTAL</b>				<b>401,561</b>		<b>886,563</b>
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
<b>BUILDING AREA</b>	<b>2,400</b>			<b>SQUARE FEET</b>		
<b>BUILDING SITE EUI</b>	<b>167.32</b>			<b>kBtu/SF/YR</b>		
<b>BUILDING SOURCE EUI</b>	<b>369.40</b>			<b>kBtu/SF/YR</b>		

**Figure 3**  
**Source Energy Use Intensity Distributions: Public Order Buildings**



### C. EPA Energy Benchmarking System

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

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

In accordance with the Local Government Energy Audit Program, CEG has created an Energy Start account for the municipal in order to allow the municipal access to monitoring their yearly energy usage as it compares to facilities of similar type. This account can be used to calculate the EUI which can be used to monitor the energy performance of the building. The account can be accessed at the following address; the username and password are also listed below:

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

Username: oldtappan  
Password: lgeaceg2009

Specific building types are detailed on the ENERGY STAR website. Non-typical buildings are covered by an “Other” category. The “Other” category is used if your building type or a section of the building is not represented by one of the specific categories. An Energy Performance Rating cannot be calculated if more than 10% of a building is classified as “Other.” DPW 25 Storage Building would be classified as “Other” and therefore cannot be given an Energy Performance Rating. However, Portfolio Manager can still be used to track the buildings energy use index.

Refer to Appendix C for detailed energy benchmarking report entitled “STATEMENT OF ENERGY PERFORMANCE.”

**Table 6**

Energy Star Performance Rating		
Facility Name	Energy Performance Rating	National Average
Old Police Station	N/A	N/A

#### **IV. FACILITY DESCRIPTION**

Old Tappan's Police Station was originally constructed in 1905 as the Borough's school house. The building is a two-story, split-level structure with first floor partially below grade and has an approximate area of 2400 square feet. It has a 4" red brick façade on 8" cinder block walls. The roof is supported by open wood truss and has blown in mineral wool insulation. In 2002 windows were replaced with double-hung, aluminum frame units having double-pane, insulating glass. The building was recently vacated as the police have relocated to a newly constructed headquarters. Discussions of future plans for the use of the building include converting it to a Senior Citizens Center.

The first floor in the building included Police headquarters consisting of the main entry and Dispatcher's area, holding cell, interrogation room, muster room, office, toilet room, and kitchen. The utility room, housing a gas-fired hot water boiler as well as the gas-fired domestic hot water heater, was also in the basement.

The second floor of the building is partitioned into various office areas.

##### Heating System

The heating system is comprised of a gas-fired, hot water boiler, three (3) small in-line pumps (circulators), and finned-tube radiators on the perimeter walls of the first and second floors. Each pump corresponds to a heating zone in the building and is independently controlled by a heating thermostat. The three (3) heating zones are upstairs, downstairs, and the stairway. Heating elements are large, convector-type radiators on the second floor and in the stairway, and smaller, residential style hot water baseboard radiators on the first floor.

The boiler is a Peerless model G-1060-W-S with 360,000 Btu/Hr input and 288,000Btu/Hr output, 80% AFUE. The boiler was manufactured in 1971. Based on the physical condition and age of the boiler, it can be safely estimated that the boilers current combustion efficiency is around 70%.

##### Cooling System

The air conditioning system for the building consists of two (2) split systems each with indoor air handlers and remote, air-cooled condensing units located at grade outside. The systems operate independently with one system serving the first floor and the other serving the second floor.

The first floor cooling system is 1-1/2 tons in capacity with a Carrier air handler model FA4ANF018 and remote condensing unit Carrier model 38CKB018. The air handler serving the second floor was unable to be inspected due to the alignment of access hatches to the attic where the unit is installed and the ladder available at the time. The remote, air-cooled condensing unit serving the second floor is manufactured by Bryant and is a model 593CJ048. This is a four (4) ton system. The condensing unit was manufactured in 1996.

### Domestic Hot Water

Domestic hot water is provided by a Rheem gas-fired, hot water heater, model 21V30-6 with 30 gallon capacity, 32,000 Btu/Hr input, and 32.3 gallons per hour (GPH) recovery at 90°F rise. The water heater serves the toilet rooms on the first and second floor and kitchen in the police headquarters.

### Controls System

Thermostats control the heating and cooling equipment. Separate, mercury switch thermostats are installed to control the heating and cooling equipment on both the first and second floors. For heating, a local thermostat activates the boiler-mounted pump which circulates heating water through the corresponding zone piping in order to maintain the thermostat's space temperature setpoint. The cooling thermostats work similarly, activating the air conditioning components as required to maintain the space temperature setpoint in their respective zones.

### Lighting

Lighting throughout the building is accomplished with either 2'x2' or 2'x4' T12 fluorescent lighting. The 2'x2' fixtures utilize U-tube lamps and the 2'x4' fixtures utilize four (4) foot tubes. All lighting is controlled with local switches.



## **V. MAJOR EQUIPMENT LIST**

Following the completion of the field survey a detailed equipment list was created. The equipment within this list is considered major energy consuming equipment whose replacement could yield substantial energy savings. Additionally, 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 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 Appendix D for the Major Equipment List.

## VI. ENERGY CONSERVATION MEASURES

Since the building is currently unoccupied, and for purposes of this report, all of the ECM's investigated were analyzed using a standard weekly occupancy of forty (40) hours per week. Results of ECM investigation show annual energy and cost savings as if the building is utilized in a manner consistent with typical business operating hours. After the Borough of Old Tappan determines the use of the building and actual operating hours, ECM's may be re-calculated to show actual energy and cost savings.

### ECM #1: Lighting Upgrades

#### Description:

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

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

This ECM utilizes Cooper Metalux T8 lighting fixtures or equivalent as the basis for energy conservation calculations.

#### Energy Savings Calculations:

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

NJ Smart Start<sup>®</sup> Program Incentives are calculated as follows:

From Appendix C, the replacement of a T-12 fixture to a T-5 or T-8 fixture warrants the following incentive: T-5 or T-8 (1-2 lamp) = \$25 per fixture; T-5 or T-8 (3-4 lamp) = \$30 per fixture.

Smart Start<sup>®</sup> Incentive = (# of 1-2 lamp fixtures × \$ 25) + (# of 3-4 lamp fixtures × \$ 30)

Smart Start<sup>®</sup> Incentive = (25 × \$ 25) + ( 20 × \$ 30) = \$1225

**Replacement and Maintenance Savings are calculated as follows:**

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

Calculations based on the estimated burn-hours per year and the life expectancy of incandescent bulbs versus compact fluorescents produced a reduction in the number of “burnouts” of 6.1 lamps per year.

$$Savings = (6.2 \text{ lamps per year}) \times (\$0.50 + \$5.00) = \$34.10 / \text{yr}$$

**Energy Savings Summary:**

<b>ECM #1 - ENERGY SAVINGS SUMMARY</b>	
<b>Installation Cost (\$):</b>	\$4,628
<b>NJ Smart Start Equipment Incentive (\$):</b>	(\$1,225)
<b>Net Installation Cost (\$):</b>	\$3,403
<b>Annual Maintenance Savings (\$ / yr):</b>	\$34
<b>Annual Energy Savings (\$ / yr):</b>	\$1,032
<b>Annual Net Savings (\$ / yr):</b>	\$1,066
<b>Simple Payback (yrs):</b>	3.19
<b>Simple Lifetime Return On Investment (%):</b>	683 %
<b>Estimated ECM Lifetime (yr.):</b>	25
<b>Simple Lifetime Energy Savings (\$):</b>	\$25,800
<b>Simple Lifetime Maintenance Savings (\$):</b>	\$850

## ECM #2: Install LED Exit Signs

### Description:

LED is an acronym for light-emitting-diode. LED's are small light sources that are readily associated with electronic equipment. LED exit signs have been manufactured in a variety of shapes and sizes. There are also retrofit kits that allow for simply modification of existing exit signs to accommodate LED technology. The benefits of LED technology are substantial. LED exit signs will last for 20-30 years without maintenance. This results in tremendous maintenance savings considering that incandescent or fluorescent lamps need to be replaced at a rate of 1-5 times per year. Lamp costs (\$2-\$7 each) and labor costs (\$8-\$20 per lamp) add up rapidly. Additionally, LED exit lights only uses 5 Watts. In comparison, conventional exit signs use 30 Watts. It is recommended that samples of the products be installed to confirm that they are compatible with the existing electrical system.

This ECM replaces the existing exit signs, three (3) total, throughout the building with highly energy efficient LED exit signs. A Pegasus Associates Lighting LED exit sign or equivalent was used for the basis of design.

### Energy Savings Calculations:

#### Existing exit sign energy costs:

$$5 \text{ units} \times 30 \text{ watts/unit} \div 1000 \text{ watts/kW} \times 8,760 \text{ hrs/yr} \times \$0.161/\text{kWh} = \$211.55$$

#### New LED exit sign energy costs:

$$5 \text{ units} \times 5 \text{ watts/unit} \div 1000 \text{ watts/kW} \times 8,760 \text{ hrs} \times \$0.161/\text{kWh} = \$35.26$$

$$\text{Net energy savings} = \$211 - \$35 = \underline{\$176/\text{yr.}}$$

$$\text{Installed cost of new LED exit signs} = \$80 \times 5 = \underline{\$400}$$

NJ Smart Start<sup>®</sup> Program Incentives are calculated as follows:

From Appendix B, the replacement of an incandescent exit sign warrants the following incentive:  
LED Exit Sign = \$20 per fixture.

$$\text{Smart Start}^{\text{®}} \text{ Incentive} = (\# \text{ of exit signs} \times \$ 20) = (5 \times \$20) = \$100$$

Maintenance Savings are calculated as follows:

$$\text{Maintenance Savings} = (\# \text{ of lamps} \times \$ \text{ per lamp}) + \text{Installation Labor}$$

*Maintenance Savings* =  $(62.5 \times \$4.50) + (62.5 \times \$14) = \$1156.25$  /yr.

**Energy Savings Summary:**

<b>ECM #2 - ENERGY SAVINGS SUMMARY</b>	
<b>Installation Cost (\$):</b>	<i>\$400</i>
<b>NJ Smart Start Equipment Incentive (\$):</b>	<i>(\$100)</i>
<b>Net Installation Cost (\$):</b>	<i>\$300</i>
<b>Annual Maintenance Savings (\$ / yr):</b>	<i>\$1156</i>
<b>Annual Energy Savings (\$ / yr):</b>	<i>\$176</i>
<b>Annual Net Savings (\$ / yr):</b>	<i>\$1332</i>
<b>Simple Payback (yrs):</b>	<i>.23</i>
<b>Simple Lifetime Return on Investment (%):</b>	<i>11,000 %</i>
<b>Estimated ECM Lifetime (yr):</b>	<i>25</i>
<b>Simple Lifetime Energy Savings (\$):</b>	<i>\$4,400</i>
<b>Simple Lifetime Maintenance Savings (\$):</b>	<i>\$28,900</i>

### **ECM #3: Lighting Controls**

#### **Description:**

In some areas the lighting is left on unnecessarily. Many times this is due to the idea that it is better to keep the lights on rather than to continuously switch them on and off. The on/off dilemma was studied and it was found that the best option is to turn the lights off whenever possible. Although this does reduce the lamp life, the energy savings far outweigh the lamp replacement costs. The cutoff for when to turn the lights off is around two minutes. If the lights can be off for more than a two minute interval, then it pays to shut them off.

Lighting controls come in many forms. Sometimes an additional switch is all it will take. Occupancy sensors detect motion and will switch the lights on when the room is occupied. They can either be mounted in place of the current wall switch, or they can be mounted on the ceiling to cover large areas. Lastly, photocells are a lighting control that sense light levels and will turn the lights off when there is adequate daylight. These are mostly used outside, but they are becoming much more popular in energy-efficient office designs as well.

To determine an estimated savings for lighting controls, we used ASHRAE 90.1-2004 (NJ Energy Code). Appendix G of the referenced standard, states that occupancy sensors have a 10% power adjustment factor for daytime occupancies for buildings over 5,000 SF. CEG recommends the installation of dual technology occupancy sensors in all areas of the facility.

#### **Energy Savings Calculations:**

From Appendix E of this report, we calculated the lighting power density (Watts/ft<sup>2</sup>) of the existing spaces to be 2.08 Watts/SF. Ten percent of this value is the resultant energy savings due to installation of occupancy sensors:

$$\text{Savings} = 10\% \times 2.08 \text{ Watts/SF} \times 2,400\text{SF} \times 2,000 \text{ hrs/yr.} = 998.4 \text{ kWh} \times \$0.161/\text{kWh}$$

$$\text{Savings} = \$160 / \text{yr}$$

Installation cost per dual-technology sensor (Basis: Sensorswitch or equivalent) is \$75/unit including material and labor. The SmartStart Buildings® incentive is \$20 per control which equates to an installed cost of \$55/unit. Total number of rooms to be retrofitted is 15. Total cost to install sensors is \$55/unit x 15 units = \$825.

**Energy Savings Summary:**

<b>ECM #3 - ENERGY SAVINGS SUMMARY</b>	
<b>Installation Cost (\$):</b>	<i>\$1,125</i>
<b>NJ Smart Start Equipment Incentive (\$):</b>	<i>(\$300)</i>
<b>Net Installation Cost (\$):</b>	<i>\$825</i>
<b>Annual Maintenance Savings (\$):</b>	<i>\$0</i>
<b>Energy Savings (\$ / yr):</b>	<i>\$160</i>
<b>Annual Net Savings (\$ / yr):</b>	<i>\$160</i>
<b>Simple Payback (yrs):</b>	<i>5.2</i>
<b>Simple Lifetime Return on Investment:</b>	<i>190 %</i>
<b>Estimated ECM Lifetime (yr.)</b>	<i>15</i>
<b>Simple Lifetime Energy Savings (\$):</b>	<i>\$2,400</i>
<b>Simple Lifetime Maintenance Savings (\$):</b>	<i>\$0</i>

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## ECM #4: Replace Heating Hot Water Boiler

### Description:

The Police Station is heated by a Peerless model G-1060-W-S natural gas fired hot water boiler which, when new, was 80 % efficient. Heating capacity of this boiler is 288,000 Btu/Hr output from a natural gas input of 360,000 Btu/Hr. The boiler was installed in 1971. It is estimated that the boiler's combustion efficiency today is approximately 70%. The physical condition of the boiler is satisfactory however it has reached the end of its useful life and may fail at any time. In this energy conservation measure we are suggesting replacing the existing boiler with a new Lochinvar "Knight" Heating Boiler rated for a modulating input of 79,800-399,000 Btu/Hr, maximum output of 360,000 Btu/Hr, and a thermal efficiency of 90.3 %.

### Existing Heating Hot Water Boiler:

Rated Capacity = 360 MBH Input (Natural Gas)  
Thermal Efficiency = 70%

### Replacement Boiler:

High Efficiency Lochinvar or Equal (with O/A HW Reset)  
Rated Capacity = 399 MBH Input  
Thermal Efficiency = 90.3%

### Energy Consumption:

To estimate the amount of energy consumed by the existing gas-fired boilers throughout the heating season, the Degree Day method of energy estimating is be used where

$$EnergyUsed = \frac{H_L \times D \times 24}{\Delta t \times k \times V} \times (C_D)$$

and:

$H_L$  = Building Heat Loss, BTU/Hr.

$D$  = number of 65 F Heating Degree Days (5945 for Old Tappan)

$\Delta t$  = Design temperature difference, deg. F (70°F)

$k$  = a correction factor that includes the effects of rated full load efficiency, part load performance, oversizing and energy conservation devices.

$V$  = Heating value of fuel, BTU/Therm

$C_D$  = empirical correction factor for heating effect vs. 65 F degree days



Heat Loss = 96,000 BTU/Hr.

$$EnergyUsed = \frac{(96,000) \times (5945) \times 24}{70 \times .6 \times 100,000} \times (.6)$$

*Energy Used* = 1956.7 Therms/Year

**Energy Savings Calculations:**

The new boiler will have a higher combustion efficiency and variable combustion capacity which will match the boiler heat output with the heating load of the space based on a Lochinvar Knight Boiler model KBN399.

$$EnergyUsed = \frac{(96,000) \times (5945) \times 24}{70 \times .9 \times 100,000} \times (.6)$$

*Energy Used* = 1304.5 Therms/Year

Annual Energy Savings = 1956.7 – 1304.5 = 652.2 Therms/Year

Cost Savings = Annual Energy Savings x \$/Therm

Cost Savings = 652.2 Therms x \$1.29/Therm = \$841 / yr.

**Energy Savings Summary:**

<b>ECM #4 - ENERGY SAVINGS SUMMARY</b>	
<b>Installation Cost (\$):</b>	\$15,000
<b>NJ Smart Start Equipment Incentive (\$):</b>	(\$698)
<b>Net Installation Cost (\$):</b>	\$14,302
<b>Annual Maintenance Savings (\$):</b>	\$0
<b>Annual Energy Savings (\$ / yr):</b>	\$841
<b>Annual Net Savings (\$ / yr):</b>	\$841
<b>Simple Payback (yrs):</b>	17.0
<b>Simple Lifetime Return on Investment:</b>	32.0 %
<b>Estimated ECM Lifetime (yrs):</b>	25
<b>Simple Lifetime Energy Savings (\$):</b>	\$21,025
<b>Simple Lifetime Maintenance Savings (\$):</b>	\$0

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## ECM #5: Programmable Thermostat

### Description:

Throughout the building there are standard, manual wall thermostats for various HVAC units that provide local control with adjustable settings for the conditioning equipment. These aged, indoor temperature controls are inaccurate due to temperature drift, age, and not having been re-calibrated. These units also do not have unoccupied setback features.

New programmable thermostats are available that utilize programming schedules for occupied and unoccupied times and can be set to vary space temperature at these respective times. In addition, the programmable thermostats can be used in conjunction with a motion sensor. When the space is not occupied the equipment can operate at the unoccupied setpoint. Once the space becomes occupied the motion sensor sends a signal to the thermostat to raise the temperature of the space to the occupied setpoint. This control system approach is ideal for facilities with low occupancy levels such as a volunteer fire house.

This energy conservation measure would replace the various HVAC unit thermostats with programmable 7-day thermostats with night time setback control. The recommended thermostat setpoints for heating/cooling are as follows:

Occupied Heating =	70° F
Unoccupied Heating =	65° F
Occupied Cooling =	75° F
Unoccupied Cooling =	80° F

CEG recommends replacement of the three (5) existing remote thermostats that control the two (2) air conditioning systems and three (3) heating zone pumps with three (3) Honeywell RTH7500D 7-day programmable thermostat or equivalent.

### Energy Savings Calculations:

The energy savings of a 7-day programmable thermostat was calculated by using Energy Star Life Cycle Cost Estimate software for qualified programmable thermostats. The referenced calculator can be found at [www.energystar.gov](http://www.energystar.gov)

Calculated energy savings for heating = \$28/Unit x 3 units = \$84/yr

Calculated energy savings for cooling = \$20/Unit x 3 units = \$60/yr

Cost of a 7-day programmable thermostat (installed) = \$180/unit x 3 units = \$540

Simple Payback = \$540/(\$84+\$60) = 3.75 Years

**Energy Savings Summary:**

<b>ECM #5 - ENERGY SAVINGS SUMMARY</b>	
<b>Installation Cost (\$):</b>	<i>\$540</i>
<b>NJ Smart Start Equipment Incentive (\$):</b>	<i>(\$0)</i>
<b>Net Installation Cost (\$):</b>	<i>\$540</i>
<b>Annual Maintenance Savings (\$):</b>	<i>\$0</i>
<b>Annual Energy Savings (\$ / yr):</b>	<i>\$144</i>
<b>Annual Net Savings (\$ / yr):</b>	<i>\$144</i>
<b>Simple Payback (yrs):</b>	<i>3.75</i>
<b>Simple Lifetime Return on Investment:</b>	<i>567 %</i>
<b>Estimated ECM Lifetime (yrs):</b>	<i>25</i>
<b>Simple Lifetime Savings (\$):</b>	<i>\$3,600</i>
<b>Simple Lifetime Maintenance Savings (\$):</b>	<i>\$0</i>

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## ECM #6: Split System Upgrade- Downstairs Zone

### Description:

Cooling is provided for the downstairs zone via a split-system air-conditioning system. The installation is typical of residential applications using an air handler with an evaporator coil and remote air-cooled condensing unit. The air-conditioning system is not as efficient as a new unit and has an estimated seasonal energy efficiency ratio (SEER) of 9.2. The NJ State Energy Code (ASHRAE 90.1-2004) mandates a minimum energy efficiency of 12.0 SEER for units of this type. The existing unit is estimated to be 24 years old at this time. The estimated service life for split system air-conditioning unit is 15 years as outlined in Chapter 36 of the 2007 ASHRAE Applications Handbook..

This energy conservation measure would replace the air handler and condensing unit serving the downstairs area. The existing equipment will be replaced with an energy efficient, split system with cooling capacity equivalent to the existing system. The average EER of the new cooling equipment will be 16.0 EER. The energy efficiency of the new equipment is based on a Lennox CBX27UH Air Handler, and model XC14 condensing unit.

### Cooling Energy Savings Calculations:

$$EnergySavings = \frac{[CoolingTons \times 12,000 Btu / ton-hr]}{[1000W / kW]} \times \left( \frac{1}{EER_{OLD}} - \frac{1}{EER_{NEW}} \right) \times EquivalentFullLoadHrs.ofCooling$$

#### Existing Air Conditioning Units

Rated Capacity = 1-1/2 Tons

Condensing Unit Efficiency = 9.2 EER

#### Proposed High-Efficiency Air Conditioning Unit

Rated Capacity = 1-1/2 Tons

New Condensing Unit Efficiency = 16.0 EER

Equivalent Full Load Hours of Cooling = 500 hrs/yr.

Average Cost of Electricity - \$0.161/kWh

$$EnergySavings = \frac{[1.5Tons \times 12,000 Btu / ton-hr]}{[1000W / kW]} \times \left( \frac{1}{9.2} - \frac{1}{16} \right) \times 500 = 415 kWh$$

Cost Savings = (415 kWh) x \$0.161/kWh = \$67/ Yr.

Installation cost for the replacement equipment is estimated at \$5,000. It is pertinent to note that this estimate includes the demolition of the existing equipment.

NJ Smart Start<sup>®</sup> Program Incentives are calculated as follows:

From Appendix C, the replacement falls under the category “Unitary HVAC and Split Systems” and warrants an incentive based on efficiency (SEER) at a certain cooling tonnage.

$$\text{SmartStar}^{\text{®}} \text{ Incentive} = (\text{Cooling Tons} \times \text{Incentive}) = (1-1/2 \text{ Tons} \times \$80/\text{Ton}) = \underline{\$120}$$

**Energy Savings Summary:**

<b>ECM #6 - ENERGY SAVINGS SUMMARY</b>	
<b>Installation Cost (\$):</b>	\$5,000
<b>NJ Smart Start Equipment Incentive (\$):</b>	(\$120)
<b>Net Installation Cost (\$):</b>	\$4,880
<b>Annual Maintenance Savings (\$ / yr):</b>	\$0
<b>Annual Energy Savings (\$ / yr):</b>	\$67
<b>Annual Net Savings (\$ /yr )</b>	\$67
<b>Simple Payback (yrs):</b>	72.8
<b>Simple Lifetime Return on Investment:</b>	-79.4 %
<b>Estimated ECM Lifetime (yr)</b>	15
<b>Simple Lifetime Energy Savings (\$):</b>	\$1,005
<b>Simple Lifetime Maintenance (\$):</b>	\$0

## ECM #7: Split System Upgrade- Upstairs Zone

### Description:

Cooling is provided for the upstairs zone via split-system air-conditioning system. The installation is typical of residential applications using an air handler with evaporator coil and remote air-cooled condensing unit. The air-conditioning system is not as efficient as a new unit and has an estimated seasonal energy efficiency ratio (SEER) of 11.0. The NJ State Energy Code (ASHRAE 90.1-2004) mandates a minimum energy efficiency of 12.0 SEER for units of this type. The existing unit is estimated to be 13 years old at this time. The estimated service life for split system air-conditioning unit is 15 years as outlined in Chapter 36 of the 2007 ASHRAE Applications Handbook..

This energy conservation measure would replace the air handler and condensing unit serving the upstairs area. The existing equipment will be replaced with an energy efficient, split system with cooling capacity equivalent to the existing system. The average EER of the new cooling equipment will be 16.0 EER. The energy efficiency of the new equipment is based on a Lennox CBX27UH Air Handler, and model SSB condensing unit.

### Cooling Energy Savings Calculations:

$$EnergySavings = \frac{[CoolingTons \times 12,000 Btu / ton-hr]}{[1000W / kW]} \times \left( \frac{1}{EER_{OLD}} - \frac{1}{EER_{NEW}} \right) \times EquivalentFullLoadHrs.ofCooling$$

#### Existing Air Conditioning Units

Rated Capacity = 4 Tons

Condensing Unit Efficiency = 11.0 EER

#### Proposed High-Efficiency Air Conditioning Unit

Rated Capacity = 4 Tons

New Condensing Unit Efficiency = 16.0 EER

Equivalent Full Load Hours of Cooling = 500 hrs/yr.

Average Cost of Electricity - \$0.161/kWh

$$EnergySavings = \frac{[4Tons \times 12,000 Btu / ton-hr]}{[1000W / kW]} \times \left( \frac{1}{11} - \frac{1}{16} \right) \times 500 = 682 kWh$$

Cost Savings = (682 kWh) x \$0.161/kWh = \$110/ Yr.

Installation cost for the replacement equipment is estimated at \$6,500. It is pertinent to note that this estimate includes the demolition of the existing equipment.

NJ Smart Start<sup>®</sup> Program Incentives are calculated as follows:

From Appendix C, the replacement falls under the category “Unitary HVAC and Split Systems” and warrants an incentive based on efficiency (SEER) at a certain cooling tonnage.

$$\text{SmartStar}^{\text{®}} \text{ Incentive} = (\text{Cooling Tons} \times \text{Incentive}) = (4 \text{ Tons} \times \$80/\text{Ton}) = \underline{\$320}$$

**Energy Savings Summary:**

<b>ECM #7 - ENERGY SAVINGS SUMMARY</b>	
<b>Installation Cost (\$):</b>	\$6,500
<b>NJ Smart Start Equipment Incentive (\$):</b>	(\$320)
<b>Net Installation Cost (\$):</b>	\$6,180
<b>Annual Maintenance Savings (\$ / yr):</b>	\$0
<b>Annual Energy Savings (\$ / yr):</b>	\$110
<b>Annual Net Savings (\$ / yr )</b>	\$110
<b>Simple Payback (yrs):</b>	56.2
<b>Simple Lifetime Return on Investment:</b>	-73.3 %
<b>Estimated ECM Lifetime (yr):</b>	15
<b>Simple Lifetime Energy Savings (\$):</b>	\$1,650
<b>Simple Lifetime Maintenance (\$):</b>	\$0

## **VII. RENEWABLE/DISTRIBUTED ENERGY MEASURES**

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

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

CEG has reviewed the existing roof area of the building being audited for the purposes of determining a potential for a roof mounted photovoltaic system. A roof area of 448 S.F. can be utilized for a PV system on the Storage Building. A depiction of the area utilized is shown in Appendix F. Using this square footage it was determined that a system size of 7 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 11,127 KWh annually, reducing the overall utility bill by 85.6 % percent. A detailed financial analysis can be found in Appendix F. This analysis illustrates the payback of the system over a 25 year period. The eventual degradation of the solar panels and the price of accumulated SREC's are factored into the payback.

The solar panel system analysis is based on Sun Power SPR-230 panels. The panel efficiency is 18% with an inverter efficiency of 95%. This region allows for a typical range of sunlight between 4.5 and 4.9 hours per day. The calculations are based on an average 4.68 hours per day. The operating hours are calculated based on 351 days per year accounting for two weeks per year of service down time. The calculations are also based on a solar PV system which utilizes the New Jersey guidelines for net metering. Net metering allows excess energy generated at production peaks to flow onto the grid. The excess energy is metered and subtracted from the facility's total energy usage on an annual basis. Due to this allowance the system design excludes the use of inefficient battery storage.

CEG has reviewed financing options for the owner. Two options were studied and they are as follows: Self-financed and direct purchase without finance. Self-finance was calculated with



95% of the total project cost financed at a 7% interest rate over 25 years. Direct purchase involves the local government paying for 100% of the total project cost upfront. Both of these calculations include a utility inflation rate as well as the degradation of the solar panels over time. Based on our calculations the following are the payback periods for the respective method of payment:

<b>PAYMENT TYPE</b>	<b>SIMPLE PAYBACK</b>	<b>INTERNAL RATE OF RETURN</b>
Self-Finance	11.3 Years	12.1%
Direct Purchase	11.3 Years	8.0%

Wind energy production is another option available through the Renewable Energy Incentive Program. Small wind turbines can be utilized to produce clean energy on a per building basis. Cash incentives are available per kWh of electric usage. CEG has reviewed the applicability of wind energy for the Police Station and has determined it is not a viable option. The electrical demand for the use of the building is not large enough to satisfy the need for a wind turbine.

## VIII. ENERGY PURCHASING AND PROCUREMENT STRATEGY

### **Load Profile:**

Load Profile analysis was performed to determine the seasonal energy usage of the facility. Irregularities in the load profile will indicate potential problems within the facility. Consequently based on the profile a recommendation will be made to remedy the irregularity in energy usage. For this report, the facility's energy consumption data was gathered in table format and plotted in graph form to create the load profile. Refer to the Electric and Natural Gas Usage Profiles included within this report to reference the respective electricity and natural gas usage load profiles.

### Electricity:

This facility has been abandoned by the Police Department. The only room that may have some use is the upstairs hall, which is partitioned into various office areas.

The Electric Usage Profile demonstrates a fairly typical load profile, with steady use throughout the year. The summer period (May- September) has had the greatest electric consumption, and this is typical with air-conditioning load. The month of July has an obvious increased electric peak. This peak is more than likely associated with the cooling system. While the cooling units are 1.5 and 4 ton capacity each, July was obviously a warmer month than normal and the cooling units were turned on simultaneously. There is a drop in electric consumption in the winter period (November –March). A flatter load profile will allow for more competitive energy prices when shopping with alternative suppliers.

### Natural Gas:

The Natural Gas Usage Profile demonstrates a very typical natural gas (heat load) profile. The summer months (June-October) demonstrate little consumption (complimenting the winter load). There is an increase in winter consumption (November – April). The increased winter consumption is due to the presence of a Peerless natural gas-fired boiler and Rheem 30 gallon hot-water heater. A base-load shaping (flat) will secure more competitive energy prices when procuring energy through an alternative energy source.

### **Tariff Analysis:**

### Electricity:

This facility receives electrical service through Orange and Rockland (O&R) on a C&I General Service Secondary (GSS) tariff rate structure, Service Classification No. 2. This service is for Sales and delivery of electric power supply, provided by the Company or delivery of electric power supply provided by an electric generation supplier (TPS) under the Company's (O&R) Retail Access Program to general secondary or primary customers. Customers under this rate schedule will use less than 1000 kW during any month or be switched to Service Classification No. 7. The character of service is for continuous electrical service is for 60 cycle A.C. single or

three phase secondary voltage. The Delivery Charges are as follows: Customer Charge, Distribution Charges, Demand Charges, and Usage Charges. Supply Charges: If customer is taking Basic Generation Charges from the utility (not a Third Party Supplier), they will pay: Transmission Charges, Demand Charges, Usage Charges, and Transmission Surcharges. Monthly Charges are as follows: Societal Benefits Charges, Regional Greenhouse Gas Initiative Surcharge, Securitization Charges, Basic Generation and Minimum Monthly Charges.

#### Natural Gas:

This facility receives natural gas service through Public Service Electric and Gas Company (PSE&G) on a GSGH (General Service Gas-Heating) rate when not receiving commodity by a Third Party Supplier. The utility tariff rate (GSGH) is for General Service. This is a firm delivery service (higher level of delivery) for general purposes where 1) customer does not qualify for RSG (residential) and 2) customers usage does not exceed 3,000 therms in any month. Customers may either purchase gas supply from a Third Party (TPS) or from Public Services Basic Gas Supply Service default service as detailed in the rate schedule.

The service described above has a much higher priority of delivery, based on the pipeline capacity. When the pipelines capacity was unbundled (much like the telecom service), it was divided into various levels of service. The “firm” service is the highest priority, and does not get interrupted (but can be interrupted).

This rate schedule has a Delivery Charge Mechanism which includes: Balancing Charge, Societal Benefits Charge, Realignment Adjustment Charge, Margin Adjustment Charge, RGGI Charge and Customer Account Service Charge. The customer can elect to have the Supply Charge (Commodity Charge) serviced through the utility or by a Third Party Supplier (TPS). Note: Should the TPS not deliver, the customer may receive service from PSE&G under Emergency Sales Service. Emergency Sales Service carries an extremely high penalty cost of service. Should the TPS under-deliver to the utility on behalf of the client, the utility will automatically supply this default service to the client.

Imbalances occur when Third Party Suppliers are used to supply natural gas, full-delivery is not made, and when a new supplier is contracted or the customer returns to the utility. It is important when utilizing a Third Party Supplier, that an experienced regional supplier is used. Otherwise, imbalances can occur, jeopardizing economics and scheduling.

#### **Recommendations:**

CEG recommends a global approach that will be consistent with all facilities within the Township. The primary area for potential improvement is seen in the electric costs. The average price per kWh (kilowatt hour) for all buildings based on 1-year historical average price is \$.1529/kWh (this is the average “price to compare” if the client intends to shop for energy). The average price per decatherm for natural gas is \$ 9.7155 / dth (dth, is the common unit of measure). Energy commodities are among the most volatile of all commodities, however at this point and time, energy is extremely competitive. The Township could see improvement in its energy costs if it were to take advantage of these current market prices quickly, before energy

increases. Based on annual historical consumption (June 2008 through May 2009) and current electric rates, the Township could see an improvement in its electric costs of up to 30% annually. (Note: Savings were calculated using Average Annual Consumption and a variance to a Fixed Average One-Year commodity contract). CEG recommends aggregating the entire electric load to gain the most optimal energy costs. CEG recommends advisement for alternative sourcing and supply of energy on a “managed approach”.

CEG’s secondary recommendation coincides with the natural gas costs. Based on the current market, Old Tappan could improve its natural gas costs by up to 15%. CEG recommends that Old Tappan receive further advisement on these prices through an energy advisor. The Township should also consider procuring energy (natural gas) through an alternative supply source.

CEG also recommends that the municipality schedule a meeting with the current utility providers to review their utility charges and current tariff structures for electricity and natural gas. This meeting would provide insight regarding alternative procurement options that are currently available. Through its meeting with the Local Distribution Company (LDC), the municipality can learn more about the competitive supply process. The municipality can acquire a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at [www.nj.gov/bpu](http://www.nj.gov/bpu). They should also consider using a billing-auditing service to further analyze the utility invoices, manage the data and use the information for ongoing demand-side management projects. Furthermore, special attention should be given to credit mechanisms, imbalances, balancing charges and commodity charges when meeting with the utility representative. The Township should ask the utility representative about alternative billing options, such as consolidated billing when utilizing the service of a Third Party Supplier. Finally, if the supplier for energy (natural gas) is changed, closely monitor balancing, particularly when the contract is close to termination. This could be performed with the aid of an “energy advisor”.

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## X. INSTALLATION FUNDING OPTIONS

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

- i. *Energy Savings Improvement Program (ESIP)* – Public Law 2009, Chapter 4 authorizes government entities to make energy related improvements to their facilities and pay for the costs using the value of energy savings that result from the improvements. The “Energy Savings Improvement Program (ESIP)” law provides a flexible approach that can allow all government agencies in New Jersey to improve and reduce energy usage with minimal expenditure of new financial resources.
- ii. *Municipal Bonds* – Municipal bonds are a bond issued by a city or other local government, or their agencies. Potential issuers of municipal bonds include cities, counties, redevelopment agencies, school districts, publicly owned airports and seaports, and any other governmental entity (or group of governments) below the state level. Municipal bonds may be general obligations of the issuer or secured by specified revenues. Interest income received by holders of municipal bonds is often exempt from the federal income tax and from the income tax of the state in which they are issued, although municipal bonds issued for certain purposes may not be tax exempt.
- iii. *Power Purchase Agreement* – Public Law 2008, Chapter 3 authorizes contractor of up to fifteen (15) years for contracts commonly known as “power purchase agreements.” These are programs where the contracting unit (Owner) procures a contract for, in most cases, a third party to install, maintain, and own a renewable energy system. These renewable energy systems are typically solar panels, windmills or other systems that create renewable energy. In exchange for the third party’s work of installing, maintaining and owning the renewable energy system, the contracting unit (Owner) agrees to purchase the power generated by the renewable energy system from the third party at agreed upon energy rates.

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

## **XI. ADDITIONAL RECOMMENDATIONS**

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

- A. Maintain all weather stripping on windows and doors.
- B. Clean all light fixtures to maximize light output.
- C. Drain and flush out water heater annually to minimize sediment build-up and mineral deposits within the tank
- D. Tune-up boiler annually. Verify circulators are working properly, boiler controls are calibrated, heat exchanger is clean and firing properly, pilot flame is normal, all safeties are operating properly.
- E. Provide more frequent air filter changes to decrease overall fan horsepower requirements and maintain better IAQ
- F. Chemically clean condenser and evaporator coils periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.

<b><u>DETAILED COST BREAKDOWN PER ECM</u></b>					
<b>CONCORD ENGINEERING GROUP</b>					
<b>Old Tappan Police Station</b>					
<b>ECM 1 LIGHTING UPGRADE</b>					
	Qty	Unit Cost \$	Material \$	Labor \$	Total \$
Lighting Retrofit	LS	\$4,628	<u>\$0</u>	<u>\$0</u>	<u>\$4,628</u>
Total Cost			\$0	\$0	\$4,628
Utility Incentive - NJ Smart Start					<u>(\$1,225)</u>
Total Cost Less Incentive					\$3,403
<b>ECM 2 LED Exit Signs</b>					
	Qty	Unit Cost \$	Material \$	Labor \$	Total \$
New LED Exit Signs	5	\$80	<u>\$50</u>	<u>\$30</u>	<u>\$400</u>
Total Cost			\$50	\$30	\$400
Utility Incentive - NJ Smart Start (\$20 per Exit Sign)					<u>(\$100)</u>
Total Cost Less Incentive					\$300
<b>ECM 3 Lighting Controls</b>					
	Qty	Unit Cost \$	Material \$	Labor \$	Total \$
Dual - Technology Sensor	15	\$75	\$525	\$600	\$1,125
Total Cost			\$525	\$600	\$1,125
Utility Incentive - NJ Smart Start (\$20 per Sensor)					<u>(\$300)</u>
Total Cost Less Incentive					\$825
<b>ECM 4 Replace Heating Hot Water Boiler</b>					
	Qty	Unit Cost \$	Material \$	Labor \$	Total \$
New Boilers	LS	\$15,000	<u>\$0</u>	<u>\$0</u>	<u>\$15,000</u>
Total Cost			\$0	\$0	\$15,000
Utility Incentive - NJ Smart Start					<u>(\$698)</u>
Total Cost Less Incentive					\$14,302
<b>ECM 5 Programmable Thermostats</b>					
	Qty	Unit Cost \$	Material \$	Labor \$	Total \$
Programmable Thermostats	3	\$180	<u>\$0</u>	<u>\$0</u>	<u>\$540</u>
Total Cost			\$0	\$0	\$540
Utility Incentive - NJ Smart Start					<u>\$0</u>
Total Cost Less Incentive					\$540
<b>ECM 6 Air Conditioning Upgrade- Downstairs</b>					
	Qty	Unit Cost \$	Material \$	Labor \$	Total \$
Split System Upgrade	LS	\$5,000	<u>\$3,000</u>	<u>\$2,000</u>	<u>\$5,000</u>
Total Cost			\$3,000	\$2,000	\$5,000
Utility Incentive - NJ Smart Start					<u>(\$120)</u>
Total Cost Less Incentive					\$4,880

<b>ECM 7 Air Conditioning Upgrade- Upstairs</b>					
	Qty	Unit Cost \$	Material \$	Labor \$	Total \$
Split System Upgrade	LS	\$6,500	<u>\$4,000</u>	<u>\$2,500</u>	<u>\$6,500</u>
Total Cost			\$4,000	\$2,500	\$6,500
Utility Incentive - NJ Smart Start					<u>(\$320)</u>
Total Cost Less Incentive					\$6,180





# 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 as of January, 2009:

### Electric Chillers

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

### Gas Cooling

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

### Desiccant Systems

	\$1.00 per cfm – gas or electric
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### Electric Unitary HVAC

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

### Ground Source Heat Pumps

Closed Loop & Open Loop	\$370 per ton
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### Gas Heating

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

### Variable Frequency Drives

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

### Natural Gas Water Heating

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

### Premium Motors

Three-Phase Motors	\$45 - \$700 per motor
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### Prescriptive Lighting

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

### Lighting Controls – Occupancy Sensors

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

### Lighting Controls – HID or Fluorescent Hi-Bay Controls

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

### Other Equipment Incentives

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



# STATEMENT OF ENERGY PERFORMANCE

## Old Police Station

**Building ID:** 1847487  
**For 12-month Period Ending:** April 30, 2009<sup>1</sup>  
**Date SEP becomes ineligible:** N/A

**Date SEP Generated:** September 09, 2009

### Facility

Old Police Station  
 247 Old Tappan Road  
 Old Tappan, NJ 07675

### Facility Owner

Borough of Old Tappan  
 227 Old Tappan Road  
 Old Tappan, NJ 07675

### Primary Contact for this Facility

Patrick O'Brien  
 227 Old Tappan Road  
 Old Tappan, NJ 07675

**Year Built:** 1925

**Gross Floor Area (ft<sup>2</sup>):** 2,400

**Energy Performance Rating<sup>2</sup> (1-100)** N/A

### Site Energy Use Summary<sup>3</sup>

Electricity - Grid Purchase(kBtu)	201,595
Natural Gas (kBtu) <sup>4</sup>	200,264
Total Energy (kBtu)	401,859

### Energy Intensity<sup>5</sup>

Site (kBtu/ft <sup>2</sup> /yr)	167
Source (kBtu/ft <sup>2</sup> /yr)	368

### Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO <sub>2</sub> e/year)	30
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### Electric Distribution Utility

Rockland Electric Co

### National Average Comparison

National Average Site EUI	104
National Average Source EUI	213
% Difference from National Average Source EUI	73%
Building Type	Other

### Meets Industry Standards<sup>6</sup> for Indoor Environmental Conditions:

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

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.

### Certifying Professional

Raymond Johnson  
 520 South Burnt Mill Road  
 Voorhees, NJ 08043

#### Notes:

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

## ENERGY STAR® Data Checklist for Commercial Buildings

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

**Please complete and sign this checklist and include it with the stamped, signed Statement of Energy Performance.**

NOTE: You must check each box to indicate that each value is correct, OR include a note.

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	<input checked="" type="checkbox"/>
<b>Building Name</b>	Old Police Station	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		<input type="checkbox"/>
<b>Type</b>	Other	Is this an accurate description of the space in question?		<input type="checkbox"/>
<b>Location</b>	247 Old Tappan Road, Old Tappan, NJ 07675	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		<input type="checkbox"/>
<b>Single Structure</b>	Single Facility	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		<input type="checkbox"/>
Downstairs Police Station (Office)				
CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	<input checked="" type="checkbox"/>
<b>Gross Floor Area</b>	1,200 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		<input type="checkbox"/>
<b>Weekly operating hours</b>	0 Hours	Is this the total number of hours per week that the Office space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		<input type="checkbox"/>
<b>Workers on Main Shift</b>	0	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100. The normal worker density ranges between 0.3 and 10 workers per 1000 square feet (92.8 square meters)		<input type="checkbox"/>
<b>Number of PCs</b>	0	Is this the number of personal computers in the Office?		<input type="checkbox"/>
<b>Percent Cooled</b>	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		<input type="checkbox"/>
<b>Percent Heated</b>	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		<input type="checkbox"/>
Upstairs Meeting Hall (Other)				
CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	<input checked="" type="checkbox"/>

<b>Gross Floor Area</b>	1,200 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.	<input type="checkbox"/>
<b>Number of PCs</b>	0 (Optional)	Is this the number of personal computers in the space?	<input type="checkbox"/>
<b>Weekly operating hours</b>	4 Hours(Optional)	Is this the total number of hours per week that the space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.	<input type="checkbox"/>
<b>Workers on Main Shift</b>	0 (Optional)	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100.	<input type="checkbox"/>

## ENERGY STAR® Data Checklist for Commercial Buildings

### Energy Consumption

**Power Generation Plant or Distribution Utility:** Rockland Electric Co

Fuel Type: Electricity		
<b>Meter: 58598-47005 (kWh (thousand Watt-hours))</b> <b>Space(s):</b> Entire Facility <b>Generation Method:</b> Grid Purchase		
Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
04/01/2009	04/30/2009	3,648.00
03/01/2009	03/31/2009	3,888.00
02/01/2009	02/28/2009	4,200.00
01/01/2009	01/31/2009	4,440.00
12/01/2008	12/31/2008	5,016.00
11/01/2008	11/30/2008	3,936.00
10/01/2008	10/31/2008	4,644.00
09/01/2008	09/30/2008	5,316.00
08/01/2008	08/31/2008	5,664.00
07/01/2008	07/31/2008	7,824.00
06/01/2008	06/30/2008	5,490.00
<b>58598-47005 Consumption (kWh (thousand Watt-hours))</b>		<b>54,066.00</b>
<b>58598-47005 Consumption (kBtu (thousand Btu))</b>		<b>184,473.19</b>
<b>Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))</b>		<b>184,473.19</b>
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		<input type="checkbox"/>
Fuel Type: Natural Gas		
<b>Meter: 41 217 438 14 (therms)</b> <b>Space(s):</b> Entire Facility		
Start Date	End Date	Energy Use (therms)
04/01/2009	04/30/2009	296.89
03/01/2009	03/31/2009	300.61
02/01/2009	02/28/2009	411.49
01/01/2009	01/31/2009	322.72
12/01/2008	12/31/2008	252.18
11/01/2008	11/30/2008	98.27
10/01/2008	10/31/2008	18.84
09/01/2008	09/30/2008	17.82
08/01/2008	08/31/2008	23.02
07/01/2008	07/31/2008	17.74
06/01/2008	06/30/2008	72.97

41 217 438 14 Consumption (therms)	1,832.55
41 217 438 14 Consumption (kBtu (thousand Btu))	183,255.00
Total Natural Gas Consumption (kBtu (thousand Btu))	183,255.00
Is this the total Natural Gas consumption at this building including all Natural Gas meters?	<input type="checkbox"/>

**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.

**Certifying Professional**

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

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Signature: \_\_\_\_\_

Signature is required when applying for the ENERGY STAR.

# FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

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

**Facility**  
Old Police Station  
247 Old Tappan Road  
Old Tappan, NJ 07675

**Facility Owner**  
Borough of Old Tappan  
227 Old Tappan Road  
Old Tappan, NJ 07675

**Primary Contact for this Facility**  
Patrick O'Brien  
227 Old Tappan Road  
Old Tappan, NJ 07675

## General Information

Old Police Station	
Gross Floor Area Excluding Parking: (ft <sup>2</sup> )	2,400
Year Built	1925
For 12-month Evaluation Period Ending Date:	April 30, 2009

## Facility Space Use Summary

Downstairs Police Station		Upstairs Meeting Hall	
Space Type	Office	Space Type	Other - Social/Meeting
Gross Floor Area(ft <sup>2</sup> )	1,200	Gross Floor Area(ft <sup>2</sup> )	1,200
Weekly operating hours	0	Number of PCs <sup>o</sup>	0
Workers on Main Shift	0	Weekly operating hours <sup>o</sup>	4
Number of PCs	0	Workers on Main Shift <sup>o</sup>	0
Percent Cooled	50% or more		
Percent Heated	50% or more		

## Energy Performance Comparison

Performance Metrics	Evaluation Periods		Comparisons		
	Current (Ending Date 04/30/2009)	Baseline (Ending Date 05/31/2009)	Rating of 75	Target	National Average
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft <sup>2</sup> )	167	167	22	N/A	104
Source (kBtu/ft <sup>2</sup> )	368	367	48	N/A	213
Energy Cost					
\$/year	\$ 11,250.18	\$ 12,175.61	\$ 1,482.87	N/A	\$ 6,987.69
\$/ft <sup>2</sup> /year	\$ 4.69	\$ 5.07	\$ 0.62	N/A	\$ 2.91
Greenhouse Gas Emissions					
MtCO <sub>2</sub> e/year	30	30	4	N/A	19
kgCO <sub>2</sub> e/ft <sup>2</sup> /year	13	12	2	N/A	8

More than 50% of your building is defined as Other. This building is currently ineligible for a rating. Please note the National Average column represents the CBECS national average data for Other. This building uses X% less energy per square foot than the CBECS national average for Other.

Notes:

o - This attribute is optional.

d - A default value has been supplied by Portfolio Manager.



**MAJOR EQUIPMENT LIST**

Concord Engineering Group

"Old Tappan Police HQ"

**Boiler**

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Input (MBh)	Output (MBh)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Basement	Entire Building	Peerless	1	G-1000-W-S	Unknown	360	288	80	Natural Gas	38	35	0	

**Boiler - Pumps**

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	HP	RPM	GPM	Fl. Hd	Frame Size	Volts	Phase	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Basement	Upstairs	Bell & Gossett	1	Series 60	Unknown	Fractional	1750	Unknown	Unknown	Unknown	120	1	15	10	0	
Basement	Staiway	Bell & Gossett	1	Series 60	Unknown	Fractional	1750	Unknown	Unknown	Unknown	120	1	15	10	0	
Basement	Downstairs	Bell & Gossett	1	Series 60	Unknown	Fractional	1750	Unknown	Unknown	Unknown	120	1	15	10	0	

**Domestic Hot Water Heater**

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Input (MBh)	Recovery (gal/h)	Capacity (gal)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Basement	Kitch/Rest rms	Rheem	1	21V30-6	Unknown	32	32.3	30	76	Natural Gas	15	15	0	

**Air Handling Units**

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Cooling Coil	Cooling Eff. (EER)	Cooling Capacity	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Basement	Downstairs	Carrier	1	FA4ANFD18	Unknown	Internal	9.2	18,000 BTU/H	120	1	Unknown	24	15	0	Assume units were installed during renovation in 1985
2nd Flr	Upstairs	Unknown	1	Unkown	Unknown	Internal	11	48,000 BTU/H	120	1	Unknown	24	15	0	

**AC Condensers**

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Cooling Capacity	Eff.	Refrigerant	Volts	Phase	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Outdoors	Downstairs	Carrier	1	38CKB018	Unknown	18,000 BTU/H	9.2	R-22	208	1	24	15	0	
Outdoors	Upstairs	Bryant	1	593CJ048	Unknown	48,000 BTU/H	11	R-22	208	1	13	15	2	

**INVESTMENT GRADE LIGHTING AUDIT**

**CONCORD ENERGY SERVICES**

"Police Station"

CEG Job #: 9C09017  
Project: Old Tappan  
Address: 247 Old Tappan Rd  
City: Old Tappan  
Building SF: 2,400

DATE: 9/28/2009  
KWH COST: **\$0.161**


EXISTING LIGHTING										PROPOSED LIGHTING										SAVINGS			
Line No.	Fixture Location	No. eFixts	Fixture eType	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. rFixts	Retro-Unit rDescription	Watts Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Payback			
1	Basement	7	2'X2' 2-Lamp T-12 U-Tube Recessed Prismatic 34W	2000	70	0.49	980	\$157.78	7	2'x2' 2-Lamp T-8, Prism Lens Electronic Ballast, Architectural surface or Recessed static METALUX 2AC-217-UNV-EB81 U	34	0.24	476	\$76.64	\$204.00	\$1,428.00	0.25	504	\$81.14	17.60			
2	Basement Office	3	2'X2' 2-Lamp T-12 U-Tube Recessed Prismatic 34W	2000	70	0.21	420	\$67.62	3	2'x2' 2-Lamp T-8, Prism Lens Electronic Ballast, Architectural surface or Recessed static METALUX 2AC-217-UNV-EB81 U	34	0.10	204	\$32.84	\$204.00	\$612.00	0.11	216	\$34.78	17.60			
3	Kitchen	1	2'X2' 2-Lamp T-12 U-Tube Recessed Prismatic 40W	2000	85	0.09	170	\$27.37	1	2'x2' 2-Lamp T-8, Prism Lens Electronic Ballast, Architectural surface or Recessed static METALUX 2AC-217-UNV-EB81 U	34	0.03	68	\$10.95	\$204.00	\$204.00	0.05	102	\$16.42	12.42			
4	Holding Room	1	2'X4' 4-Lamp T-12 Recessed Prismatic 34W	2000	168	0.17	336	\$54.10	1	3 Lamp T-8 GE-332	47	0.05	94	\$15.13	\$29.36	\$29.36	0.12	242	\$38.96	0.75			
5	Boiler Room	2	75W Incandescent	150	75	0.15	22.5	\$3.62	2	Eiko-25w mini spiral	25	0.05	7.5	\$1.21	\$5.75	\$11.50	0.10	15	\$2.42	4.76			
6	Bathroom	1	1'X2' 1-Lamp T-12 Surface Mounted Vanity 20W	1000	40	0.04	40	\$6.44	1	2' 1-Lamp T-8 17W wall Mtd. Metalux BC117	20	0.02	20	\$3.22	\$148.00	\$148.00	0.02	20	\$3.22	45.96			
7	Locker Room	1	2'X4' 4-Lamp T-12 Recessed Prismatic 34W	2000	168	0.17	336	\$54.10	1	3 Lamp T-8 GE-332	47	0.05	94	\$15.13	\$29.36	\$29.36	0.12	242	\$38.96	0.75			
8	Main Office	7	2'X4' 4-Lamp T-12 Recessed Prismatic 34W	2000	168	1.18	2352	\$378.67	7	3 Lamp T-8 GE-332	47	0.33	658	\$105.94	\$29.36	\$205.52	0.85	1694	\$272.73	0.75			
9		5	2'X2' 2-Lamp T-12 U-Tube Recessed Prismatic 34W	2000	70	0.35	700	\$112.70	5	2'x2' 2-Lamp T-8, Prism Lens Electronic Ballast, Architectural surface or Recessed static METALUX 2AC-217-UNV-EB81 U	34	0.17	340	\$54.74	\$204.00	\$1,020.00	0.18	360	\$57.96	17.60			
11	Kitchen	2	2'X4' 4-Lamp T-12 Recessed Prismatic 34W	2000	168	0.34	672	\$108.19	2	3 Lamp T-8 GE-332	47	0.09	188	\$30.27	\$29.36	\$58.72	0.24	484	\$77.92	0.75			
12	Office	3	2'X4' 4-Lamp T-12 Recessed Prismatic 34W	2000	168	0.50	1008	\$162.29	3	3 Lamp T-8 GE-332	47	0.14	282	\$45.40	\$29.36	\$88.08	0.36	726	\$116.89	0.75			
13		1	2'X2' 2-Lamp T-12 U-Tube Recessed Prismatic 40W	2000	85	0.09	170	\$27.37	1	2'x2' 2-Lamp T-8, Prism Lens Electronic Ballast, Architectural surface or Recessed static METALUX 2AC-217-UNV-EB81 U	34	0.03	68	\$10.95	\$204.00	\$204.00	0.05	102	\$16.42	12.42			
14	Bathroom	1	65W Incandescent	1000	65	0.07	65	\$10.47	1	18 W CFL Lamp	18	0.02	18	\$2.90	\$5.75	\$5.75	0.05	47	\$7.57	0.76			
15	Office	3	2'X4' 4-Lamp T-12 Recessed Prismatic 34W	2000	168	0.50	1008	\$162.29	3	3 Lamp T-8 GE-332	47	0.14	282	\$45.40	\$29.36	\$88.08	0.36	726	\$116.89	0.75			
16	Office	2	2'X4' 4-Lamp T-12 Recessed Prismatic 34W	2000	168	0.34	672	\$108.19	2	3 Lamp T-8 GE-332	47	0.09	188	\$30.27	\$29.36	\$58.72	0.24	484	\$77.92	0.75			
17	Entrance	1	2'X4' 4-Lamp T-12 Recessed Prismatic 34W	2000	168	0.17	336	\$54.10	1	3 Lamp T-8 GE-332	47	0.05	94	\$15.13	\$29.36	\$29.36	0.12	242	\$38.96	0.75			
20	Basement Office	2	2'X2' 2-Lamp T-12 U-Tube Recessed Prismatic 40W	2000	85	0.17	340	\$54.74	2	2'x2' 2-Lamp T-8, Prism Lens Electronic Ballast, Architectural surface or Recessed static METALUX 2AC-217-UNV-EB81 U	34	0.07	136	\$21.90	\$204.00	\$408.00	0.10	204	\$32.84	12.42			
<b>Totals</b>		43				5.01	9627.5	\$1,550.03	43			1.67	3217.5	\$518.02		\$4,628.45	3.33	6410	\$1,032.01	4.48			

Project Name: LGEA Solar PV Project - 9C09017										
Location: 247 Old Tappan Rd, Old Tappan, NJ										
Description: Photovoltaic System 95% Financing - 20 year										
<b>Simple Payback Analysis</b>										
		<b>Photovoltaic System 95% Financing - 20 year</b>								
Total Construction Cost		\$82,800								
Annual kWh Production		14,357								
Annual Energy Cost Reduction		\$2,311								
Annual SREC Revenue		\$5,025								
First Cost Premium		<b>\$82,800</b>								
Simple Payback:		<b>11.29</b> Years								
<b>Life Cycle Cost Analysis</b>										
Analysis Period (years):	25								Financing %:	95%
Financing Term (mths):	240								Maintenance Escalation Rate:	3.0%
Average Energy Cost (\$/kWh):	<b>\$0.161</b>								Energy Cost Escalation Rate:	3.0%
Financing Rate:	7.00%								SREC Value (\$/kWh):	\$0.350
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	\$4,140	0	0	0	\$0	0	0	(4,140)	0	
1	\$0	14,357	\$2,311	\$0	\$5,025	\$5,447	\$1,871	\$18	(\$4,122)	
2	\$0	14,285	\$2,381	\$0	\$5,000	\$5,312	\$2,007	\$62	(\$4,059)	
3	\$0	14,214	\$2,452	\$0	\$4,975	\$5,167	\$2,152	\$109	(\$3,950)	
4	\$0	14,143	\$2,526	\$0	\$4,950	\$5,011	\$2,307	\$158	(\$3,793)	
5	\$0	14,072	\$2,602	\$145	\$4,925	\$4,844	\$2,474	\$64	(\$3,729)	
6	\$0	14,002	\$2,680	\$144	\$4,901	\$4,665	\$2,653	\$118	(\$3,611)	
7	\$0	13,932	\$2,760	\$143	\$4,876	\$4,474	\$2,845	\$174	(\$3,437)	
8	\$0	13,862	\$2,843	\$143	\$4,852	\$4,268	\$3,050	\$234	(\$3,203)	
9	\$0	13,793	\$2,928	\$142	\$4,827	\$4,048	\$3,271	\$295	(\$2,908)	
10	\$0	13,724	\$3,016	\$141	\$4,803	\$3,811	\$3,507	\$360	(\$2,548)	
11	\$0	13,655	\$3,106	\$141	\$4,779	\$3,558	\$3,761	\$427	(\$2,122)	
12	\$0	13,587	\$3,200	\$140	\$4,755	\$3,286	\$4,033	\$497	(\$1,625)	
13	\$0	13,519	\$3,296	\$139	\$4,732	\$2,994	\$4,324	\$570	(\$1,055)	
14	\$0	13,451	\$3,394	\$139	\$4,708	\$2,682	\$4,637	\$646	(\$409)	
15	\$0	13,384	\$3,496	\$138	\$4,684	\$2,346	\$4,972	\$725	\$315	
16	\$0	13,317	\$3,601	\$137	\$4,661	\$1,987	\$5,331	\$807	\$1,122	
17	\$0	13,251	\$3,709	\$136	\$4,638	\$1,602	\$5,717	\$892	\$2,015	
18	\$0	13,184	\$3,821	\$136	\$4,615	\$1,188	\$6,130	\$981	\$2,996	
19	\$0	13,118	\$3,935	\$135	\$4,591	\$745	\$6,573	\$1,073	\$4,069	
20	\$0	13,053	\$4,053	\$134	\$4,568	\$270	\$7,048	\$1,169	\$5,238	
21	\$0	12,988	\$4,175	\$134	\$4,546	\$229	\$6,479	\$1,878	\$7,116	
22	\$0	12,923	\$4,300	\$133	\$4,523	\$157	\$5,332	\$3,201	\$10,317	
23	\$0	12,858	\$4,429	\$132	\$4,500	\$0	\$0	\$8,797	\$19,114	
24	\$0	12,794	\$4,562	\$132	\$4,478	\$0	\$0	\$8,908	\$28,022	
25	\$0	12,730	\$4,699	\$131	\$4,455	\$0	\$0	\$9,023	\$37,045	
<b>Totals:</b>		273,902	\$62,110	\$2,234	\$95,866	\$67,704	\$78,660	\$90,471	\$76,798	
Net Present Value (NPV)								\$5,195		
Internal Rate of Return (IRR)								12.1%		

Project Name: LGEA Solar PV Project - 9C09017							
Location: 247 Old Tappan Rd, Old Tappan, NJ							
Description: Photovoltaic System - Direct Purchase							
<b>Simple Payback Analysis</b>							
	<b>Photovoltaic System - Direct Purchase</b>						
Total Construction Cost	\$82,800						
Annual kWh Production	14,357						
Annual Energy Cost Reduction	\$2,311						
Annual SREC Revenue	\$5,025						
First Cost Premium	<b>\$82,800</b>						
Simple Payback:	<b>11.29</b>						Years
<b>Life Cycle Cost Analysis</b>							
Analysis Period (years):	25			Financing %:	0%		
Financing Term (mths):	0			Maintenance Escalation Rate:	3.0%		
Average Energy Cost (\$/kWh)	<b>\$0.161</b>			Energy Cost Escalation Rate:	3.0%		
Financing Rate:	0.00%			SREC Value (\$/kWh)	\$0.350		
Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Net Cash Flow	Cumulative Cash Flow
0	\$82,800	0	0	0	\$0	(82,800)	0
1	\$0	14,357	\$2,311	\$0	\$5,025	\$7,336	(\$75,464)
2	\$0	14,285	\$2,381	\$0	\$5,000	\$7,381	(\$68,083)
3	\$0	14,214	\$2,452	\$0	\$4,975	\$7,427	(\$60,656)
4	\$0	14,143	\$2,526	\$0	\$4,950	\$7,476	(\$53,180)
5	\$0	14,072	\$2,602	\$145	\$4,925	\$7,382	(\$45,798)
6	\$0	14,002	\$2,680	\$144	\$4,901	\$7,436	(\$38,362)
7	\$0	13,932	\$2,760	\$143	\$4,876	\$7,493	(\$30,870)
8	\$0	13,862	\$2,843	\$143	\$4,852	\$7,552	(\$23,318)
9	\$0	13,793	\$2,928	\$142	\$4,827	\$7,613	(\$15,704)
10	\$0	13,724	\$3,016	\$141	\$4,803	\$7,678	(\$8,026)
11	\$0	13,655	\$3,106	\$141	\$4,779	\$7,745	(\$281)
12	\$0	13,587	\$3,200	\$140	\$4,755	\$7,815	\$7,534
13	\$0	13,519	\$3,296	\$139	\$4,732	\$7,888	\$15,422
14	\$0	13,451	\$3,394	\$139	\$4,708	\$7,964	\$23,386
15	\$0	13,384	\$3,496	\$138	\$4,684	\$8,043	\$31,429
16	\$0	13,317	\$3,601	\$137	\$4,661	\$8,125	\$39,554
17	\$0	13,251	\$3,709	\$136	\$4,638	\$8,210	\$47,764
18	\$0	13,184	\$3,821	\$136	\$4,615	\$8,299	\$56,063
19	\$0	13,118	\$3,935	\$135	\$4,591	\$8,391	\$64,455
20	\$0	13,053	\$4,053	\$134	\$4,568	\$8,487	\$72,942
21	\$1	12,988	\$4,175	\$134	\$4,546	\$8,587	\$81,529
22	\$2	12,923	\$4,300	\$133	\$4,523	\$8,690	\$90,218
23	\$3	12,858	\$4,429	\$132	\$4,500	\$8,797	\$99,015
24	\$4	12,794	\$4,562	\$132	\$4,478	\$8,908	\$107,923
25	\$5	12,730	\$4,699	\$131	\$4,455	\$9,023	\$116,946
<b>Totals:</b>		273,902	\$62,110	\$2,234	\$95,866	\$199,746	\$155,742
<b>Net Present Value (NPV)</b>						<b>\$116,971</b>	
<b>Internal Rate of Return (IRR)</b>						<b>8.0%</b>	

Building	Roof Area (sq ft)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW	Total Annual kWh	Panel Weight (33 lbs)	W/SQFT
Police Station	576	Sunpower SPR230	40	14.7	588	9.20	14,357	1,320	15.64



 = Proposed PV Layout

Notes:

1. Estimated kWh based on 4.68 hours full output per day per 365 day year. Actual kWh will vary day to day.