

**SADDLE RIVER  
PUBLIC SAFETY COMPLEX  
ENERGY ASSESSMENT**

**for**

**NEW JERSEY  
BOARD OF PUBLIC UTILITIES**

**CHA PROJECT NO. 21351**

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Prepared by:



6 Campus Drive  
Parsippany, NJ 07054

(973) 538-2120

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## **1.0 INTRODUCTION AND BACKGROUND**

The Saddle River Public Safety Complex is a 16,800 SF facility located at 83 East Allendale Road and consists of two, two story buildings. The Fire Headquarters (7,900 SF) and Police Headquarters (8,900 SF) were constructed in 1989. The Fire Headquarters consists of a large engine room, social hall, kitchen, offices, and an upstairs bar and game room. Spaces within the Police Headquarters include numerous offices, booking and interview rooms, holding cells, breakroom, locker room, vehicle bays, dispatch center, evidence storage, and an upstairs weight room and training room. The Public Safety Complex is occupied 24 hours per day, year round.

New Jersey's Clean Energy Program, funded by the New Jersey Board of Public Utilities, supports energy efficiency and sustainability for Municipal and Local Government Energy Audits. Through the support of a utility trust fund, New Jersey is able to assist state and local authorities in reducing energy consumption while increasing comfort.

## 2.0 EXECUTIVE SUMMARY

This report details the results of the Saddle River Public Safety Complex consisting of two, two story buildings, including the Fire and Police Headquarters, constructed in 1989. The 7,900 SF Fire Headquarters contains a large engine room, social hall, kitchen, offices, and an upstairs bar and game room. The Police Headquarters, 8,900 SF, include offices, booking and interview rooms, holding cells, breakroom, locker room, vehicle bays, dispatch center, evidence storage, and an upstairs weight room and training room. The following areas were evaluated for energy conservation measures:

- Night setback
- Electric domestic hot water heater replacement
- Lighting replacements with occupancy sensors
- Boiler replacement with hot water temperature reset
- Unit heater replacement with infrared heaters

Various potential Energy Conservation Measures (ECMs) were identified for the above categories. Potential annual savings of \$11,100 for the recommended ECMs may be realized with a payback of 3.0 years.

The ECMs identified in this report will allow for the building to reduce its energy usage and if pursued has the opportunity to qualify for the New Jersey SmartStart Buildings Program. A summary of the costs, savings, and paybacks for the recommended ECMs follows:

### ECM-1 Night Setback

| Budgetary<br>Cost | Annual Utility Savings |     |             |       |       | Estimated<br>Maintenance<br>Savings | Total<br>Savings | ROI  | Potential<br>Incentive* | Payback<br>(without<br>Incentive) | Payback<br>(with<br>Incentive) |
|-------------------|------------------------|-----|-------------|-------|-------|-------------------------------------|------------------|------|-------------------------|-----------------------------------|--------------------------------|
|                   | Electricity            |     | Natural Gas | Water | Total |                                     |                  |      |                         |                                   |                                |
| \$                | kW                     | kWh | Therms      | kGals | \$    | \$                                  | \$               |      | \$                      | Years                             | Years                          |
| 100               | 0                      | 720 | 230         | 0     | 400   | 0                                   | 400              | 65.1 | NA                      | 0.3                               | NA                             |

\*Incentive shown is per the New Jersey Smart Start Program, 2010 Electric Unitary HVAC Application.

### ECM-2 Replace Electric Domestic Hot Water Heater

| Budgetary<br>Cost | Annual Utility Savings |        |             |       |       | Estimated<br>Maintenance<br>Savings | Total<br>Savings | ROI | Potential<br>Incentive* | Payback<br>(without<br>Incentive) | Payback<br>(with<br>Incentive) |
|-------------------|------------------------|--------|-------------|-------|-------|-------------------------------------|------------------|-----|-------------------------|-----------------------------------|--------------------------------|
|                   | Electricity            |        | Natural Gas | Water | Total |                                     |                  |     |                         |                                   |                                |
| \$                | kW                     | kWh    | Therms      | kGals | \$    | \$                                  | \$               |     | \$                      | Years                             | Years                          |
| 7,500             | 9.0                    | 13,410 | (640)       | 0     | 2,100 | 0                                   | 2,100            | 2.7 | 600                     | 3.6                               | 3.3                            |

\* Incentive shown is per the New Jersey Smart Start Program, Gas Water Heating Application.

### ECM-4 Furnace Replacement

| Budgetary<br>Cost | Annual Utility Savings |       |             |       |       | Estimated<br>Maintenance<br>Savings | Total<br>Savings | ROI | Potential<br>Incentive* | Payback<br>(without<br>Incentive) | Payback<br>(with<br>Incentive) |
|-------------------|------------------------|-------|-------------|-------|-------|-------------------------------------|------------------|-----|-------------------------|-----------------------------------|--------------------------------|
|                   | Electricity            |       | Natural Gas | Water | Total |                                     |                  |     |                         |                                   |                                |
| \$                | kW                     | kWh   | Therms      | kGals | \$    | \$                                  | \$               |     | \$                      | Years                             | Years                          |
| 6,300             | 0                      | 1,180 | 240         | 0     | 500   | 0                                   | 500              | 0.4 | 800                     | 12.6                              | 11.0                           |

\* Incentive shown is per the New Jersey Smart Start Program, Gas Heating and Electric Unitary HVAC Applications.

### ECM-8 Lighting Replacements with Occupancy Sensors

| Budgetary<br>Cost | Annual Utility Savings |        |             |       |       | Estimated<br>Maintenance<br>Savings | Total<br>Savings | ROI | Potential<br>Incentive* | Payback<br>(without<br>Incentive) | Payback<br>(with<br>Incentive) |
|-------------------|------------------------|--------|-------------|-------|-------|-------------------------------------|------------------|-----|-------------------------|-----------------------------------|--------------------------------|
|                   | Electricity            |        | Natural Gas | Water | Total |                                     |                  |     |                         |                                   |                                |
| \$                | kW                     | kWh    | Therms      | kGals | \$    | \$                                  | \$               |     | \$                      | Years                             | Years                          |
| 24,800            | 6.7                    | 53,150 | 0           | 0     | 8,100 | 0                                   | 8,100            | 3.9 | 3,600                   | 3.1                               | 2.6                            |

\* Incentive shown is per the New Jersey Smart Start Program, Prescriptive Lighting and Lighting Controls Applications.

### **3.0 EXISTING CONDITIONS**

#### **3.1 Building - General**

The Saddle River Public Safety Complex, constructed in 1989, consists of the Fire Headquarters (7,900 SF) and Police Headquarters (8,900 SF). The Fire Headquarters contains a large engine room, social hall, kitchen, offices, and upstairs bar and game room. The Police Headquarters include offices, booking, holding cells, breakroom, locker room, vehicle bays, dispatch center, evidence storage, and upstairs weight room and training room.

Both buildings have continuous occupancy, year round. During daytime hours, there are typically four personnel at the fire and 10 at the police facility; during nighttime hours, occupancy is about half.

Both buildings were constructed in the same manner. The exterior walls consist of 4" exterior face brick, 1-1/2" rigid board insulation, and 6" concrete masonry unit (CMU) block with Korfil insulation inserts. The pitched roofs are constructed of asphalt shingles over felt paper and 3/4" plywood sheathing on 2"x8" rafters. Six inch batt insulation has been installed between the roof rafters and the ceiling joists. All windows are aluminum clad with wood on the interior, double pane glass, and tinted. Main entrance doors are steel frame with 15 lite glass panes and the remaining are steel security type. The Fire Headquarters has five overhead doors; the Police Headquarters has three. All are insulated steel with center panel windows and good door seals.

#### **3.2 Utility Usage**

The two buildings share utility meters located in the Fire Headquarters. Utilities include electricity, natural gas, and potable water. Electricity is purchased from Orange & Rockland (O&R) and natural gas from Public Service Electric & Gas Company (PSE&G). The potable water source was recently converted from an on-site well to the municipal water department.

In 2009, electric usage for the Public Safety Complex was approximately 224,080 kWh at a cost of about \$35,500. Analyzing electricity bills during this period showed that the facility was charged at the following rates: supply unit cost of \$0.139 per kWh; demand unit cost of \$8.65 per kW; and a blended unit cost of \$0.159 per kWh. Electricity usage was highest during summer months when cooling equipment operates. During the same timeframe, the building heat produced by natural gas-fired equipment required about 4,110 therms. Based on the annual cost of about \$4,600, the blended price for natural gas was \$1.128 per therm. Natural gas consumption is highest in the winter months when the buildings are in heating mode. Utility data can be found in Appendix A.

Electricity and natural gas commodity supply and delivery is presently purchased from O&R and PSE&G, respectively. The delivery component will always be the responsibility of the utility that connects the facility to the power grid or gas line; however, the supply can be purchased from a third party. The electricity or natural gas commodity supply entity will require submission of one to three years of past energy bills. Contract terms can vary among suppliers. A list of approved electrical and natural gas energy commodity suppliers can be found in Appendix A.

### **3.3 HVAC Systems**

#### **3.3.1 Fire Headquarters**

HVAC for the Saddle River Fire Headquarters is provided by several different types of equipment depending on the space. The engine room is heated by three Reznor gas-fired unit heaters suspended from the ceiling. Each unit heater has an input of 105,000 Btuh and output of 81,900 Btuh. Located in the mechanical room and serving most of the first floor is a Carrier 125,000 Btuh, 80% efficient gas-fired furnace equipped with a direct expansion (DX) cooling coil. The accompanying remote condensing unit for the furnace is located outside on grade and has a capacity of five tons. Additional cooling for the first floor social hall, kitchen, and restrooms is provided by a cooling only Carrier fan coil unit (FCU) located in the second floor mechanical space; the remote condensing unit is located outside and has a capacity of 3.5 tons. The second floor bar and game room areas are heated and cooled by an Amana furnace in combination with a five ton remote condensing unit. The unit is gas-fired with a thermal efficiency of 95%. The Officer's and Chief's offices each utilize a Carrier packaged terminal air conditioner (PTAC) heat pump unit with a cooling capacity up to 11,700 Btuh and heating capacity up to 14,500 Btuh.

Other heating equipment includes three small 1 kW electric wall heaters located at the two entrances and stairwell. Ventilation for the engine room is provided by two large exhaust fans mounted in dormers, which building personnel indicated are not used. A vehicle exhaust management system is also in place to maintain air quality while vehicles are running inside. Four ceiling fans are used to circulate air in the engine room. Restrooms are equipped with a common exhaust fan that operates continuously.

#### **3.3.2 Police Headquarters**

The Police Headquarters' primary heating plant is a Multi-Temp gas-fired hot water boiler. Original to the building, the boiler has an input of 500,000 Btuh and operates with a thermal efficiency of about 76%. Heating hot water (HHW) is distributed to hydronic equipment via two 1/2 HP inline circulating pumps which operate in a lead/standby configuration. Terminal hydronic heating equipment includes ceiling suspended unit heaters, cabinet unit heaters, and duct coils.

Located in the attic space are six Carrier FCUs with DX cooling. Each unit has an outdoor air duct connected to the return, and a HW duct coil for heat positioned within the discharge ductwork. The accompanying six remote condensing units can be found outside on grade and provide a total of about 20 tons of cooling capacity.

Other HVAC equipment includes an electric wall heater in the front restroom; and several exhaust fans serving areas such as restrooms, locker rooms, holding cells, garages, janitor closet, kitchen, and unconditioned attic spaces. Most HVAC equipment is original to the building and in good condition.

### **3.4 Lighting/Electrical Systems**

#### **3.4.1 Fire Headquarters**

Most interior lighting fixtures in the Fire Headquarters utilize inefficient 'U' shape T-12 lamps and magnetic ballasts. Other lighting includes several T-12 strip lights; 100 watt flood lamps; incandescent track lighting, and trophy case lighting. Exit signs throughout the building utilize energy efficient LED technology. A majority of the existing lighting throughout the building can be upgraded to more energy efficient technology.

Exterior building lighting includes three 400 watt metal halide fixtures above the overhead doors; six wall-mounted uplight fixtures with 100 watt incandescent bulbs; 100 watt metal halide sign light; and two 1,500 watt flag lights. All exterior lighting is controlled by a timer or photocell.

#### 3.4.2 Police Headquarters

Similarly to the Fire Headquarters, the Police Headquarters is equipped with a significant number of lighting fixtures which utilize inefficient T-12 lamps and magnetic ballasts. The building also includes 65 watt and 75 watt flood lamps; 2-lamp 'U' shape T-8 fixtures; T-12 strip lights; and LED exit signs.

Exterior building lighting includes one 400 watt metal halide fixture above the overhead doors; five wall-mounted uplight fixtures with 100 watt incandescent bulbs; and a 100 watt metal halide sign light. All exterior lighting is controlled by a timer or photocell.

#### 3.4.3 Emergency Power Systems

Emergency backup power for the complex is provided by a gas-fired Kohler generator located adjacent to the parking lot. The generator serves the Police and Fire Headquarters, with the Police receiving priority backup. Building maintenance personnel run the unit monthly to verify proper operation and exercise the motor.

### 3.5 Control Systems

#### 3.5.1 Fire Headquarters

Each of the three unit heaters in the engine room are controlled by a mechanical dial-type thermostat set to 68°F. The furnace and FCU serving the downstairs are both controlled by programmable thermostats located in the social hall. Each thermostat is set to hold the space temperature at 72°F since the social hall is occupied by EMS crew members 24/7, unless on call. Temperature for the second floor bar and game room area is also controlled by a programmable thermostat set at 71°F. However, this space is not occupied continuously.

Controls for the PTAC unit serving the Officer's office are integral and mounted on the face. The PTAC unit located in the Chief's office is connected to a wall-mounted programmable thermostat set to hold the space at 71°F. Exhaust systems in the engine room are manually controlled on an as-needed basis.

#### 3.5.2 Police Headquarters

Each FCU and HW duct coil combination is controlled by a programmable thermostat located within the units' corresponding space. Thermostats have not been programmed for night setback since most spaces are occupied 24/7 and the occupants often adjust them for comfort. Typical temperature setpoints found during the time of the energy audit were 72°F during cooling and 68°F during heating.

Unit heaters in the garage areas are controlled by mechanical dial type thermostats set to 60°F. The remaining HW terminal equipment is also controlled by dial type thermostats with varying setpoints. Two-way valves are controlled by thermostats and adjust HHW flow through hydronic equipment to maintain space temperature. Additionally, the boiler is set to maintain a HW loop temperature of 165°F during operation.

### **3.6 Plumbing Systems**

Domestic hot water (DHW) for the Fire Headquarters is generated by a 40 gallon, Bradford White electric water heater. Located in the mechanical room, the unit is equipped with a 4,500 watt element. Also located in the mechanical room are an Ingersoll Rand upright air compressor and an ice machine. In the Police Headquarters, DHW is also produced by a 40 gallon, 4,500 watt Bradford White electric water heater, located in the janitor's closet. Plumbing fixtures for both buildings include standard toilets, urinals, hand sinks, and kitchen sinks.

## **4.0 ENERGY CONSERVATION MEASURES**

### **4.1 ECM-1 Night Setback**

While most areas within the buildings of the Public Safety Complex are utilized continuously, the second floor areas of both buildings are occupied much less frequently. Thermostats controlling HVAC equipment in these areas are programmable, but have not been set up for nighttime temperature setback. During the energy audit, it was noted that the heating and cooling setpoints for the second floor areas are 68°F during heating and 71°F during cooling in the Fire Headquarters; and 68°F during heating and 72°F during cooling in the Police Headquarters. Heating and cooling energy can be saved by programming the existing electronic thermostats to set back the space temperature in these areas during unoccupied times. This ECM models the expected savings of adjusting the unoccupied temperature setpoints to 60°F during heating and 80°F during cooling periods. In the calculations for this measure, occupied temperature setpoints were maintained per those in use at the time of the energy audit.

To calculate the benefits of night setback, a block load building model was created to approximate the existing energy load for each building. Since each building has three areas with differing setpoints or occupancy schedules, six block loads were generated to properly model the entire complex. The block loads, provided in Appendix B, model the maximum overall cooling and heating loads for each space, taking into account various parameters such as roof, wall, and window construction; total envelope surface area; ventilation and infiltration loads; building occupancy; internal heat generation; and other sources of heat gains and losses. By entering this calculated maximum load into a spreadsheet containing bin temperature data, the total accumulated year-round cooling and heating energy requirements were determined for each space. The heating and cooling loads for the six areas were then combined and reconciled to building utility data and HVAC equipment energy requirements to confirm the model's accuracy. Bin data for Saddle River, NJ was not available; therefore, data from Newark, NJ was used. The bin temperature spreadsheets are included in Appendix B.

To determine the proposed energy usage in the two second floor areas during temperature setback, a second bin spreadsheet was created for the new accumulated heating and cooling loads for each space. These models were identical to the existing usage spreadsheets except the unoccupied temperatures were adjusted as noted above. The difference in heating therms and cooling kWh between the initial and proposed models is the savings. The total annual natural gas and electricity consumption for the two buildings may be reduced by approximately 230 therms and 720 kWh, respectively.

The existing programmable thermostats have an expected life of 10 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 2,300 therms, 7,200 kWh, and \$4,000.

The implementation cost and savings related to this ECM are presented in Appendix B and summarized as follows:

### ECM-1 Night Setback

| Budgetary<br>Cost | Annual Utility Savings |     |             |       |       | Estimated<br>Maintenance<br>Savings | Total<br>Savings | ROI  | Potential<br>Incentive* | Payback<br>(without<br>Incentive) | Payback<br>(with<br>Incentive) |
|-------------------|------------------------|-----|-------------|-------|-------|-------------------------------------|------------------|------|-------------------------|-----------------------------------|--------------------------------|
|                   | Electricity            |     | Natural Gas | Water | Total |                                     |                  |      |                         |                                   |                                |
| \$                | kW                     | kWh | Therms      | kGals | \$    | \$                                  | \$               |      | \$                      | Years                             | Years                          |
| 100               | 0                      | 720 | 230         | 0     | 400   | 0                                   | 400              | 65.1 | NA                      | 0.3                               | NA                             |

\* Incentive shown is per the New Jersey Smart Start Program, 2010 Electric Unitary HVAC Application.

This measure is recommended.

### 4.2 ECM-2 Replace Electric Domestic Hot Water Heaters

Both buildings utilize a 40 gallon, 4,500 watt electric DHW heater. During periods of little or no HW use, the units must still heat the water within the storage tanks. Energy required to maintain the hot water temperature setpoint during times of zero demand are known as standby losses. This measure evaluated replacing the existing DHW heaters with tankless, gas-fired, condensing hot water heaters to eliminate standby losses. Additionally, by converting from electric to gas-fired units, DHW can be generated more economically and reduce electric demand.

According to the U.S. Department of Energy, 2.5% of stored capacity is lost every hour during hot water heater standby. This value was applied to the total volume of the existing hot water heater storage tanks to determine annual standby losses. Proposed efficiency was based on the Navien CR180 tankless, condensing hot water heater; it was calculated that 13,410 kWh would be saved per year for the water heaters combined. A more detailed hot water demand analysis may be necessary to verify proper sizing. The new water heaters will require gas piping, venting, electrical connections, and minor water piping.

Tankless hot water heaters have an expected life of 13 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 174,330 kWh, (8,320) therms, and \$27,300.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

### ECM-2 Replace Electric Domestic Hot Water Heater

| Budgetary<br>Cost | Annual Utility Savings |        |             |       |       | Estimated<br>Maintenance<br>Savings | Total<br>Savings | ROI | Potential<br>Incentive* | Payback<br>(without<br>Incentive) | Payback<br>(with<br>Incentive) |
|-------------------|------------------------|--------|-------------|-------|-------|-------------------------------------|------------------|-----|-------------------------|-----------------------------------|--------------------------------|
|                   | Electricity            |        | Natural Gas | Water | Total |                                     |                  |     |                         |                                   |                                |
| \$                | kW                     | kWh    | Therms      | kGals | \$    | \$                                  | \$               |     | \$                      | Years                             | Years                          |
| 7,500             | 9.0                    | 13,410 | (640)       | 0     | 2,100 | 0                                   | 2,100            | 2.7 | 600                     | 3.6                               | 3.3                            |

\* Incentive shown is per the New Jersey Smart Start Program, Gas Water Heating Application.

This measure is recommended.

### 4.3 ECM-3 Replace Unit Heaters with Infrared Heaters

The Fire Headquarters engine room is heated by three 78% efficient gas-fired unit heaters suspended from the ceiling and blowing horizontally across the space. This ECM evaluated replacement of the unit heaters with infrared gas fired heaters. Infrared heaters distribute heat more effectively than traditional unit heaters, have higher burner efficiencies, and do not require an air circulation fan.

The existing heating load for the engine room was previously determined in section 4.1 by generating a block load spreadsheet. A key input in this model is the effectiveness factor. This value is representative of the amount of heat generated by the equipment which actually contributes to heating the occupied area of the space. Since unit heaters rely on air movement to distribute heat to the space, their effectiveness is directly related to their orientation, air discharge, and other air movement in the space. Taking these factors into account for the engine room, an effectiveness factor of 85% was estimated. The existing block load model determined that the unit heaters require about 720 therms of energy per year to meet the heating load in the engine room.

The proposed infrared heaters have a burner efficiency of 85% and will transfer heat more effectively via radiation. Radiant heating equipment transfers heat to solid objects and does not rely on air movement; therefore this method of heating has an effectiveness of 100%. Using the block load spreadsheet and applying efficiency improvements, it was determined that the annual heating gas energy required using infrared heaters is about 560 therms, providing a savings of 160 therms when compared to the existing unit heaters. Electrical energy savings will also be realized by eliminating the need to operate the air circulation fans utilized by the existing unit heaters. The electrical energy saving was calculated by applying the annual heating operating hours from the bin data spreadsheet to the power requirement for the existing unit heaters. The total annual electrical savings for this ECM is estimated to be 1,910 kWh.

To calculate the budgetary cost, three high intensity 100 MBh infrared heaters were used as outlined in the cost estimate. The quantity, size, and capacity of the heaters were used for estimating purposes only. Exact selection and sizing cannot be completed without generating a heating load profile for the space.

Infrared heaters have an expected life of 18 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 2,880 therms, 34,380 kWh, and \$9,000.

The implementation cost and savings related to this ECM are presented in Appendix D and summarized below:

#### ECM-3 Replace Unit Heaters with Infrared Heaters

| Budgetary<br>Cost | Annual Utility Savings |       |             |       |       | Estimated<br>Maintenance<br>Savings | Total<br>Savings | ROI | Potential<br>Incentive* | Payback<br>(without<br>Incentive) | Payback<br>(with<br>Incentive) |
|-------------------|------------------------|-------|-------------|-------|-------|-------------------------------------|------------------|-----|-------------------------|-----------------------------------|--------------------------------|
|                   | Electricity            |       | Natural Gas | Water | Total |                                     |                  |     |                         |                                   |                                |
| \$                | kW                     | kWh   | Therms      | kGals | \$    | \$                                  | \$               |     | \$                      | Years                             | Years                          |
| 8,600             | 0                      | 1,910 | 160         | 0     | 500   | 0                                   | 500              | 0.0 | NA                      | 17.2                              | NA                             |

\* There is no incentive available through the New Jersey Smart Start Program for this ECM.

This measure is not recommended.

#### 4.4 ECM-4 Furnace Replacement

The furnace which provides HVAC to most of the first floor at the Fire Headquarters was installed in 1989 and has a thermal efficiency of about 80%. In addition, the connected remote condensing unit, also installed in 1989, provides cooling at an energy efficiency ratio (EER) of approximately 10.6. Both units are at the end of their useful lives and should be considered for replacement. By replacing these units with a condensing furnace and high efficiency remote condenser, it will be possible to achieve a thermal efficiency of 95% and an EER of 14.0; saving both heating and cooling energy.

Utilizing the block load building model for the Fire Headquarters' first floor created in section 4.1, the savings for this measure were found by adjusting the heating and cooling efficiencies to reflect those of the proposed equipment, and comparing the overall energy requirements to the original model. The resulting annual energy reductions attributed to heating and cooling efficiency improvements were approximately 240 therms and 1,180 kWh.

While the payback period for this measure does not fall within the normal parameters for recommendation, the age and condition of the existing furnace/condensing unit warrants that this measure be recommended for implementation.

Condensing gas-fired furnaces and remote condensing units have an expected life of 18 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 4,320 therms, 21,240 kWh, and \$9,000.

The implementation cost and savings related to this ECM are presented in Appendix E and summarized below:

#### ECM-4 Furnace Replacement

| Budgetary<br>Cost | Annual Utility Savings |       |             |       |       | Estimated<br>Maintenance<br>Savings | Total<br>Savings | ROI | Potential<br>Incentive* | Payback<br>(without<br>Incentive) | Payback<br>(with<br>Incentive) |
|-------------------|------------------------|-------|-------------|-------|-------|-------------------------------------|------------------|-----|-------------------------|-----------------------------------|--------------------------------|
|                   | Electricity            |       | Natural Gas | Water | Total |                                     |                  |     |                         |                                   |                                |
| \$                | kW                     | kWh   | Therms      | kGals | \$    | \$                                  | \$               |     | \$                      | Years                             | Years                          |
| 6,300             | 0                      | 1,180 | 240         | 0     | 500   | 0                                   | 500              | 0.4 | 800                     | 12.6                              | 11.0                           |

\* Incentive shown is per the New Jersey Smart Start Program, Gas Heating and Electric Unitary HVAC Applications.

This measure is recommended.

#### 4.5 ECM-5 Boiler Replacement with HW Temperature Reset

Heating hot water in the Police Headquarters is provided by a 1989 Mult-Temp gas-fired boiler. The unit is rated at 500 MBH input, 380 MBH output, with a thermal efficiency of 76%. This ECM evaluated replacing the unit with a high efficiency, condensing boiler with a hot water (HW) temperature reset control system. By installing a HW reset system, heat losses from the building's HHW piping system can be greatly reduced. Additionally, combining the control system with a condensing boiler can improve firing efficiency up to 95%, or higher.

The benefits of applying HW temperature reset were evaluated by generating a spreadsheet that compared the existing piping system losses to those of the proposed system (Appendix F). Using estimated dimensions of the existing HHW hydronic system and bin weather data, with an average HHW temperature of 165°F, the current annual heat loss by the system was found to be about 65,160 MBh. With a HW reset control system in place, the average HHW temperature can be reduced to about 100°F. The resulting annual heat loss from the HHW piping system is reduced to approximately 34,300 MBh.

Piping heat losses calculated for the existing system and with HW reset in place were then applied to the proposed boiler efficiency rates to determine the required therms to overcome the losses. Since the efficiency of the proposed condensing boiler varies based on the return water temperature, the efficiency curve for an Aerco Modulux MLX-454 boiler was used to input the different firing efficiencies with the HW reset system. Averaging the boiler firing efficiencies yielded an annual thermal efficiency of 95%.

The difference between the existing and proposed therms required to overcome heat losses result in an annual energy savings of about 320 therms of natural gas.

The ECM also projected savings for boiler replacement. Utilizing the block loads created for the Police Headquarters in section 4.1, it was determined that the existing boiler system consumes about 1,760 therms annually. Applying the 76% boiler efficiency to its annual natural gas usage established a baseline boiler load of approximately 133,880 MBH per year. With the improved efficiency determined in the HW reset calculation, the proposed condensing boiler will require 1,400 therms to meet this load, resulting in a savings of about 360 therms of natural gas per year. As previously stated, the proposed boiler efficiency rating is based on the use of an Aerco Modulex MLX-454 boiler for the calculation. Exact boiler selection and sizing cannot be completed without a more detailed analysis of the building's hydronic heating system and generation of a load profile.

For implementation of this measure, a new gas-fired, condensing, hot water boiler would be installed, along with an integral HW temperature reset control system. New immediate HW supply and return piping must also be installed; valves would be reused where possible. A new exhaust flue system will also be required.

Condensing boilers have an expected life of 25 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 17,000 therms and \$20,000.

The implementation cost and savings related to this ECM are presented in Appendix F and summarized below:

#### ECM-5 Boiler Replacement with HW Temperature Reset

| Budgetary<br>Cost | Annual Utility Savings |     |             |       |       | Estimated<br>Maintenance<br>Savings | Total<br>Savings | ROI | Potential<br>Incentive* | Payback<br>(without<br>Incentive) | Payback<br>(with<br>Incentive) |
|-------------------|------------------------|-----|-------------|-------|-------|-------------------------------------|------------------|-----|-------------------------|-----------------------------------|--------------------------------|
|                   | Electricity            |     | Natural Gas | Water | Total |                                     |                  |     |                         |                                   |                                |
| \$                | kW                     | kWh | Therms      | kGals | \$    | \$                                  | \$               |     | \$                      | Years                             | Years                          |
| 20,000            | 0                      | 0   | 680         | 0     | 800   | 0                                   | 800              | 0.0 | 1,800                   | 25.0                              | 22.8                           |

\*Incentive shown is per the New Jersey Smart Start Program, 2010 Gas Heating Application.

This measure is not recommended.

#### 4.6 ECM-6 Lighting Replacements

A comprehensive fixture survey was conducted of both the Fire and Police Headquarters of the Public Safety Complex. Each switch and circuit were identified, and the number of fixtures, locations, and existing wattage established. Inefficient lighting fixtures include those that utilize T-12 fluorescent lamps and incandescent screw type bulbs. Upgrading these lighting fixtures to more efficient technology provides energy savings.

Energy savings for this measure were calculated by applying the existing and proposed fixture wattages to the estimated time of operation. The difference resulted in an annual savings of 26,770 kWh for the overall complex. Supporting calculations, including assumptions for lighting hours and annual energy usage for each fixture, are provided in Appendix G.

Retrofitting fixtures that utilize T-12 lamps would require replacement with electronic ballasts and T-8 lamps. Incandescent lamps would be replaced with compact fluorescent spiral lightbulbs or flood lamps where applicable.

Lighting has an expected life of 15 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 401,550 kWh, totaling \$66,000.

The implementation cost and savings related to this ECM are presented in Appendix G and summarized below:

#### ECM-6 Lighting Replacements

| Budgetary<br>Cost | Annual Utility Savings |        |             |       |       | Estimated<br>Maintenance<br>Savings | Total<br>Savings | ROI | Potential<br>Incentive* | Payback<br>(without<br>Incentive) | Payback<br>(with<br>Incentive) |
|-------------------|------------------------|--------|-------------|-------|-------|-------------------------------------|------------------|-----|-------------------------|-----------------------------------|--------------------------------|
|                   | Electricity            |        | Natural Gas | Water | Total |                                     |                  |     |                         |                                   |                                |
| \$                | kW                     | kWh    | Therms      | kGals | \$    | \$                                  | \$               |     | \$                      | Years                             | Years                          |
| 20,800            | 6.7                    | 26,770 | 0           | 0     | 4,400 | 0                                   | 4,400            | 2.2 | 2,900                   | 4.7                               | 4.1                            |

\* Incentive shown is per the New Jersey Smart Start Program, Prescriptive Lighting Application.

This measure is not recommended in lieu of ECM-8.

#### 4.7 ECM-7 Install Occupancy Sensors

Review of the comprehensive lighting survey determined that lighting in several areas such as common spaces, restrooms, offices, interview rooms, breakroom, weight room, training room, and engine room are operated continuously throughout the day regardless of occupancy. Therefore, it is proposed that an occupancy sensor be installed in each space to turn off lights when the areas are unoccupied. While also not continuously occupied throughout the day, due to safety concerns, occupancy sensors were not considered in mechanical spaces and paths of egress.

Using a process similar to that utilized in section 4.6, the energy savings for this measure were calculated by applying the known fixture wattages to the estimated existing and proposed times of operation for each fixture. The difference between the two values resulted in an annual savings of 29,160 kWh per year for the overall facility. Required for this measure are (9) ceiling mounted occupancy sensors, (18) wall-mounted occupancy sensors and some electrical work.

Occupancy sensors have an expected life of 15 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 437,400 kWh and \$69,000.

The implementation cost and savings related to this ECM are presented in Appendix H and summarized as follows:

**ECM-7 Install Occupancy Sensors**

| Budgetary<br>Cost | Annual Utility Savings |        |             |       |       | Estimated<br>Maintenance<br>Savings | Total<br>Savings | ROI  | Potential<br>Incentive* | Payback<br>(without<br>Incentive) | Payback<br>(with<br>Incentive) |
|-------------------|------------------------|--------|-------------|-------|-------|-------------------------------------|------------------|------|-------------------------|-----------------------------------|--------------------------------|
|                   | Electricity            |        | Natural Gas | Water | Total |                                     |                  |      |                         |                                   |                                |
| \$                | kW                     | kWh    | Therms      | kGals | \$    | \$                                  | \$               |      | \$                      | Years                             | Years                          |
| 4,000             | 0                      | 29,160 | 0           | 0     | 4,600 | 0                                   | 4,600            | 16.4 | 700                     | 0.9                               | 0.7                            |

\* Incentive shown is per the New Jersey Smart Start Program, Lighting Controls Application.

This measure is not recommended in lieu of ECM-8.

**4.8 ECM-8 Lighting Replacements with Occupancy Sensors**

This measure is a combination of ECMs-6 and 7 to allow for maximum energy and demand reduction. Due to interactive effects, the energy and cost savings for occupancy sensors and lighting upgrades are not cumulative.

The lighting retrofits and controls have an expected lifetime of 15 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 797,250 kWh, totaling \$121,500.

The implementation cost and savings related to this ECM are presented in Appendix I and summarized below:

**ECM-8 Lighting Replacements with Occupancy Sensors**

| Budgetary<br>Cost | Annual Utility Savings |        |             |       |       | Estimated<br>Maintenance<br>Savings | Total<br>Savings | ROI | Potential<br>Incentive* | Payback<br>(without<br>Incentive) | Payback<br>(with<br>Incentive) |
|-------------------|------------------------|--------|-------------|-------|-------|-------------------------------------|------------------|-----|-------------------------|-----------------------------------|--------------------------------|
|                   | Electricity            |        | Natural Gas | Water | Total |                                     |                  |     |                         |                                   |                                |
| \$                | kW                     | kWh    | Therms      | kGals | \$    | \$                                  | \$               |     | \$                      | Years                             | Years                          |
| 24,800            | 6.7                    | 53,150 | 0           | 0     | 8,100 | 0                                   | 8,100            | 3.9 | 3,600                   | 3.1                               | 2.6                            |

\* Incentive shown is per the New Jersey Smart Start Program, Prescriptive Lighting and Lighting Controls Applications.

This measure is recommended.

## **5.0 PROJECT INCENTIVES**

### **5.1 Incentives Overview**

#### **5.1.1 New Jersey Pay For Performance Program**

The building will be eligible for incentives from the New Jersey Office of Clean Energy. The most significant incentives will be from the New Jersey Pay for Performance (P4P) Program. The P4P program is designed for qualified energy conservation projects in facilities whose demand in any of the preceding 12 months exceeds 200 kW. However, the 200 kW/month average minimum has been waived for buildings owned by local governments or municipalities and non-profit organizations. Facilities that meet this criterion must also achieve a minimum performance target of 15% energy reduction by using the EPA Portfolio Manager benchmarking tool before and after implementation of the measure(s). If the participant is a municipal electric company customer, and a customer of a regulated gas New Jersey Utility, only gas measures will be eligible under the Program. American Recovery and Reinvestment Act (ARRA) funding, when available, may allow oil, propane and municipal electric customers to be eligible for the P4P Program. Available incentives are as follows:

**Incentive #1: Energy Reduction Plan** – This incentive is designed to offset the cost of services associated with the development of the Energy Reduction Plan (ERP). The standard incentive pays \$0.10 per square foot, up to a maximum of \$50,000, not to exceed 50% of facility annual energy cost, paid after approval of application. For building audits funded by the New Jersey Board of Public Utilities, which receive an initial 75% incentive toward performance of the energy audit, facilities are only eligible for an additional \$0.05 per square foot, up to a maximum of \$25,000, rather than the standard incentive noted above.

**Incentive #2: Installation of Recommended Measures** – This incentive is based on projected energy saving and designed to pay approximately 60% of the total performance-based incentive. Base incentives deliver \$0.11/kWh and \$1.10/therm not to exceed 30% of total project cost.

**Incentive #3: Post-Construction Benchmarking Report** – This incentive is paid after acceptance of a report proving energy savings over one year utilizing the Environmental Protection Agency (EPA) Portfolio Manager benchmarking tool. Incentive #3 base incentives deliver \$0.07/kWh and \$0.70/therm not to exceed 20% of total project cost.

Combining incentives #2 and #3 will provide a total of \$0.18/ kWh and \$1.80/therm not to exceed 50% of total project cost. Additional incentives for #2 and #3 are increased by \$0.005/kWh and \$0.05/therm for each percentage increase above the 15% minimum target to 20%, calculated with the EPA Portfolio Manager benchmarking tool, not to exceed 50% of total project cost.

#### **5.1.2 New Jersey Smart Start Program**

For this program, specific incentives for energy conservation measures are calculated on an individual basis utilizing the 2010 New Jersey Smart Start incentive program. This program provides incentives dependent upon mechanical and electrical equipment. If applicable, incentives from this program are reflected in the ECM summaries and attached appendices.

If the building qualifies and enters into the New Jersey Pay for Performance Program, all energy savings will be included in the total building energy reduction, and savings will be applied towards the Pay for Performance incentive. A project is not applicable for both New Jersey incentive programs.

### 5.1.3 Energy Efficient and Conservation Block Grant

Below is a brief summary of the Energy Efficient and Conservation Block Grant (EECBG) program. The Energy Efficiency and Conservation Block Grant Complete Program Application Package should be consulted for rules and regulations.

Additional funding is available to local government entities through the EECBG, a part of New Jersey's Clean Energy program (NJCEP). The grant is for local government entities only, and can offset the cost of energy reduction implementation to a maximum of \$20,000 per building.

This program is provided in conjunction with NJCEP funding and any utility incentive programs; the total amount of the three incentives combined cannot exceed 100% of project cost. Funds shall first be provided by NJCEP, followed by the EECBG and any utility incentives available to the customer. The total amount of the incentive shall be determined by TRC Solutions, a third party technical consulting firm for the NJCEP.

In order to receive EECBG incentives, local governments must not have received a Direct Block Grant from the US Department of Energy. A list of the 512 qualifying municipalities and counties is provided on the NJCEP website. Qualifying municipalities must participate in at least one eligible Commercial & Industrial component of the NJCEP, utility incentive programs, or install building shell measures recommended by the Local Government Energy Audit Program. Eligible conservation programs through NJCEP include:

- Direct Install
- Pay for Performance
- NJ SmartStart Buildings for measures recommended by a Local Government Energy Audit (LGEA) or an equivalent audit completed within the last 12 months
- Applicants may propose to independently install building shell measures recommended by a LGEA or an equivalent audit. The audit must have been completed within the past 12 months.
- Any eligible utility energy efficiency incentive program

Most facilities owned or leased by an eligible local government within the State of New Jersey are eligible for this grant. Ineligible facilities include casinos or other gambling establishments, aquariums, zoos, golf courses, swimming pools, and any building owned or leased by the United States Federal Government. New construction is also ineligible.

### 5.1.4 ARRA Initiative "Energy Efficiency Programs through the Clean Energy Program"

The American Recovery and Reinvestment Act (ARRA) Initiative is available to New Jersey oil, propane, cooperative and municipal electric customers who do not pay the Societal Benefits Charge. This charge can be seen on any electric bill as the line item "SBC Charge." Applicants can participate in this program in conjunction with other New Jersey Clean Energy Program initiatives including Pay for Performance, Local Government Energy Audits, and Direct Install programs.

Funding for this program is dispersed on a first come, first serve basis until all funds are exhausted. The program does not limit the municipality to a minimum or maximum incentive, and the availability of

funding cannot be determined prior to application. If the municipality meets all qualifications, the application must be submitted to TRC Energy Solutions for review. TRC will then determine the amount of the incentive based on projected energy savings of the project. It is important to note that all applications for this incentive must be submitted before implementation of energy conservation measures.

Additional information is available on New Jersey's Clean Energy Program website.

#### 5.1.5 Direct Install Program

The Direct Install Program targets small and medium sized facilities where the peak electrical demand does not exceed 200 kW in any of the previous 12 months. Buildings must be located in New Jersey and served by one of the state's public, regulated electric or natural gas utility companies. On a case-by-case basis, the program manager may accept a project for a customer that is within 10% of the 200 kW peak demand threshold.

The 200 kW peak demand threshold has been waived for local government entities that receive and utilize their Energy Efficiency and Conservation Block Grant as discussed in section 5.1.3 in conjunction with Direct Install.

Direct Install is funded through New Jersey's Clean Energy Program and is designed to provide capital for building energy upgrade projects to fast track implementation. The program will pay up to 60% of the costs for lighting, HVAC, motors, natural gas, refrigeration, and other equipment upgrades with higher efficiency alternatives. If a building is eligible for this funding, the Direct Install Program can significantly reduce the implementation cost of energy conservation projects.

The program pays a maximum amount of \$50,000 per building, and up to \$250,000 per customer per year. Installations must be completed by a Direct Install participating contractor, a list of which can be found on the New Jersey Clean Energy Website at <http://www.njcleanenergy.com>. Contractors will coordinate with the applicant to arrange installation of recommended measures identified in a previous energy assessment, such as this document.

## 5.2 Building Incentives

### 5.2.1 New Jersey Pay For Performance Program

Under incentive #1 of the New Jersey Pay for Performance Program, the 16,800 square foot facility is eligible for about \$800 towards the development of an Energy Reduction Plan. When calculating the total amount under Incentives #2 and #3, all energy conservation measures are applicable as the amount received is based on building wide energy improvements. Since the overall energy reduction for the building is estimated to exceed the 15% minimum, the building is eligible to receive monies based as discussed above in section 5.1.1. All together, incentives through the NJ P4P program are expected to total about \$14,700, reducing the total project payback from 5.5 years to 4.3 years. See Appendix J for calculations.

### 5.2.2 New Jersey Smart Start Program

The Public Safety Complex buildings are eligible for several incentives available under New Jersey Smart Start Programs. The total amount of all qualified incentives is about \$6,800 and includes installing a high efficiency gas-fired boiler, a high efficiency furnace and condensing unit, new gas-fired DHW heaters and upgrades to the lighting systems.

### 5.2.3 Energy Efficient and Conservation Block Grant

The Public Safety Complex is owned by local government which makes it eligible for this incentive. The incentive amount is determined by TRC Solutions and is not calculable at this time. Further information about this incentive, including the application, can be found at:

<http://www.njcleanenergy.com/commercial-industrial/programs/energy-efficiency-and-conservation-block-grants>

### 5.2.4 ARRA Initiative “Energy Efficiency Programs through the Clean Energy Program”

The Public Safety Complex pays the Societal Benefits charge on their monthly utility bill and therefore is not eligible for this incentive.

### 5.2.5 Direct Install Program

The facility will be eligible to receive funding from the Direct Install Program. This money will be in conjunction with the Energy Efficiency and Conservation Block Grant. The total implementation cost for all ECMs in the Public Safety Complex is about \$67,300. This program would pay 60%, or about \$40,400 of these initial costs. This funding has the potential to significantly affect the payback periods of all energy conservation measures, bringing the simple payback from about 5.4 years, to approximately 2.2 years.

In order to apply for this program the borough must contact their local Direct Install contractor. Contact information is available on the New Jersey Clean Energy Website.

## **6.0 ALTERNATIVE ENERGY SCREENING EVALUATION**

### **6.1 Geothermal**

Geothermal heat pumps (GHP) transfer heat between the constant temperature of the earth and the building to maintain the building's interior space conditions. Below the surface of the earth throughout New Jersey the temperature remains in the low 50°F range throughout the year. This stable temperature provides a source for heat in the winter and a means to reject excess heat in the summer. With GHP systems, water is circulated between the building and the piping buried in the ground. The ground heat exchanger in a GHP system is made up of a closed or open loop pipe system. Most common is the closed loop in which high density polyethylene pipe is buried horizontally at 4-6 feet deep or vertically at 100 to 400 feet deep. These pipes are filled with an environmentally friendly antifreeze/water solution that acts as a heat exchanger. In the summer, the water picks up heat from the building and moves it to the ground. In the winter the system reverses and fluid picks up heat from the ground and moves it to the building. Heat pumps make collection and transfer of this heat to and from the building possible.

The buildings use a variety of gas-fired heating and DX cooling equipment to meet the HVAC requirements. With exception to the hydronic heating system in the police headquarters, most of the existing equipment is not compatible with a geothermal energy source. Therefore, to take advantage of a GHP system, the existing mechanical equipment would have to be removed or overhauled; and either a low temperature closed loop water source heat pump system or a water to water heat pump system would have to be installed to realize the benefit of the consistent temperature of the ground.

This measure is not recommended due to a lack of open space for ground wells and the extent of HVAC system renovations needed for implementation

### **6.2 Solar**

#### **6.2.1 Photovoltaic Rooftop Solar Power Generation**

The facility was evaluated for the potential to install rooftop photovoltaic (PV) solar panels for power generation. Present technology incorporates the use of solar cell arrays that produce direct current (DC) electricity. This DC current is converted to alternating current (AC) with the use of an electrical device known as an inverter. The building's roof has sufficient room to install a large solar cell array. A structural analysis would be required to determine if the roof framing could support a cell array.

The PVWATTS solar power generation model was utilized to calculate PV power generation. The New Jersey Clean Power Estimator provided by the New Jersey Clean Energy Program is presently being updated; therefore, the site recommended use of the PVWATT solar grid analyzer version 1. The closest city available in the model is Newark, New Jersey and a fixed tilt array type was utilized to calculate energy production. The PVWATT solar power generation model is provided in Appendix K.

The State of New Jersey incentives for non-residential PV applications is \$0.75/watt up to 30 kW of installed PV array with a maximum system capacity of 50 kW. Federal tax credits are also available for renewable energy projects up to 30% of installation cost. Municipalities do not pay federal taxes; therefore, would not be able to utilize the federal tax credit incentive.

Installation of (PV) arrays in the state New Jersey will allow the owner to participate in the New Jersey solar renewable energy certificates program (SREC). This is a program that has been set up to allow

entities with large amounts of environmentally unfriendly emissions to purchase credits from zero emission (PV) solar-producers. An alternative compliance penalty (ACP) is paid for by the high emission producers and is set each year on a declining scale of 3% per year. One SREC credit is equivalent to 1000 kilowatt hours of PV electrical production; these credits can be traded for period of 15 years from the date of installation. The cost of the ACP penalty for 2009 is \$700; this is the amount that must be paid per SERC by the high emission producers. The expected dollar amount that will be paid to the PV producer for 2010 is expected to be \$600/SREC credit. Payments that will be received from the PV producer will change from year to year dependent upon supply and demand. Renewable Energy Consultants is a third party SREC broker that has been approved by the New Jersey Clean Energy Program. As stated above there is no definitive way to calculate an exact price that will be received by the PV producer per SREC over the next 15 years. Renewable Energy Consultants estimated an average of \$487/ SERC per year and this number was utilized in the cash flow for this report.

In 2009 the facility had a maximum electricity demand of 52.8 kW and a minimum of 33.6 kW. The monthly average over the observed 12 month period was 41.5 kW. The existing load does justify the use of the maximum incentive cap of 30 kW of installed PV solar array. The system costs for PV installations were derived from the most recent NYSERDA (New York State Energy Research and Development Authority) estimates of total cost of system installation. It should be noted that the cost of installation is currently \$8 per watt or \$8,000 per kW of installed system. This has increased in the past few years due to the rise in national demand for PV power generator systems. Other cost considerations will also need to be considered. PV panels have an approximate 20 year life span; however, the inverter device that converts DC electricity to AC has a life span of 10 to 12 years and will need to be replaced multiple times during the useful life of the PV system.

The implementation cost and savings related to this ECM are presented in Appendix K and summarized as follows:

#### Photovoltaic (PV) Rooftop Solar Power Generation – 30 kW System

| Budgetary<br>Cost | Annual Utility Savings |        |             |       | Total<br>Savings | New<br>Jersey<br>Renewable<br>Energy<br>Incentive* | New<br>Jersey<br>Renewable<br>SREC** | Payback<br>(without<br>incentive) | Payback<br>(with<br>incentives) |
|-------------------|------------------------|--------|-------------|-------|------------------|----------------------------------------------------|--------------------------------------|-----------------------------------|---------------------------------|
|                   | Electricity            |        | Natural Gas | Total |                  |                                                    |                                      |                                   |                                 |
| \$                | kW                     | kWh    | Therms      | \$    | \$               | \$                                                 | \$                                   | Years                             | Years                           |
| 240,000           | 0                      | 35,490 | 0           | 5,600 | 5,600            | 22,500                                             | 17,300                               | >25                               | 9.5                             |

\*Incentive based on New Jersey Renewable Energy Program for non-residential applications of \$0.75 per Watt of installed capacity

\*\* Estimated Solar Renewable Energy Certificate Program (SREC) for 15 years at \$487/1000 kWh

While the payback period is within the parameters for recommended measures, further investigation of possible installation locations, required system maintenance, and local installation costs are suggested prior to consideration for implementation.

#### 6.2.2 Solar Thermal Hot Water Plant

Active solar thermal systems use solar collectors to gather the sun's energy to heat water, another fluid, or air. An absorber in the collector converts the sun's energy into heat. The heat is then transferred by circulating water, antifreeze, or sometimes air to another location for immediate use or storage for later utilization. Applications for active solar thermal energy include providing hot water, heating swimming pools, space heating, and preheating air in residential and commercial buildings.

A standard solar hot water system is typically composed of solar collectors, heat storage vessel, piping, circulators, and controls. Systems are typically integrated to work alongside a conventional heating system that provides heat when solar resources are not sufficient. The solar collectors are usually placed on the roof of the building, oriented south, and tilted around the site's latitude, to maximize the amount of radiation collected on a yearly basis.

Several options exist for using active solar thermal systems for space heating. The most common method involves using glazed collectors to heat a liquid held in a storage tank (similar to an active solar hot water system). The most practical system would transfer the heat from the panels to thermal storage tanks and transfer solar produced thermal energy to use for domestic hot water production. DHW is presently produced by electric water heaters and, therefore, this measure would offer electric utility savings.

Currently, an incentive is not available for installation of thermal solar systems. A Federal tax credit of 30% of installation cost for the thermal applications is available; however, the Borough of Saddle River does not pay Federal taxes and, therefore, would not benefit from this program.

The implementation cost and savings related to this ECM are presented in Appendix L and summarized as follows:

#### **Solar Thermal Domestic Hot Water Plant – Fire Headquarters**

| Budgetary<br>Cost | Annual Utility Savings |       |             |       | Total<br>Savings | New Jersey<br>Renewable<br>Energy<br>Incentive | Payback<br>(without<br>incentive) | Payback<br>(with incentive) |
|-------------------|------------------------|-------|-------------|-------|------------------|------------------------------------------------|-----------------------------------|-----------------------------|
|                   | Electricity            |       | Natural Gas | Total |                  |                                                |                                   |                             |
| \$                | kW                     | kWh   | Therms      | \$    | \$               | \$                                             | Years                             | Years                       |
| 27,100            | 0                      | 1,670 | 0           | 300   | 300              | NA                                             | >25                               | NA                          |

\* No incentive is available in New Jersey at this time.

#### **Solar Thermal Domestic Hot Water Plant – Police Headquarters**

| Budgetary<br>Cost | Annual Utility Savings |       |             |       | Total<br>Savings | New Jersey<br>Renewable<br>Energy<br>Incentive | Payback<br>(without<br>incentive) | Payback<br>(with incentive) |
|-------------------|------------------------|-------|-------------|-------|------------------|------------------------------------------------|-----------------------------------|-----------------------------|
|                   | Electricity            |       | Natural Gas | Total |                  |                                                |                                   |                             |
| \$                | kW                     | kWh   | Therms      | \$    | \$               | \$                                             | Years                             | Years                       |
| 27,100            | 0                      | 6,140 | 0           | 1,000 | 1,000            | NA                                             | >25                               | NA                          |

\* No incentive is available in New Jersey at this time.

This measure is not recommended.

### **6.3 Wind**

Small wind turbines use a horizontal axis propeller, or rotor, to capture the kinetic energy of the wind and convert it into rotary motion to drive a generator which usually is designed specifically for the wind turbine. The rotor consists of two or three blades, usually made from wood or fiberglass. These materials give the turbine the needed strength and flexibility, and have the added advantage of not interfering with television signals. The structural backbone of the wind turbine is the mainframe, and includes the slip-rings that connect the wind turbine, which rotates as it points into changing wind directions, and the fixed tower wiring. The tail aligns the rotor into the wind.

To avoid turbulence and capture greater wind energy, turbines are mounted on towers. Turbines should be mounted at least 30 feet above any structure or natural feature within 300 feet of the installation. Smaller turbines can utilize shorter towers. For example, a 250-watt turbine may be mounted on a 30-50 foot tower, while a 10 kW turbine will usually need a tower of 80-120 feet. Tower designs include tubular or latticed, guyed or self-supporting. Wind turbine manufacturers also provide towers.

The New Jersey Clean Energy Program for small wind installations has designated numerous pre-approved wind turbines for installation in the State of New Jersey. Incentives for wind turbine installations are based on kilowatt hours saved in the first year. Systems sized under 16,000 kWh per year of production will receive a \$3.20 per kWh incentive. Systems producing over 16,000 kWh will receive \$51,200 for the first 16,000 kWh of production with an additional \$0.50 per kWh up to a maximum cap of 750,000 kWh per year. Federal tax credits are also available for renewable energy projects up to 30% of installation cost for systems less than 100 kW. However, as noted previously, municipalities do not pay federal taxes and is, therefore, not eligible for the tax credit incentive.

The most important part of any small wind generation project is the mean annual wind speed at the height of which the turbine will be installed. In the Saddle River area, the map indicates a mean annual wind speed of 10 miles per hour. For The Public Safety Complex, there are site restrictions such as parking lots, trees and surrounding structures would greatly affect a tower location.

A wind speed map and aerial site photo are included in Appendix M.

This measure is not recommended due to the low mean annual wind speed.

#### **6.4 Combined Heat and Power Generation (CHP)**

Combined heat and power, cogeneration, is self-production of electricity on-site with beneficial recovery of the heat byproduct from the electrical generator. Common CHP equipment includes reciprocating engine-driven, micro turbines, steam turbines, and fuel cells. Typical CHP customers include industrial, commercial, institutional, educational institutions, and multifamily residential facilities. CHP systems that are commercially viable at the present time are sized approximately 50 kW and above, with numerous options in blocks grouped around 300 kW, 800 kW, 1,200 kW and larger. Typically, CHP systems are used to produce a portion of the electricity needed by a facility some or all of the time, with the balance of electric needs satisfied by purchase from the grid.

Any proposed CHP project will need to consider many factors, such as existing system load, use of thermal energy produced, system size, natural gas fuel availability, and proposed plant location. The building has sufficient need for electrical generation and the ability to use most of the thermal byproduct during the winter, thermal usage during the summer months is low. Thermal energy produced by the CHP plant in the warmer months will be wasted. An absorption chiller could be installed to utilize the heat to produce chilled water; however, there is no chilled water distribution system in the building. The most viable selection for a CHP plant at this location would be a reciprocating engine natural gas-fired unit. Purchasing this system and performing modifications to the existing HVAC and electrical systems would greatly outweigh the savings over the life of the equipment.

This measure is not recommended.

## **6.5 Biomass Power Generation**

Biomass power generation is a process in which waste organic materials are used to produce electricity or thermal energy. These materials would otherwise be sent to the landfill or expelled to the atmosphere. To participate in NJCEP's Customer On-Site Renewable Energy program, participants must install an on-site sustainable biomass or fuel cell energy generation system. Incentives for bio-power installations are available to support up to 1MW-dc of rated capacity.

\*Class I organic residues are eligible for funding through the NJCEP CORE program. Class I wastes include the following renewable supply of organic material:

- Wood wastes not adulterated with chemicals, glues or adhesives
- Agricultural residues (corn stover, rice hulls or nut shells, manures, poultry litter, horse manure, etc) and/or methane gases from landfills
- Food wastes
- Municipal tree trimming and grass clipping wastes
- Paper and cardboard wastes
- Non adulterated construction wood wastes, pallets

The NJDEP evaluates biomass resources not identified in the RPS.

Examples of eligible facilities for a CORE incentive include:

- Digestion of sewage sludge
- Landfill gas facilities
- Combustion of wood wastes to steam turbine
- Gasification of wood wastes to reciprocating engine
- Gasification or pyrolysis of bio-solid wastes to generation equipment

\* from NJOCE Website

This measure is not recommended due to initial cost, noise issues and because the Public Safety Complex does not have a steady waste stream to use as a fuel source. Purchasing this system and performing modifications to the existing HVAC and electrical systems would greatly outweigh the savings over the life of the equipment.

## **6.6 Demand Response Curtailment**

Presently, electricity is delivered by PSE&G, which receives the electricity from regional power grid RFC. PSE&G is the regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of 13 states and the District of Columbia including the State of New Jersey.

Utility Curtailment is an agreement with the PSE&G regional transmission organization and an approved Curtailment Service Provider (CSP) to shed electrical load by either turning major equipment off or energizing all or part of a facility utilizing an emergency generator; therefore, reducing the electrical demand on the utility grid. This program is to benefit the utility company during high demand periods and PSE&G offers incentives to the CSP to participate in this program. Enrolling in the program will require program participants to drop electrical load or turn on emergency generators during high electrical

demand conditions or during emergencies. Part of the program also will require that program participants reduce their required load or run emergency generators with notice to test the system.

A PSE&G pre-approved CSP will require a minimum of 100 kW of load reduction to participate in any curtailment program. The Saddle River Public Safety Complex had a monthly average electricity demand of 41.5 kW and a maximum demand of 52.8 kW in 2009.

This measure is not recommended because the facility does not have adequate load to meet the required minimum load reduction.

## **7.0 EPA PORTFOLIO MANAGER**

The United State Environmental Protection Agency (EPA) is a federal agency in charge of regulating environment waste and policy in the United States. The EPA has released the EPA Portfolio Manager for public use. The program is designed to allow property owners and managers to share, compare and improve upon their facility's energy consumption. Inputting such parameters as electricity, heating fuel, building characteristics and location into the website based program generates a naturalized energy rating score out of 100. Once an account is registered, monthly utility data can be entered to track the savings progress and retrieve an updated energy rating score on a monthly basis.

The Public Safety Complex is considered a below average energy consumer per the Portfolio Manager with a Site Energy Usage Index (EUI) of 70 kBTU/ft<sup>2</sup>/year. The EUI can still be improved upon by addressing wasted energy from over inefficient HVAC equipment, electric domestic hot water heating, inefficient lighting systems, etc. By implementing the measures discussed in this report, it is expected that the EUI can be reduced to approximately 52 kBTU/ft<sup>2</sup>/year; the national average for this building type is 78 kBTU/ft<sup>2</sup>/year. The EPA Portfolio Manager did not generate an energy rating score for this building because the building type (Fire Station/Police Station) is currently not eligible for the EPA's Energy Star performance rating.

A full EPA Energy Star Portfolio Manager Report is located in Appendix N.

The user name and password for the building's EPA Portfolio Manager Account has been provided to Charles Cuccia of the Borough of Saddle River.

## 8.0 CONCLUSIONS & RECOMMENDATIONS

The energy audit conducted by CHA at the Saddle River Public Safety Complex in Saddle River, New Jersey identified potential ECMs for variable speed drives, motor upgrade, boiler replacement, lighting replacements and controls, and direct digital control upgrades and strategies. Potential annual savings of \$11,100 may be realized for the recommended ECMs, with a summary of the costs, savings, and paybacks as follows:

### ECM-1 Night Setback

| Budgetary<br>Cost | Annual Utility Savings |     |             |       |       | Estimated<br>Maintenance<br>Savings | Total<br>Savings | ROI  | Potential<br>Incentive* | Payback<br>(without<br>Incentive) | Payback<br>(with<br>Incentive) |
|-------------------|------------------------|-----|-------------|-------|-------|-------------------------------------|------------------|------|-------------------------|-----------------------------------|--------------------------------|
|                   | Electricity            |     | Natural Gas | Water | Total |                                     |                  |      |                         |                                   |                                |
| \$                | kW                     | kWh | Therms      | kGals | \$    | \$                                  | \$               |      | \$                      | Years                             | Years                          |
| 100               | 0                      | 720 | 230         | 0     | 400   | 0                                   | 400              | 65.1 | NA                      | 0.3                               | NA                             |

\* Incentive shown is per the New Jersey Smart Start Program, 2010 Electric Unitary HVAC Application.

### ECM-2 Replace Electric Domestic Hot Water Heater

| Budgetary<br>Cost | Annual Utility Savings |        |             |       |       | Estimated<br>Maintenance<br>Savings | Total<br>Savings | ROI | Potential<br>Incentive* | Payback<br>(without<br>Incentive) | Payback<br>(with<br>Incentive) |
|-------------------|------------------------|--------|-------------|-------|-------|-------------------------------------|------------------|-----|-------------------------|-----------------------------------|--------------------------------|
|                   | Electricity            |        | Natural Gas | Water | Total |                                     |                  |     |                         |                                   |                                |
| \$                | kW                     | kWh    | Therms      | kGals | \$    | \$                                  | \$               |     | \$                      | Years                             | Years                          |
| 7,500             | 9.0                    | 13,410 | (640)       | 0     | 2,100 | 0                                   | 2,100            | 2.7 | 600                     | 3.6                               | 3.3                            |

\* Incentive shown is per the New Jersey Smart Start Program, Gas Water Heating Application.

### ECM-4 Furnace Replacement

| Budgetary<br>Cost | Annual Utility Savings |       |             |       |       | Estimated<br>Maintenance<br>Savings | Total<br>Savings | ROI | Potential<br>Incentive* | Payback<br>(without<br>Incentive) | Payback<br>(with<br>Incentive) |
|-------------------|------------------------|-------|-------------|-------|-------|-------------------------------------|------------------|-----|-------------------------|-----------------------------------|--------------------------------|
|                   | Electricity            |       | Natural Gas | Water | Total |                                     |                  |     |                         |                                   |                                |
| \$                | kW                     | kWh   | Therms      | kGals | \$    | \$                                  | \$               |     | \$                      | Years                             | Years                          |
| 6,300             | 0                      | 1,180 | 240         | 0     | 500   | 0                                   | 500              | 0.4 | 800                     | 12.6                              | 11.0                           |

\* Incentive shown is per the New Jersey Smart Start Program, Gas Heating and Electric Unitary HVAC Applications.

### ECM-8 Lighting Replacements with Occupancy Sensors

| Budgetary<br>Cost | Annual Utility Savings |        |             |       |       | Estimated<br>Maintenance<br>Savings | Total<br>Savings | ROI | Potential<br>Incentive* | Payback<br>(without<br>Incentive) | Payback<br>(with<br>Incentive) |
|-------------------|------------------------|--------|-------------|-------|-------|-------------------------------------|------------------|-----|-------------------------|-----------------------------------|--------------------------------|
|                   | Electricity            |        | Natural Gas | Water | Total |                                     |                  |     |                         |                                   |                                |
| \$                | kW                     | kWh    | Therms      | kGals | \$    | \$                                  | \$               |     | \$                      | Years                             | Years                          |
| 24,800            | 6.7                    | 53,150 | 0           | 0     | 8,100 | 0                                   | 8,100            | 3.9 | 3,600                   | 3.1                               | 2.6                            |

\* Incentive shown is per the New Jersey Smart Start Program, Prescriptive Lighting and Lighting Controls Applications.

## **APPENDIX A**

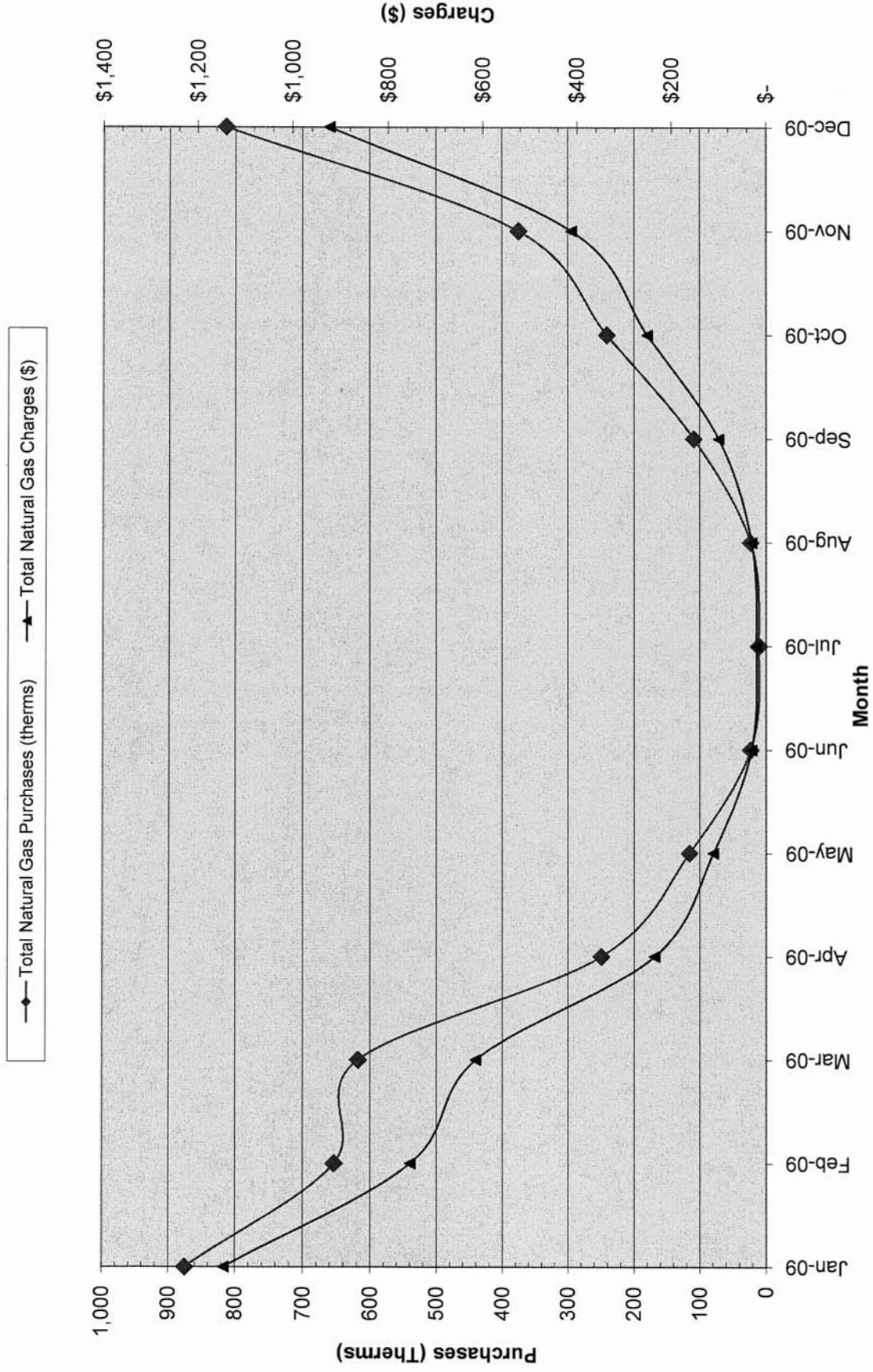
### **Utility Usage Analysis**

**New Jersey BPU Energy Audit Program**  
**CHA Project No.: 21351**  
**Borough of Saddle River - Public Safety Complex**  
**PSE&G - Natural Gas Service**

**Address:** 83 East Allendale Rd.  
**Account No.:** 65 233 234 04  
**Meter No.:** 2278746

| Month        | Therms       | Charges (\$)       | (\$/Therm)      |
|--------------|--------------|--------------------|-----------------|
| January-09   | 875.2        | \$ 1,143.82        | \$ 1.307        |
| February-09  | 653.6        | \$ 755.63          | \$ 1.156        |
| March-09     | 617.8        | \$ 616.63          | \$ 0.998        |
| April-09     | 249.4        | \$ 236.51          | \$ 0.948        |
| May-09       | 115.6        | \$ 111.46          | \$ 0.964        |
| June-09      | 22.9         | \$ 30.52           | \$ 1.333        |
| July-09      | 10.4         | \$ 19.88           | \$ 1.912        |
| August-09    | 22.9         | \$ 30.25           | \$ 1.321        |
| September-09 | 108.8        | \$ 99.51           | \$ 0.915        |
| October-09   | 240.6        | \$ 251.44          | \$ 1.045        |
| November-09  | 374.5        | \$ 412.07          | \$ 1.100        |
| December-09  | 814.0        | \$ 923.47          | \$ 1.134        |
| <b>Total</b> | <b>4,106</b> | <b>\$ 4,631.19</b> | <b>\$ 1.128</b> |

# Natural Gas Usage - Borough of Saddle River - Public Safety Complex

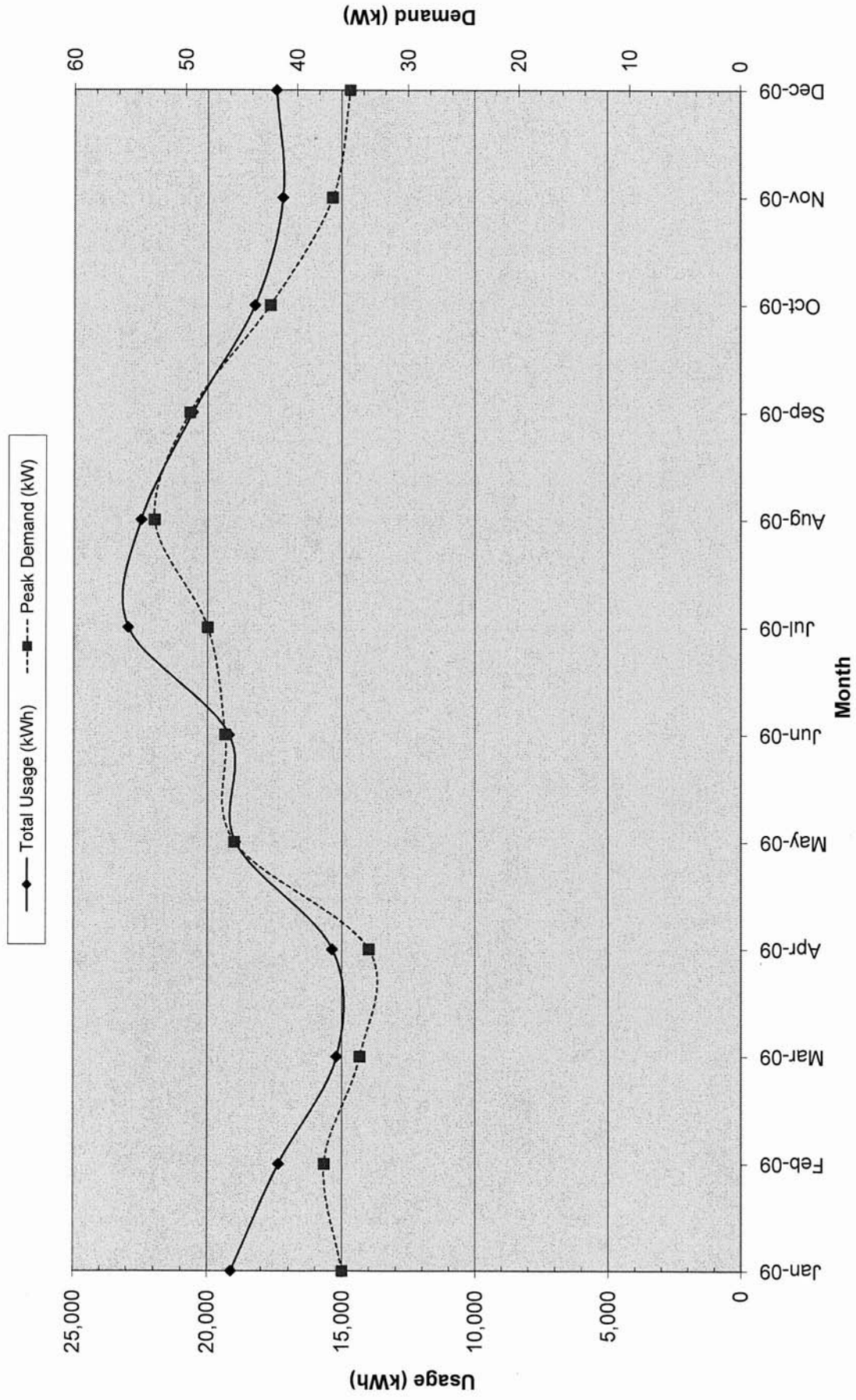


**New Jersey BPU Energy Audit Program**  
**CHA Project No.: 21351**  
**Borough of Saddle River - Public Safety Complex**  
**Orange & Rockland - Electric Service**

**Address:** 83 East Allendale Rd.  
**Account No.:** 82895-58003  
**Meter No.:** -

| Month        | Charges           |             | Unit Costs            |                |
|--------------|-------------------|-------------|-----------------------|----------------|
|              | Consumption (kWh) | Demand (kW) | Blended Rate (\$/kWh) | Demand (\$/kW) |
| January-09   | 19,120            | 36.0        | \$ 0.152              | \$ 8.66        |
| February-09  | 17,360            | 37.6        | \$ 0.123              | \$ 8.29        |
| March-09     | 15,200            | 34.4        | \$ 0.154              | \$ 9.07        |
| April-09     | 15,360            | 33.6        | \$ 0.142              | \$ 9.28        |
| May-09       | 18,960            | 45.6        | \$ 0.157              | \$ 8.41        |
| June-09      | 19,200            | 46.4        | \$ 0.175              | \$ 8.59        |
| July-09      | 22,960            | 48.0        | \$ 0.171              | \$ 8.74        |
| August-09    | 22,480            | 52.8        | \$ 0.177              | \$ 8.84        |
| September-09 | 20,560            | 49.6        | \$ 0.163              | \$ 8.78        |
| October-09   | 18,240            | 42.4        | \$ 0.156              | \$ 8.44        |
| November-09  | 17,200            | 36.8        | \$ 0.152              | \$ 8.15        |
| December-09  | 17,440            | 35.2        | \$ 0.168              | \$ 8.52        |
| <b>Total</b> | <b>224,080</b>    | <b>52.8</b> | <b>\$ 0.159</b>       | <b>\$ 8.65</b> |

# Electric Usage - Borough of Saddle River - Public Safety Complex



## **APPENDIX B**

### **ECM-1 Night Setback**

# NJ BPU Energy Audit Saddle River

CHA #21351

Building: Public Safety Complex

## ECM-1A Night Setback Fire Headquarters - Second Floor

|                              |             |                                 |              |                           |             |                        |           |
|------------------------------|-------------|---------------------------------|--------------|---------------------------|-------------|------------------------|-----------|
| Building Footprint           | 1,440 SF    | Ex Occupied Cing Temp.          | 71.1 °F      | Ex Occupied Htg Temp.     | 68 °F       | Heating Energy Savings | 76 therms |
| Heating Efficiency           | 80%         | Ex Unoccupied Cing Temp.        | 71 °F        | Ex Unoccupied Htg Temp.   | 68 °F       | Cooling Energy Savings | 208 kWh   |
| Cooling Efficiency           | 1.13 kW/ton | Prop Occupied Cing Temp.        | 71.1 °F      | Prop Occupied Htg Temp.   | 68 °F       |                        |           |
| Building Balance             | 60 °F       | Prop Unoccupied Cing Temp.      | 70 °F        | Prop Unoccupied Htg Temp. | 66 °F       |                        |           |
| Infiltration                 | 14.238 bluh | Occupied Cooling UA             | -384 btuh/°F | Occupied Heating UA       | 100 btuh/°F |                        |           |
| Unec Internal Gain factor    | 0.03        | Unoccupied Cooling UA           | -271 btuh/°F | Unoccupied Heating UA     | 100 btuh/°F |                        |           |
| Ave Occ Internal Gain Factor | 0.7         | Cooling Occ Enthalpy Setpoint   | 50 Bulb/°F   |                           |             |                        |           |
|                              |             | Cooling Unocc Enthalpy Setpoint | 50 Bulb/°F   |                           |             |                        |           |

Heating and cooling energy are unrelated in this model. If the building being analyzed is not cooled, disregard cooling energy calculations

|                              |      |                               |       | EXISTING LOADS |       |                                 |   | PROPOSED LOADS     |         |                       |        |                    |        |                               |        |                       |         |                    |        |                    |         |                               |        |                       |        |                    |      |                             |                             |                                |                                |     |
|------------------------------|------|-------------------------------|-------|----------------|-------|---------------------------------|---|--------------------|---------|-----------------------|--------|--------------------|--------|-------------------------------|--------|-----------------------|---------|--------------------|--------|--------------------|---------|-------------------------------|--------|-----------------------|--------|--------------------|------|-----------------------------|-----------------------------|--------------------------------|--------------------------------|-----|
|                              |      |                               |       | Occupied       |       | Unoccupied                      |   | Occupied           |         | Unoccupied            |        | Occupied           |        | Unoccupied                    |        |                       |         |                    |        |                    |         |                               |        |                       |        |                    |      |                             |                             |                                |                                |     |
| Avg Outdoor Air Temp. Bins F | A    | Existing Equipment Bins Hours | B     | Occupied Hours | C     | Unoccupied Equipment Bins Hours | D | Envelope Load BTUH | E       | Ventilation Load BTUH | F      | Internal Gain BTUH | G      | Unoccupied Envelope Load BTUH | H      | Ventilation Load BTUH | I       | Internal Gain BTUH | J      | Envelope Load BTUH | K       | Unoccupied Envelope Load BTUH | N      | Ventilation Load BTUH | O      | Internal Gain BTUH | P    | Existing Cooling Energy kWh | Proposed Cooling Energy kWh | Existing Heating Energy therms | Proposed Heating Energy therms |     |
| 102.5                        | 49.1 | 0                             | 0     | 0              | 0     | 0                               | 0 | -10,522            | -20,614 | -20,614               | -9,961 | -9,961             | -8,614 | -8,614                        | -7,247 | -13,491               | -13,491 | -9,961             | -9,961 | -10,522            | -20,614 | -20,614                       | -9,961 | -9,961                | -6,700 | -20,614            | -427 | -427                        | 0                           | 0                              | 0                              | 0   |
| 97.5                         | 42.5 | 3                             | 3     | 1              | 1     | 0                               | 0 | -8,851             | -9,961  | -13,491               | -9,961 | -9,961             | -7,247 | -9,961                        | -8,851 | -13,491               | -13,491 | -9,961             | -9,961 | -8,851             | -13,491 | -13,491                       | -9,961 | -9,961                | -5,333 | -13,491            | -427 | -427                        | 7                           | 7                              | 0                              | 0   |
| 92.5                         | 39.5 | 34                            | 28    | 6              | 28    | 0                               | 0 | -7,181             | -9,961  | -10,253               | -9,961 | -9,961             | -5,880 | -9,961                        | -7,181 | -10,253               | -10,253 | -9,961             | -9,961 | -5,880             | -10,253 | -10,253                       | -9,961 | -9,961                | -2,998 | -10,253            | -427 | -427                        | 59                          | 54                             | 0                              | 0   |
| 87.5                         | 36.6 | 131                           | 109   | 22             | 109   | 0                               | 0 | -5,511             | -7,123  | -7,123                | -9,961 | -9,961             | -4,512 | -9,961                        | -5,511 | -7,123                | -7,123  | -9,961             | -9,961 | -4,512             | -7,123  | -7,123                        | -9,961 | -9,961                | -2,698 | -7,123             | -427 | -427                        | 170                         | 151                            | 0                              | 0   |
| 82.5                         | 34   | 500                           | 34    | 83             | 417   | 0                               | 0 | -3,841             | -4,317  | -4,317                | -9,961 | -9,961             | -3,145 | -9,961                        | -3,841 | -4,317                | -4,317  | -9,961             | -9,961 | -3,145             | -4,317  | -4,317                        | -9,961 | -9,961                | -1,231 | -4,317             | -427 | -427                        | 452                         | 377                            | 0                              | 0   |
| 77.5                         | 31.6 | 620                           | 103   | 103            | 517   | 0                               | 0 | -2,171             | -1,727  | -1,727                | -9,961 | -9,961             | -1,778 | -9,961                        | -2,171 | -1,727                | -1,727  | -9,961             | -9,961 | -1,778             | -1,727  | -1,727                        | -9,961 | -9,961                | 0      | 0                  | -427 | -427                        | 326                         | 156                            | 0                              | 0   |
| 72.5                         | 29.2 | 664                           | 111   | 111            | 553   | 0                               | 0 | -501               | -863    | -863                  | -9,961 | -9,961             | -410   | -9,961                        | -501   | -863                  | -863    | -9,961             | -9,961 | -410               | -863    | -863                          | -9,961 | -9,961                | 0      | 0                  | -427 | -427                        | 100                         | 122                            | 0                              | 0   |
| 67.5                         | 27   | 854                           | 142   | 142            | 712   | 0                               | 0 | 50                 | 130     | 130                   | -9,961 | -9,961             | 50     | 130                           | 50     | 130                   | 130     | -9,961             | -9,961 | 50                 | 130     | 130                           | -9,961 | -9,961                | 0      | 0                  | -427 | -427                        | 148                         | 160                            | 0                              | 0   |
| 62.5                         | 24.5 | 927                           | 155   | 155            | 773   | 0                               | 0 | 549                | 1,425   | 1,425                 | -9,961 | -9,961             | 549    | 1,425                         | 549    | 1,425                 | 1,425   | -9,961             | -9,961 | 549                | 1,425   | 1,425                         | -9,961 | -9,961                | 0      | 0                  | -427 | -427                        | 116                         | 147                            | 0                              | 0   |
| 57.5                         | 21.4 | 600                           | 100   | 100            | 500   | 0                               | 0 | 1,048              | 2,720   | 2,720                 | -9,961 | -9,961             | 1,048  | 2,720                         | 1,048  | 2,720                 | 2,720   | -9,961             | -9,961 | 1,048              | 2,720   | 2,720                         | -9,961 | -9,961                | 249    | 648                | -427 | -427                        | 58                          | 58                             | 0                              | 0   |
| 52.5                         | 18.7 | 610                           | 102   | 102            | 508   | 0                               | 0 | 1,546              | 4,015   | 4,015                 | -9,961 | -9,961             | 1,546  | 4,015                         | 1,546  | 4,015                 | 4,015   | -9,961             | -9,961 | 1,546              | 4,015   | 4,015                         | -9,961 | -9,961                | 748    | 1,943              | -427 | -427                        | 42                          | 42                             | 0                              | 0   |
| 47.5                         | 16.2 | 611                           | 102   | 102            | 509   | 0                               | 0 | 2,045              | 5,310   | 5,310                 | -9,961 | -9,961             | 2,045  | 5,310                         | 2,045  | 5,310                 | 5,310   | -9,961             | -9,961 | 2,045              | 5,310   | 5,310                         | -9,961 | -9,961                | 1,247  | 3,238              | -427 | -427                        | 25                          | 25                             | 0                              | 0   |
| 42.5                         | 14.4 | 656                           | 109   | 109            | 547   | 0                               | 0 | 2,544              | 6,605   | 6,605                 | -9,961 | -9,961             | 2,544  | 6,605                         | 2,544  | 6,605                 | 6,605   | -9,961             | -9,961 | 2,544              | 6,605   | 6,605                         | -9,961 | -9,961                | 1,746  | 4,533              | -427 | -427                        | 8                           | 8                              | 0                              | 0   |
| 37.5                         | 12.6 | 1,023                         | 171   | 171            | 853   | 0                               | 0 | 3,043              | 7,900   | 7,900                 | -9,961 | -9,961             | 3,043  | 7,900                         | 3,043  | 7,900                 | 7,900   | -9,961             | -9,961 | 3,043              | 7,900   | 7,900                         | -9,961 | -9,961                | 2,245  | 5,828              | -427 | -427                        | 0                           | 0                              | 84                             | 84  |
| 32.5                         | 10.7 | 734                           | 122   | 122            | 612   | 0                               | 0 | 3,542              | 9,195   | 9,195                 | -9,961 | -9,961             | 3,542  | 9,195                         | 3,542  | 9,195                 | 9,195   | -9,961             | -9,961 | 3,542              | 9,195   | 9,195                         | -9,961 | -9,961                | 2,744  | 7,123              | -427 | -427                        | 0                           | 0                              | 114                            | 114 |
| 27.5                         | 8.6  | 334                           | 56    | 278            | 278   | 0                               | 0 | 4,041              | 10,491  | 10,491                | -9,961 | -9,961             | 4,041  | 10,491                        | 4,041  | 10,491                | 10,491  | -9,961             | -9,961 | 4,041              | 10,491  | 10,491                        | -9,961 | -9,961                | 3,242  | 8,418              | -427 | -427                        | 0                           | 0                              | 98                             | 98  |
| 22.5                         | 6.8  | 252                           | 42    | 210            | 210   | 0                               | 0 | 4,539              | 11,786  | 11,786                | -9,961 | -9,961             | 4,539  | 11,786                        | 4,539  | 11,786                | 11,786  | -9,961             | -9,961 | 4,539              | 11,786  | 11,786                        | -9,961 | -9,961                | 3,741  | 9,714              | -427 | -427                        | 0                           | 0                              | 52                             | 42  |
| 17.5                         | 5.5  | 125                           | 21    | 104            | 104   | 0                               | 0 | 5,038              | 13,081  | 13,081                | -9,961 | -9,961             | 5,038  | 13,081                        | 5,038  | 13,081                | 13,081  | -9,961             | -9,961 | 5,038              | 13,081  | 13,081                        | -9,961 | -9,961                | 4,240  | 11,009             | -427 | -427                        | 0                           | 0                              | 45                             | 38  |
| 12.5                         | 4.1  | 47                            | 8     | 39             | 39    | 0                               | 0 | 5,537              | 14,376  | 14,376                | -9,961 | -9,961             | 5,537  | 14,376                        | 5,537  | 14,376                | 14,376  | -9,961             | -9,961 | 5,537              | 14,376  | 14,376                        | -9,961 | -9,961                | 4,739  | 12,304             | -427 | -427                        | 0                           | 0                              | 25                             | 21  |
| 7.5                          | 2.6  | 22                            | 4     | 7.5            | 18    | 0                               | 0 | 6,036              | 15,671  | 15,671                | -9,961 | -9,961             | 6,036  | 15,671                        | 6,036  | 15,671                | 15,671  | -9,961             | -9,961 | 6,036              | 15,671  | 15,671                        | -9,961 | -9,961                | 5,238  | 13,599             | -427 | -427                        | 0                           | 0                              | 11                             | 9   |
| 2.5                          | 1    | 13                            | 2     | 11             | 11    | 0                               | 0 | 6,535              | 16,966  | 16,966                | -9,961 | -9,961             | 6,535  | 16,966                        | 6,535  | 16,966                | 16,966  | -9,961             | -9,961 | 6,535              | 16,966  | 16,966                        | -9,961 | -9,961                | 5,737  | 14,894             | -427 | -427                        | 0                           | 0                              | 5                              | 3   |
| -2.5                         | 0    | 0                             | 0     | 0              | 0     | 0                               | 0 | 7,034              | 18,261  | 18,261                | -9,961 | -9,961             | 7,034  | 18,261                        | 7,034  | 18,261                | 18,261  | -9,961             | -9,961 | 7,034              | 18,261  | 18,261                        | -9,961 | -9,961                | 6,236  | 16,189             | -427 | -427                        | 0                           | 0                              | 0                              | 0   |
| -7.5                         | -1.5 | 0                             | 0     | 0              | 0     | 0                               | 0 | 7,533              | 19,557  | 19,557                | -9,961 | -9,961             | 7,533  | 19,557                        | 7,533  | 19,557                | 19,557  | -9,961             | -9,961 | 7,533              | 19,557  | 19,557                        | -9,961 | -9,961                | 6,734  | 17,484             | -427 | -427                        | 0                           | 0                              | 0                              | 0   |
| TOTALS                       |      | 8,760                         | 1,460 | 7,300          | 7,300 |                                 |   |                    |         |                       |        |                    |        |                               |        |                       |         |                    |        |                    |         |                               |        |                       |        |                    |      |                             | 1,511                       | 1,511                          | 354                            | 278 |

Existing Building Ventilation & Infiltration (occ) 240 cfm

Overheat Ventilation Factor 1.00

Additional Ventilation to offset overheat 0 cfm

Existing Building Ventilation & Infiltration (unocc) 240 cfm

NJ BPU Energy Audit Saddle River  
CHA #21351  
Building: Public Safety Complex

ECM-1A Night Setback Police Headquarters - Second Floor

|                              |             |
|------------------------------|-------------|
| Building Footprint           | 2,815 SF    |
| Heating Efficiency           | 76%         |
| Cooling Efficiency           | 1.13 kWton  |
| Building Balance Temp.       | 60 °F       |
| Internal Gains               | 19,893 btuh |
| Unoc Internal Gain Factor    | 0.03        |
| Ave Occ Internal Gain Factor | 0.7         |

|               |
|---------------|
| 72 °F         |
| 72 °F         |
| 72 °F         |
| 80 °F         |
| -708 btuh/r°F |
| -498 btuh/r°F |
| 29 Bulb       |
| 29 Bulb       |

|                                 |
|---------------------------------|
| Ex Occupied Hg Temp.            |
| Ex Unoccupied Hg Temp.          |
| Prop Occupied Hg Temp.          |
| Prop Unoccupied Hg Temp.        |
| Occupied Cooling UA             |
| Unoccupied Cooling UA           |
| Cooling Occ Enthalpy Setpoint   |
| Cooling Unocc Enthalpy Setpoint |

|              |
|--------------|
| 68 °F        |
| 68 °F        |
| 68 °F        |
| 60 °F        |
| 170 btuh/r°F |
| 170 btuh/r°F |

|                        |
|------------------------|
| Heating Energy Savings |
| Cooling Energy Savings |

|            |
|------------|
| 155 therms |
| 511 kWh    |

Heating and cooling energy are unrelated in this model. If the building being analyzed is not cooled, disregard cooling energy calculations

| Avg Outdoor Air Temp. Bins F |  | Avg Outdoor Air Enthalpy |  | EXISTING LOADS |  |            |  | PROPOSED LOADS     |  |                       |  | Existing Cooling Energy kWh |  | Proposed Cooling Energy kWh   |  | Existing Heating Energy Therms |  | Proposed Heating Energy Therms |  |
|------------------------------|--|--------------------------|--|----------------|--|------------|--|--------------------|--|-----------------------|--|-----------------------------|--|-------------------------------|--|--------------------------------|--|--------------------------------|--|
| A                            |  | B                        |  | Occupied       |  | Unoccupied |  | Envelope Load BTUH |  | Ventilation Load BTUH |  | Internal Gain BTUH          |  | Unoccupied Envelope Load BTUH |  | Ventilation Load BTUH          |  | Internal Gain BTUH             |  |
| Hours                        |  | Hours                    |  | F              |  | H          |  | K                  |  | L                     |  | M                           |  | N                             |  | O                              |  | P                              |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F          |  | G                  |  | H                     |  | I                           |  | J                             |  | K                              |  | L                              |  |
| Hours                        |  | Hours                    |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| Bin                          |  | Bin                      |  | BTUH           |  | BTUH       |  | BTUH               |  | BTUH                  |  | BTUH                        |  | BTUH                          |  | BTUH                           |  | BTUH                           |  |
| C                            |  | D                        |  | E              |  | F</        |  |                    |  |                       |  |                             |  |                               |  |                                |  |                                |  |

NJ BPU Energy Audit Saddle River  
CHA #21351  
Building: Public Safety Complex

Reconcile Thermal Model

Fire Headquarters - First Floor

|                              |              |                                 |                  |                         |              |
|------------------------------|--------------|---------------------------------|------------------|-------------------------|--------------|
| Building Footprint           | 3,080 SF     | Ex Occupied Cing Temp.          | 72 °F            | Ex Occupied Htg Temp.   | 68 °F        |
| Heating Efficiency           | 80%          | Ex Unoccupied Cing Temp.        | 72 °F            | Ex Unoccupied Htg Temp. | 68 °F        |
| Cooling Efficiency           | 1.13 kWh/ton | Occupied Cooling UA             | (1,168) btu/hr°F | Occupied Heating UA     | 354 btu/hr°F |
| Internal Gains               | 22,114 btu/h | Unocc Internal Gain Factor      | 30 Btu/lb        | Unoccupied Heating UA   | 354 btu/hr°F |
| Ave Occ Internal Gain factor | 0.03         | Cooling Occ Enthalpy Setpoint   | 30 Btu/lb        |                         |              |
| Ave Occ Internal Gain Factor | 0.7          | Cooling Unocc Enthalpy Setpoint | 30 Btu/lb        |                         |              |
| Economizer available (Y/N)   | No           |                                 |                  |                         |              |

|  |  | EXISTING LOADS                      |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|--|--|-------------------------------------|--|------------------------------------|--|--------------------------------------|--|-------------------------------------|--|--------------------------|--|-----------------------|--|
|  |  | Occupied                            |  |                                    |  | Unoccupied                           |  |                                     |  |                          |  |                       |  |
|  |  | Envelope Load<br>BTUH               |  | Ventilation Load<br>BTUH           |  | Internal Gain<br>BTUH                |  | Unoccupied<br>Envelope Load<br>BTUH |  | Ventilation Load<br>BTUH |  | Internal Gain<br>BTUH |  |
|  |  | E                                   |  | F                                  |  | G                                    |  | H                                   |  | I                        |  | J                     |  |
|  |  | B                                   |  | C                                  |  | D                                    |  |                                     |  |                          |  |                       |  |
|  |  | Total Bin<br>Hours                  |  | Occupied<br>Equipment Bin<br>Hours |  | Unoccupied<br>Equipment Bin<br>Hours |  |                                     |  |                          |  |                       |  |
|  |  | Avg Outdoor<br>Air Enthalpy         |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  | A                                   |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  | Avg Outdoor<br>Air Temp.<br>Bins °F |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
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|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
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|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
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|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
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|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
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|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
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|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
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|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
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|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
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|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |
|  |  |                                     |  |                                    |  |                                      |  |                                     |  |                          |  |                       |  |

Existing Building Ventilation Factor 997 cfm

Overheat Ventilation Factor 1.00

Additional Ventilation to offset overheat  
Existing Building Ventilation & Infiltration (unocc)  
Economizer Ventilation (from AHU's)

Electrical Requirements for Heating Equipment (Fire HQ)

| Unit      | Area Served | Cing Hrs | Volts | Phase | Amps | Power Factor | % Runtime | Annual kWh | Equlv Therms |
|-----------|-------------|----------|-------|-------|------|--------------|-----------|------------|--------------|
| Baseboard | Vestibule   | 1,952    | 230   | 1     | 34.2 | 0.8          | 75%       | 1,675      | 5            |
| PTAC      | Officers    | 1,952    | 230   | 1     | 39.2 | 0.8          | 50%       | 10,717     | 31           |
| PTAC      | Chiefs      | 1,952    | 230   | 1     | 39.2 | 0.8          | 50%       | 10,717     | 31           |
| Wall Htr  | Corridor    | 1,952    | 230   | 1     | 5.3  | 0.8          | 75%       | 4,466      | 13           |
| Wall Htr  | Starwell    | 1,952    | 230   | 1     | 5.3  | 0.8          | 50%       | 2,977      | 9            |
| Total     |             |          |       |       |      |              |           | 30,551     | 90           |

Electrical Requirements for Cooling Equipment (Fire HQ)

| Unit        | Area Served | Cing Hrs | Volts | Phase | Amps | Power Factor | % Runtime | Annual kWh |
|-------------|-------------|----------|-------|-------|------|--------------|-----------|------------|
| Condenser 1 | First Fir   | 1,952    | 230   | 1     | 34.2 | 0.8          | 30%       | 3869       |
| Condenser 2 | First Fir   | 1,952    | 230   | 1     | 34.2 | 0.8          | 30%       | 3869       |
| Condenser 3 | Second Fir  | 1,952    | 230   | 1     | 39.2 | 0.8          | 35%       | 4778       |
| PTAC        | Officers    | 1,952    | 230   | 1     | 5.3  | 0.8          | 40%       | 800        |
| PTAC        | Chiefs      | 1,952    | 230   | 1     | 5.3  | 0.8          | 40%       | 800        |
| Total       |             |          |       |       |      |              |           | 12,905     |

| Heating        | Base Case | Cooling        | Base Case |
|----------------|-----------|----------------|-----------|
| FHQ First Fir  | 1,416     | FHQ First Fir  | 7,578     |
| FHQ Second Fir | 354       | FHQ Second Fir | 1,511     |
| FHQ Engine Rm  | 723       | FHQ Engine Rm  | 0         |
| Police HQ      | 1,762     | Police HQ      | 21,551    |
| Total          | 4,254     | Total          | 30,640    |
| Target ->      | 4,110     | Target ->      | 30,496    |
|                | 103.5%    |                | 100.5%    |

# HEAT GAIN/LOSS WORKSHEET

Project Name: NJ BPU Energy Audit Saddle River  
 Location: Saddle River, NJ  
 Building Name: Public Safety Complex  
 Engineer: CAA

Project No.: CHA #21351  
 Site Elevation: 460 Feet  
 Date: 09/13/10  
 Specific Volume: 13.50 CF#

Building/Facility Designation: Fire Headquarters - First Floor

|                                      |           |                                     |           |
|--------------------------------------|-----------|-------------------------------------|-----------|
| Outdoor Winter Design DB Temperature | 14 °F     | Indoor Winter Design DB Temperature | 68 °F     |
| Outdoor Summer Design DB Temperature | 91 °F     | Indoor Summer Design DB Temperature | 72 °F     |
| Outdoor Summer Design WB Temperature | 73 °F     | Indoor Summer Design WB Temperature | 60 °F     |
| Outdoor Summer Humidity Ratio        | 0.0121 ## | Indoor Air (70°F) Humidity Ratio    | 0.0078 ## |

## ENVELOPE DESCRIPTIONS (Descriptions are from Interior to Exterior)

### Walls (Select One - Type X)

|                                                                 | R Value | Wall Type |
|-----------------------------------------------------------------|---------|-----------|
| Steel Siding, 4" Insulation, Steel Siding                       | 15.2    | 1         |
| Plaster or Gypsum, frame construction, 5" Insulation, 1" stucco | 18.2    | 1         |
| 4" WH CMU, 1" Insulation, Finished Exterior                     | 5.2     | 2         |
| Plaster or Gypsum, frame construction, 3" Insulation, 8" LW CMU | 7.8     | 5         |
| 4" Face Brick, 2" Concrete, 1" Insulation, Exterior Finish      | 5.1     | 12        |
| 4" Face Brick, 4" Concrete, 1" Insulation, Exterior Finish      | 4.0     | 11        |
| Interior Finish, 2" Insulation, 8" CMU, 4" Face Brick           | 10.9    | 16        |
| Finished Surface, 8" LW CMU (filled), Air Space, 4" Face Brick  | 11.1    | 16        |
| Stucco or Gypsum, 2.5" Insul, Face Brick                        | 14.3    | 10        |
| 4" Block, 1" insulation, 8" Block                               | 19.9    | 16        |
| x U value calculator                                            | 13.1    |           |

### Roofs (Select One)

|                                                    | R Value | Roof Type |
|----------------------------------------------------|---------|-----------|
| Tectum Deck, 3.3" Insul., BU Roof                  | 13.0    | 1         |
| Steel Deck, 5" Insul., BU Roof                     | 18.2    | 1         |
| Attic Roof with 6" Insul.                          | 25.0    | 4         |
| 4" HW Concrete Deck, BU Roof                       | 2.7     | 2         |
| Ceiling, 3" Insulation, 4" Concrete Deck, BU Roof  | 14.9    | 4         |
| Ceiling, 4" Concrete Deck, 3" Insulation, BU Roof  | 18.5    | 13        |
| Ceiling, 4" Concrete Deck, 6" Insulation, BU Roof  | 21.7    | 14        |
| Ceiling, Wood Deck, 6" Insulation, Felt & Membrane | 22.7    | 10        |
| Wood Deck, 6" insulation, Felt & Membrane          | 18.0    |           |
| x U value calculator                               | 42.5    |           |

### Windows (Select One)

|                                           | U Value |
|-------------------------------------------|---------|
| Aluminum Frame, 1/8" SP Glazing           | 1.05    |
| Aluminum Frame, 1/4" DP Glazing           | 0.60    |
| Aluminum Frame, 3/16" DP Glazing          | 0.62    |
| Aluminum Frame, 1/2" DP Glazing           | 0.50    |
| Skylights                                 | 0.90    |
| x Aluminum Clad, DP Glazing, Tinted Glass | 0.42    |

|                            | No Storm |
|----------------------------|----------|
| Flat Glass                 | 1.05     |
| Flat Glass (e=.6)          | 1.00     |
| Flat Glass (e=.4)          | 0.90     |
| Flat Glass (e=.2)          | 0.77     |
| Double Glaze (3/16 in air) | 0.63     |
| Double Glaze (1/4 in air)  | 0.60     |
| Double Glaze (1/2 in air)  | 0.53     |
| Double Glaze (e=.6)        | 0.50     |
| Double Glaze (e=.4)        | 0.42     |
| Double Glaze (e=.2)        | 0.35     |
| Triple Glaze (1/4 in air)  | 0.42     |
| Triple Glaze (1/2 in air)  | 0.35     |

## BUILDING CHARACTERISTICS

Roof Area: 1,640 SF  
 Occupied Area: 3,080 SF

Return Plenum? n

|                               | Gross Wall Length | Average Wall Height | Ceiling Height | Window Area | Door Area | Net Wall Area |
|-------------------------------|-------------------|---------------------|----------------|-------------|-----------|---------------|
| North Exposure                | 41 Ft             | 11.0 Ft             | 9.0 Ft         | 19 SF       | 0 SF      | 427 SF        |
| East Exposure                 | 27 Ft             | 11.0 Ft             | 9.0 Ft         | 19 SF       | 21 SF     | 257 SF        |
| South Exposure                | 91 Ft             | 15.5 Ft             | 9.0 Ft         | 160 SF      | 0 SF      | 1,241 SF      |
| West Exposure                 | 46 Ft             | 18.0 Ft             | 9.0 Ft         | 48 SF       | 42 SF     | 738 SF        |
| Occupied Forced Ventilation   | 650 cfm           | #DIV/0! AC/hr       |                |             |           |               |
| Unoccupied Forced Ventilation | 650 cfm           | #DIV/0! AC/hr       |                |             |           |               |

# HEAT GAIN/LOSS WORKSHEET

Project Name: NJ BPU Energy Audit Saddle River  
 Location: Saddle River, NJ  
 Building Name: Public Safety Complex  
 Engineer: CAA

Project No.: CHA #21351  
 Site Elevation: 460 Feet  
 Date: 09/13/10

Specific Volume 13.50 CF/#

Building/Facility Designation Fire Headquarters - First Floor

## COOLING HEAT GAINS TO THE ROOM - SENSIBLE

### SOLAR GAINS

| WINDOWS        | AREA (SF) | SHGF         | Shade Coef | Cooling Load Factor | Glass Type   | Solar Heat Gain |
|----------------|-----------|--------------|------------|---------------------|--------------|-----------------|
| North Exposure | 19        | 38 btu/h/sf  | 0.8        | 0.75                | Glass Type C | 433 Btu/hr      |
| East Exposure  | 19        | 216 btu/h/sf | 0.8        | 0.31                | Glass Type C | 1,018 Btu/hr    |
| South Exposure | 160       | 109 btu/h/sf | 0.8        | 0.58                | Glass Type C | 8,092 Btu/hr    |
| West Exposure  | 48        | 216 btu/h/sf | 0.8        | 0.29                | Glass Type C | 2,418 Btu/hr    |
|                |           |              |            |                     |              | 11,961 Btu/h    |

### CONDUCTION

|                | NET AREA (SF) | U-VALUE | Cooling Load Temp. Dif. | Return Air Factor | Room Heat Gain |
|----------------|---------------|---------|-------------------------|-------------------|----------------|
| North Exposure | 346           | 0.08    | 20 °F                   | 1.0               | 527 Btu/hr     |
| East Exposure  | 203           | 0.08    | 39 °F                   | 1.0               | 603 Btu/hr     |
| South Exposure | 655           | 0.08    | 27 °F                   | 1.0               | 1,347 Btu/hr   |
| West Exposure  | 324           | 0.08    | 22 °F                   | 1.0               | 543 Btu/hr     |
| Roof           | 1,640         | 0.02    | 73 °F                   | 1.0               | 2,815 Btu/hr   |
| Fenestration   | 246           | 0.42    | 19 °F                   |                   | 1,965 Btu/hr   |
| Doors          | 63            | 0.14    | 27 °F                   |                   | 238 Btu/hr     |
| Ceiling        | 3,080         | 0.14    | 0 °F                    |                   | 0 Btu/hr       |
| Partition      |               | 0.05    | 0 °F                    |                   | 0 Btu/hr       |
| Floor          | 3,080         | 0.04    | 0 °F                    |                   | 0 Btu/hr       |
|                |               |         |                         |                   | 8,038 Btu/h    |

### INTERNAL HEAT GAINS (all loads below are based on Occupied Periods)

|                        |                  |                  |                     |           |              |
|------------------------|------------------|------------------|---------------------|-----------|--------------|
| Lights                 | 1.00 w/sf x      | 3,080 Occ Area = | 3.1 kW x 3.4x       | 1.0 RAF = | 10,512 Btu/h |
| Plug Load              | 0.25 w/sf x      | 3,080 Occ Area = | 0.8 kW x 3.4x       | 1.0 RAF = | 2,628 Btu/h  |
| People                 | 4 people x       | 255 btu/person x | 50% time in space = |           | 510 Btu/h    |
| Computer Work Stations |                  | 4 Units x        | 120 W/Unit x        | 3414 =    | 1,638 Btu/h  |
| Equipment              | 2.0 kW x 3.413 = |                  |                     |           | 6,826 Btu/h  |
| Misc.                  |                  |                  |                     |           | 0 Btu/h      |
|                        |                  |                  |                     |           | 22,114 Btu/h |

### VENTILATION AND INFILTRATION

|              |          | Infiltration Factor | Perimeter Ratio | Coef | Temp. Diff. | Room Heat Gain |
|--------------|----------|---------------------|-----------------|------|-------------|----------------|
| Walls        | 1,527 SF | 0.10 CFM/SF         |                 | 1.08 | 19 °F       | 3,391 Btu/h    |
| Doors        | 63 SF    | 0.20 CFM/LF         | 0.95 LF/SF      | 1.08 | 19 °F       | 266 Btu/h      |
| Windows      | 246 SF   | 0.18 CFM/LF         | 1.56 LF/SF      | 1.08 | 19 °F       | 1,535 Btu/h    |
| Ventilation  | 650 cfm  |                     |                 | 1.08 | 19 °F       | 14,435 Btu/h   |
|              |          |                     |                 |      |             | 19,627 Btu/h   |
| Infiltration | 234 cfm  | #DIV/0!             | AC/hr           |      |             |                |

Infiltration 234 cfm #DIV/0! AC/hr

## COOLING HEAT GAINS TO THE RA PLENUM - SENSIBLE

4,950

### CONDUCTION

|                | NET<br>AREA<br>(SF) | U-VALUE | Cooling<br>Load Temp.<br>Dif. | Return Air Factor | Room Heat Gain |
|----------------|---------------------|---------|-------------------------------|-------------------|----------------|
| North Exposure | 81                  | 0.08    | 20                            | 1.0               | 123 Btu/hr     |
| East Exposure  | 54                  | 0.08    | 39                            | 1.0               | 161 Btu/hr     |
| South Exposure | 586                 | 0.08    | 27                            | 1.0               | 1,206 Btu/hr   |
| West Exposure  | 414                 | 0.08    | 22                            | 1.0               | 694 Btu/hr     |
| Roof           | 1,640               | 0.02    | 73                            | 0.0               | 0 Btu/hr       |
|                |                     |         |                               |                   | 2,184 Btu/h    |

### INTERNAL HEAT GAINS

|        |             |                  |               |            |         |
|--------|-------------|------------------|---------------|------------|---------|
| Lights | 1.00 w/sf x | 3,080 Occ Area = | 3.1 kW x3413x | 0.00 RAF = | 0 Btu/h |
| Misc.  |             |                  |               |            | 0 Btu/h |
|        |             |                  |               |            | 0 Btu/h |

### SENSIBLE HEAT GAINS - TEMP. DEPENDENT

|                              |        |
|------------------------------|--------|
| Solar                        | 11,961 |
| Conduction to Room           | 8,038  |
| Conduction to Plenum         | 2,184  |
| Ventilation and Infiltration | 19,627 |
| Sub Total                    | 41,810 |

### SENSIBLE HEAT GAINS - TEMP. INDEPENDENT

|                          |        |
|--------------------------|--------|
| Internal Gains to Room   | 22,114 |
| Internal Gains to Plenum | 0      |
| Sub Total                | 22,114 |

# HEAT GAIN/LOSS WORKSHEET

Project Name: NJ BPU Energy Audit Saddle River  
 Location: Saddle River, NJ  
 Building Name: Public Safety Complex  
 Engineer: CAA

Project No.: CHA #21351  
 Site Elevation: 480 Feet  
 Date: 09/13/10

Specific Volume 13.50 CF/#

Building/Facility Designation Fire Headquarters - First Floor

## LATENT COOLING LOADS

### Infiltration

|             |          | Infiltration Factor | Air Density | Humidity Ratio Dif. |
|-------------|----------|---------------------|-------------|---------------------|
| Walls       | 2,775 SF | 0.10 CFM/SF         | 4,800       | 0.0043 ##           |
| Doors       | 63 SF    | 0.20 CFM/LF         | 4,800       | 0.0043 ##           |
| Windows     | 246 SF   | 0.18 CFM/LF         | 4,800       | 0.0043 ##           |
| Ventilation | 650 cfm  |                     | 4,800       | 0.0043 ##           |
| People      | 4 people | 0.50 time in space  |             | 250 Btu/hr/person   |

### Room Heat Gain

|              |
|--------------|
| 5,785 Btu/h  |
| 250 Btu/h    |
| 1,441 Btu/h  |
| 13,550 Btu/h |
| 500 Btu/h    |

21,525 Btu/h

## Cooling Load Summary

|                             | Sensible | Latent | Total  |
|-----------------------------|----------|--------|--------|
| Temperature Dependent Gains | 41,810   | 21,525 | 63,336 |
| Temperature Indep. Gains    | 22,114   |        | 22,114 |
| Total                       | 63,925   | 21,525 | 85,450 |

SHR= 0.75

Building Cooling Load 7.1 Tons at 433 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is

4,754 CFM

1.54 CFM/sf

## HEATING CALCULATION

### CONDUCTION

|                | NET AREA (SF) | U-VALUE | Heating Load Temp. Dif. |
|----------------|---------------|---------|-------------------------|
| North Exposure | 427           | 0.08    | 54                      |
| East Exposure  | 257           | 0.08    | 54                      |
| South Exposure | 1,241         | 0.08    | 54                      |
| West Exposure  | 738           | 0.08    | 54                      |
| Fenestration   | 246           | 0.42    | 54                      |
| Roof           | 1,640         | 0.02    | 54                      |
| Doors          | 63            | 0.14    | 54                      |
| Ceiling        | 3,080         | 0.14    | 0                       |
| Partition      | 0             | 0.05    | 0                       |
| Floor          | 1,640         | 0.04    | 0                       |

### Room Heat Gain

|             |
|-------------|
| 1,755 Btu/h |
| 1,058 Btu/h |
| 5,106 Btu/h |
| 3,037 Btu/h |
| 5,585 Btu/h |
| 2,082 Btu/h |
| 475 Btu/h   |
| 0 Btu/h     |
| 0 Btu/h     |
| 0 Btu/h     |

### Ventilation and Infiltration

|                  | Infiltration Factor | Coef | Temp. Difference |
|------------------|---------------------|------|------------------|
| Walls            | 0.10 CFM/SF         | 1.08 | 54               |
| Doors            | 0.20 CFM/LF         | 1.08 | 54               |
| Windows          | 0.18 CFM/LF         | 1.08 | 54               |
| Ventilation Load |                     | 1.08 | 54               |

### Air Flow

|         |
|---------|
| 266 cfm |
| 12 cfm  |
| 69 cfm  |
| 650 cfm |

### Room Heat Gain

|              |
|--------------|
| 15,556 Btu/h |
| 701 Btu/h    |
| 4,040 Btu/h  |
| 41,027 Btu/h |
| 61,323 Btu/h |

Total Ventilation & Infiltration Load

997 cfm

Building Heating Load 80,421 btu/h

26.1 btu/sf

NJ BPU Energy Audit Saddle River  
 CHA #21351  
 Building: Public Safety Complex  
 Fire Headquarters - First Floor

Doors

|       | Width (ft) | Height (ft) | Quantity | Area (SF) | Lineal Feet |
|-------|------------|-------------|----------|-----------|-------------|
| North |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       | Sub-total  |             |          | 0.0       | 0.0         |
| East  | 3.0        | 7.0         | 1        | 0.0       | 0.0         |
|       |            |             |          | 21.0      | 20.0        |
|       |            |             |          | 0.0       | 0.0         |
|       | Sub-total  |             |          | 21.0      | 20.0        |
| South |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       | Sub-total  |             |          | 0.0       | 0.0         |
| West  | 3.0        | 7.0         | 2        | 42.0      | 40.0        |
|       |            |             |          | 0.0       | 0.0         |
|       | Sub-total  |             |          | 42.0      | 40.0        |
| Total |            |             | 63.0     | 60.0      |             |

|       |
|-------|
| LF/SF |
| 0.95  |

# Walls

|       | Width (ft) | Height (ft) | Quantity | Area (SF) | Lineal Feet |                                             |
|-------|------------|-------------|----------|-----------|-------------|---------------------------------------------|
| North |            |             |          | 0.0       | 0.0         | All wall quantities must remain equal to 1  |
|       | 31.0       | 11.0        | 1        | 341.0     | 84.0        |                                             |
|       | 9.5        | 11.0        | 1        | 104.5     | 41.0        |                                             |
|       |            |             |          | 0.0       | 0.0         |                                             |
|       |            |             |          | 0.0       | 0.0         |                                             |
|       | 40.5       |             |          | 445.5     | 125.0       | Ave. height 11.0                            |
|       |            |             |          |           |             | Average height wall automatically linked to |

|      |      |      |   |       |      |                                             |
|------|------|------|---|-------|------|---------------------------------------------|
| East | 27.0 | 11.0 | 1 | 297.0 | 76.0 |                                             |
|      |      |      |   | 0.0   | 0.0  |                                             |
|      |      |      |   | 0.0   | 0.0  |                                             |
|      |      |      |   | 0.0   | 0.0  |                                             |
|      |      |      |   | 0.0   | 0.0  |                                             |
|      | 27.0 |      |   | 297.0 | 76.0 | Ave. height 11.0                            |
|      |      |      |   |       |      | Average height wall automatically linked to |

|       |      |      |   |        |       |                                             |
|-------|------|------|---|--------|-------|---------------------------------------------|
| South | 81.0 | 16.0 | 1 | 1296.0 | 194.0 |                                             |
|       | 9.5  | 11.0 | 1 | 104.5  | 41.0  |                                             |
|       |      |      |   | 0.0    | 0.0   |                                             |
|       |      |      |   | 0.0    | 0.0   |                                             |
|       |      |      |   | 0.0    | 0.0   |                                             |
|       | 90.5 |      |   | 1400.5 | 235.0 | Ave. height 15.5                            |
|       |      |      |   |        |       | Average height wall automatically linked to |

|      |      |      |   |       |       |                                                |
|------|------|------|---|-------|-------|------------------------------------------------|
| West | 46.0 | 18.0 | 1 | 828.0 | 128.0 |                                                |
|      |      |      |   | 0.0   | 0.0   |                                                |
|      |      |      |   | 0.0   | 0.0   |                                                |
|      |      |      |   | 0.0   | 0.0   |                                                |
|      |      |      |   | 0.0   | 0.0   |                                                |
|      | 46.0 |      |   | 828.0 | 128.0 | Ave. height 18.0                               |
|      |      |      |   |       |       | Average height auto linked to block load sheet |

# Windows

|       | Width (ft) | Height (ft) | Quantity  | Area (SF) | Lineal Feet |
|-------|------------|-------------|-----------|-----------|-------------|
| North |            |             |           | 0.0       | 0.0         |
|       | 2.0        | 4.0         | 2         | 16.0      | 24.0        |
|       | 3.0        | 1.0         | 1         | 3.0       | 8.0         |
|       |            |             |           | 0.0       | 0.0         |
|       |            |             |           | 0.0       | 0.0         |
|       |            |             | Sub-total | 19.0      | 32.0        |

|      |     |     |           |      |      |
|------|-----|-----|-----------|------|------|
| East | 2.0 | 4.0 | 2         | 16.0 | 24.0 |
|      | 3.0 | 1.0 | 1         | 3.0  | 8.0  |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     | Sub-total | 19.0 | 32.0 |

|       |     |     |           |       |       |
|-------|-----|-----|-----------|-------|-------|
| South | 2.0 | 4.0 | 20        | 160.0 | 240.0 |
|       |     |     |           | 0.0   | 0.0   |
|       |     |     |           | 0.0   | 0.0   |
|       |     |     |           | 0.0   | 0.0   |
|       |     |     |           | 0.0   | 0.0   |
|       |     |     | Sub-total | 160.0 | 240.0 |

|      |     |     |           |      |      |
|------|-----|-----|-----------|------|------|
| West | 2.0 | 4.0 | 4         | 32.0 | 48.0 |
|      | 6.0 | 1.0 | 1         | 6.0  | 14.0 |
|      | 1.5 | 1.5 | 1         | 2.3  | 6.0  |
|      | 4.0 | 2.0 | 1         | 8.0  | 12.0 |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     | Sub-total | 48.3 | 80.0 |

|  |  |  |       |       |       |            |
|--|--|--|-------|-------|-------|------------|
|  |  |  |       |       |       | LF/SF 1.56 |
|  |  |  | Total | 246.3 | 384.0 |            |

NJ BPU Energy Audit Saddle River  
CHA #21351  
Building: Public Safety Complex

Reconcile Thermal Model

Fire Headquarters - Second Floor

|                              |              |                                 |                |                         |              |
|------------------------------|--------------|---------------------------------|----------------|-------------------------|--------------|
| Building Footprint           | 1,440 SF     | Ex Occupied Cing Temp.          | 71 °F          | Ex Occupied Htg Temp.   | 68 °F        |
| Heating Efficiency           | 80%          | Ex Unoccupied Cing Temp.        | 71 °F          | Ex Unoccupied Htg Temp. | 68 °F        |
| Cooling Efficiency           | 1.13 kW/ton  | Occupied Cooling UA             | (334) btu/hr°F | Occupied Heating UA     | 100 btu/hr°F |
| Internal Gains               | 14,230 btu/h | Unoccupied Cooling UA           | (273) btu/hr°F | Unoccupied Heating UA   | 100 btu/hr°F |
| Unoc Internal Gain factor    | 0.03         | Cooling Occ Enthalpy Setpoint   | 30 Btu/lb      |                         |              |
| Ave Occ Internal Gain Factor | 0.7          | Cooling Unocc Enthalpy Setpoint | 30 Btu/lb      |                         |              |
| Economizer available (Y/N)   | No           |                                 |                |                         |              |

| EXISTING LOADS                |                 |                              |                                |               |         |                  |        |               |      |                                  |                              |                             |                                |
|-------------------------------|-----------------|------------------------------|--------------------------------|---------------|---------|------------------|--------|---------------|------|----------------------------------|------------------------------|-----------------------------|--------------------------------|
|                               |                 |                              |                                | Occupied      |         |                  |        | Unoccupied    |      |                                  |                              |                             |                                |
| Avg Outdoor Air Temp. Bins °F | Total Bin Hours | Occupied Equipment Bin Hours | Unoccupied Equipment Bin Hours | Envelope Load |         | Ventilation Load |        | Internal Gain |      | Available Economizer Cooling kWh | Necessary Cooling Energy kWh | Existing Cooling Energy kWh | Existing Heating Energy therms |
|                               |                 |                              |                                | BTUH          | BTUH    | BTUH             | BTUH   | BTUH          | BTUH |                                  |                              |                             |                                |
| A                             | B               | C                            | D                              | E             | F       | G                | H      | I             | J    | K                                | L                            | M                           | M                              |
| 102.5                         | 49.1            | 0                            | 0                              | -10,522       | -20,614 | -9,961           | -8,614 | -20,614       | -427 | 0                                | 0                            | 0                           | 0                              |
| 97.5                          | 42.5            | 3                            | 3                              | -8,851        | -13,491 | -9,961           | -7,247 | -13,491       | -427 | 0                                | 7                            | 0                           | 0                              |
| 92.5                          | 39.5            | 34                           | 28                             | -7,181        | -10,253 | -9,961           | -5,880 | -10,253       | -427 | 0                                | 59                           | 59                          | 0                              |
| 87.5                          | 36.6            | 131                          | 109                            | -5,511        | -7,123  | -9,961           | -4,512 | -7,123        | -427 | 0                                | 170                          | 170                         | 0                              |
| 82.5                          | 34.0            | 500                          | 417                            | -3,841        | -4,317  | -9,961           | -3,145 | -4,317        | -427 | 0                                | 452                          | 452                         | 0                              |
| 77.5                          | 31.6            | 620                          | 517                            | -2,171        | -1,727  | -9,961           | -1,778 | -1,727        | -427 | 0                                | 326                          | 326                         | 0                              |
| 72.5                          | 29.2            | 664                          | 553                            | -501          | 863     | -9,961           | -410   | 863           | -427 | 0                                | 100                          | 100                         | 0                              |
| 67.5                          | 27.0            | 854                          | 712                            | 50            | 130     | -9,961           | 50     | 130           | -427 | 0                                | 148                          | 148                         | 0                              |
| 62.5                          | 24.5            | 927                          | 773                            | 549           | 1,425   | -9,961           | 549    | 1,425         | -427 | 0                                | 116                          | 116                         | 0                              |
| 57.5                          | 21.4            | 600                          | 500                            | 1,048         | 2,720   | -9,961           | 1,048  | 2,720         | -427 | 0                                | 58                           | 58                          | 0                              |
| 52.5                          | 18.7            | 610                          | 508                            | 1,546         | 4,015   | -9,961           | 1,546  | 4,015         | -427 | 0                                | 42                           | 42                          | 0                              |
| 47.5                          | 16.2            | 611                          | 509                            | 2,045         | 5,310   | -9,961           | 2,045  | 5,310         | -427 | 0                                | 25                           | 25                          | 0                              |
| 42.5                          | 14.4            | 656                          | 547                            | 2,544         | 6,605   | -9,961           | 2,544  | 6,605         | -427 | 0                                | 8                            | 8                           | 0                              |
| 37.5                          | 12.6            | 1,023                        | 853                            | 3,043         | 7,900   | -9,961           | 3,043  | 7,900         | -427 | 0                                | 0                            | 0                           | 114                            |
| 32.5                          | 10.7            | 734                          | 612                            | 3,542         | 9,195   | -9,961           | 3,542  | 9,195         | -427 | 0                                | 0                            | 0                           | 98                             |
| 27.5                          | 8.6             | 334                          | 278                            | 4,041         | 10,491  | -9,961           | 4,041  | 10,491        | -427 | 0                                | 0                            | 0                           | 52                             |
| 22.5                          | 6.8             | 252                          | 210                            | 4,539         | 11,786  | -9,961           | 4,539  | 11,786        | -427 | 0                                | 0                            | 0                           | 45                             |
| 17.5                          | 5.5             | 125                          | 104                            | 5,038         | 13,081  | -9,961           | 5,038  | 13,081        | -427 | 0                                | 0                            | 0                           | 25                             |
| 12.5                          | 4.1             | 47                           | 39                             | 5,537         | 14,376  | -9,961           | 5,537  | 14,376        | -427 | 0                                | 0                            | 0                           | 11                             |
| 7.5                           | 2.6             | 22                           | 18                             | 6,036         | 15,671  | -9,961           | 6,036  | 15,671        | -427 | 0                                | 0                            | 0                           | 5                              |
| 2.5                           | 1.0             | 13                           | 11                             | 6,535         | 16,966  | -9,961           | 6,535  | 16,966        | -427 | 0                                | 0                            | 0                           | 3                              |
| -2.5                          | 0.0             | 0                            | 0                              | 7,034         | 18,261  | -9,961           | 7,034  | 18,261        | -427 | 0                                | 0                            | 0                           | 0                              |
| -7.5                          | -1.5            | 0                            | 0                              | 7,533         | 19,557  | -9,961           | 7,533  | 19,557        | -427 | 0                                | 0                            | 0                           | 0                              |
| TOTALS                        |                 | 8,760                        | 1,460                          | 7,300         |         |                  |        |               |      |                                  | 1,511                        | 1,511                       | 354                            |

240 cfm

1.00

0 cfm

240 cfm

Existing Building Ventilation & Infiltration (occ)

Overheat Ventilation Factor

Additional ventilation to offset overheat

Existing Building Ventilation & Infiltration (unocc)

Economizer Ventilation (from AHU's)

Energy Use Indices (calculated)

| Heating        | Base Case | Cooling        | Base Case |
|----------------|-----------|----------------|-----------|
| FHQ First Flr  | 1,416     | FHQ First Flr  | 7,578     |
| FHQ Second Flr | 354       | FHQ Second Flr | 1,511     |
| FHQ Engine Rm  | 723       | FHQ Engine Rm  | 0         |
| Police HQ      | 1,762     | Police HQ      | 21,551    |
| Total          | 4,254     | Total          | 30,640    |
| Target ->      | 103.5%    | Target ->      | 100.5%    |

# HEAT GAIN/LOSS WORKSHEET

Project Name: NJ BPU Energy Audit Saddle River  
 Location: Saddle River, NJ  
 Building Name: Public Safety Complex  
 Engineer: CAA

Project No.: CHA #21351  
 Site Elevation: 480 Feet  
 Date: 09/13/10

Specific Volume 13.50 CF/#

Building/Facility Designation Fire Headquarters - Second Floor

Outdoor Winter Design DB Temperature 14 \*F  
 Outdoor Summer Design DB Temperature 91 \*F  
 Outdoor Summer Design WB Temperature 73 \*F  
 Outdoor Summer Humidity Ratio 0.0121 ##

Indoor Winter Design DB Temperature 68 \*F  
 Indoor Summer Design DB Temperature 71 \*F  
 Indoor Summer Design WB Temperature 60 \*F  
 Indoor Air (70°F) Humidity Ratio 0.0078 ##

## ENVELOPE DESCRIPTIONS (Descriptions are from Interior to Exterior)

### Walls (Select One - Type X)

|                                                                 | R Value | Wall Type |
|-----------------------------------------------------------------|---------|-----------|
| Steel Siding, 4" Insulation, Steel Siding                       | 15.2    | 1         |
| Plaster or Gypsum, frame construction, 5" Insulation, 1" stucco | 18.2    | 1         |
| 4" WH CMU, 1" Insulation, Finished Exterior                     | 5.2     | 2         |
| Plaster or Gypsum, frame construction, 3" Insulation, 8" LW CMU | 7.8     | 5         |
| 4" Face Brick, 2" Concrete, 1" Insulation, Exterior Finish      | 5.1     | 12        |
| 4" Face Brick, 4" Concrete, 1" Insulation, Exterior Finish      | 4.0     | 11        |
| Interior Finish, 2" Insulation, 8" CMU, 4" Face Brick           | 10.9    | 16        |
| Finished Surface, 8" LW CMU (filled), Air Space, 4" Face Brick  | 11.1    | 16        |
| Stucco or Gypsum, 2.5" Insul, Face Brick                        | 14.3    | 10        |
| 4" Block, 1" Insulation, 8" Block                               | 19.9    | 16        |
| x U value calculator                                            | 13.1    |           |

### Roofs (Select One)

|                                                    | R Value | Roof Type |
|----------------------------------------------------|---------|-----------|
| Tectum Deck, 3.3" Insul., BU Roof                  | 13.0    | 1         |
| Steel Deck, 5" Insul., BU Roof                     | 18.2    | 1         |
| Attic Roof with 6" Insul.                          | 25.0    | 4         |
| 4" HW Concrete Deck, BU Roof                       | 2.7     | 2         |
| Ceiling, 3" Insulation, 4" Concrete Deck, BU Roof  | 14.9    | 4         |
| Ceiling, 4" Concrete Deck, 3" Insulation, BU Roof  | 18.5    | 13        |
| Ceiling, 4" Concrete Deck, 6" Insulation, BU Roof  | 21.7    | 14        |
| Ceiling, Wood Deck, 6" Insulation, Felt & Membrane | 22.7    | 10        |
| Wood Deck, 6" Insulation, Felt & Membrane          | 18.0    |           |
| x U value calculator                               | 23.2    |           |

### Windows (Select One)

|                                           | U Value |
|-------------------------------------------|---------|
| Aluminum Frame, 1/8" SP Glazing           | 1.05    |
| Aluminum Frame, 1/4" DP Glazing           | 0.60    |
| Aluminum Frame, 3/16" DP Glazing          | 0.62    |
| Aluminum Frame, 1/2" DP Glazing           | 0.50    |
| Skylights                                 | 0.90    |
| x Aluminum Clad, DP Glazing, Tinted Glass | 0.42    |

|                            | No Storm |
|----------------------------|----------|
| Flat Glass                 | 1.05     |
| Flat Glass (e=.6)          | 1.00     |
| Flat Glass (e=0.4)         | 0.90     |
| Flat Glass (e=0.2)         | 0.77     |
| Double Glaze (3/16 in air) | 0.63     |
| Double Glaze (1/4 in air)  | 0.60     |
| Double Glaze (1/2 in air)  | 0.53     |
| Double Glaze (e=.6)        | 0.50     |
| Double Glaze (e=0.4)       | 0.42     |
| Double Glaze (e=0.2)       | 0.35     |
| Triple Glaze (1/4 in air)  | 0.42     |
| Triple Glaze (1/2 in air)  | 0.35     |

## BUILDING CHARACTERISTICS

Roof Area 1,440 SF  
 Occupied Area 1,440 SF

Return Plenum? n

|                               | Gross Wall Length | Average Wall Height | Ceiling Height | Window Area | Door Area | Net Wall Area |
|-------------------------------|-------------------|---------------------|----------------|-------------|-----------|---------------|
| North Exposure                | 5 Ft              | 9.0 Ft              | 9.0 Ft         | 12 SF       | 0 SF      | 33 SF         |
| East Exposure                 | 12 Ft             | 9.0 Ft              | 9.0 Ft         | 9 SF        | 0 SF      | 99 SF         |
| South Exposure                | 5 Ft              | 9.0 Ft              | 9.0 Ft         | 9 SF        | 0 SF      | 36 SF         |
| West Exposure                 | 18 Ft             | 9.0 Ft              | 9.0 Ft         | 0 SF        | 0 SF      | 162 SF        |
| Occupied Forced Ventilation   | 200 cfm           | #DIV/0! AC/hr       |                |             |           |               |
| Unoccupied Forced Ventilation | 200 cfm           | #DIV/0! AC/hr       |                |             |           |               |

# HEAT GAIN/LOSS WORKSHEET

Project Name: NJ BPU Energy Audit Saddle River  
 Location: Saddle River, NJ  
 Building Name: Public Safety Complex  
 Engineer: CAA

Project No.: CHA #21351  
 Site Elevation: 460 Feet  
 Date: 09/13/10

Specific Volume 13.50 CF/#

Building/Facility Designation Fire Headquarters - Second Floor

## COOLING HEAT GAINS TO THE ROOM - SENSIBLE

### SOLAR GAINS

| WINDOWS        | AREA (SF) | SHGF         | Shade Coef | Cooling Load Factor | Glass Type C | Solar Heat Gain |
|----------------|-----------|--------------|------------|---------------------|--------------|-----------------|
| North Exposure | 12        | 38 btu/h/sf  | 0.8        | 0.75                | Glass Type C | 274 Btu/hr      |
| East Exposure  | 9         | 216 btu/h/sf | 0.8        | 0.31                | Glass Type C | 482 Btu/hr      |
| South Exposure | 9         | 109 btu/h/sf | 0.8        | 0.58                | Glass Type C | 455 Btu/hr      |
| West Exposure  | 0         | 216 btu/h/sf | 0.8        | 0.29                | Glass Type C | 0 Btu/hr        |
|                |           |              |            |                     |              | 1,211 Btu/h     |

### CONDUCTION

|                | NET<br>AREA<br>(SF) | U-VALUE | Cooling<br>Load Temp.<br>Dif. | Return Air Factor | Room Heat Gain |
|----------------|---------------------|---------|-------------------------------|-------------------|----------------|
| North Exposure | 33                  | 0.08    | 20 °F                         | 1.0               | 50 Btu/hr      |
| East Exposure  | 99                  | 0.08    | 39 °F                         | 1.0               | 294 Btu/hr     |
| South Exposure | 36                  | 0.08    | 27 °F                         | 1.0               | 74 Btu/hr      |
| West Exposure  | 162                 | 0.08    | 22 °F                         | 1.0               | 272 Btu/hr     |
| Roof           | 1,440               | 0.04    | 73 °F                         | 1.0               | 4,527 Btu/hr   |
| Fenestration   | 30                  | 0.42    | 20 °F                         |                   | 252 Btu/hr     |
| Doors          | 0                   | 0.14    | 27 °F                         |                   | 0 Btu/hr       |
| Ceiling        | 1,440               | 0.14    | 0 °F                          |                   | 0 Btu/hr       |
| Partition      |                     | 0.05    | 0 °F                          |                   | 0 Btu/hr       |
| Floor          | 1,440               | 0.04    | 0 °F                          |                   | 0 Btu/hr       |
|                |                     |         |                               |                   | 5,469 Btu/h    |

### INTERNAL HEAT GAINS (all loads below are based on Occupied Periods)

|                        |                  |                  |                     |           |              |
|------------------------|------------------|------------------|---------------------|-----------|--------------|
| Lights                 | 1.50 w/sf x      | 1,440 Occ Area = | 2.2 kW x 3.4x       | 1.0 RAF = | 7,372 Btu/h  |
| Plug Load              | 0.25 w/sf x      | 1,440 Occ Area = | 0.4 kW x 3.4x       | 1.0 RAF = | 1,229 Btu/h  |
| People                 | 4 people x       | 255 btu/person x | 50% time in space = |           | 510 Btu/h    |
| Computer Work Stations |                  | Units x          | 120 W/Unit x        | 3414 =    | 0 Btu/h      |
| Equipment              | 1.5 kW x 3.413 = |                  |                     |           | 5,120 Btu/h  |
| Misc.                  |                  |                  |                     |           | 0 Btu/h      |
|                        |                  |                  |                     |           | 14,230 Btu/h |

### VENTILATION AND INFILTRATION

|              |         | Infiltration Factor | Perimeter Ratio | Coef | Temp. Diff. | Room Heat Gain |
|--------------|---------|---------------------|-----------------|------|-------------|----------------|
| Walls        | 330 SF  | 0.10 CFM/SF         |                 | 1.08 | 20 °F       | 771 Btu/h      |
| Doors        | 0 SF    | 0.20 CFM/LF         | 0.00 LF/SF      | 1.08 | 20 °F       | 0 Btu/h        |
| Windows      | 30 SF   | 0.18 CFM/LF         | 1.27 LF/SF      | 1.08 | 20 °F       | 160 Btu/h      |
| Ventilation  | 200 cfm |                     |                 | 1.08 | 20 °F       | 4,675 Btu/h    |
|              |         |                     |                 |      |             | 5,607 Btu/h    |
| Infiltration | 40 cfm  | #DIV/0! AC/hr       |                 |      |             |                |

Infiltration 40 cfm #DIV/0! AC/hr

## COOLING HEAT GAINS TO THE RA PLENUM - SENSIBLE

4,950

### CONDUCTION

|                | NET<br>AREA<br>(SF) | U-VALUE | Cooling<br>Load Temp.<br>Dif. | Return Air Factor | Room Heat Gain |
|----------------|---------------------|---------|-------------------------------|-------------------|----------------|
| North Exposure | 0                   | 0.08    | 20                            | 1.0               | 0 Btu/hr       |
| East Exposure  | 0                   | 0.08    | 39                            | 1.0               | 0 Btu/hr       |
| South Exposure | 0                   | 0.08    | 27                            | 1.0               | 0 Btu/hr       |
| West Exposure  | 0                   | 0.08    | 22                            | 1.0               | 0 Btu/hr       |
| Roof           | 1,440               | 0.04    | 73                            | 0.0               | 0 Btu/hr       |
|                |                     |         |                               |                   | 0 Btu/h        |

### INTERNAL HEAT GAINS

|        |             |                  |               |            |         |
|--------|-------------|------------------|---------------|------------|---------|
| Lights | 1.50 w/sf x | 1,440 Occ Area = | 2.2 kW x3413x | 0.00 RAF = | 0 Btu/h |
| Misc.  |             |                  |               |            | 0 Btu/h |
|        |             |                  |               |            | 0 Btu/h |

### SENSIBLE HEAT GAINS - TEMP. DEPENDENT

|                              |        |
|------------------------------|--------|
| Solar                        | 1,211  |
| Conduction to Room           | 5,469  |
| Conduction to Plenum         | 0      |
| Ventilation and Infiltration | 5,607  |
| Sub Total                    | 12,287 |

### SENSIBLE HEAT GAINS - TEMP. INDEPENDENT

|                          |        |
|--------------------------|--------|
| Internal Gains to Room   | 14,230 |
| Internal Gains to Plenum | 0      |
| Sub Total                | 14,230 |

# HEAT GAIN/LOSS WORKSHEET

Project Name: NJ BPU Energy Audit Saddle River  
 Location: Saddle River, NJ  
 Building Name: Public Safety Complex  
 Engineer: CAA

Project No.: CHA #21351  
 Site Elevation: 460 Feet  
 Date: 09/13/10

Specific Volume 13.50 CF/#

Building/Facility Designation Fire Headquarters - Second Floor

## LATENT COOLING LOADS

### Infiltration

|             |          | Infiltration Factor | Air Density | Humidity Ratio Dif. |
|-------------|----------|---------------------|-------------|---------------------|
| Walls       | 1,440 SF | 0.10 CFM/SF         | 4,800       | 0.0043 ##           |
| Doors       | 0 SF     | 0.20 CFM/LF         | 4,800       | 0.0043 ##           |
| Windows     | 30 SF    | 0.18 CFM/LF         | 4,800       | 0.0043 ##           |
| Ventilation | 200 cfm  |                     | 4,800       | 0.0043 ##           |
| People      | 4 people | 0.50 time in space  |             | 250 Btu/hr/person   |

### Room Heat Gain

|             |
|-------------|
| 3,002 Btu/h |
| 0 Btu/h     |
| 143 Btu/h   |
| 4,169 Btu/h |
| 500 Btu/h   |

7,814 Btu/h

## Cooling Load Summary

|                             | Sensible | Latent | Total  |
|-----------------------------|----------|--------|--------|
| Temperature Dependent Gains | 12,287   | 7,814  | 20,101 |
| Temperature Indep. Gains    | 14,230   |        | 14,230 |
| Total                       | 26,517   | 7,814  | 34,331 |

SHR= 0.77

Building Cooling Load 2.9 Tons at 503 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is

|             |
|-------------|
| 2,042 CFM   |
| 1.42 CFM/sf |

## HEATING CALCULATION

### CONDUCTION

|                | NET AREA (SF) | U-VALUE | Heating Load Temp. Dif. |
|----------------|---------------|---------|-------------------------|
| North Exposure | 33            | 0.08    | 54                      |
| East Exposure  | 99            | 0.08    | 54                      |
| South Exposure | 36            | 0.08    | 54                      |
| West Exposure  | 162           | 0.08    | 54                      |
| Fenestration   | 30            | 0.42    | 54                      |
| Roof           | 1,440         | 0.04    | 54                      |
| Doors          | 0             | 0.14    | 54                      |
| Ceiling        | 1,440         | 0.14    | 0                       |
| Partition      | 0             | 0.05    | 0                       |
| Floor          | 1,440         | 0.04    | 0                       |

### Room Heat Gain

|             |
|-------------|
| 136 Btu/h   |
| 407 Btu/h   |
| 148 Btu/h   |
| 667 Btu/h   |
| 680 Btu/h   |
| 3,349 Btu/h |
| 0 Btu/h     |
| 0 Btu/h     |
| 0 Btu/h     |
| 0 Btu/h     |

### Ventilation and Infiltration

|                  |         | Infiltration Factor | Coef | Temp. Difference |
|------------------|---------|---------------------|------|------------------|
| Walls            | 330 SF  | 0.10 CFM/SF         | 1.08 | 54               |
| Doors            | 0 SF    | 0.20 CFM/LF         | 1.08 | 54               |
| Windows          | 30 SF   | 0.18 CFM/LF         | 1.08 | 54               |
| Ventilation Load | 200 cfm |                     | 1.08 | 54               |

### Air Flow

|         |
|---------|
| 33 cfm  |
| 0 cfm   |
| 7 cfm   |
| 200 cfm |
| 240 cfm |

### Room Heat Gain

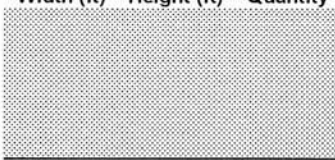
|              |
|--------------|
| 1,929 Btu/h  |
| 0 Btu/h      |
| 400 Btu/h    |
| 12,624 Btu/h |
| 14,952 Btu/h |

Total Ventilation & Infiltration Load

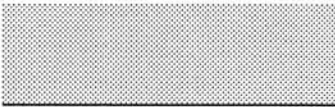
|                       |        |             |
|-----------------------|--------|-------------|
| Building Heating Load | 20,339 | btu/h       |
|                       |        | 14.1 btu/sf |

NJ BPU Energy Audit Saddle River  
 CHA #21351  
 Building: Public Safety Complex  
 Fire Headquarters - Second Floor

Doors

|       | Width (ft)                                                                        | Height (ft) | Quantity | Area (SF) | Lineal Feet |
|-------|-----------------------------------------------------------------------------------|-------------|----------|-----------|-------------|
| North |  |             |          | 0.0       | 0.0         |
|       |                                                                                   |             |          | 0.0       | 0.0         |
|       |                                                                                   |             |          | 0.0       | 0.0         |
|       |                                                                                   |             |          | 0.0       | 0.0         |
|       |                                                                                   |             |          | 0.0       | 0.0         |
|       | Sub-total                                                                         |             |          | 0.0       | 0.0         |

|      |                                                                                   |  |  |     |     |
|------|-----------------------------------------------------------------------------------|--|--|-----|-----|
| East |  |  |  | 0.0 | 0.0 |
|      |                                                                                   |  |  | 0.0 | 0.0 |
|      |                                                                                   |  |  | 0.0 | 0.0 |
|      | Sub-total                                                                         |  |  | 0.0 | 0.0 |

|       |                                                                                   |  |  |     |     |
|-------|-----------------------------------------------------------------------------------|--|--|-----|-----|
| South |  |  |  | 0.0 | 0.0 |
|       |                                                                                   |  |  | 0.0 | 0.0 |
|       |                                                                                   |  |  | 0.0 | 0.0 |
|       |                                                                                   |  |  | 0.0 | 0.0 |
|       | Sub-total                                                                         |  |  | 0.0 | 0.0 |

|      |                                                                                   |  |  |     |     |
|------|-----------------------------------------------------------------------------------|--|--|-----|-----|
| West |  |  |  | 0.0 | 0.0 |
|      |                                                                                   |  |  | 0.0 | 0.0 |
|      | Sub-total                                                                         |  |  | 0.0 | 0.0 |

Total 0.0 0.0

|       |
|-------|
| LF/SF |
| 0.00  |

# Walls

|       | Width (ft) | Height (ft) | Quantity | Area (SF) | Lineal Feet |                                            |
|-------|------------|-------------|----------|-----------|-------------|--------------------------------------------|
| North | 5.0        | 9.0         | 1        | 0.0       | 0.0         | All wall quantities must remain equal to 1 |
|       |            |             |          | 45.0      | 28.0        |                                            |
|       |            |             |          | 0.0       | 0.0         |                                            |
|       |            |             |          | 0.0       | 0.0         |                                            |
|       |            |             |          | 0.0       | 0.0         |                                            |
|       |            |             |          | 0.0       | 0.0         |                                            |
|       |            |             |          | 5.0       | 45.0        | 28.0                                       |

Average height wall automatically linked to

|      |                     |       |      |                                |
|------|---------------------|-------|------|--------------------------------|
| East | <div>12.09.01</div> | 108.0 | 42.0 | <div>Ave. height<br/>9.0</div> |
|      |                     | 0.0   | 0.0  |                                |
|      |                     | 0.0   | 0.0  |                                |
|      |                     | 0.0   | 0.0  |                                |
|      |                     | 0.0   | 0.0  |                                |
|      |                     | 0.0   | 0.0  |                                |
|      |                     | 0.0   | 0.0  |                                |
|      |                     | 0.0   | 0.0  |                                |
|      |                     | 108.0 | 42.0 |                                |

Average height wall automatically linked to

|       |                                                     |      |      |                                                 |
|-------|-----------------------------------------------------|------|------|-------------------------------------------------|
| South | <div><div>5.0</div><div>9.0</div><div>1</div></div> | 45.0 | 28.0 | <div><div>Ave. height</div><div>9.0</div></div> |
|       |                                                     | 0.0  | 0.0  |                                                 |
|       |                                                     | 0.0  | 0.0  |                                                 |
|       |                                                     | 0.0  | 0.0  |                                                 |
|       |                                                     | 0.0  | 0.0  |                                                 |
|       |                                                     | 0.0  | 0.0  |                                                 |
|       |                                                     | 45.0 | 28.0 |                                                 |

Average height wall automatically linked to

|      |      |     |   |       |      |                    |
|------|------|-----|---|-------|------|--------------------|
| West | 18.0 | 9.0 | 1 | 162.0 | 54.0 | Ave. height<br>9.0 |
|      |      |     |   | 0.0   | 0.0  |                    |
|      |      |     |   | 0.0   | 0.0  |                    |
|      |      |     |   | 0.0   | 0.0  |                    |
|      |      |     |   | 0.0   | 0.0  |                    |
|      |      |     |   | 0.0   | 0.0  |                    |
|      | 18.0 |     |   | 162.0 | 54.0 |                    |

Average height auto linked to block load sheet

# Windows

|           | Width (ft) | Height (ft) | Quantity | Area (SF) | Lineal Feet |
|-----------|------------|-------------|----------|-----------|-------------|
| North     | 3.0        | 4.0         | 1        | 0.0       | 0.0         |
|           |            |             |          | 12.0      | 14.0        |
|           |            |             |          | 0.0       | 0.0         |
|           |            |             |          | 0.0       | 0.0         |
|           |            |             |          | 0.0       | 0.0         |
|           |            |             |          | 0.0       | 0.0         |
|           |            |             |          | 0.0       | 0.0         |
| Sub-total |            |             |          | 12.0      | 14.0        |

|      |           |     |   |     |      |
|------|-----------|-----|---|-----|------|
| East | 3.0       | 3.0 | 1 | 9.0 | 12.0 |
|      |           |     |   | 0.0 | 0.0  |
|      |           |     |   | 0.0 | 0.0  |
|      |           |     |   | 0.0 | 0.0  |
|      |           |     |   | 0.0 | 0.0  |
|      |           |     |   | 0.0 | 0.0  |
|      |           |     |   | 0.0 | 0.0  |
|      | Sub-total |     |   | 9.0 | 12.0 |

|       |           |     |   |     |      |
|-------|-----------|-----|---|-----|------|
| South | 3.0       | 3.0 | 1 | 9.0 | 12.0 |
|       |           |     |   | 0.0 | 0.0  |
|       |           |     |   | 0.0 | 0.0  |
|       |           |     |   | 0.0 | 0.0  |
|       |           |     |   | 0.0 | 0.0  |
|       |           |     |   | 0.0 | 0.0  |
|       |           |     |   | 0.0 | 0.0  |
|       | Sub-total |     |   | 9.0 | 12.0 |

|      |           |     |     |
|------|-----------|-----|-----|
| West |           | 0.0 | 0.0 |
|      |           | 0.0 | 0.0 |
|      |           | 0.0 | 0.0 |
|      |           | 0.0 | 0.0 |
|      |           | 0.0 | 0.0 |
|      |           | 0.0 | 0.0 |
|      | Sub-total | 0.0 | 0.0 |

Total 30.0 38.0

LF/SF 1.27

NJ BPU Energy Audit Saddle River  
CHA #21351  
Building: Public Safety Complex

Reconcile Thermal Model Fire Headquarters - Engine Room

|                                 |              |                                 |                  |                         |              |
|---------------------------------|--------------|---------------------------------|------------------|-------------------------|--------------|
| Building Footprint              | 3,700 SF     | Ex Occupied Chg Temp.           | 71 °F            | Ex Occupied Htg Temp.   | 68 °F        |
| Heating Efficiency              | 78%          | Ex Unoccupied Chg Temp.         | 71 °F            | Ex Unoccupied Htg Temp. | 68 °F        |
| Cooling Efficiency              | 0.00 kW/ton  | Unoccupied Cooling UA           | (1,247) btu/hr°F | Occupied Heating UA     | 490 btu/hr°F |
| Internal Gains                  | 21,227 btu/h | Unoccupied Cooling UA           | (985) btu/hr°F   | Unoccupied Heating UA   | 490 btu/hr°F |
| Unoc Internal Gain Factor       | 0.5          | Cooling Occ Enthalpy Setpoint   | 30 Btu/lb        |                         |              |
| Ave Occ Internal Gain Factor    | 0.8          | Cooling Unocc Enthalpy Setpoint | 30 Btu/lb        |                         |              |
| Economizer available (Y/N)      | No           |                                 |                  |                         |              |
| Heat Distribution Effectiveness | 85.0%        |                                 |                  |                         |              |

Heat Distribution Factor per ASHRAE Handbook - Fundamentals for Unit Heaters

| EXISTING LOADS                |                  |                               |                                 |                    |                    |                               |                                  |                    |                                  |                              |                             |
|-------------------------------|------------------|-------------------------------|---------------------------------|--------------------|--------------------|-------------------------------|----------------------------------|--------------------|----------------------------------|------------------------------|-----------------------------|
| Occupied                      |                  |                               |                                 |                    |                    | Unoccupied                    |                                  |                    |                                  |                              |                             |
| Avg Outdoor Air Temp. Bins °F | Total Bins Hours | Occupied Equipment Bins Hours | Unoccupied Equipment Bins Hours | Envelope Load BTUH | Internal Gain BTUH | Unoccupied Envelope Load BTUH | Unoccupied Ventilation Load BTUH | Internal Gain BTUH | Available Economizer Cooling kWh | Necessary Cooling Energy kWh | Existing Cooling Energy kWh |
| A                             | B                | C                             | D                               | E                  | F                  | G                             | H                                | I                  | J                                | K                            | L                           |
| 102.5                         | 49.1             | 0                             | 0                               | -39,273            | -25,128            | -16,982                       | -31,347                          | -25,128            | -10,613                          | 0                            | 0                           |
| 97.5                          | 42.5             | 3                             | 2                               | -33,039            | -16,445            | -16,982                       | -26,372                          | -16,445            | -10,613                          | 0                            | 0                           |
| 92.5                          | 39.5             | 34                            | 23                              | -26,806            | -12,498            | -16,982                       | -21,396                          | -12,498            | -10,613                          | 0                            | 0                           |
| 87.5                          | 36.6             | 131                           | 87                              | -20,572            | -8,683             | -16,982                       | -16,420                          | -8,683             | -10,613                          | 0                            | 0                           |
| 82.5                          | 34.0             | 500                           | 333                             | -14,338            | -5,262             | -16,982                       | -11,444                          | -5,262             | -10,613                          | 0                            | 0                           |
| 77.5                          | 31.6             | 620                           | 413                             | -8,104             | -2,105             | -16,982                       | -6,469                           | -2,105             | -10,613                          | 0                            | 0                           |
| 72.5                          | 29.2             | 664                           | 221                             | -1,870             | 1,052              | -16,982                       | -1,493                           | 1,052              | -10,613                          | 0                            | 0                           |
| 67.5                          | 27.0             | 854                           | 285                             | 245                | 158                | -16,982                       | 245                              | 158                | -10,613                          | 0                            | 0                           |
| 62.5                          | 24.5             | 927                           | 309                             | 2,697              | 1,737              | -16,982                       | 2,697                            | 1,737              | -10,613                          | 0                            | 0                           |
| 57.5                          | 21.4             | 600                           | 200                             | 5,149              | 3,315              | -16,982                       | 5,149                            | 3,315              | -10,613                          | 0                            | 0                           |
| 52.5                          | 18.7             | 510                           | 203                             | 7,601              | 4,894              | -16,982                       | 7,601                            | 4,894              | -10,613                          | 0                            | 0                           |
| 47.5                          | 16.2             | 611                           | 204                             | 10,053             | 6,473              | -16,982                       | 10,053                           | 6,473              | -10,613                          | 0                            | 0                           |
| 42.5                          | 14.4             | 656                           | 219                             | 12,504             | 8,052              | -16,982                       | 12,504                           | 8,052              | -10,613                          | 0                            | 0                           |
| 37.5                          | 12.6             | 1,023                         | 341                             | 14,956             | 9,630              | -16,982                       | 14,956                           | 9,630              | -10,613                          | 0                            | 0                           |
| 32.5                          | 10.7             | 734                           | 245                             | 17,408             | 11,209             | -16,982                       | 17,408                           | 11,209             | -10,613                          | 0                            | 0                           |
| 27.5                          | 8.6              | 334                           | 111                             | 19,860             | 12,788             | -16,982                       | 19,860                           | 12,788             | -10,613                          | 0                            | 0                           |
| 22.5                          | 6.8              | 252                           | 84                              | 22,312             | 14,367             | -16,982                       | 22,312                           | 14,367             | -10,613                          | 0                            | 0                           |
| 17.5                          | 5.5              | 125                           | 42                              | 24,764             | 15,945             | -16,982                       | 24,764                           | 15,945             | -10,613                          | 0                            | 0                           |
| 12.5                          | 4.1              | 47                            | 16                              | 27,215             | 17,524             | -16,982                       | 27,215                           | 17,524             | -10,613                          | 0                            | 0                           |
| 7.5                           | 2.6              | 22                            | 7                               | 29,667             | 19,103             | -16,982                       | 29,667                           | 19,103             | -10,613                          | 0                            | 0                           |
| 2.5                           | 1.0              | 13                            | 4                               | 32,119             | 20,682             | -16,982                       | 32,119                           | 20,682             | -10,613                          | 0                            | 0                           |
| -2.5                          | 0.0              | 0                             | 0                               | 34,571             | 22,260             | -16,982                       | 34,571                           | 22,260             | -10,613                          | 0                            | 0                           |
| -7.5                          | -1.5             | 0                             | 0                               | 37,023             | 23,839             | -16,982                       | 37,023                           | 23,839             | -10,613                          | 0                            | 0                           |
| TOTALS                        |                  | 8,760                         | 2,920                           | 5,840              |                    |                               |                                  |                    |                                  | 0                            | 0                           |

Existing Building Ventilation & Infiltration (oc)

Overheat Ventilation Factor

Additional Ventilation to offset overheat

Existing Building Ventilation & Infiltration (unocc)

Economizer Ventilation (from AHU's)

Energy Use Indices (calculated)

| Heating        | Base Case | Cooling        | Base Case |
|----------------|-----------|----------------|-----------|
| FHQ First Flr  | 1,416     | FHQ First Flr  | 7,578     |
| FHQ Second Flr | 354       | FHQ Second Flr | 1,511     |
| FHQ Engine Rm  | 723       | FHQ Engine Rm  | 0         |
| Police HQ      | 1,762     | Police HQ      | 21,551    |
| Total          | 4,254     | Total          | 30,640    |
| Target ->      | 4,110     | Target ->      | 30,496    |

103.5%

100.5%

# HEAT GAIN/LOSS WORKSHEET

Project Name: NJ BPU Energy Audit Saddle River  
 Location: Saddle River, NJ  
 Building Name: Public Safety Complex  
 Engineer: CAA

Project No.: CHA #21351  
 Site Elevation: 460 Feet  
 Date: 09/13/10

Specific Volume: 13.50 CF/#

Building/Facility Designation: Fire Headquarters - Engine Room

Outdoor Winter Design DB Temperature: 14°F  
 Outdoor Summer Design DB Temperature: 91°F  
 Outdoor Summer Design WB Temperature: 73°F  
 Outdoor Summer Humidity Ratio: 0.0121 ##

Indoor Winter Design DB Temperature: 68°F  
 Indoor Summer Design DB Temperature: 71°F  
 Indoor Summer Design WB Temperature: 60°F  
 Indoor Air (70°F) Humidity Ratio: 0.0078 ##

## ENVELOPE DESCRIPTIONS (Descriptions are from Interior to Exterior)

### Walls (Select One - Type X)

|                                                                                          | R Value | Wall Type |
|------------------------------------------------------------------------------------------|---------|-----------|
| <input type="checkbox"/> Steel Siding, 4" Insulation, Steel Siding                       | 15.2    | 1         |
| <input type="checkbox"/> Plaster or Gypsum, frame construction, 5" Insulation, 1" stucco | 18.2    | 1         |
| <input type="checkbox"/> 4" WH CMU, 1" Insulation, Finished Exterior                     | 5.2     | 2         |
| <input type="checkbox"/> Plaster or Gypsum, frame construction, 3" Insulation, 8" LW CMU | 7.8     | 5         |
| <input type="checkbox"/> 4" Face Brick, 2" Concrete, 1" Insulation, Exterior Finish      | 5.1     | 12        |
| <input type="checkbox"/> 4" Face Brick, 4" Concrete, 1" Insulation, Exterior Finish      | 4.0     | 11        |
| <input type="checkbox"/> Interior Finish, 2" Insulation, 8" CMU, 4" Face Brick           | 10.9    | 16        |
| <input type="checkbox"/> Finished Surface, 8" LW CMU (filled), Air Space, 4" Face Brick  | 11.1    | 16        |
| <input type="checkbox"/> Stucco or Gypsum, 2.5" Insul, Face Brick                        | 14.3    | 10        |
| <input type="checkbox"/> 4" Block, 1" insulation, 8" Block                               | 19.9    | 16        |
| <input checked="" type="checkbox"/> U value calculator                                   | 13.1    |           |

### Roofs (Select One)

|                                                                             | R Value | Roof Type |
|-----------------------------------------------------------------------------|---------|-----------|
| <input type="checkbox"/> Tectum Deck, 3.3" Insul., BU Roof                  | 13.0    | 1         |
| <input type="checkbox"/> Steel Deck, 5" Insul., BU Roof                     | 18.2    | 1         |
| <input type="checkbox"/> Attic Roof with 6" Insul.                          | 25.0    | 4         |
| <input type="checkbox"/> 4" HW Concrete Deck, BU Roof                       | 2.7     | 2         |
| <input type="checkbox"/> Ceiling, 3" Insulation, 4" Concrete Deck, BU Roof  | 14.9    | 4         |
| <input type="checkbox"/> Ceiling, 4" Concrete Deck, 3" Insulation, BU Roof  | 18.5    | 13        |
| <input type="checkbox"/> Ceiling, 4" Concrete Deck, 6" Insulation, BU Roof  | 21.7    | 14        |
| <input type="checkbox"/> Ceiling, Wood Deck, 6" Insulation, Felt & Membrane | 22.7    | 10        |
| <input type="checkbox"/> Wood Deck, 6" insulation, Felt & Membrane          | 18.0    |           |
| <input checked="" type="checkbox"/> U value calculator                      | 23.2    |           |

### Windows (Select One)

|                                                                             | U Value |
|-----------------------------------------------------------------------------|---------|
| <input type="checkbox"/> Aluminum Frame, 1/8" SP Glazing                    | 1.05    |
| <input type="checkbox"/> Aluminum Frame, 1/4" DP Glazing                    | 0.60    |
| <input type="checkbox"/> Aluminum Frame, 3/16" DP Glazing                   | 0.62    |
| <input type="checkbox"/> Aluminum Frame, 1/2" DP Glazing                    | 0.50    |
| <input type="checkbox"/> Skylights                                          | 0.90    |
| <input checked="" type="checkbox"/> Aluminum Clad, DP Glazing, Tinted Glass | 0.42    |

|                            | No Storm |
|----------------------------|----------|
| Flat Glass                 | 1.05     |
| Flat Glass (e=.6)          | 1.00     |
| Flat Glass (e=.4)          | 0.90     |
| Flat Glass (e=.2)          | 0.77     |
| Double Glaze (3/16 in air) | 0.63     |
| Double Glaze (1/4 in air)  | 0.60     |
| Double Glaze (1/2 in air)  | 0.53     |
| Double Glaze (e=.6)        | 0.50     |
| Double Glaze (e=.4)        | 0.42     |
| Double Glaze (e=.2)        | 0.35     |
| Triple Glaze (1/4 in air)  | 0.42     |
| Triple Glaze (1/2 in air)  | 0.35     |

## BUILDING CHARACTERISTICS

Roof Area: 3,700 SF  
 Occupied Area: 3,700 SF

Return Plenum? n

|                               | Gross Wall Length | Average Wall Height | Ceiling Height | Window Area | Door Area | Net Wall Area |
|-------------------------------|-------------------|---------------------|----------------|-------------|-----------|---------------|
| North Exposure                | 50 Ft             | 16.0 Ft             | 16.0 Ft        | 73 SF       | 121 SF    | 606 SF        |
| East Exposure                 | 77 Ft             | 16.0 Ft             | 16.0 Ft        | 3 SF        | 801 SF    | 428 SF        |
| South Exposure                | 0 Ft              | 0.0 Ft              | 16.0 Ft        | 0 SF        | 0 SF      | 0 SF          |
| West Exposure                 | 57 Ft             | 16.0 Ft             | 16.0 Ft        | 64 SF       | 0 SF      | 848 SF        |
| Occupied Forced Ventilation   | 0 cfm             | #DIV/0!             | AC/hr          |             |           |               |
| Unoccupied Forced Ventilation | 0 cfm             | #DIV/0!             | AC/hr          |             |           |               |

# HEAT GAIN/LOSS WORKSHEET

Project Name: NJ BPU Energy Audit Saddle River  
 Location: Saddle River, NJ  
 Building Name: Public Safety Complex  
 Engineer: CAA

Project No.: CHA #21351  
 Site Elevation: 460 Feet  
 Date: 09/13/10

Specific Volume 13.50 CF/#

Building/Facility Designation Fire Headquarters - Engine Room

## COOLING HEAT GAINS TO THE ROOM - SENSIBLE

### SOLAR GAINS

| WINDOWS        | AREA (SF) | SHGF         | Shade Coef | Cooling Load Factor | Glass Type   | Solar Heat Gain |
|----------------|-----------|--------------|------------|---------------------|--------------|-----------------|
| North Exposure | 73        | 38 btu/h/sf  | 0.8        | 0.75                | Glass Type C | 1,664 Btu/hr    |
| East Exposure  | 3         | 216 btu/h/sf | 0.8        | 0.31                | Glass Type C | 161 Btu/hr      |
| South Exposure | 0         | 109 btu/h/sf | 0.8        | 0.58                | Glass Type C | 0 Btu/hr        |
| West Exposure  | 64        | 216 btu/h/sf | 0.8        | 0.29                | Glass Type C | 3,207 Btu/hr    |
|                |           |              |            |                     |              | 5,032 Btu/h     |

### CONDUCTION

|                | NET AREA (SF) | U-VALUE | Cooling Load Temp. Dif. | Return Air Factor | Room Heat Gain |
|----------------|---------------|---------|-------------------------|-------------------|----------------|
| North Exposure | 606           | 0.08    | 20 °F                   | 1.0               | 924 Btu/hr     |
| East Exposure  | 428           | 0.08    | 39 °F                   | 1.0               | 1,272 Btu/hr   |
| South Exposure | 0             | 0.08    | 27 °F                   | 1.0               | 0 Btu/hr       |
| West Exposure  | 848           | 0.08    | 22 °F                   | 1.0               | 1,422 Btu/hr   |
| Roof           | 3,700         | 0.04    | 73 °F                   | 1.0               | 11,632 Btu/hr  |
| Fenestration   | 140           | 0.42    | 20 °F                   |                   | 1,176 Btu/hr   |
| Doors          | 922           | 0.14    | 27 °F                   |                   | 3,477 Btu/hr   |
| Ceiling        | 3,700         | 0.14    | 0 °F                    |                   | 0 Btu/hr       |
| Partition      |               | 0.05    | 0 °F                    |                   | 0 Btu/hr       |
| Floor          | 3,700         | 0.04    | 0 °F                    |                   | 0 Btu/hr       |
|                |               |         |                         |                   | 19,903 Btu/h   |

### INTERNAL HEAT GAINS (all loads below are based on Occupied Periods)

|                        |             |                  |                     |           |              |
|------------------------|-------------|------------------|---------------------|-----------|--------------|
| Lights                 | 1.00 w/sf x | 3,700 Occ Area = | 3.7 kW x 3.4x       | 1.0 RAF = | 12,628 Btu/h |
| Plug Load              | 0.10 w/sf x | 3,700 Occ Area = | 0.4 kW x 3.4x       | 1.0 RAF = | 1,263 Btu/h  |
| People                 | 4 people x  | 255 btu/person x | 50% time in space = |           | 510 Btu/h    |
| Computer Work Stations |             | Units x          | 120 W/Unit x        | 3414 =    | 0 Btu/h      |
| Equipment              | 2.0 kW x    | 3,413 =          |                     |           | 6,826 Btu/h  |
| Misc.                  |             |                  |                     |           | 0 Btu/h      |
|                        |             |                  |                     |           | 21,227 Btu/h |

### VENTILATION AND INFILTRATION

|              |          | Infiltration Factor | Perimeter Ratio | Coef | Temp. Diff. | Room Heat Gain |
|--------------|----------|---------------------|-----------------|------|-------------|----------------|
| Walls        | 1,882 SF | 0.10 CFM/SF         |                 | 1.08 | 20 °F       | 4,400 Btu/h    |
| Doors        | 922 SF   | 0.20 CFM/LF         | 0.36 LF/SF      | 1.08 | 20 °F       | 1,543 Btu/h    |
| Windows      | 140 SF   | 0.18 CFM/LF         | 1.51 LF/SF      | 1.08 | 20 °F       | 892 Btu/h      |
| Ventilation  | 0 cfm    |                     |                 | 1.08 | 20 °F       | 0 Btu/h        |
|              |          |                     |                 |      |             | 6,834 Btu/h    |
| Infiltration | 292 cfm  | #DIV/0!             | AC/hr           |      |             |                |

Infiltration 292 cfm #DIV/0! AC/hr

## COOLING HEAT GAINS TO THE RA PLENUM - SENSIBLE

4,950

### CONDUCTION

|                | NET<br>AREA<br>(SF) | U-VALUE | Cooling<br>Load Temp.<br>Dif. | Return Air Factor | Room Heat Gain |
|----------------|---------------------|---------|-------------------------------|-------------------|----------------|
| North Exposure | 0                   | 0.08    | 20                            | 1.0               | 0 Btu/hr       |
| East Exposure  | 0                   | 0.08    | 39                            | 1.0               | 0 Btu/hr       |
| South Exposure | 0                   | 0.08    | 27                            | 1.0               | 0 Btu/hr       |
| West Exposure  | 0                   | 0.08    | 22                            | 1.0               | 0 Btu/hr       |
| Roof           | 3,700               | 0.04    | 73                            | 0.0               | 0 Btu/hr       |
|                |                     |         |                               |                   | 0 Btu/h        |

### INTERNAL HEAT GAINS

|        |             |                  |               |            |         |
|--------|-------------|------------------|---------------|------------|---------|
| Lights | 1.00 w/sf x | 3,700 Occ Area = | 3.7 kW x3413x | 0.00 RAF = | 0 Btu/h |
| Misc.  |             |                  |               |            | 0 Btu/h |
|        |             |                  |               |            | 0 Btu/h |

### SENSIBLE HEAT GAINS - TEMP. DEPENDENT

|                              |        |
|------------------------------|--------|
| Solar                        | 5,032  |
| Conduction to Room           | 19,903 |
| Conduction to Plenum         | 0      |
| Ventilation and Infiltration | 6,834  |
| Sub Total                    | 31,770 |

### SENSIBLE HEAT GAINS - TEMP. INDEPENDENT

|                          |        |
|--------------------------|--------|
| Internal Gains to Room   | 21,227 |
| Internal Gains to Plenum | 0      |
| Sub Total                | 21,227 |

# HEAT GAIN/LOSS WORKSHEET

Project Name: NJ BPU Energy Audit Saddle River  
 Location: Saddle River, NJ  
 Building Name: Public Safety Complex  
 Engineer: CAA

Project No.: CHA #21351  
 Site Elevation: 460 Feet  
 Date: 09/13/10

Specific Volume 13.50 CF/#

Building/Facility Designation Fire Headquarters - Engine Room

## LATENT COOLING LOADS

### Infiltration

|             |          | Infiltration Factor | Air Density | Humidity Ratio Dif. |
|-------------|----------|---------------------|-------------|---------------------|
| Walls       | 3,700 SF | 0.10 CFM/SF         | 4,800       | 0.0043 ##           |
| Doors       | 922 SF   | 0.20 CFM/LF         | 4,800       | 0.0043 ##           |
| Windows     | 140 SF   | 0.18 CFM/LF         | 4,800       | 0.0043 ##           |
| Ventilation | 0 cfm    |                     | 4,800       | 0.0043 ##           |
| People      | 4 people | 0.50 time in space  |             | 250 Btu/hr/person   |

| Room Heat Gain |
|----------------|
| 7,713 Btu/h    |
| 1,376 Btu/h    |
| 795 Btu/h      |
| 0 Btu/h        |
| 500 Btu/h      |

10,384 Btu/h

## Cooling Load Summary

|                             | Sensible | Latent | Total  | SHR= |  |
|-----------------------------|----------|--------|--------|------|--|
| Temperature Dependent Gains | 31,770   | 10,384 | 42,154 |      |  |
| Temperature Indep. Gains    | 21,227   |        | 21,227 | 0.84 |  |
| Total                       | 52,997   | 10,384 | 63,381 |      |  |

Building Cooling Load 5.3 Tons at 701 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is

4,081 CFM

1.10 CFM/sf

## HEATING CALCULATION

### CONDUCTION

|                | NET AREA (SF) | U-VALUE | Heating Load Temp. Dif. |
|----------------|---------------|---------|-------------------------|
| North Exposure | 606           | 0.08    | 54                      |
| East Exposure  | 428           | 0.08    | 54                      |
| South Exposure | 0             | 0.08    | 54                      |
| West Exposure  | 848           | 0.08    | 54                      |
| Fenestration   | 140           | 0.42    | 54                      |
| Roof           | 3,700         | 0.04    | 54                      |
| Doors          | 922           | 0.14    | 54                      |
| Ceiling        | 3,700         | 0.14    | 0                       |
| Partition      | 0             | 0.05    | 0                       |
| Floor          | 3,700         | 0.04    | 0                       |

### Room Heat Gain

|             |
|-------------|
| 2,494 Btu/h |
| 1,762 Btu/h |
| 0 Btu/h     |
| 3,490 Btu/h |
| 3,175 Btu/h |
| 8,605 Btu/h |
| 6,954 Btu/h |
| 0 Btu/h     |
| 0 Btu/h     |
| 0 Btu/h     |
| 0 Btu/h     |

### Ventilation and Infiltration

|                  |          | Infiltration Factor | Coef | Temp. Difference |
|------------------|----------|---------------------|------|------------------|
| Walls            | 1,882 SF | 0.10 CFM/SF         | 1.08 | 54               |
| Doors            | 922 SF   | 0.20 CFM/LF         | 1.08 | 54               |
| Windows          | 140 SF   | 0.18 CFM/LF         | 1.08 | 54               |
| Ventilation Load | 0 cfm    |                     | 1.08 | 54               |

### Air Flow

|         |
|---------|
| 188 cfm |
| 66 cfm  |
| 38 cfm  |
| 0 cfm   |

### Room Heat Gain

|              |
|--------------|
| 10,999 Btu/h |
| 3,857 Btu/h  |
| 2,230 Btu/h  |
| 0 Btu/h      |
| 17,086 Btu/h |

Total Ventilation & Infiltration Load

292 cfm

Building Heating Load 43,566 btu/h

11.8 btu/sf

NJ BPU Energy Audit Saddle River  
 CHA #21351  
 Building: Public Safety Complex  
 Fire Headquarters - Engine Room

Doors

|       | Width (ft) | Height (ft) | Quantity | Area (SF) | Lineal Feet |
|-------|------------|-------------|----------|-----------|-------------|
| North | 3.0        | 7.0         | 1        | 21.0      | 20.0        |
|       | 10.0       | 10.0        | 1        | 100.0     | 40.0        |
|       |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       | Sub-total  |             |          | 121.0     | 60.0        |
| East  | 12.0       | 13.0        | 5        | 780.0     | 250.0       |
|       | 3.0        | 7.0         | 1        | 21.0      | 20.0        |
|       |            |             |          | 0.0       | 0.0         |
|       | Sub-total  |             |          | 801.0     | 270.0       |
| South |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       | Sub-total  |             |          | 0.0       | 0.0         |
| West  |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       | Sub-total  |             |          | 0.0       | 0.0         |
| Total |            |             |          | 922.0     | 330.0       |

|       |
|-------|
| LF/SF |
| 0.36  |

# Walls

|       | Width (ft) | Height (ft) | Quantity | Area (SF) | Lineal Feet |                                            |                     |                                             |
|-------|------------|-------------|----------|-----------|-------------|--------------------------------------------|---------------------|---------------------------------------------|
| North | 50.0       | 16.0        | 1        | 0.0       | 0.0         | All wall quantities must remain equal to 1 |                     |                                             |
|       |            |             |          | 800.0     | 132.0       |                                            |                     |                                             |
|       |            |             |          | 0.0       | 0.0         |                                            |                     |                                             |
|       |            |             |          | 0.0       | 0.0         |                                            |                     |                                             |
|       |            |             |          | 0.0       | 0.0         |                                            |                     |                                             |
|       |            |             |          | 0.0       | 0.0         |                                            |                     |                                             |
|       |            |             |          | 50.0      | 800.0       | 132.0                                      | Ave. height<br>16.0 | Average height wall automatically linked to |
|       |            |             |          |           |             |                                            |                     |                                             |

|      |      |      |   |        |       |                                                |
|------|------|------|---|--------|-------|------------------------------------------------|
| East | 77.0 | 16.0 | 1 | 1232.0 | 186.0 |                                                |
|      |      |      |   | 0.0    | 0.0   |                                                |
|      |      |      |   | 0.0    | 0.0   |                                                |
|      |      |      |   | 0.0    | 0.0   |                                                |
|      |      |      |   | 0.0    | 0.0   |                                                |
|      |      |      |   | 0.0    | 0.0   |                                                |
|      | 77.0 |      |   | 1232.0 | 186.0 | Ave. height<br>16.0                            |
|      |      |      |   |        |       | Average height wall<br>automatically linked to |

|       |                                                                                   |     |     |                                |                                                |
|-------|-----------------------------------------------------------------------------------|-----|-----|--------------------------------|------------------------------------------------|
| South |  | 0.0 | 0.0 | <div>Ave. height<br/>0.0</div> | Average height wall<br>automatically linked to |
|       |                                                                                   | 0.0 | 0.0 |                                |                                                |
|       |                                                                                   | 0.0 | 0.0 |                                |                                                |
|       |                                                                                   | 0.0 | 0.0 |                                |                                                |
|       |                                                                                   | 0.0 | 0.0 |                                |                                                |
|       |                                                                                   | 0.0 | 0.0 |                                |                                                |
|       |                                                                                   | 0.0 | 0.0 |                                |                                                |
| 0.0   |                                                                                   | 0.0 | 0.0 |                                |                                                |

|      |                      |                  |                  |                                 |                                                |
|------|----------------------|------------------|------------------|---------------------------------|------------------------------------------------|
| West | <div>57.016.01</div> | 912.0            | 146.0            |                                 |                                                |
|      |                      | 0.0              | 0.0              |                                 |                                                |
|      |                      | 0.0              | 0.0              |                                 |                                                |
|      |                      | 0.0              | 0.0              |                                 |                                                |
|      |                      | 0.0              | 0.0              |                                 |                                                |
|      |                      | 0.0              | 0.0              |                                 |                                                |
|      | <div>57.0</div>      | <div>912.0</div> | <div>146.0</div> | <div>Ave. height<br/>16.0</div> | Average height auto linked to block load sheet |

# Windows

|       | Width (ft) | Height (ft) | Quantity | Area (SF) | Lineal Feet |
|-------|------------|-------------|----------|-----------|-------------|
| North | 2.0        | 4.0         | 8        | 0.0       | 0.0         |
|       |            |             |          | 64.0      | 96.0        |
|       | 3.0        | 3.0         | 1        | 9.0       | 12.0        |
|       |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       |            | Sub-total   | 73.0     | 108.0     |             |

|      |           |     |   |     |     |
|------|-----------|-----|---|-----|-----|
| East | 3.0       | 1.0 | 1 | 3.0 | 8.0 |
|      |           |     |   | 0.0 | 0.0 |
|      |           |     |   | 0.0 | 0.0 |
|      |           |     |   | 0.0 | 0.0 |
|      |           |     |   | 0.0 | 0.0 |
|      |           |     |   | 0.0 | 0.0 |
|      |           |     |   | 0.0 | 0.0 |
|      |           |     |   | 0.0 | 0.0 |
|      | Sub-total |     |   | 3.0 | 8.0 |

|       |           |     |     |
|-------|-----------|-----|-----|
| South |           | 0.0 | 0.0 |
|       |           | 0.0 | 0.0 |
|       |           | 0.0 | 0.0 |
|       |           | 0.0 | 0.0 |
|       |           | 0.0 | 0.0 |
|       |           | 0.0 | 0.0 |
|       |           | 0.0 | 0.0 |
|       | Sub-total | 0.0 | 0.0 |

|      |           |     |   |      |      |
|------|-----------|-----|---|------|------|
| West | 2.0       | 4.0 | 8 | 64.0 | 96.0 |
|      |           |     |   | 0.0  | 0.0  |
|      |           |     |   | 0.0  | 0.0  |
|      |           |     |   | 0.0  | 0.0  |
|      |           |     |   | 0.0  | 0.0  |
|      |           |     |   | 0.0  | 0.0  |
|      | Sub-total |     |   | 64.0 | 96.0 |

|       |  |  |  |               |       |
|-------|--|--|--|---------------|-------|
| Total |  |  |  | 140.0         | 212.0 |
|       |  |  |  | LF/SF<br>1.51 |       |

4,110  
103.5%

# HEAT GAIN/LOSS WORKSHEET

Project Name: NJ BPU Energy Audit Saddle River  
 Location: Saddle River, NJ  
 Building Name: Public Safety Complex  
 Engineer: CAA

Project No.: CHA #21351  
 Site Elevation: 460 Feet  
 Date: 09/13/10

Specific Volume 13.50 CF/#

Building/Facility Designation Police Headquarters - First Floor

Outdoor Winter Design DB Temperature 14 \*F  
 Outdoor Summer Design DB Temperature 91 \*F  
 Outdoor Summer Design WB Temperature 73 \*F  
 Outdoor Summer Humidity Ratio 0.0121 ##

Indoor Winter Design DB Temperature 68 \*F  
 Indoor Summer Design DB Temperature 72 \*F  
 Indoor Summer Design WB Temperature 60 \*F  
 Indoor Air (70°F) Humidity Ratio 0.0078 ##

## ENVELOPE DESCRIPTIONS (Descriptions are from Interior to Exterior)

### Walls (Select One - Type X)

|                                                                 | R Value | Wall Type |
|-----------------------------------------------------------------|---------|-----------|
| Steel Siding, 4" Insulation, Steel Siding                       | 15.2    | 1         |
| Plaster or Gypsum, frame construction, 5" Insulation, 1" stucco | 18.2    | 1         |
| 4" WH CMU, 1" Insulation, Finished Exterior                     | 5.2     | 2         |
| Plaster or Gypsum, frame construction, 3" Insulation, 8" LW CMU | 7.8     | 5         |
| 4" Face Brick, 2" Concrete, 1" Insulation, Exterior Finish      | 5.1     | 12        |
| 4" Face Brick, 4" Concrete, 1" Insulation, Exterior Finish      | 4.0     | 11        |
| Interior Finish, 2" Insulation, 8" CMU, 4" Face Brick           | 10.9    | 16        |
| Finished Surface, 8" LW CMU (filled), Air Space, 4" Face Brick  | 11.1    | 16        |
| Stucco or Gypsum, 2.5" Insul, Face Brick                        | 14.3    | 10        |
| 4" Block, 1" insulation, 8" Block                               | 19.9    | 16        |
| x U value calculator                                            | 13.1    |           |

### Roofs (Select One)

|                                                    | R Value | Roof Type |
|----------------------------------------------------|---------|-----------|
| Tectum Deck, 3.3" Insul., BU Roof                  | 13.0    | 1         |
| Steel Deck, 5" Insul., BU Roof                     | 18.2    | 1         |
| Attic Roof with 6" Insul.                          | 25.0    | 4         |
| 4" HW Concrete Deck, BU Roof                       | 2.7     | 2         |
| Ceiling, 3" Insulation, 4" Concrete Deck, BU Roof  | 14.9    | 4         |
| Ceiling, 4" Concrete Deck, 3" Insulation, BU Roof  | 18.5    | 13        |
| Ceiling, 4" Concrete Deck, 6" Insulation, BU Roof  | 21.7    | 14        |
| Ceiling, Wood Deck, 6" Insulation, Felt & Membrane | 22.7    | 10        |
| Wood Deck, 6" insulation, Felt & Membrane          | 18.0    |           |
| x U value calculator                               | 42.5    |           |

### Windows (Select One)

|                                           | U Value |
|-------------------------------------------|---------|
| Aluminum Frame, 1/8" SP Glazing           | 1.05    |
| Aluminum Frame, 1/4" DP Glazing           | 0.60    |
| Aluminum Frame, 3/16" DP Glazing          | 0.62    |
| Aluminum Frame, 1/2" DP Glazing           | 0.50    |
| Skylights                                 | 0.90    |
| x Aluminum Clad, DP Glazing, Tinted Glass | 0.42    |

|                            | No Storm |
|----------------------------|----------|
| Flat Glass                 | 1.05     |
| Flat Glass (e=.6)          | 1.00     |
| Flat Glass (e=0.4)         | 0.90     |
| Flat Glass (e=0.2)         | 0.77     |
| Double Glaze (3/16 in air) | 0.63     |
| Double Glaze (1/4 in air)  | 0.60     |
| Double Glaze (1/2 in air)  | 0.53     |
| Double Glaze (e=.6)        | 0.50     |
| Double Glaze (e=0.4)       | 0.42     |
| Double Glaze (e=0.2)       | 0.35     |
| Triple Glaze (1/4 in air)  | 0.42     |
| Triple Glaze (1/2 in air)  | 0.35     |

## BUILDING CHARACTERISTICS

Roof Area 3,175 SF  
 Occupied Area 5,430 SF

Return Plenum? n

|                               | Gross Wall Length | Average Wall Height | Ceiling Height | Window Area | Door Area | Net Wall Area |
|-------------------------------|-------------------|---------------------|----------------|-------------|-----------|---------------|
| North Exposure                | 41 Ft             | 11.0 Ft             | 9.0 Ft         | 0 SF        | 0 SF      | 446 SF        |
| East Exposure                 | 78 Ft             | 11.0 Ft             | 9.0 Ft         | 83 SF       | 63 SF     | 712 SF        |
| South Exposure                | 91 Ft             | 11.0 Ft             | 9.0 Ft         | 160 SF      | 0 SF      | 836 SF        |
| West Exposure                 | 77 Ft             | 11.0 Ft             | 9.0 Ft         | 51 SF       | 21 SF     | 775 SF        |
| Occupied Forced Ventilation   | 1,000 cfm         | #DIV/0! AC/hr       |                |             |           |               |
| Unoccupied Forced Ventilation | 1,000 cfm         | #DIV/0! AC/hr       |                |             |           |               |

# HEAT GAIN/LOSS WORKSHEET

Project Name: NJ BPU Energy Audit Saddle River  
 Location: Saddle River, NJ  
 Building Name: Public Safety Complex  
 Engineer: CAA

Project No.: CHA #21351  
 Site Elevation: 460 Feet  
 Date: 09/13/10

Specific Volume 13.50 CF/#

Building/Facility Designation Police Headquarters - First Floor

## COOLING HEAT GAINS TO THE ROOM - SENSIBLE

### SOLAR GAINS

| WINDOWS        | AREA (SF) | SHGF         | Shade Coef | Cooling Load Factor | Glass Type C | Solar Heat Gain |
|----------------|-----------|--------------|------------|---------------------|--------------|-----------------|
| North Exposure | 0         | 38 btu/h/sf  | 0.8        | 0.75                | Glass Type C | 0 Btu/hr        |
| East Exposure  | 83        | 216 btu/h/sf | 0.8        | 0.31                | Glass Type C | 4,460 Btu/hr    |
| South Exposure | 160       | 109 btu/h/sf | 0.8        | 0.58                | Glass Type C | 8,092 Btu/hr    |
| West Exposure  | 51        | 216 btu/h/sf | 0.8        | 0.29                | Glass Type C | 2,556 Btu/hr    |
|                |           |              |            |                     |              | 15,107 Btu/h    |

### CONDUCTION

|                | NET AREA (SF) | U-VALUE | Cooling Load Temp. Dif. | Return Air Factor | Room Heat Gain |
|----------------|---------------|---------|-------------------------|-------------------|----------------|
| North Exposure | 365           | 0.08    | 20 °F                   | 1.0               | 556 Btu/hr     |
| East Exposure  | 556           | 0.08    | 39 °F                   | 1.0               | 1,652 Btu/hr   |
| South Exposure | 655           | 0.08    | 27 °F                   | 1.0               | 1,347 Btu/hr   |
| West Exposure  | 621           | 0.08    | 22 °F                   | 1.0               | 1,041 Btu/hr   |
| Roof           | 3,175         | 0.02    | 73 °F                   | 1.0               | 5,450 Btu/hr   |
| Fenestration   | 294           | 0.42    | 19 °F                   |                   | 2,348 Btu/hr   |
| Doors          | 84            | 0.14    | 27 °F                   |                   | 317 Btu/hr     |
| Ceiling        | 5,430         | 0.14    | 0 °F                    |                   | 0 Btu/hr       |
| Partition      |               | 0.05    | 0 °F                    |                   | 0 Btu/hr       |
| Floor          | 5,430         | 0.04    | 0 °F                    |                   | 0 Btu/hr       |
|                |               |         |                         |                   | 12,711 Btu/h   |

### INTERNAL HEAT GAINS (all loads below are based on Occupied Periods)

|                        |                  |                  |                      |           |              |
|------------------------|------------------|------------------|----------------------|-----------|--------------|
| Lights                 | 1.50 w/sf x      | 5,430 Occ Area = | 8.1 kW x 3.4x        | 1.0 RAF = | 27,799 Btu/h |
| Plug Load              | 0.25 w/sf x      | 5,430 Occ Area = | 1.4 kW x 3.4x        | 1.0 RAF = | 4,633 Btu/h  |
| People                 | 10 people x      | 255 btu/person x | 100% time in space = |           | 2,550 Btu/h  |
| Computer Work Stations |                  | 15 Units x       | 120 W/Unit x 3414 =  |           | 6,143 Btu/h  |
| Equipment              | 5.0 kW x 3.413 = |                  |                      |           | 17,065 Btu/h |
| Misc.                  |                  |                  |                      |           | 0 Btu/h      |
|                        |                  |                  |                      |           | 58,190 Btu/h |

### VENTILATION AND INFILTRATION

|              |           | Infiltration Factor | Perimeter Ratio | Coef | Temp. Diff. | Room Heat Gain |
|--------------|-----------|---------------------|-----------------|------|-------------|----------------|
| Walls        | 2,196 SF  | 0.10 CFM/SF         |                 | 1.08 | 19 °F       | 4,876 Btu/h    |
| Doors        | 84 SF     | 0.20 CFM/LF         | 0.95 LF/SF      | 1.08 | 19 °F       | 355 Btu/h      |
| Windows      | 294 SF    | 0.18 CFM/LF         | 1.55 LF/SF      | 1.08 | 19 °F       | 1,823 Btu/h    |
| Ventilation  | 1,000 cfm |                     |                 | 1.08 | 19 °F       | 22,208 Btu/h   |
|              |           |                     |                 |      |             | 29,263 Btu/h   |
| Infiltration | 318 cfm   | #DIV/0! AC/hr       |                 |      |             |                |

## COOLING HEAT GAINS TO THE RA PLENUM - SENSIBLE

4,950

### CONDUCTION

|                | NET<br>AREA<br>(SF) | U-VALUE | Cooling<br>Load Temp.<br>Dif. | Return Air Factor | Room Heat Gain |
|----------------|---------------------|---------|-------------------------------|-------------------|----------------|
| North Exposure | 81                  | 0.08    | 20                            | 1.0               | 123 Btu/hr     |
| East Exposure  | 156                 | 0.08    | 39                            | 1.0               | 464 Btu/hr     |
| South Exposure | 181                 | 0.08    | 27                            | 1.0               | 372 Btu/hr     |
| West Exposure  | 154                 | 0.08    | 22                            | 1.0               | 258 Btu/hr     |
| Roof           | 3,175               | 0.02    | 73                            | 0.0               | 0 Btu/hr       |
|                |                     |         |                               |                   | 1,218 Btu/h    |

### INTERNAL HEAT GAINS

|        |             |                  |               |            |         |
|--------|-------------|------------------|---------------|------------|---------|
| Lights | 1.50 w/sf x | 5,430 Occ Area = | 8.1 kW x3413x | 0.00 RAF = | 0 Btu/h |
| Misc.  |             |                  |               |            | 0 Btu/h |
|        |             |                  |               |            | 0 Btu/h |

### SENSIBLE HEAT GAINS - TEMP. DEPENDENT

|                              |        |
|------------------------------|--------|
| Solar                        | 15,107 |
| Conduction to Room           | 12,711 |
| Conduction to Plenum         | 1,218  |
| Ventilation and Infiltration | 29,263 |
| Sub Total                    | 58,299 |

### SENSIBLE HEAT GAINS - TEMP. INDEPENDENT

|                          |        |
|--------------------------|--------|
| Internal Gains to Room   | 58,190 |
| Internal Gains to Plenum | 0      |
| Sub Total                | 58,190 |

# HEAT GAIN/LOSS WORKSHEET

Project Name: NJ BPU Energy Audit Saddle River  
 Location: Saddle River, NJ  
 Building Name: Public Safety Complex  
 Engineer: CAA

Project No.: CHA #21351  
 Site Elevation: 460 Feet  
 Date: 09/13/10

Specific Volume 13.50 CF/#

Building/Facility Designation Police Headquarters - First Floor

## LATENT COOLING LOADS

### Infiltration

|             |           | Infiltration Factor | Air Density | Humidity Ratio Dif. |
|-------------|-----------|---------------------|-------------|---------------------|
| Walls       | 3,747 SF  | 0.10 CFM/SF         | 4,800       | 0.0043 ##           |
| Doors       | 84 SF     | 0.20 CFM/LF         | 4,800       | 0.0043 ##           |
| Windows     | 294 SF    | 0.18 CFM/LF         | 4,800       | 0.0043 ##           |
| Ventilation | 1,000 cfm |                     | 4,800       | 0.0043 ##           |
| People      | 10 people | 1.00 time in space  |             | 250 Btu/hr/person   |

### Room Heat Gain

|              |
|--------------|
| 7,811 Btu/h  |
| 334 Btu/h    |
| 1,711 Btu/h  |
| 20,846 Btu/h |
| 2,500 Btu/h  |

33,201 Btu/h

## Cooling Load Summary

|                             | Sensible | Latent | Total   |
|-----------------------------|----------|--------|---------|
| Temperature Dependent Gains | 58,299   | 33,201 | 91,500  |
| Temperature Indep. Gains    | 58,190   |        | 58,190  |
| Total                       | 116,489  | 33,201 | 149,690 |

SHR= 0.78

Building Cooling Load 12.5 Tons at 435 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is

8,876 CFM

1.63 CFM/sf

## HEATING CALCULATION

### CONDUCTION

|                | NET AREA (SF) | U-VALUE | Heating Load Temp. Dif. |
|----------------|---------------|---------|-------------------------|
| North Exposure | 446           | 0.08    | 54                      |
| East Exposure  | 712           | 0.08    | 54                      |
| South Exposure | 836           | 0.08    | 54                      |
| West Exposure  | 775           | 0.08    | 54                      |
| Fenestration   | 294           | 0.42    | 54                      |
| Roof           | 3,175         | 0.02    | 54                      |
| Doors          | 84            | 0.14    | 54                      |
| Ceiling        | 5,430         | 0.14    | 0                       |
| Partition      | 0             | 0.05    | 0                       |
| Floor          | 3,175         | 0.04    | 0                       |

### Room Heat Gain

|             |
|-------------|
| 1,834 Btu/h |
| 2,930 Btu/h |
| 3,439 Btu/h |
| 3,190 Btu/h |
| 6,674 Btu/h |
| 4,031 Btu/h |
| 634 Btu/h   |
| 0 Btu/h     |
| 0 Btu/h     |
| 0 Btu/h     |

### Ventilation and Infiltration

|                                       |           | Infiltration Factor | Coef | Temp. Difference | Air Flow  |
|---------------------------------------|-----------|---------------------|------|------------------|-----------|
| Walls                                 | 2,768 SF  | 0.10 CFM/SF         | 1.08 | 54               | 277 cfm   |
| Doors                                 | 84 SF     | 0.20 CFM/LF         | 1.08 | 54               | 16 cfm    |
| Windows                               | 294 SF    | 0.18 CFM/LF         | 1.08 | 54               | 82 cfm    |
| Ventilation Load                      | 1,000 cfm |                     | 1.08 | 54               | 1,000 cfm |
| Total Ventilation & Infiltration Load |           |                     |      |                  | 1,375 cfm |

### Room Heat Gain

|              |
|--------------|
| 16,175 Btu/h |
| 935 Btu/h    |
| 4,797 Btu/h  |
| 63,118 Btu/h |
| 85,025 Btu/h |

Building Heating Load 107,756 btu/h

19.8 btu/sf

NJ BPU Energy Audit Saddle River

CHA #21351

Building: Public Safety Complex

Police Headquarters - First Floor

Doors

|       | Width (ft)                                                                        | Height (ft) | Quantity | Area (SF) | Lineal Feet |
|-------|-----------------------------------------------------------------------------------|-------------|----------|-----------|-------------|
| North |  |             |          | 0.0       | 0.0         |
|       |                                                                                   |             |          | 0.0       | 0.0         |
|       |                                                                                   |             |          | 0.0       | 0.0         |
|       |                                                                                   |             |          | 0.0       | 0.0         |
|       |                                                                                   |             |          | 0.0       | 0.0         |
|       |                                                                                   |             |          | 0.0       | 0.0         |
|       |                                                                                   |             |          | 0.0       | 0.0         |
|       | Sub-total                                                                         |             |          | 0.0       | 0.0         |

|      |           |     |   |      |      |
|------|-----------|-----|---|------|------|
| East | 3.0       | 7.0 | 3 | 63.0 | 60.0 |
|      |           |     |   | 0.0  | 0.0  |
|      |           |     |   | 0.0  | 0.0  |
|      | Sub-total |     |   | 63.0 | 60.0 |

|       |           |     |     |
|-------|-----------|-----|-----|
| South |           | 0.0 | 0.0 |
|       |           | 0.0 | 0.0 |
|       |           | 0.0 | 0.0 |
|       |           | 0.0 | 0.0 |
|       | Sub-total | 0.0 | 0.0 |

|      |           |     |   |      |      |
|------|-----------|-----|---|------|------|
| West | 3.0       | 7.0 | 1 | 21.0 | 20.0 |
|      |           |     |   | 0.0  | 0.0  |
|      | Sub-total |     |   | 21.0 | 20.0 |

**Total**      **84.0**      **80.0**

|       |
|-------|
| LF/SF |
| 0.95  |

**Walls**

|       | Width (ft) | Height (ft) | Quantity | Area (SF) | Lineal Feet |                                            |
|-------|------------|-------------|----------|-----------|-------------|--------------------------------------------|
| North | 31.0       | 11.0        | 1        | 341.0     | 84.0        | All wall quantities must remain equal to 1 |
|       | 9.5        | 11.0        | 1        | 104.5     | 41.0        |                                            |
|       |            |             |          | 0.0       | 0.0         |                                            |
|       |            |             |          | 0.0       | 0.0         |                                            |
|       |            |             |          | 0.0       | 0.0         |                                            |
|       |            |             |          | 0.0       | 0.0         |                                            |
|       | 40.5       |             |          | 445.5     | 125.0       | Ave. height 11.0                           |

Average height wall automatically linked to

|      |      |      |   |       |       |                  |
|------|------|------|---|-------|-------|------------------|
| East | 32.0 | 11.0 | 1 | 352.0 | 86.0  |                  |
|      | 46.0 | 11.0 | 1 | 506.0 | 114.0 |                  |
|      |      |      |   | 0.0   | 0.0   |                  |
|      |      |      |   | 0.0   | 0.0   |                  |
|      |      |      |   | 0.0   | 0.0   |                  |
|      |      |      |   | 0.0   | 0.0   |                  |
|      | 78.0 |      |   | 858.0 | 200.0 | Ave. height 11.0 |

Average height wall automatically linked to

|       |      |      |   |       |       |                  |
|-------|------|------|---|-------|-------|------------------|
| South | 81.0 | 11.0 | 1 | 891.0 | 184.0 |                  |
|       | 9.5  | 11.0 | 1 | 104.5 | 41.0  |                  |
|       |      |      |   | 0.0   | 0.0   |                  |
|       |      |      |   | 0.0   | 0.0   |                  |
|       |      |      |   | 0.0   | 0.0   |                  |
|       |      |      |   | 0.0   | 0.0   |                  |
|       | 90.5 |      |   | 995.5 | 225.0 | Ave. height 11.0 |

Average height wall automatically linked to

|      |      |      |   |       |       |                  |
|------|------|------|---|-------|-------|------------------|
| West | 77.0 | 11.0 | 1 | 847.0 | 176.0 |                  |
|      |      |      |   | 0.0   | 0.0   |                  |
|      |      |      |   | 0.0   | 0.0   |                  |
|      |      |      |   | 0.0   | 0.0   |                  |
|      |      |      |   | 0.0   | 0.0   |                  |
|      |      |      |   | 0.0   | 0.0   |                  |
|      | 77.0 |      |   | 847.0 | 176.0 | Ave. height 11.0 |

Average height auto linked to block load sheet

**Windows**

|       | Width (ft) | Height (ft) | Quantity | Area (SF) | Lineal Feet |
|-------|------------|-------------|----------|-----------|-------------|
| North |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       |            |             |          | 0.0       | 0.0         |
|       | Sub-total  |             |          | 0.0       | 0.0         |

|      |           |     |   |      |       |
|------|-----------|-----|---|------|-------|
| East | 2.0       | 4.0 | 8 | 64.0 | 96.0  |
|      | 3.0       | 1.0 | 1 | 3.0  | 8.0   |
|      | 6.0       | 1.0 | 1 | 6.0  | 14.0  |
|      | 1.5       | 1.5 | 1 | 2.3  | 6.0   |
|      | 4.0       | 2.0 | 1 | 8.0  | 12.0  |
|      |           |     |   | 0.0  | 0.0   |
|      |           |     |   | 0.0  | 0.0   |
|      | Sub-total |     |   | 83.3 | 136.0 |

|       |           |     |    |       |       |
|-------|-----------|-----|----|-------|-------|
| South | 2.0       | 4.0 | 20 | 160.0 | 240.0 |
|       |           |     |    | 0.0   | 0.0   |
|       |           |     |    | 0.0   | 0.0   |
|       |           |     |    | 0.0   | 0.0   |
|       |           |     |    | 0.0   | 0.0   |
|       |           |     |    | 0.0   | 0.0   |
|       |           |     |    | 0.0   | 0.0   |
|       | Sub-total |     |    | 160.0 | 240.0 |

|      |           |     |   |      |      |
|------|-----------|-----|---|------|------|
| West | 2.0       | 4.0 | 6 | 48.0 | 72.0 |
|      | 3.0       | 1.0 | 1 | 3.0  | 8.0  |
|      |           |     |   | 0.0  | 0.0  |
|      |           |     |   | 0.0  | 0.0  |
|      |           |     |   | 0.0  | 0.0  |
|      |           |     |   | 0.0  | 0.0  |
|      | Sub-total |     |   | 51.0 | 80.0 |

|              |              |              |            |
|--------------|--------------|--------------|------------|
| <b>Total</b> | <b>294.3</b> | <b>456.0</b> | LF/SF 1.55 |
|--------------|--------------|--------------|------------|

NJ BPU Energy Audit Saddle River  
CHA #21351  
Building: Public Safety Complex

Reconcile Thermal Model

Police Headquarters - Second Floor

|                              |              |                                 |                |                         |              |
|------------------------------|--------------|---------------------------------|----------------|-------------------------|--------------|
| Building Footprint           | 2,516 SF     | Ex Occupied Cing Temp.          | 72 °F          | Ex Occupied Htg Temp.   | 68 °F        |
| Heating Efficiency           | 76%          | Ex Unoccupied Cing Temp.        | 72 °F          | Ex Unoccupied Htg Temp. | 68 °F        |
| Cooling Efficiency           | 1.13 kWh/ton | Occupied Cooling UA             | (708) btu/hr/F | Occupied Heating UA     | 170 btu/hr/F |
| Internal Gains               | 19,891 btu/h | Unoccupied Cooling UA           | (489) btu/hr/F | Unoccupied Heating UA   | 170 btu/hr/F |
| Unoc Internal Gain factor    | 0.03         | Cooling Occ Enthalpy Setpoint   | 28 Btu/lb      |                         |              |
| Ave Occ Internal Gain Factor | 0.7          | Cooling Unocc Enthalpy Setpoint | 28 Btu/lb      |                         |              |
| Economizer available (Y/N)   | No           |                                 |                |                         |              |

| Avg Outdoor Air Temp. Bins °F | Avg Outdoor Air Enthalpy | EXISTING LOADS  |                              |                                |                    |                       |                    |                               |                       |                    |       | Available Economizer Cooling kWh | Necessary Cooling Energy kWh | Existing Cooling Energy kWh | Existing Heating Energy therms |
|-------------------------------|--------------------------|-----------------|------------------------------|--------------------------------|--------------------|-----------------------|--------------------|-------------------------------|-----------------------|--------------------|-------|----------------------------------|------------------------------|-----------------------------|--------------------------------|
|                               |                          | Occupied        |                              |                                |                    |                       | Unoccupied         |                               |                       |                    |       |                                  |                              |                             |                                |
|                               |                          | Total Bin Hours | Occupied Equipment Bin Hours | Unoccupied Equipment Bin Hours | Envelope Load BTUH | Ventilation Load BTUH | Internal Gain BTUH | Unoccupied Envelope Load BTUH | Ventilation Load BTUH | Internal Gain BTUH |       |                                  |                              |                             |                                |
| A                             | B                        | C               | D                            | E                              | F                  | G                     | H                  | I                             | J                     | K                  | L     | M                                | M                            |                             |                                |
| 102.5                         | 49.1                     | 0               | 0                            | 0                              | -21,606            | -31,878               | -13,924            | -15,232                       | -31,878               | 0                  | 0     | 0                                | 0                            |                             |                                |
| 97.5                          | 42.5                     | 3               | 1                            | 3                              | -18,064            | -21,411               | -13,924            | -12,735                       | -21,411               | 0                  | 11    | 0                                | 11                           |                             |                                |
| 92.5                          | 39.5                     | 34              | 6                            | 28                             | -14,522            | -16,653               | -13,924            | -10,238                       | -16,653               | 0                  | 97    | 0                                | 97                           |                             |                                |
| 87.5                          | 36.6                     | 131             | 22                           | 109                            | -10,980            | -12,053               | -13,924            | -7,741                        | -12,053               | 0                  | 286   | 0                                | 286                          |                             |                                |
| 82.5                          | 34.0                     | 500             | 83                           | 417                            | -7,438             | -7,930                | -13,924            | -5,244                        | -7,930                | 0                  | 770   | 0                                | 770                          |                             |                                |
| 77.5                          | 31.6                     | 620             | 103                          | 517                            | -3,896             | -4,124                | -13,924            | -2,747                        | -4,124                | 0                  | 577   | 0                                | 577                          |                             |                                |
| 72.5                          | 29.2                     | 664             | 111                          | 553                            | -354               | -317                  | -13,924            | -250                          | -317                  | 0                  | 213   | 0                                | 213                          |                             |                                |
| 67.5                          | 27.0                     | 854             | 142                          | 712                            | 85                 | 190                   | -13,924            | 85                            | 190                   | 0                  | 204   | 0                                | 204                          |                             |                                |
| 62.5                          | 24.5                     | 927             | 155                          | 773                            | 936                | 2,093                 | -13,924            | 936                           | 2,093                 | 0                  | 159   | 0                                | 159                          |                             |                                |
| 57.5                          | 21.4                     | 600             | 100                          | 500                            | 1,786              | 3,997                 | -13,924            | 1,786                         | 3,997                 | 0                  | 77    | 0                                | 77                           |                             |                                |
| 52.5                          | 18.7                     | 610             | 102                          | 508                            | 2,637              | 5,900                 | -13,924            | 2,637                         | 5,900                 | 0                  | 52    | 0                                | 52                           |                             |                                |
| 47.5                          | 16.2                     | 611             | 102                          | 509                            | 3,487              | 7,803                 | -13,924            | 3,487                         | 7,803                 | 0                  | 25    | 0                                | 25                           |                             |                                |
| 42.5                          | 14.4                     | 656             | 109                          | 547                            | 4,338              | 9,706                 | -13,924            | 4,338                         | 9,706                 | 0                  | 0     | 0                                | 0                            |                             |                                |
| 37.5                          | 12.6                     | 1,023           | 122                          | 853                            | 5,189              | 11,609                | -13,924            | 5,189                         | 11,609                | 0                  | 0     | 0                                | 0                            |                             |                                |
| 32.5                          | 10.7                     | 734             | 122                          | 612                            | 6,039              | 13,513                | -13,924            | 6,039                         | 13,513                | 0                  | 0     | 0                                | 0                            |                             |                                |
| 27.5                          | 8.6                      | 334             | 56                           | 278                            | 6,890              | 15,416                | -13,924            | 6,890                         | 15,416                | 0                  | 0     | 0                                | 0                            |                             |                                |
| 22.5                          | 6.8                      | 252             | 42                           | 210                            | 7,740              | 17,319                | -13,924            | 7,740                         | 17,319                | 0                  | 0     | 0                                | 0                            |                             |                                |
| 17.5                          | 5.5                      | 125             | 21                           | 104                            | 8,591              | 19,222                | -13,924            | 8,591                         | 19,222                | 0                  | 0     | 0                                | 0                            |                             |                                |
| 12.5                          | 4.1                      | 47              | 8                            | 39                             | 9,442              | 21,125                | -13,924            | 9,442                         | 21,125                | 0                  | 0     | 0                                | 0                            |                             |                                |
| 7.5                           | 2.6                      | 22              | 4                            | 18                             | 10,292             | 23,028                | -13,924            | 10,292                        | 23,028                | 0                  | 0     | 0                                | 0                            |                             |                                |
| 2.5                           | 1.0                      | 13              | 2                            | 11                             | 11,143             | 24,932                | -13,924            | 11,143                        | 24,932                | 0                  | 0     | 0                                | 0                            |                             |                                |
| -2.5                          | 0.0                      | 0               | 0                            | 0                              | 11,993             | 26,835                | -13,924            | 11,993                        | 26,835                | 0                  | 0     | 0                                | 0                            |                             |                                |
| -7.5                          | -1.5                     | 0               | 0                            | 0                              | 12,844             | 28,738                | -13,924            | 12,844                        | 28,738                | 0                  | 0     | 0                                | 0                            |                             |                                |
| TOTALS                        |                          | 8,760           | 1,460                        | 7,300                          |                    |                       |                    |                               |                       |                    | 2,470 | 2,470                            | 679                          |                             |                                |

|                                                      |         |
|------------------------------------------------------|---------|
| Existing Building Ventilation & Infiltration (occ)   | 352 cfm |
| Overheat Ventilation Factor                          | 1.00    |
| Additional Ventilation to offset overheat            | 0 cfm   |
| Existing Building Ventilation & Infiltration (unocc) | 352 cfm |
| Economizer Ventilation (from AHU's)                  | cfm     |

Energy Use Indices (calculated)

| Heating        | Base Case |
|----------------|-----------|
| PHQ First Flr  | 1,029     |
| PHQ Second Flr | 679       |
| PHQ Garages    | 54        |
| Fire HQ        | 2,493     |
| Total          | 4,254     |
| Target ->      | 4,110     |
|                | 103.5%    |

| Cooling        | Base Case |
|----------------|-----------|
| PHQ First Flr  | 19,082    |
| PHQ Second Flr | 2,470     |
| PHQ Garages    | 0         |
| Fire HQ        | 9,089     |
| Total          | 30,640    |
| Target ->      | 30,496    |
|                | 100.5%    |

# HEAT GAIN/LOSS WORKSHEET

Project Name: NJ BPU Energy Audit Saddle River  
 Location: Saddle River, NJ  
 Building Name: Public Safety Complex  
 Engineer: CAA

Project No.: CHA #21351  
 Site Elevation: 480 Feet  
 Date: 09/13/10

Specific Volume 13.50 CF#

Building/Facility Designation Police Headquarters - Second Floor

Outdoor Winter Design DB Temperature 14°F  
 Outdoor Summer Design DB Temperature 91°F  
 Outdoor Summer Design WB Temperature 73°F  
 Outdoor Summer Humidity Ratio 0.0121##

Indoor Winter Design DB Temperature 68°F  
 Indoor Summer Design DB Temperature 72°F  
 Indoor Summer Design WB Temperature 60°F  
 Indoor Air (70°F) Humidity Ratio 0.0078##

## ENVELOPE DESCRIPTIONS (Descriptions are from Interior to Exterior)

### Walls (Select One - Type X)

|                                                                 | R Value | Wall Type |
|-----------------------------------------------------------------|---------|-----------|
| Steel Siding, 4" Insulation, Steel Siding                       | 15.2    | 1         |
| Plaster or Gypsum, frame construction, 5" Insulation, 1" stucco | 18.2    | 1         |
| 4" WH CMU, 1" Insulation, Finished Exterior                     | 5.2     | 2         |
| Plaster or Gypsum, frame construction, 3" Insulation, 8" LW CMU | 7.8     | 5         |
| 4" Face Brick, 2" Concrete, 1" Insulation, Exterior Finish      | 5.1     | 12        |
| 4" Face Brick, 4" Concrete, 1" Insulation, Exterior Finish      | 4.0     | 11        |
| Interior Finish, 2" Insulation, 8" CMU, 4" Face Brick           | 10.9    | 16        |
| Finished Surface, 8" LW CMU (filled), Air Space, 4" Face Brick  | 11.1    | 16        |
| Stucco or Gypsum, 2.5" Insul, Face Brick                        | 14.3    | 10        |
| 4" Block, 1" insulation, 8" Block                               | 19.9    | 16        |
| x U value calculator                                            | 13.1    |           |

### Roofs (Select One)

|                                                    | R Value | Roof Type |
|----------------------------------------------------|---------|-----------|
| Tectum Deck, 3.3" Insul., BU Roof                  | 13.0    | 1         |
| Steel Deck, 5" Insul., BU Roof                     | 18.2    | 1         |
| Attic Roof with 6" Insul.                          | 25.0    | 4         |
| 4" HW Concrete Deck, BU Roof                       | 2.7     | 2         |
| Ceiling, 3" Insulation, 4" Concrete Deck, BU Roof  | 14.9    | 4         |
| Ceiling, 4" Concrete Deck, 3" Insulation, BU Roof  | 18.5    | 13        |
| Ceiling, 4" Concrete Deck, 6" Insulation, BU Roof  | 21.7    | 14        |
| Ceiling, Wood Deck, 6" Insulation, Felt & Membrane | 22.7    | 10        |
| Wood Deck, 6" insulation, Felt & Membrane          | 18.0    |           |
| x U value calculator                               | 23.2    |           |

### Windows (Select One)

|                                           | U Value |
|-------------------------------------------|---------|
| Aluminum Frame, 1/8" SP Glazing           | 1.05    |
| Aluminum Frame, 1/4" DP Glazing           | 0.60    |
| Aluminum Frame, 3/16" DP Glazing          | 0.62    |
| Aluminum Frame, 1/2" DP Glazing           | 0.50    |
| Skylights                                 | 0.90    |
| x Aluminum Clad, DP Glazing, Tinted Glass | 0.42    |

|                            | No Storm |
|----------------------------|----------|
| Flat Glass                 | 1.05     |
| Flat Glass (e=.6)          | 1.00     |
| Flat Glass (e=.4)          | 0.90     |
| Flat Glass (e=.2)          | 0.77     |
| Double Glaze (3/16 in air) | 0.63     |
| Double Glaze (1/4 in air)  | 0.60     |
| Double Glaze (1/2 in air)  | 0.53     |
| Double Glaze (e=.6)        | 0.50     |
| Double Glaze (e=.4)        | 0.42     |
| Double Glaze (e=.2)        | 0.35     |
| Triple Glaze (1/4 in air)  | 0.42     |
| Triple Glaze (1/2 in air)  | 0.35     |

## BUILDING CHARACTERISTICS

Roof Area 2,515 SF  
 Occupied Area 2,515 SF

Return Plenum? n

|                               | Gross Wall Length | Average Wall Height | Ceiling Height | Window Area | Door Area | Net Wall Area |
|-------------------------------|-------------------|---------------------|----------------|-------------|-----------|---------------|
| North Exposure                | 6 Ft              | 9.0 Ft              | 8.0 Ft         | 12 SF       | 0 SF      | 42 SF         |
| East Exposure                 | 30 Ft             | 9.0 Ft              | 8.0 Ft         | 24 SF       | 0 SF      | 246 SF        |
| South Exposure                | 6 Ft              | 9.0 Ft              | 8.0 Ft         | 12 SF       | 0 SF      | 42 SF         |
| West Exposure                 | 6 Ft              | 9.0 Ft              | 8.0 Ft         | 36 SF       | 0 SF      | 18 SF         |
| Occupied Forced Ventilation   | 300 cfm           | #DIV/0!             | AC/hr          |             |           |               |
| Unoccupied Forced Ventilation | 300 cfm           | #DIV/0!             | AC/hr          |             |           |               |

# HEAT GAIN/LOSS WORKSHEET

Project Name: NJ BPU Energy Audit Saddle River  
 Location: Saddle River, NJ  
 Building Name: Public Safety Complex  
 Engineer: CAA

Project No.: CHA #21351  
 Site Elevation: 460 Feet  
 Date: 09/13/10

Specific Volume 13.50 CF/#

Building/Facility Designation Police Headquarters - Second Floor

## COOLING HEAT GAINS TO THE ROOM - SENSIBLE

### SOLAR GAINS

| WINDOWS        | AREA (SF) | SHGF         | Shade Coef | Cooling Load Factor | Glass Type   | Solar Heat Gain |
|----------------|-----------|--------------|------------|---------------------|--------------|-----------------|
| North Exposure | 12        | 38 btu/h/sf  | 0.8        | 0.75                | Glass Type C | 274 Btu/hr      |
| East Exposure  | 24        | 216 btu/h/sf | 0.8        | 0.31                | Glass Type C | 1,286 Btu/hr    |
| South Exposure | 12        | 109 btu/h/sf | 0.8        | 0.58                | Glass Type C | 607 Btu/hr      |
| West Exposure  | 36        | 216 btu/h/sf | 0.8        | 0.29                | Glass Type C | 1,804 Btu/hr    |
|                |           |              |            |                     |              | 3,970 Btu/h     |

### CONDUCTION

|                | NET AREA (SF) | U-VALUE | Cooling Load Temp. Dif. | Return Air Factor | Room Heat Gain |
|----------------|---------------|---------|-------------------------|-------------------|----------------|
| North Exposure | 36            | 0.08    | 20 °F                   | 1.0               | 55 Btu/hr      |
| East Exposure  | 216           | 0.08    | 39 °F                   | 1.0               | 642 Btu/hr     |
| South Exposure | 36            | 0.08    | 27 °F                   | 1.0               | 74 Btu/hr      |
| West Exposure  | 12            | 0.08    | 22 °F                   | 1.0               | 20 Btu/hr      |
| Roof           | 2,515         | 0.04    | 73 °F                   | 1.0               | 7,907 Btu/hr   |
| Fenestration   | 84            | 0.42    | 19 °F                   |                   | 670 Btu/hr     |
| Doors          | 0             | 0.14    | 27 °F                   |                   | 0 Btu/hr       |
| Ceiling        | 2,515         | 0.14    | 0 °F                    |                   | 0 Btu/hr       |
| Partition      |               | 0.05    | 0 °F                    |                   | 0 Btu/hr       |
| Floor          | 2,515         | 0.04    | 0 °F                    |                   | 0 Btu/hr       |
|                |               |         |                         |                   | 9,368 Btu/h    |

### INTERNAL HEAT GAINS (all loads below are based on Occupied Periods)

|                        |      |              |       |              |     |                 |      |       |        |       |
|------------------------|------|--------------|-------|--------------|-----|-----------------|------|-------|--------|-------|
| Lights                 | 1.50 | w/sf x       | 2,515 | Occ Area =   | 3.8 | kW x 3.4x       | 1.0  | RAF = | 12,876 | Btu/h |
| Plug Load              | 0.25 | w/sf x       | 2,515 | Occ Area =   | 0.6 | kW x 3.4x       | 1.0  | RAF = | 2,146  | Btu/h |
| People                 | 10   | people x     | 255   | btu/person x | 25% | time in space = |      |       | 638    | Btu/h |
| Computer Work Stations |      |              | 2     | Units x      | 120 | W/Unit x        | 3414 | =     | 819    | Btu/h |
| Equipment              | 1.0  | kW x 3.413 = |       |              |     |                 |      |       | 3,413  | Btu/h |
| Misc.                  |      |              |       |              |     |                 |      |       | 0      | Btu/h |
|                        |      |              |       |              |     |                 |      |       | 19,891 | Btu/h |

### VENTILATION AND INFILTRATION

|              |         | Infiltration Factor | Perimeter Ratio | Coef | Temp. Diff. | Room Heat Gain |
|--------------|---------|---------------------|-----------------|------|-------------|----------------|
| Walls        | 300 SF  | 0.10 CFM/SF         |                 | 1.08 | 19 °F       | 666 Btu/h      |
| Doors        | 0 SF    | 0.20 CFM/LF         | 0.00 LF/SF      | 1.08 | 19 °F       | 0 Btu/h        |
| Windows      | 84 SF   | 0.18 CFM/LF         | 1.17 LF/SF      | 1.08 | 19 °F       | 392 Btu/h      |
| Ventilation  | 300 cfm |                     |                 | 1.08 | 19 °F       | 6,662 Btu/h    |
|              |         |                     |                 |      |             | 7,720 Btu/h    |
| Infiltration | 48 cfm  | #DIV/0!             | AC/hr           |      |             |                |

## COOLING HEAT GAINS TO THE RA PLENUM - SENSIBLE

4,950

### CONDUCTION

|                | NET<br>AREA<br>(SF) | U-VALUE | Cooling<br>Load Temp.<br>Dif. | Return Air Factor | Room Heat Gain |
|----------------|---------------------|---------|-------------------------------|-------------------|----------------|
| North Exposure | 6                   | 0.08    | 20                            | 1.0               | 9 Btu/hr       |
| East Exposure  | 30                  | 0.08    | 39                            | 1.0               | 89 Btu/hr      |
| South Exposure | 6                   | 0.08    | 27                            | 1.0               | 12 Btu/hr      |
| West Exposure  | 6                   | 0.08    | 22                            | 1.0               | 10 Btu/hr      |
| Roof           | 2,515               | 0.04    | 73                            | 0.0               | 0 Btu/hr       |
|                |                     |         |                               |                   | 121 Btu/h      |

### INTERNAL HEAT GAINS

|        |             |                  |               |            |         |
|--------|-------------|------------------|---------------|------------|---------|
| Lights | 1.50 w/sf x | 2,515 Occ Area = | 3.8 kW x3413x | 0.00 RAF = | 0 Btu/h |
| Misc.  |             |                  |               |            | 0 Btu/h |
|        |             |                  |               |            | 0 Btu/h |

### SENSIBLE HEAT GAINS - TEMP. DEPENDENT

|                              |        |
|------------------------------|--------|
| Solar                        | 3,970  |
| Conduction to Room           | 9,368  |
| Conduction to Plenum         | 121    |
| Ventilation and Infiltration | 7,720  |
| Sub Total                    | 21,180 |

### SENSIBLE HEAT GAINS - TEMP. INDEPENDENT

|                          |        |
|--------------------------|--------|
| Internal Gains to Room   | 19,891 |
| Internal Gains to Plenum | 0      |
| Sub Total                | 19,891 |

# HEAT GAIN/LOSS WORKSHEET

Project Name: NJ BPU Energy Audit Saddle River  
 Location: Saddle River, NJ  
 Building Name: Public Safety Complex  
 Engineer: CAA

Project No.: CHA #21351  
 Site Elevation: 460 Feet  
 Date: 09/13/10

Specific Volume 13.50 CF/#

Building/Facility Designation Police Headquarters - Second Floor

## LATENT COOLING LOADS

### Infiltration

|             |           | Infiltration Factor | Air Density | Humidity Ratio Dif. |
|-------------|-----------|---------------------|-------------|---------------------|
| Walls       | 2,563 SF  | 0.10 CFM/SF         | 4,800       | 0.0043 ##           |
| Doors       | 0 SF      | 0.20 CFM/LF         | 4,800       | 0.0043 ##           |
| Windows     | 84 SF     | 0.18 CFM/LF         | 4,800       | 0.0043 ##           |
| Ventilation | 300 cfm   |                     | 4,800       | 0.0043 ##           |
| People      | 10 people | 0.25 time in space  |             | 250 Btu/hr/person   |

### Room Heat Gain

|             |
|-------------|
| 5,343 Btu/h |
| 0 Btu/h     |
| 368 Btu/h   |
| 6,254 Btu/h |
| 625 Btu/h   |

12,589 Btu/h

### Cooling Load Summary

|                             | Sensible | Latent | Total  |
|-----------------------------|----------|--------|--------|
| Temperature Dependent Gains | 21,180   | 12,589 | 33,769 |
| Temperature Indep. Gains    | 19,891   |        | 19,891 |
| Total                       | 41,071   | 12,589 | 53,660 |

SHR= 0.77

Building Cooling Load 4.5 Tons at 562 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is

3,153 CFM

1.25 CFM/sf

## HEATING CALCULATION

### CONDUCTION

|                | NET AREA (SF) | U-VALUE | Heating Load Temp. Dif. |
|----------------|---------------|---------|-------------------------|
| North Exposure | 42            | 0.08    | 54                      |
| East Exposure  | 246           | 0.08    | 54                      |
| South Exposure | 42            | 0.08    | 54                      |
| West Exposure  | 18            | 0.08    | 54                      |
| Fenestration   | 84            | 0.42    | 54                      |
| Roof           | 2,515         | 0.04    | 54                      |
| Doors          | 0             | 0.14    | 54                      |
| Ceiling        | 2,515         | 0.14    | 0                       |
| Partition      | 0             | 0.05    | 0                       |
| Floor          | 2,515         | 0.04    | 0                       |

### Room Heat Gain

|             |
|-------------|
| 173 Btu/h   |
| 1,013 Btu/h |
| 173 Btu/h   |
| 74 Btu/h    |
| 1,905 Btu/h |
| 5,849 Btu/h |
| 0 Btu/h     |
| 0 Btu/h     |
| 0 Btu/h     |
| 0 Btu/h     |

### Ventilation and Infiltration

|                  | Infiltration Factor | Coef | Temp. Difference |
|------------------|---------------------|------|------------------|
| Walls            | 0.10 CFM/SF         | 1.08 | 54               |
| Doors            | 0.20 CFM/LF         | 1.08 | 54               |
| Windows          | 0.18 CFM/LF         | 1.08 | 54               |
| Ventilation Load |                     | 1.08 | 54               |

### Air Flow

|         |
|---------|
| 35 cfm  |
| 0 cfm   |
| 18 cfm  |
| 300 cfm |

### Room Heat Gain

|              |
|--------------|
| 2,034 Btu/h  |
| 0 Btu/h      |
| 1,031 Btu/h  |
| 18,935 Btu/h |
| 22,000 Btu/h |

Total Ventilation & Infiltration Load

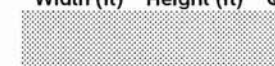
352 cfm

Building Heating Load 31,186 btu/h

12.4 btu/sf

NJ BPU Energy Audit Saddle River  
 CHA #21351  
 Building: Public Safety Complex  
 Police Headquarters - Second Floor

Doors

|           | Width (ft)                                                                        | Height (ft) | Quantity | Area (SF) | Lineal Feet |
|-----------|-----------------------------------------------------------------------------------|-------------|----------|-----------|-------------|
| North     |  |             |          | 0.0       | 0.0         |
|           |                                                                                   |             |          | 0.0       | 0.0         |
|           |                                                                                   |             |          | 0.0       | 0.0         |
|           |                                                                                   |             |          | 0.0       | 0.0         |
|           |                                                                                   |             |          | 0.0       | 0.0         |
|           |                                                                                   |             |          | 0.0       | 0.0         |
|           |                                                                                   |             |          | 0.0       | 0.0         |
| Sub-total |                                                                                   |             | 0.0      | 0.0       |             |

|           |                                                                                   |     |     |
|-----------|-----------------------------------------------------------------------------------|-----|-----|
| East      |  | 0.0 | 0.0 |
|           |                                                                                   | 0.0 | 0.0 |
|           |                                                                                   | 0.0 | 0.0 |
|           |                                                                                   | 0.0 | 0.0 |
| Sub-total |                                                                                   | 0.0 | 0.0 |

|           |                                                                                   |     |     |
|-----------|-----------------------------------------------------------------------------------|-----|-----|
| South     |  | 0.0 | 0.0 |
|           |                                                                                   | 0.0 | 0.0 |
|           |                                                                                   | 0.0 | 0.0 |
|           |                                                                                   | 0.0 | 0.0 |
|           |                                                                                   | 0.0 | 0.0 |
| Sub-total |                                                                                   | 0.0 | 0.0 |

|      |                                                                                   |       |     |
|------|-----------------------------------------------------------------------------------|-------|-----|
| West |  | 0.0   | 0.0 |
|      |                                                                                   | 0.0   | 0.0 |
|      |                                                                                   | <hr/> |     |
|      | Sub-total                                                                         | 0.0   | 0.0 |

Total

0.0

0.0

|       |
|-------|
| LF/SF |
| 0.00  |

# Walls

|       | Width (ft) | Height (ft) | Quantity | Area (SF) | Lineal Feet |                                             |
|-------|------------|-------------|----------|-----------|-------------|---------------------------------------------|
| North | 6.0        | 9.0         | 1        | 54.0      | 30.0        | All wall quantities must remain equal to 1  |
|       |            |             |          | 0.0       | 0.0         |                                             |
|       |            |             |          | 0.0       | 0.0         |                                             |
|       |            |             |          | 0.0       | 0.0         |                                             |
|       |            |             |          | 0.0       | 0.0         |                                             |
|       |            |             |          | 0.0       | 0.0         |                                             |
|       | 6.0        |             |          | 54.0      | 30.0        | Ave. height 9.0                             |
|       |            |             |          |           |             | Average height wall automatically linked to |

|      |      |     |   |       |      |                                             |
|------|------|-----|---|-------|------|---------------------------------------------|
| East | 18.0 | 9.0 | 1 | 162.0 | 54.0 |                                             |
|      |      |     |   | 0.0   | 0.0  |                                             |
|      |      |     |   | 0.0   | 0.0  |                                             |
|      |      |     |   | 0.0   | 0.0  |                                             |
|      |      |     |   | 0.0   | 0.0  |                                             |
|      |      |     |   | 0.0   | 0.0  |                                             |
|      | 12.0 | 9.0 | 1 | 108.0 | 42.0 |                                             |
|      |      |     |   | 0.0   | 0.0  |                                             |
|      |      |     |   | 0.0   | 0.0  |                                             |
|      |      |     |   | 0.0   | 0.0  |                                             |
|      |      |     |   | 0.0   | 0.0  |                                             |
|      |      |     |   | 0.0   | 0.0  |                                             |
|      | 30.0 |     |   | 270.0 | 96.0 | Ave. height 9.0                             |
|      |      |     |   |       |      | Average height wall automatically linked to |

|       |     |     |   |      |      |                                             |
|-------|-----|-----|---|------|------|---------------------------------------------|
| South | 6.0 | 9.0 | 1 | 54.0 | 30.0 |                                             |
|       |     |     |   | 0.0  | 0.0  |                                             |
|       |     |     |   | 0.0  | 0.0  |                                             |
|       |     |     |   | 0.0  | 0.0  |                                             |
|       |     |     |   | 0.0  | 0.0  |                                             |
|       |     |     |   | 0.0  | 0.0  |                                             |
|       | 6.0 |     | 1 | 54.0 | 30.0 | Ave. height 9.0                             |
|       |     |     |   |      |      | Average height wall automatically linked to |

|      |     |     |   |      |      |                                                |
|------|-----|-----|---|------|------|------------------------------------------------|
| West | 6.0 | 9.0 | 1 | 54.0 | 30.0 |                                                |
|      |     |     |   | 0.0  | 0.0  |                                                |
|      |     |     |   | 0.0  | 0.0  |                                                |
|      |     |     |   | 0.0  | 0.0  |                                                |
|      |     |     |   | 0.0  | 0.0  |                                                |
|      |     |     |   | 0.0  | 0.0  |                                                |
|      | 6.0 |     |   | 54.0 | 30.0 | Ave. height 9.0                                |
|      |     |     |   |      |      | Average height auto linked to block load sheet |

# Windows

|       | Width (ft) | Height (ft) | Quantity  | Area (SF) | Lineal Feet |
|-------|------------|-------------|-----------|-----------|-------------|
| North | 3.0        | 4.0         | 1         | 12.0      | 14.0        |
|       |            |             |           | 0.0       | 0.0         |
|       |            |             |           | 0.0       | 0.0         |
|       |            |             |           | 0.0       | 0.0         |
|       |            |             |           | 0.0       | 0.0         |
|       |            |             |           | 0.0       | 0.0         |
|       |            |             | Sub-total | 12.0      | 14.0        |

|      |     |     |           |      |      |
|------|-----|-----|-----------|------|------|
| East | 3.0 | 4.0 | 2         | 24.0 | 28.0 |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     | Sub-total | 24.0 | 28.0 |

|       |     |     |           |      |      |
|-------|-----|-----|-----------|------|------|
| South | 3.0 | 4.0 | 1         | 12.0 | 14.0 |
|       |     |     |           | 0.0  | 0.0  |
|       |     |     |           | 0.0  | 0.0  |
|       |     |     |           | 0.0  | 0.0  |
|       |     |     |           | 0.0  | 0.0  |
|       |     |     |           | 0.0  | 0.0  |
|       |     |     | Sub-total | 12.0 | 14.0 |

|      |     |     |           |      |      |
|------|-----|-----|-----------|------|------|
| West | 3.0 | 4.0 | 3         | 36.0 | 42.0 |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     | Sub-total | 36.0 | 42.0 |

Total
84.0
98.0
LF/SF 1.17

NJ BPU Energy Audit Saddle River  
CHA #21351  
Building: Public Safety Complex

Reconcile Thermal Model

Police Headquarters - Garages

|                              |             |                                 |                |                         |              |
|------------------------------|-------------|---------------------------------|----------------|-------------------------|--------------|
| Building Footprint           | 1,250 SF    | Ex Occupied Cing Temp.          | 72 °F          | Ex Occupied Htg Temp.   | 60 °F        |
| Heating Efficiency           | 76%         | Ex Unoccupied Cing Temp.        | 72 °F          | Ex Unoccupied Htg Temp. | 60 °F        |
| Cooling Efficiency           | 0.00 kW/ton | Occupied Cooling UA             | (408) btu/hr°F | Occupied Heating UA     | 155 btu/hr°F |
| Internal Gains               | 8,588 Btu/h | Unoccupied Cooling UA           | (318) btu/hr°F | Unoccupied Heating UA   | 155 btu/hr°F |
| Unoc Internal Gain Factor    | 0.7         | Cooling Occ Enthalpy Setpoint   | 28 Btu/lb      |                         |              |
| Ave Occ Internal Gain Factor | 0.7         | Cooling Unocc Enthalpy Setpoint | 28 Btu/lb      |                         |              |
| Economizer available (Y/N)   | No          |                                 |                |                         |              |

| Avg Outdoor Air Temp. Bins °F | Avg Outdoor Air Enthalpy | Total Bin Hours | EXISTING LOADS     |                       |                    |                               |                       |                    |                               |                       |                    |   | Available Economizer Cooling kWh | Necessary Cooling Energy kWh | Existing Cooling Energy kWh | Existing Heating Energy therms |
|-------------------------------|--------------------------|-----------------|--------------------|-----------------------|--------------------|-------------------------------|-----------------------|--------------------|-------------------------------|-----------------------|--------------------|---|----------------------------------|------------------------------|-----------------------------|--------------------------------|
|                               |                          |                 | Occupied           |                       |                    |                               |                       | Unoccupied         |                               |                       |                    |   |                                  |                              |                             |                                |
|                               |                          |                 | Envelope Load BTUH | Ventilation Load BTUH | Internal Gain BTUH | Unoccupied Envelope Load BTUH | Ventilation Load BTUH | Internal Gain BTUH | Unoccupied Envelope Load BTUH | Ventilation Load BTUH | Internal Gain BTUH |   |                                  |                              |                             |                                |
| A                             |                          | B               | C                  | D                     | E                  | F                             | G                     | H                  | I                             | J                     | K                  | L | M                                | M                            |                             |                                |
| 102.5                         | 49.1                     | 0               | 0                  | 0                     | -12,372            | -11,068                       | -6,719                | -9,709             | -10,062                       | -6,719                | 0                  | 0 | 0                                | 0                            | 0                           |                                |
| 97.5                          | 42.5                     | 3               | 3                  | 0                     | -10,344            | -7,434                        | -6,719                | -8,118             | -6,758                        | -6,719                | 0                  | 0 | 0                                | 0                            | 0                           |                                |
| 92.5                          | 39.5                     | 34              | 34                 | 0                     | -8,316             | -5,782                        | -6,719                | -6,526             | -5,256                        | -6,719                | 0                  | 0 | 0                                | 0                            | 0                           |                                |
| 87.5                          | 36.6                     | 131             | 131                | 0                     | -6,288             | -4,185                        | -6,719                | -4,934             | -3,804                        | -6,719                | 0                  | 0 | 0                                | 0                            | 0                           |                                |
| 82.5                          | 34.0                     | 500             | 500                | 0                     | -4,259             | -2,753                        | -6,719                | -3,343             | -2,503                        | -6,719                | 0                  | 0 | 0                                | 0                            | 0                           |                                |
| 77.5                          | 31.6                     | 620             | 620                | 0                     | -2,231             | -1,432                        | -6,719                | -1,751             | -1,302                        | -6,719                | 0                  | 0 | 0                                | 0                            | 0                           |                                |
| 72.5                          | 29.2                     | 664             | 664                | 0                     | -203               | -110                          | -6,719                | -159               | -100                          | -6,719                | 0                  | 0 | 0                                | 0                            | 0                           |                                |
| 67.5                          | 27.0                     | 854             | 854                | 0                     | 0                  | 0                             | -6,719                | 0                  | 0                             | -6,719                | 0                  | 0 | 0                                | 0                            | 0                           |                                |
| 62.5                          | 24.5                     | 927             | 927                | 0                     | 0                  | 0                             | -6,719                | 0                  | 0                             | -6,719                | 0                  | 0 | 0                                | 0                            | 0                           |                                |
| 57.5                          | 21.4                     | 600             | 600                | 0                     | 388                | 330                           | -6,719                | 388                | 300                           | -6,719                | 0                  | 0 | 0                                | 0                            | 0                           |                                |
| 52.5                          | 18.7                     | 610             | 610                | 0                     | 1,163              | 991                           | -6,719                | 1,163              | 901                           | -6,719                | 0                  | 0 | 0                                | 0                            | 0                           |                                |
| 47.5                          | 16.2                     | 611             | 611                | 0                     | 1,938              | 1,652                         | -6,719                | 1,938              | 1,502                         | -6,719                | 0                  | 0 | 0                                | 0                            | 0                           |                                |
| 42.5                          | 14.4                     | 656             | 656                | 0                     | 2,713              | 2,313                         | -6,719                | 2,713              | 2,102                         | -6,719                | 0                  | 0 | 0                                | 0                            | 0                           |                                |
| 37.5                          | 12.6                     | 1,023           | 1,023              | 0                     | 3,488              | 2,973                         | -6,719                | 3,488              | 2,703                         | -6,719                | 0                  | 0 | 0                                | 0                            | 0                           |                                |
| 32.5                          | 10.7                     | 734             | 734                | 0                     | 4,264              | 3,634                         | -6,719                | 4,264              | 3,304                         | -6,719                | 0                  | 0 | 0                                | 0                            | 11                          |                                |
| 27.5                          | 8.6                      | 334             | 334                | 0                     | 5,039              | 4,295                         | -6,719                | 5,039              | 3,905                         | -6,719                | 0                  | 0 | 0                                | 0                            | 11                          |                                |
| 22.5                          | 6.8                      | 252             | 252                | 0                     | 5,814              | 4,956                         | -6,719                | 5,814              | 4,505                         | -6,719                | 0                  | 0 | 0                                | 0                            | 13                          |                                |
| 17.5                          | 5.5                      | 125             | 125                | 0                     | 6,589              | 5,617                         | -6,719                | 6,589              | 5,106                         | -6,719                | 0                  | 0 | 0                                | 0                            | 9                           |                                |
| 12.5                          | 4.1                      | 47              | 47                 | 0                     | 7,364              | 6,277                         | -6,719                | 7,364              | 5,707                         | -6,719                | 0                  | 0 | 0                                | 0                            | 4                           |                                |
| 7.5                           | 2.6                      | 22              | 22                 | 0                     | 8,140              | 6,938                         | -6,719                | 8,140              | 6,307                         | -6,719                | 0                  | 0 | 0                                | 0                            | 2                           |                                |
| 2.5                           | 1.0                      | 13              | 13                 | 0                     | 8,915              | 7,599                         | -6,719                | 8,915              | 6,908                         | -6,719                | 0                  | 0 | 0                                | 0                            | 2                           |                                |
| -2.5                          | 0.0                      | 0               | 0                  | 0                     | 9,690              | 8,260                         | -6,719                | 9,690              | 7,509                         | -6,719                | 0                  | 0 | 0                                | 0                            | 0                           |                                |
| -7.5                          | -1.5                     | 0               | 0                  | 0                     | 10,465             | 8,920                         | -6,719                | 10,465             | 8,109                         | -6,719                | 0                  | 0 | 0                                | 0                            | 0                           |                                |
| TOTALS                        |                          | 8,760           | 8,760              | 0                     |                    |                               |                       |                    |                               |                       | 0                  | 0 | 0                                | 0                            | 54                          |                                |

Existing Building Ventilation & Infiltration (occ)

111 cfm

Due to overhead doors being opened and closed

Overheat Ventilation Factor

1.10

Additional ventilation to offset overheat

11 cfm

Existing Building Ventilation & Infiltration (unocc)

111 cfm

Economizer Ventilation (from AHUs)

Energy Use Indices (calculated)

| Heating        | Base Case | Cooling        | Base Case |
|----------------|-----------|----------------|-----------|
| PHQ First Flr  | 1,029     | PHQ First Flr  | 19,082    |
| PHQ Second Flr | 679       | PHQ Second Flr | 2,470     |
| PHQ Garages    | 54        | PHQ Garages    | 0         |
| Fire HQ        | 2,493     | Fire HQ        | 9,089     |
| Total          | 4,254     | Total          | 30,640    |
| Target ->      | 4,110     | Target ->      | 30,496    |
|                | 103.5%    |                | 100.5%    |

# HEAT GAIN/LOSS WORKSHEET

Project Name: NJ BPU Energy Audit Saddle River  
 Location: Saddle River, NJ  
 Building Name: Public Safety Complex  
 Engineer: CAA

Project No.: CHA #21351  
 Site Elevation: 460 Feet  
 Date: 09/13/10

Specific Volume 13.50 CF/#

Building/Facility Designation Police Headquarters - Garages

Outdoor Winter Design DB Temperature 14 \*F  
 Outdoor Summer Design DB Temperature 91 \*F  
 Outdoor Summer Design WB Temperature 73 \*F  
 Outdoor Summer Humidity Ratio 0.0121 ##

Indoor Winter Design DB Temperature 60 \*F  
 Indoor Summer Design DB Temperature 72 \*F  
 Indoor Summer Design WB Temperature 60 \*F  
 Indoor Air (70°F) Humidity Ratio 0.0078 ##

## ENVELOPE DESCRIPTIONS (Descriptions are from Interior to Exterior)

### Walls (Select One - Type X)

|                                                                                          | R Value | Wall Type |
|------------------------------------------------------------------------------------------|---------|-----------|
| <input type="checkbox"/> Steel Siding, 4" Insulation, Steel Siding                       | 15.2    | 1         |
| <input type="checkbox"/> Plaster or Gypsum, frame construction, 5" Insulation, 1" stucco | 18.2    | 1         |
| <input type="checkbox"/> 4" WH CMU, 1" Insulation, Finished Exterior                     | 5.2     | 2         |
| <input type="checkbox"/> Plaster or Gypsum, frame construction, 3" Insulation, 8" LW CMU | 7.8     | 5         |
| <input type="checkbox"/> 4" Face Brick, 2" Concrete, 1" Insulation, Exterior Finish      | 5.1     | 12        |
| <input type="checkbox"/> 4" Face Brick, 4" Concrete, 1" Insulation, Exterior Finish      | 4.0     | 11        |
| <input type="checkbox"/> Interior Finish, 2" Insulation, 8" CMU, 4" Face Brick           | 10.9    | 16        |
| <input type="checkbox"/> Finished Surface, 8" LW CMU (filled), Air Space, 4" Face Brick  | 11.1    | 16        |
| <input type="checkbox"/> Stucco or Gypsum, 2.5" Insul, Face Brick                        | 14.3    | 10        |
| <input type="checkbox"/> 4" Block, 1" insulation, 8" Block                               | 19.9    | 16        |
| <input checked="" type="checkbox"/> U value calculator                                   | 13.1    |           |

### Roofs (Select One)

|                                                                             | R Value | Roof Type |
|-----------------------------------------------------------------------------|---------|-----------|
| <input type="checkbox"/> Tectum Deck, 3.3" Insul., BU Roof                  | 13.0    | 1         |
| <input type="checkbox"/> Steel Deck, 5" Insul., BU Roof                     | 18.2    | 1         |
| <input type="checkbox"/> Attic Roof with 6" Insul.                          | 25.0    | 4         |
| <input type="checkbox"/> 4" HW Concrete Deck, BU Roof                       | 2.7     | 2         |
| <input type="checkbox"/> Ceiling, 3" Insulation, 4" Concrete Deck, BU Roof  | 14.9    | 4         |
| <input type="checkbox"/> Ceiling, 4" Concrete Deck, 3" Insulation, BU Roof  | 18.5    | 13        |
| <input type="checkbox"/> Ceiling, 4" Concrete Deck, 6" Insulation, BU Roof  | 21.7    | 14        |
| <input type="checkbox"/> Ceiling, Wood Deck, 6" Insulation, Felt & Membrane | 22.7    | 10        |
| <input type="checkbox"/> Wood Deck, 6" insulation, Felt & Membrane          | 18.0    |           |
| <input checked="" type="checkbox"/> U value calculator                      | 23.2    |           |

### Windows (Select One)

|                                                                             | U Value |
|-----------------------------------------------------------------------------|---------|
| <input type="checkbox"/> Aluminum Frame, 1/8" SP Glazing                    | 1.05    |
| <input type="checkbox"/> Aluminum Frame, 1/4" DP Glazing                    | 0.60    |
| <input type="checkbox"/> Aluminum Frame, 3/16" DP Glazing                   | 0.62    |
| <input type="checkbox"/> Aluminum Frame, 1/2" DP Glazing                    | 0.50    |
| <input type="checkbox"/> Skylights                                          | 0.90    |
| <input checked="" type="checkbox"/> Aluminum Clad, DP Glazing, Tinted Glass | 0.42    |

|                            | No Storm |
|----------------------------|----------|
| Flat Glass                 | 1.05     |
| Flat Glass (e=.6)          | 1.00     |
| Flat Glass (e=.4)          | 0.90     |
| Flat Glass (e=.2)          | 0.77     |
| Double Glaze (3/16 in air) | 0.63     |
| Double Glaze (1/4 in air)  | 0.60     |
| Double Glaze (1/2 in air)  | 0.53     |
| Double Glaze (e=.6)        | 0.50     |
| Double Glaze (e=.4)        | 0.42     |
| Double Glaze (e=.2)        | 0.35     |
| Triple Glaze (1/4 in air)  | 0.42     |
| Triple Glaze (1/2 in air)  | 0.35     |

## BUILDING CHARACTERISTICS

Roof Area 1,000 SF  
 Occupied Area 1,250 SF

Return Plenum? n

|                               | Gross Wall Length | Average Wall Height | Ceiling Height | Window Area | Door Area | Net Wall Area |
|-------------------------------|-------------------|---------------------|----------------|-------------|-----------|---------------|
| North Exposure                | 50 Ft             | 11.0 Ft             | 8.0 Ft         | 0 SF        | 270 SF    | 280 SF        |
| East Exposure                 | 25 Ft             | 11.0 Ft             | 8.0 Ft         | 16 SF       | 0 SF      | 259 SF        |
| South Exposure                | 0 Ft              | 0.0 Ft              | 8.0 Ft         | 0 SF        | 0 SF      | 0 SF          |
| West Exposure                 | 25 Ft             | 11.0 Ft             | 8.0 Ft         | 16 SF       | 0 SF      | 259 SF        |
| Occupied Forced Ventilation   | 0 cfm             | #DIV/0!             | AC/hr          |             |           |               |
| Unoccupied Forced Ventilation | 0 cfm             | #DIV/0!             | AC/hr          |             |           |               |

# HEAT GAIN/LOSS WORKSHEET

Project Name: NJ BPU Energy Audit Saddle River  
 Location: Saddle River, NJ  
 Building Name: Public Safety Complex  
 Engineer: CAA

Project No.: CHA #21351  
 Site Elevation: 460 Feet  
 Date: 09/13/10

Specific Volume 13.50 CF/#

Building/Facility Designation Police Headquarters - Garages

## COOLING HEAT GAINS TO THE ROOM - SENSIBLE

### SOLAR GAINS

| WINDOWS        | AREA (SF) | SHGF         | Shade Coef | Cooling Load Factor | Glass Type   | Solar Heat Gain |
|----------------|-----------|--------------|------------|---------------------|--------------|-----------------|
| North Exposure | 0         | 38 btu/h/sf  | 0.8        | 0.75                | Glass Type C | 0 Btu/hr        |
| East Exposure  | 16        | 216 btu/h/sf | 0.8        | 0.31                | Glass Type C | 857 Btu/hr      |
| South Exposure | 0         | 109 btu/h/sf | 0.8        | 0.58                | Glass Type C | 0 Btu/hr        |
| West Exposure  | 16        | 216 btu/h/sf | 0.8        | 0.29                | Glass Type C | 802 Btu/hr      |
|                |           |              |            |                     |              | 1,659 Btu/h     |

### CONDUCTION

|                | NET AREA (SF) | U-VALUE | Cooling Load Temp. Dif. | Return Air Factor | Room Heat Gain |
|----------------|---------------|---------|-------------------------|-------------------|----------------|
| North Exposure | 130           | 0.08    | 20 °F                   | 1.0               | 198 Btu/hr     |
| East Exposure  | 184           | 0.08    | 39 °F                   | 1.0               | 547 Btu/hr     |
| South Exposure | 0             | 0.08    | 27 °F                   | 1.0               | 0 Btu/hr       |
| West Exposure  | 184           | 0.08    | 22 °F                   | 1.0               | 309 Btu/hr     |
| Roof           | 1,000         | 0.04    | 73 °F                   | 1.0               | 3,144 Btu/hr   |
| Fenestration   | 32            | 0.42    | 19 °F                   |                   | 255 Btu/hr     |
| Doors          | 270           | 0.14    | 27 °F                   |                   | 1,018 Btu/hr   |
| Ceiling        | 1,250         | 0.14    | 0 °F                    |                   | 0 Btu/hr       |
| Partition      |               | 0.05    | 0 °F                    |                   | 0 Btu/hr       |
| Floor          | 1,250         | 0.04    | 0 °F                    |                   | 0 Btu/hr       |
|                |               |         |                         |                   | 5,471 Btu/h    |

### INTERNAL HEAT GAINS (all loads below are based on Occupied Periods)

|                        |                  |                  |                      |           |             |
|------------------------|------------------|------------------|----------------------|-----------|-------------|
| Lights                 | 1.25 w/sf x      | 1,250 Occ Area = | 1.6 kW x 3.4x        | 1.0 RAF = | 5,333 Btu/h |
| Plug Load              | 0.20 w/sf x      | 1,250 Occ Area = | 0.3 kW x 3.4x        | 1.0 RAF = | 853 Btu/h   |
| People                 | 0 people x       | 255 btu/person x | 100% time in space = |           | 0 Btu/h     |
| Computer Work Stations |                  | 0 Units x        | 120 W/Unit x         | 3414 =    | 0 Btu/h     |
| Equipment              | 1.0 kW x 3.413 = |                  |                      |           | 3,413 Btu/h |
| Misc.                  |                  |                  |                      |           | 0 Btu/h     |
|                        |                  |                  |                      |           | 9,599 Btu/h |

### VENTILATION AND INFILTRATION

|              |        | Infiltration Factor | Perimeter Ratio | Coef | Temp. Diff. | Room Heat Gain |
|--------------|--------|---------------------|-----------------|------|-------------|----------------|
| Walls        | 498 SF | 0.10 CFM/SF         |                 | 1.08 | 19 °F       | 1,106 Btu/h    |
| Doors        | 270 SF | 0.20 CFM/LF         | 0.42 LF/SF      | 1.08 | 19 °F       | 506 Btu/h      |
| Windows      | 32 SF  | 0.18 CFM/LF         | 1.50 LF/SF      | 1.08 | 19 °F       | 192 Btu/h      |
| Ventilation  | 0 cfm  |                     |                 | 1.08 | 19 °F       | 0 Btu/h        |
|              |        |                     |                 |      |             | 1,804 Btu/h    |
| Infiltration | 81 cfm | #DIV/0! AC/hr       |                 |      |             |                |

## COOLING HEAT GAINS TO THE RA PLENUM - SENSIBLE

4,950

### CONDUCTION

|                | NET<br>AREA<br>(SF) | U-VALUE | Cooling<br>Load Temp.<br>Dif. | Return Air Factor | Room Heat Gain |
|----------------|---------------------|---------|-------------------------------|-------------------|----------------|
| North Exposure | 150                 | 0.08    | 20                            | 1.0               | 229 Btu/hr     |
| East Exposure  | 75                  | 0.08    | 39                            | 1.0               | 223 Btu/hr     |
| South Exposure | 0                   | 0.08    | 27                            | 1.0               | 0 Btu/hr       |
| West Exposure  | 75                  | 0.08    | 22                            | 1.0               | 126 Btu/hr     |
| Roof           | 1,000               | 0.04    | 73                            | 0.0               | 0 Btu/hr       |
|                |                     |         |                               |                   | 577 Btu/h      |

### INTERNAL HEAT GAINS

|        |             |                  |               |            |         |
|--------|-------------|------------------|---------------|------------|---------|
| Lights | 1.25 w/sf x | 1,250 Occ Area = | 1.6 kW x3413x | 0.00 RAF = | 0 Btu/h |
| Misc.  |             |                  |               |            | 0 Btu/h |
|        |             |                  |               |            | 0 Btu/h |

### SENSIBLE HEAT GAINS - TEMP. DEPENDENT

|                              |       |
|------------------------------|-------|
| Solar                        | 1,659 |
| Conduction to Room           | 5,471 |
| Conduction to Plenum         | 577   |
| Ventilation and Infiltration | 1,804 |
| Sub Total                    | 9,512 |

### SENSIBLE HEAT GAINS - TEMP. INDEPENDENT

|                          |       |
|--------------------------|-------|
| Internal Gains to Room   | 9,599 |
| Internal Gains to Plenum | 0     |
| Sub Total                | 9,599 |

# HEAT GAIN/LOSS WORKSHEET

Project Name: NJ BPU Energy Audit Saddle River  
 Location: Saddle River, NJ  
 Building Name: Public Safety Complex  
 Engineer: CAA

Project No.: CHA #21351  
 Site Elevation: 480 Feet  
 Date: 09/13/10

Specific Volume 13.50 CF/#

Building/Facility Designation Police Headquarters - Garages

## LATENT COOLING LOADS

### Infiltration

|             |          | Infiltration Factor | Air Density | Humidity Ratio Dif. |
|-------------|----------|---------------------|-------------|---------------------|
| Walls       | 1,300 SF | 0.10 CFM/SF         | 4,800       | 0.0043 ##           |
| Doors       | 270 SF   | 0.20 CFM/LF         | 4,800       | 0.0043 ##           |
| Windows     | 32 SF    | 0.18 CFM/LF         | 4,800       | 0.0043 ##           |
| Ventilation | 0 cfm    |                     | 4,800       | 0.0043 ##           |
| People      | 0 people | 1.00 time in space  |             | 250 Btu/hr/person   |

| Room Heat Gain |
|----------------|
| 2,710 Btu/h    |
| 475 Btu/h      |
| 180 Btu/h      |
| 0 Btu/h        |
| 0 Btu/h        |

3,365 Btu/h

### Cooling Load Summary

|                             | Sensible | Latent | Total  | SHR= |  |
|-----------------------------|----------|--------|--------|------|--|
| Temperature Dependent Gains | 9,512    | 3,365  | 12,877 |      |  |
| Temperature Indep. Gains    | 9,599    |        | 9,599  | 0.85 |  |
| Total                       | 19,111   | 3,365  | 22,476 |      |  |

Building Cooling Load 1.9 Tons at 667 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is

1,427 CFM  
 1.14 CFM/sf

## HEATING CALCULATION

### CONDUCTION

|                | NET AREA (SF) | U-VALUE | Heating Load Temp. Dif. |
|----------------|---------------|---------|-------------------------|
| North Exposure | 280           | 0.08    | 46                      |
| East Exposure  | 259           | 0.08    | 46                      |
| South Exposure | 0             | 0.08    | 46                      |
| West Exposure  | 259           | 0.08    | 46                      |
| Fenestration   | 32            | 0.42    | 46                      |
| Roof           | 1,000         | 0.04    | 46                      |
| Doors          | 270           | 0.14    | 46                      |
| Ceiling        | 1,250         | 0.14    | 0                       |
| Partition      | 0             | 0.05    | 0                       |
| Floor          | 1,000         | 0.04    | 0                       |

### Room Heat Gain

|             |
|-------------|
| 982 Btu/h   |
| 908 Btu/h   |
| 0 Btu/h     |
| 908 Btu/h   |
| 618 Btu/h   |
| 1,981 Btu/h |
| 1,735 Btu/h |
| 0 Btu/h     |
| 0 Btu/h     |
| 0 Btu/h     |

### Ventilation and Infiltration

|                  |        | Infiltration Factor | Coef | Temp. Difference |
|------------------|--------|---------------------|------|------------------|
| Walls            | 798 SF | 0.10 CFM/SF         | 1.08 | 46               |
| Doors            | 270 SF | 0.20 CFM/LF         | 1.08 | 46               |
| Windows          | 32 SF  | 0.18 CFM/LF         | 1.08 | 46               |
| Ventilation Load | 0 cfm  |                     | 1.08 | 46               |

### Air Flow

|        |
|--------|
| 80 cfm |
| 23 cfm |
| 9 cfm  |
| 0 cfm  |

### Room Heat Gain

|             |
|-------------|
| 3,973 Btu/h |
| 1,135 Btu/h |
| 430 Btu/h   |
| 0 Btu/h     |
| 5,538 Btu/h |

Total Ventilation & Infiltration Load

111 cfm

Building Heating Load 12,670 btu/h

10.1 btu/sf

NJ BPU Energy Audit Saddle River

CHA #21351

Building: Public Safety Complex

Police Headquarters - Garages

Doors

|           | Width (ft) | Height (ft) | Quantity | Area (SF) | Lineal Feet |
|-----------|------------|-------------|----------|-----------|-------------|
| North     | 10.0       | 9.0         | 3        | 270.0     | 114.0       |
|           |            |             |          | 0.0       | 0.0         |
|           |            |             |          | 0.0       | 0.0         |
|           |            |             |          | 0.0       | 0.0         |
|           |            |             |          | 0.0       | 0.0         |
|           |            |             |          | 0.0       | 0.0         |
|           |            |             |          | 0.0       | 0.0         |
| Sub-total |            |             |          | 270.0     | 114.0       |
| East      |            |             |          | 0.0       | 0.0         |
|           |            |             |          | 0.0       | 0.0         |
|           |            |             |          | 0.0       | 0.0         |
|           | Sub-total  |             |          | 0.0       | 0.0         |
| South     |            |             |          | 0.0       | 0.0         |
|           |            |             |          | 0.0       | 0.0         |
|           |            |             |          | 0.0       | 0.0         |
|           |            |             |          | 0.0       | 0.0         |
|           | Sub-total  |             |          | 0.0       | 0.0         |
| West      |            |             |          | 0.0       | 0.0         |
|           |            |             |          | 0.0       | 0.0         |
|           | Sub-total  |             |          | 0.0       | 0.0         |
| Total     |            |             |          | 270.0     | 114.0       |

|               |
|---------------|
| LF/SF<br>0.42 |
|---------------|

# Walls

|       | Width (ft) | Height (ft) | Quantity | Area (SF) | Lineal Feet |                                             |
|-------|------------|-------------|----------|-----------|-------------|---------------------------------------------|
| North | 50.0       | 11.0        | 1        | 550.0     | 122.0       | All wall quantities must remain equal to 1  |
|       |            |             |          | 0.0       | 0.0         |                                             |
|       |            |             |          | 0.0       | 0.0         |                                             |
|       |            |             |          | 0.0       | 0.0         |                                             |
|       |            |             |          | 0.0       | 0.0         |                                             |
|       |            |             |          | 0.0       | 0.0         |                                             |
|       | 50.0       |             |          | 550.0     | 122.0       | Ave. height 11.0                            |
|       |            |             |          |           |             | Average height wall automatically linked to |

|      |      |      |   |       |      |                                             |
|------|------|------|---|-------|------|---------------------------------------------|
| East | 25.0 | 11.0 | 1 | 275.0 | 72.0 |                                             |
|      |      |      |   | 0.0   | 0.0  |                                             |
|      |      |      |   | 0.0   | 0.0  |                                             |
|      |      |      |   | 0.0   | 0.0  |                                             |
|      |      |      |   | 0.0   | 0.0  |                                             |
|      |      |      |   | 0.0   | 0.0  |                                             |
|      | 25.0 |      |   | 275.0 | 72.0 | Ave. height 11.0                            |
|      |      |      |   |       |      | Average height wall automatically linked to |

|       |     |  |  |     |     |                                             |
|-------|-----|--|--|-----|-----|---------------------------------------------|
| South |     |  |  | 0.0 | 0.0 |                                             |
|       |     |  |  | 0.0 | 0.0 |                                             |
|       |     |  |  | 0.0 | 0.0 |                                             |
|       |     |  |  | 0.0 | 0.0 |                                             |
|       |     |  |  | 0.0 | 0.0 |                                             |
|       |     |  |  | 0.0 | 0.0 |                                             |
|       | 0.0 |  |  | 0.0 | 0.0 | Ave. height 0.0                             |
|       |     |  |  |     |     | Average height wall automatically linked to |

|      |      |      |   |       |      |                                                |
|------|------|------|---|-------|------|------------------------------------------------|
| West | 25.0 | 11.0 | 1 | 275.0 | 72.0 |                                                |
|      |      |      |   | 0.0   | 0.0  |                                                |
|      |      |      |   | 0.0   | 0.0  |                                                |
|      |      |      |   | 0.0   | 0.0  |                                                |
|      |      |      |   | 0.0   | 0.0  |                                                |
|      |      |      |   | 0.0   | 0.0  |                                                |
|      | 25.0 |      |   | 275.0 | 72.0 | Ave. height 11.0                               |
|      |      |      |   |       |      | Average height auto linked to block load sheet |

# Windows

|       | Width (ft) | Height (ft) | Quantity  | Area (SF) | Lineal Feet |
|-------|------------|-------------|-----------|-----------|-------------|
| North |            |             |           | 0.0       | 0.0         |
|       |            |             |           | 0.0       | 0.0         |
|       |            |             |           | 0.0       | 0.0         |
|       |            |             |           | 0.0       | 0.0         |
|       |            |             |           | 0.0       | 0.0         |
|       |            |             |           | 0.0       | 0.0         |
|       |            |             | Sub-total | 0.0       | 0.0         |

|      |     |     |           |      |      |
|------|-----|-----|-----------|------|------|
| East | 2.0 | 4.0 | 2         | 16.0 | 24.0 |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     | Sub-total | 16.0 | 24.0 |

|       |  |  |           |     |     |
|-------|--|--|-----------|-----|-----|
| South |  |  |           | 0.0 | 0.0 |
|       |  |  |           | 0.0 | 0.0 |
|       |  |  |           | 0.0 | 0.0 |
|       |  |  |           | 0.0 | 0.0 |
|       |  |  |           | 0.0 | 0.0 |
|       |  |  |           | 0.0 | 0.0 |
|       |  |  | Sub-total | 0.0 | 0.0 |

|      |     |     |           |      |      |
|------|-----|-----|-----------|------|------|
| West | 2.0 | 4.0 | 2         | 16.0 | 24.0 |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     |           | 0.0  | 0.0  |
|      |     |     | Sub-total | 16.0 | 24.0 |

|  |  |  |  |       |      |            |
|--|--|--|--|-------|------|------------|
|  |  |  |  | Total | 32.0 | 48.0       |
|  |  |  |  |       |      | LF/SF 1.50 |

|           |           |                           |
|-----------|-----------|---------------------------|
| \$        | 61        | Subtotal                  |
| \$        | -         | 0% Contingency Contractor |
| \$        | -         | 0% O&P                    |
| \$        | -         | 0% Engineering            |
| <b>\$</b> | <b>61</b> | <b>Total</b>              |

## **APPENDIX C**

### **ECM-2 Replace Electric Domestic Hot Water Heaters**

## ECM-2A Replace Electric DHW Heater

- Replace Electric DHW Heater w/ Tankless, Condensing, Gas-Fired DHW Heater

Daily Hot Water Demand

\*GPM is per standard fixtures, adjust as necessary if actual GPM is known.

\*These are the occupant that use the fixtures. If fixture does not exist change to (0).

On 10 per cent standard fixtures, adjust as necessary if actual GFI is known.

NJ BPU Energy Audit Saddle River  
CHA #21351  
Building: Public Safety Complex

ECM-2 Replace Electric Domestic Hot Water Heaters

| Multipliers |      |
|-------------|------|
| Material:   | 0.98 |
| Labor:      | 1.21 |
| Equipment:  | 1.09 |

| Description                     | QTY | UNIT | UNIT COSTS |          |        | SUBTOTAL COSTS |          |        | TOTAL COST | REMARKS    |
|---------------------------------|-----|------|------------|----------|--------|----------------|----------|--------|------------|------------|
|                                 |     |      | MAT.       | LABOR    | EQUIP. | MAT.           | LABOR    | EQUIP. |            |            |
| Electric DHW Heater Removal     | 2   | LS   |            | \$ 50    |        | \$ -           | \$ 121   | \$ -   | \$ 121     |            |
| Tankless Gas-Fired DHW Heater   | 2   | EA   | \$ 1,200   | \$ 280   |        | \$ 2,352       | \$ 678   | \$ -   | \$ 3,030   |            |
| Miscellaneous Electrical        | 1   | LS   | \$ 150     | \$ 200   |        | \$ 147         | \$ 242   | \$ -   | \$ 389     |            |
| Venting                         | 30  | LF   | \$ 5.50    | \$ 6.70  |        | \$ 162         | \$ 243   | \$ -   | \$ 405     | PVC piping |
| Miscellaneous Piping and Valves | 1   | LS   | \$ 750     | \$ 1,000 |        | \$ 735         | \$ 1,210 | \$ -   | \$ 1,945   |            |
|                                 |     |      |            |          |        | \$ -           | \$ -     | \$ -   | \$ -       |            |
|                                 |     |      |            |          |        | \$ -           | \$ -     | \$ -   | \$ -       |            |
|                                 |     |      |            |          |        | \$ -           | \$ -     | \$ -   | \$ -       |            |
|                                 |     |      |            |          |        | \$ -           | \$ -     | \$ -   | \$ -       |            |
|                                 |     |      |            |          |        | \$ -           | \$ -     | \$ -   | \$ -       |            |

|                 |                    |
|-----------------|--------------------|
| \$ 5,890        | Subtotal           |
| \$ 883          | 15% Contingency    |
| \$ 677          | Contractor 10% O&P |
| \$ -            | 0% Engineering     |
| <b>\$ 7,450</b> | <b>Total</b>       |

| New Jersey Smart Start Incentive Program | QTY | UNIT | \$ / UNIT | TOTAL SAVINGS | Cost W/O INCENTIVE | Cost W/ INCENTIVE |
|------------------------------------------|-----|------|-----------|---------------|--------------------|-------------------|
|                                          |     |      |           |               |                    |                   |
| Tankless Water Heater                    | 2   | EA   | \$300     | \$600         | \$ 3,030           | \$ 2,430          |
|                                          |     |      |           |               |                    |                   |
|                                          |     |      |           | \$600         | \$3,030            | \$2,430           |

|                                     |                |
|-------------------------------------|----------------|
| <b>Total ECM Cost w/ Incentives</b> | <b>\$6,850</b> |
|-------------------------------------|----------------|

## **APPENDIX D**

### **ECM-3 Replace Unit Heaters with Infrared Heaters**

**NJ BPU Energy Audit Saddle River  
CHA #21351  
Building: Public Safety Complex**

**ECM-3 Replace Unit Heaters with Infrared Heaters**

**Fire Headquarters - Engine Room**

|                              |                   |
|------------------------------|-------------------|
| Building Footprint           | 3,700 SF          |
| Natural Gas Heat Content     | 100,000 Btu/Therm |
| Building Balance Temp.       | 60 °F             |
| Internal Gains               | 21,227 btuh       |
| Unocc Internal Gain factor   | 0.5               |
| Ave Occ Internal Gain Factor | 0.8               |

|                         |             |
|-------------------------|-------------|
| Ex Occupied Htg Temp.   | 68 °F       |
| Ex Unoccupied Htg Temp. | 63 °F       |
| Occupied Heating UA     | 490 btuh/°F |
| Unoccupied Heating UA   | 490 btuh/°F |

|                         |               |
|-------------------------|---------------|
| Heating Energy Savings  | 158 Therms/yr |
| Electric Energy Savings | 1,908 kWh/yr  |

|                                          |       |                                                                                  |
|------------------------------------------|-------|----------------------------------------------------------------------------------|
| Existing Burner Efficiency               | 78.0% | Existing unit heater burner efficiency                                           |
| Existing Heat Distribution Effectiveness | 85.0% | Heat Distribution Factor per ASHRAE Handbook - Fundamentals for Unit Heaters     |
| Proposed Burner Efficiency               | 85.0% | Based on Rezor Infrared Tube Heaters                                             |
| Proposed Heat Distribution Effectiveness | 100%  | Heat Distribution Factor per ASHRAE Handbook - Fundamentals for Infrared Heaters |

| Avg Outdoor Air Temp. Bin # | A    | Avg Outdoor Air Enthalpy | Existing Equipment |       |       | Unoccupied |        |        | Occupied |        |        | Unoccupied |        |        | Occupied |        |        | Unoccupied |        |        | Existing Heating Therms | Proposed Heating Therms |
|-----------------------------|------|--------------------------|--------------------|-------|-------|------------|--------|--------|----------|--------|--------|------------|--------|--------|----------|--------|--------|------------|--------|--------|-------------------------|-------------------------|
|                             |      |                          | B                  | C     | D     | E          | F      | G      | H        | I      | J      | K          | L      | M      | N        | O      | P      | Q          | R      | S      |                         |                         |
| 102.5                       | 49.1 | 49.1                     | 0                  | 0     | 0     | 0          | 0      | 0      | 0        | 0      | 0      | 0          | 0      | 0      | 0        | 0      | 0      | 0          | 0      | 0      | 0                       | 0                       |
| 97.5                        | 42.5 | 42.5                     | 3                  | 1     | 2     | 0          | 0      | 0      | 0        | 0      | 0      | 0          | 0      | 0      | 0        | 0      | 0      | 0          | 0      | 0      | 0                       | 0                       |
| 92.5                        | 39.5 | 39.5                     | 34                 | 11    | 23    | 0          | 0      | 0      | 0        | 0      | 0      | 0          | 0      | 0      | 0        | 0      | 0      | 0          | 0      | 0      | 0                       | 0                       |
| 87.5                        | 36.5 | 36.5                     | 131                | 44    | 87    | 0          | 0      | 0      | 0        | 0      | 0      | 0          | 0      | 0      | 0        | 0      | 0      | 0          | 0      | 0      | 0                       | 0                       |
| 82.5                        | 34   | 34                       | 500                | 167   | 333   | 0          | 0      | 0      | 0        | 0      | 0      | 0          | 0      | 0      | 0        | 0      | 0      | 0          | 0      | 0      | 0                       | 0                       |
| 77.5                        | 31.5 | 31.5                     | 620                | 207   | 413   | 0          | 0      | 0      | 0        | 0      | 0      | 0          | 0      | 0      | 0        | 0      | 0      | 0          | 0      | 0      | 0                       | 0                       |
| 72.5                        | 29.2 | 29.2                     | 664                | 221   | 443   | 0          | 0      | 0      | 0        | 0      | 0      | 0          | 0      | 0      | 0        | 0      | 0      | 0          | 0      | 0      | 0                       | 0                       |
| 67.5                        | 27   | 27                       | 854                | 285   | 569   | 245        | 158    | 158    | 245      | 158    | 158    | 245        | 158    | 158    | 245      | 158    | 158    | 245        | 158    | 158    | 245                     | 158                     |
| 62.5                        | 24.5 | 24.5                     | 927                | 309   | 618   | 2,697      | 1,737  | 1,737  | 2,697    | 1,737  | 1,737  | 2,697      | 1,737  | 1,737  | 2,697    | 1,737  | 1,737  | 2,697      | 1,737  | 1,737  | 2,697                   | 1,737                   |
| 57.5                        | 21.4 | 21.4                     | 600                | 200   | 400   | 5,149      | 3,315  | 3,315  | 5,149    | 3,315  | 3,315  | 5,149      | 3,315  | 3,315  | 5,149    | 3,315  | 3,315  | 5,149      | 3,315  | 3,315  | 5,149                   | 3,315                   |
| 52.5                        | 18.7 | 18.7                     | 611                | 203   | 407   | 7,601      | 4,894  | 4,894  | 7,601    | 4,894  | 4,894  | 7,601      | 4,894  | 4,894  | 7,601    | 4,894  | 4,894  | 7,601      | 4,894  | 4,894  | 7,601                   | 4,894                   |
| 47.5                        | 16.2 | 16.2                     | 610                | 204   | 407   | 10,053     | 6,473  | 6,473  | 10,053   | 6,473  | 6,473  | 10,053     | 6,473  | 6,473  | 10,053   | 6,473  | 6,473  | 10,053     | 6,473  | 6,473  | 10,053                  | 6,473                   |
| 42.5                        | 14.4 | 14.4                     | 656                | 219   | 437   | 12,504     | 8,052  | 8,052  | 12,504   | 8,052  | 8,052  | 12,504     | 8,052  | 8,052  | 12,504   | 8,052  | 8,052  | 12,504     | 8,052  | 8,052  | 12,504                  | 8,052                   |
| 37.5                        | 12.6 | 12.6                     | 1,023              | 341   | 682   | 14,956     | 9,630  | 9,630  | 14,956   | 9,630  | 9,630  | 14,956     | 9,630  | 9,630  | 14,956   | 9,630  | 9,630  | 14,956     | 9,630  | 9,630  | 14,956                  | 9,630                   |
| 32.5                        | 10.7 | 10.7                     | 734                | 245   | 489   | 17,408     | 11,209 | 11,209 | 17,408   | 11,209 | 11,209 | 17,408     | 11,209 | 11,209 | 17,408   | 11,209 | 11,209 | 17,408     | 11,209 | 11,209 | 17,408                  | 11,209                  |
| 27.5                        | 8.6  | 8.6                      | 334                | 111   | 223   | 19,860     | 12,768 | 12,768 | 19,860   | 12,768 | 12,768 | 19,860     | 12,768 | 12,768 | 19,860   | 12,768 | 12,768 | 19,860     | 12,768 | 12,768 | 19,860                  | 12,768                  |
| 22.5                        | 6.8  | 6.8                      | 252                | 84    | 168   | 22,312     | 14,367 | 14,367 | 22,312   | 14,367 | 14,367 | 22,312     | 14,367 | 14,367 | 22,312   | 14,367 | 14,367 | 22,312     | 14,367 | 14,367 | 22,312                  | 14,367                  |
| 17.5                        | 5.5  | 5.5                      | 125                | 42    | 83    | 24,764     | 15,945 | 15,945 | 24,764   | 15,945 | 15,945 | 24,764     | 15,945 | 15,945 | 24,764   | 15,945 | 15,945 | 24,764     | 15,945 | 15,945 | 24,764                  | 15,945                  |
| 12.5                        | 4.1  | 4.1                      | 47                 | 16    | 31    | 27,215     | 17,524 | 17,524 | 27,215   | 17,524 | 17,524 | 27,215     | 17,524 | 17,524 | 27,215   | 17,524 | 17,524 | 27,215     | 17,524 | 17,524 | 27,215                  | 17,524                  |
| 7.5                         | 2.6  | 2.6                      | 22                 | 7     | 15    | 29,667     | 19,103 | 19,103 | 29,667   | 19,103 | 19,103 | 29,667     | 19,103 | 19,103 | 29,667   | 19,103 | 19,103 | 29,667     | 19,103 | 19,103 | 29,667                  | 19,103                  |
| 2.5                         | 1    | 1                        | 13                 | 4     | 8     | 32,119     | 20,662 | 20,662 | 32,119   | 20,662 | 20,662 | 32,119     | 20,662 | 20,662 | 32,119   | 20,662 | 20,662 | 32,119     | 20,662 | 20,662 | 32,119                  | 20,662                  |
| -2.5                        | 0    | 0                        | 0                  | 0     | 0     | 34,571     | 22,260 | 22,260 | 34,571   | 22,260 | 22,260 | 34,571     | 22,260 | 22,260 | 34,571   | 22,260 | 22,260 | 34,571     | 22,260 | 22,260 | 34,571                  | 22,260                  |
| -7.5                        | -1.5 | -1.5                     | 0                  | 0     | 0     | 37,023     | 23,639 | 23,639 | 37,023   | 23,639 | 23,639 | 37,023     | 23,639 | 23,639 | 37,023   | 23,639 | 23,639 | 37,023     | 23,639 | 23,639 | 37,023                  | 23,639                  |
| TOTALS                      |      |                          | 8,760              | 2,920 | 5,840 |            |        |        |          |        |        |            |        |        |          |        |        |            |        |        | 723                     | 584                     |

Existing Building Ventilation & Infiltration (occ) 292 cfm

Overheat Ventilation Factor 1000

Additional Ventilation to offset overheat 0 cfm

Existing Building Ventilation & Infiltration (unocc) 292 cfm

**Electrical Requirements for Heating Equipment**

| Unit  | Htg Hrs | Amps | Volts | Phase | Power Factor | Annual kWh |
|-------|---------|------|-------|-------|--------------|------------|
| UH-1  | 2,161   | 3.2  | 115   | 1     | 0.8          | 636        |
| UH-2  | 2,161   | 3.2  | 115   | 1     | 0.8          | 636        |
| UH-3  | 2,161   | 3.2  | 115   | 1     | 0.8          | 636        |
| Total |         |      |       |       |              | 1908       |

| Unit         | Htg Hrs | Amps | Volts | Phase | Power Factor | Annual kWh |
|--------------|---------|------|-------|-------|--------------|------------|
| Infrared Htr | 2,161   | 0    | 115   | 1     | 0.8          | 0          |
| Infrared Htr | 2,161   | 0    | 115   | 1     | 0.8          | 0          |
| Infrared Htr | 2,161   | 0    | 115   | 1     | 0.8          | 0          |
| Total        |         |      |       |       |              | 0          |

\*Electrical data based on Rezor RHVYN Series High Intensity Infrared Heaters  
Electrical connection for controls only with minimal draw.

| Bin   | Avg OA Temp °F | Heating Hrs | Assumed % Time of Operation | Hrs of Operation |
|-------|----------------|-------------|-----------------------------|------------------|
| 102.5 | 102.5          | 0           | 0%                          | 0                |
| 97.5  | 97.5           | 0           | 0%                          | 0                |
| 92.5  | 92.5           | 0           | 0%                          | 0                |
| 87.5  | 87.5           | 0           | 0%                          | 0                |
| 82.5  | 82.5           | 0           | 0%                          | 0                |
| 77.5  | 77.5           | 0           | 0%                          | 0                |
| 72.5  | 72.5           | 0           | 0%                          | 0                |
| 67.5  | 67.5           | 0           | 0%                          | 0                |
| 62.5  | 62.5           | 927         | 8%                          | 71               |
| 57.5  | 57.5           | 800         | 15%                         | 92               |
| 52.5  | 52.5           | 810         | 23%                         | 141              |
| 47.5  | 47.5           | 611         | 31%                         | 188              |
| 42.5  | 42.5           | 656         | 38%                         | 252              |
| 37.5  | 37.5           | 1023        | 46%                         | 472              |
| 32.5  | 32.5           | 734         | 54%                         | 395              |
| 27.5  | 27.5           | 334         | 62%                         | 206              |
| 22.5  | 22.5           | 252         | 69%                         | 174              |
| 17.5  | 17.5           | 125         | 77%                         | 96               |
| 12.5  | 12.5           | 47          | 85%                         | 40               |
| 7.5   | 7.5            | 22          | 92%                         | 20               |
| 2.5   | 2.5            | 13          | 100%                        | 13               |
| -2.5  | -2.5           | 0           | 100%                        | 0                |
| -7.5  | -7.5           | 0           | 100%                        | 0                |
| TOTAL |                | 5,954       | 36%                         | 2,161            |

NJ BPU Energy Audit Saddle River  
CHA #21351

Building: Public Safety Complex

ECM-3 Replace Unit Heaters with Infrared Heaters

| Multipliers |      |
|-------------|------|
| Material:   | 0.98 |
| Labor:      | 1.21 |
| Equipment:  | 1.09 |

| Description                            | QTY | UNIT | UNIT COSTS |        |        | SUBTOTAL COSTS |          |        | TOTAL COST | REMARKS                  |
|----------------------------------------|-----|------|------------|--------|--------|----------------|----------|--------|------------|--------------------------|
|                                        |     |      | MAT.       | LABOR  | EQUIP. | MAT.           | LABOR    | EQUIP. |            |                          |
| Unit Heater Removal                    | 3   | EA   |            | \$ 400 |        | \$ -           | \$ 1,452 | \$ -   | \$ -       |                          |
| 100 MBH Infrared High Intensity Heater | 3   | EA   | \$ 600     | \$ 250 |        | \$ 1,764       | \$ 908   | \$ -   | \$ 2,672   | Includes Disposal        |
|                                        |     |      |            |        |        |                |          |        |            | Includes Controls        |
| Miscellaneous Gas Piping, Valves, etc. | 3   | EA   | \$ 200     | \$ 250 |        | \$ 588         | \$ 908   | \$ -   | \$ 1,496   |                          |
| 4" Class B Vent Piping                 | 30  | LF   | \$ 6.70    | \$ 10  |        | \$ 197         | \$ 363   | \$ -   | \$ 560     | Use existing flue stacks |
| Miscellaneous electrical               | 1   | LS   |            | \$ 500 |        | \$ -           | \$ 605   | \$ -   | \$ 605     |                          |
|                                        |     |      |            |        |        |                |          |        |            |                          |
|                                        |     |      |            |        |        | \$ -           | \$ -     | \$ -   | \$ -       |                          |

Note: Unit selections and budgetary pricing are per Reznor RIHVN series high intensity infrared heaters.

|                |                    |
|----------------|--------------------|
| \$6,784        | Subtotal           |
| \$1,018        | 15% Contingency    |
| \$780          | 10% Contractor O&P |
| \$0            | 0% Engineering     |
| <b>\$8,582</b> | <b>Total</b>       |

## **APPENDIX E**

### **ECM-4 Furnace Replacement**

NJ BPU Energy Audit Saddle River  
CHA #21351  
Building: Public Safety Complex

ECM-4 Furnace Replacement Fire Headquarters

|                              |             |
|------------------------------|-------------|
| Building Footprint           | 3,080 SF    |
| Building Balance Temp.       | 60 °F       |
| Internal Gains               | 22,114 btuh |
| Unoc Internal Gain factor    | 0.03        |
| Ave Occ Internal Gain Factor | 0.7         |

|                                 |               |
|---------------------------------|---------------|
| Ex Occupied Cng Temp.           | 72 °F         |
| Ex Unoccupied Cng Temp.         | 72 °F         |
| Prop Occupied Cng Temp.         | 72 °F         |
| Prop Unoccupied Cng Temp.       | 71 °F         |
| Occupied Cooling UA             | -1168 btuh/°F |
| Unoccupied Cooling UA           | -538 btuh/°F  |
| Cooling Occ Enthalpy Setpoint   | 30 Btu/lb     |
| Cooling Unocc Enthalpy Setpoint | 30 Btu/lb     |

|                           |             |
|---------------------------|-------------|
| Ex Occupied Htg Temp.     | 68 °F       |
| Ex Unoccupied Htg Temp.   | 68 °F       |
| Prop Occupied Htg Temp.   | 68 °F       |
| Prop Unoccupied Htg Temp. | 68 °F       |
| Occupied Heating UA       | 354 btuh/°F |
| Unoccupied Heating UA     | 354 btuh/°F |

|                        |            |
|------------------------|------------|
| Heating Energy Savings | 233 therms |
| Cooling Energy Savings | 1,176 kWh  |

|                             |             |
|-----------------------------|-------------|
| Existing Cooling Efficiency | 1.13 kW/ton |
| Proposed Cooling Efficiency | 0.86 kW/ton |
| Existing Heating Efficiency | 80%         |
| Proposed Heating Efficiency | 95%         |

| Avg Outdoor Air Temp. Bins °F | Existing Equipment Bins Hours | Occupied Equipment Bins Hours | Unoccupied Equipment Bins Hours | EXISTING LOADS     |                       |                    |                               | PROPOSED LOADS                   |                    |                               |                                  | Existing Cooling Energy kWh | Proposed Cooling Energy kWh | Existing Heating Energy therms | Proposed Heating Energy therms |
|-------------------------------|-------------------------------|-------------------------------|---------------------------------|--------------------|-----------------------|--------------------|-------------------------------|----------------------------------|--------------------|-------------------------------|----------------------------------|-----------------------------|-----------------------------|--------------------------------|--------------------------------|
|                               |                               |                               |                                 | Envelope Load BTUH | Ventilation Load BTUH | Internal Gain BTUH | Unoccupied Envelope Load BTUH | Unoccupied Ventilation Load BTUH | Internal Gain BTUH | Unoccupied Envelope Load BTUH | Unoccupied Ventilation Load BTUH |                             |                             |                                |                                |
| 102.5                         | 49.1                          | 0                             | 0                               | -35,609            | -85,718               | -663               | -16,409                       | -85,718                          | -663               | -16,409                       | -85,718                          | 0                           | 0                           | 0                              | 0                              |
| 97.5                          | 42.5                          | 3                             | 0                               | -29,772            | -55,098               | -663               | -13,719                       | -55,098                          | -663               | -14,257                       | -55,098                          | 29                          | 22                          | 0                              | 0                              |
| 92.5                          | 36.5                          | 34                            | 0                               | -23,034            | -42,034               | -663               | -11,029                       | -42,034                          | -663               | -11,567                       | -42,034                          | 263                         | 200                         | 0                              | 0                              |
| 87.5                          | 30.5                          | 131                           | 0                               | -16,097            | -29,020               | -663               | -8,339                        | -29,020                          | -663               | -8,877                        | -29,020                          | 700                         | 593                         | 0                              | 0                              |
| 82.5                          | 24.5                          | 500                           | 0                               | -12,239            | -17,951               | -663               | -5,049                        | -17,951                          | -663               | -5,587                        | -17,951                          | 2,151                       | 1,637                       | 0                              | 0                              |
| 77.5                          | 18.5                          | 620                           | 0                               | -8,421             | -11,811               | -663               | -2,959                        | -11,811                          | -663               | -3,497                        | -11,811                          | 1,998                       | 1,292                       | 0                              | 0                              |
| 72.5                          | 12.5                          | 894                           | 0                               | -394               | -3,590                | -663               | -177                          | -3,590                           | -663               | -307                          | -3,590                           | 780                         | 1,880                       | 0                              | 0                              |
| 67.5                          | 6.5                           | 854                           | 0                               | 1,945              | 5,324                 | -663               | 1,945                         | 5,324                            | -663               | 1,177                         | 5,324                            | 1,187                       | 664                         | 0                              | 0                              |
| 62.5                          | 0.5                           | 927                           | 0                               | 3,714              | 11,309                | -663               | 3,714                         | 11,309                           | -663               | 3,714                         | 11,309                           | 26                          | 26                          | 0                              | 0                              |
| 57.5                          | 16.7                          | 610                           | 0                               | 5,462              | 16,695                | -663               | 5,462                         | 16,695                           | -663               | 5,462                         | 16,695                           | 0                           | 0                           | 51                             | 43                             |
| 52.5                          | 16.2                          | 611                           | 0                               | 7,250              | 22,080                | -663               | 7,250                         | 22,080                           | -663               | 7,250                         | 22,080                           | 0                           | 0                           | 106                            | 89                             |
| 47.5                          | 14.4                          | 656                           | 0                               | 9,019              | 27,466                | -663               | 9,019                         | 27,466                           | -663               | 9,019                         | 27,466                           | 0                           | 0                           | 172                            | 145                            |
| 42.5                          | 12.6                          | 1,023                         | 0                               | 10,787             | 32,851                | -663               | 10,787                        | 32,851                           | -663               | 10,787                        | 32,851                           | 0                           | 0                           | 360                            | 303                            |
| 37.5                          | 10.7                          | 734                           | 0                               | 12,555             | 38,236                | -663               | 12,555                        | 38,236                           | -663               | 12,555                        | 38,236                           | 0                           | 0                           | 324                            | 273                            |
| 32.5                          | 8.6                           | 334                           | 0                               | 14,324             | 43,622                | -663               | 14,324                        | 43,622                           | -663               | 14,324                        | 43,622                           | 0                           | 0                           | 177                            | 149                            |
| 27.5                          | 6.8                           | 252                           | 0                               | 16,092             | 49,007                | -663               | 16,092                        | 49,007                           | -663               | 16,092                        | 49,007                           | 0                           | 0                           | 156                            | 132                            |
| 22.5                          | 5.5                           | 125                           | 0                               | 17,860             | 54,392                | -663               | 17,860                        | 54,392                           | -663               | 17,860                        | 54,392                           | 0                           | 0                           | 89                             | 75                             |
| 17.5                          | 4.1                           | 47                            | 0                               | 19,629             | 59,778                | -663               | 19,629                        | 59,778                           | -663               | 19,629                        | 59,778                           | 0                           | 0                           | 38                             | 32                             |
| 12.5                          | 2.6                           | 22                            | 0                               | 21,397             | 65,163                | -663               | 21,397                        | 65,163                           | -663               | 21,397                        | 65,163                           | 0                           | 0                           | 20                             | 16                             |
| 7.5                           | 1                             | 13                            | 0                               | 23,165             | 70,549                | -663               | 23,165                        | 70,549                           | -663               | 23,165                        | 70,549                           | 0                           | 0                           | 13                             | 11                             |
| -2.5                          | 0                             | 0                             | 0                               | 24,934             | 75,934                | -663               | 24,934                        | 75,934                           | -663               | 24,934                        | 75,934                           | 0                           | 0                           | 0                              | 0                              |
| -7.5                          | -1.5                          | 0                             | 0                               | 26,702             | 81,319                | -663               | 26,702                        | 81,319                           | -663               | 26,702                        | 81,319                           | 0                           | 0                           | 0                              | 0                              |
| TOTALS                        |                               | 8,760                         | 8,760                           | 0                  |                       |                    |                               |                                  |                    |                               |                                  | 7,578                       | 6,402                       | 1,505                          | 1,268                          |

Existing Building Ventilation & Infiltration (occ) 997 cfm  
Overheat Ventilation Factor 1.00  
Additional ventilation to offset overheat 0 cfm  
Existing Building Ventilation & Infiltration (unocc) 997 cfm

NJ BPU Energy Audit Saddle River  
CHA #21351

Building: Public Safety Complex

ECM-4 Furnace Replacement

|             |      |
|-------------|------|
| Multipliers |      |
| Material:   | 0.98 |
| Labor:      | 1.21 |
| Equipment:  | 1.09 |

| Description                                   | QTY | UNIT | UNIT COSTS |        |        | SUBTOTAL COSTS |          |        | TOTAL COST | REMARKS           |
|-----------------------------------------------|-----|------|------------|--------|--------|----------------|----------|--------|------------|-------------------|
|                                               |     |      | MAT.       | LABOR  | EQUIP. | MAT.           | LABOR    | EQUIP. |            |                   |
| Furnace Removal                               | 1   | EA   |            | \$ 240 |        | \$ -           | \$ 290   | \$ -   | \$ 290     |                   |
| Condensing Unit Removal                       | 1   | EA   |            | \$ 300 |        | \$ -           | \$ 363   | \$ -   | \$ 363     |                   |
| 125 MBH High Efficiency Condensing Furnace    | 1   | EA   | \$ 900     | \$ 700 |        | \$ 882         | \$ 847   | \$ -   | \$ 1,729   | Includes Controls |
| 5 Ton High Efficiency Outdoor Condensing Unit | 1   | EA   | \$ 2,100   | \$ 830 |        | \$ 2,058       | \$ 1,004 | \$ -   | \$ 3,062   |                   |
| Miscellaneous Electrical and Ductwork         | 1   | LS   | \$ 300     |        |        | \$ 294         | \$ -     | \$ -   | \$ 294     |                   |
|                                               |     |      |            |        |        | \$ -           | \$ -     | \$ -   | \$ -       |                   |
|                                               |     |      |            |        |        | \$ -           | \$ -     | \$ -   | \$ -       |                   |
|                                               |     |      |            |        |        | \$ -           | \$ -     | \$ -   | \$ -       |                   |
|                                               |     |      |            |        |        | \$ -           | \$ -     | \$ -   | \$ -       |                   |

|          |                   |
|----------|-------------------|
| \$ 5,739 | Subtotal          |
| \$ 287   | 5% Contingency    |
| \$ 301   | Contractor 5% O&P |
| \$ -     | 0% Engineering    |
| \$ 6,327 | Total             |

| New Jersey Smart Start Incentive Program | QTY | UNIT | \$/UNIT | TOTAL SAVINGS | Cost W/O INCENTIVE | Cost W/ INCENTIVE |
|------------------------------------------|-----|------|---------|---------------|--------------------|-------------------|
|                                          |     |      |         |               |                    |                   |
| Gas-Fired Furnace                        | 1   | EA   | \$300   | \$300         | \$ 1,729           | \$ 1,429          |
| Split system <5.4 tons                   | 5   | Tons | \$92    | \$460         | \$ 3,062           | \$ 2,602          |
|                                          |     |      |         | \$760         | \$4,791            | \$4,031           |

|                              |         |
|------------------------------|---------|
| Total ECM Cost w/ Incentives | \$5,567 |
|------------------------------|---------|

## **APPENDIX F**

### **ECM-5 Boiler Replacement with HW Temperature Reset**

NJ BPU Energy Audit Saddle River  
CHA #21351  
Building: Public Safety Complex

ECM-5 Boiler Replacement with HW Temperature Reset

|               |         |   |
|---------------|---------|---|
| Existing Fuel | Nat.Gas | ▼ |
| Proposed Fuel | Nat.Gas | ▼ |

| Item                             | Value      | Units   | Formula/Comments                                             |
|----------------------------------|------------|---------|--------------------------------------------------------------|
| Baseline Fuel Cost               | \$ 1.13    |         |                                                              |
| Proposed Fuel Cost               | \$ 1.13    |         |                                                              |
| Baseline Fuel Use                | 1,762      | Therms  | Based on historical utility data                             |
| Existing Boiler Plant Efficiency | 76%        |         | Estimated or Measured                                        |
| Baseline Boiler Load             | 133,884    | Mbtu/yr | Baseline Fuel Use x Existing Efficiency x 100 Mbtu/Therms    |
| Baseline Fuel Cost               | \$ 1,987   |         |                                                              |
| Proposed Boiler Plant Efficiency | 95%        |         | New Boiler Efficiency per Aerco Modulex MLX - 454 Boiler     |
| Proposed Fuel Use                | 1,403      | Therms  | Baseline Boiler Load / Proposed Efficiency / 100 Mbtu/Therms |
| Proposed Fuel Cost               | \$ 1,583   |         |                                                              |
| Annual Savings                   | 358        | Therms  |                                                              |
| Annual Savings                   | \$ 404 /yr |         |                                                              |

NJ BPU Energy Audit Saddle River  
CHA #21351  
Building: Public Safety Complex

**ECM-5. Boiler Replacement with HW Temperature Reset**

**Description**

Existing heating hot water (HHW) average loop temperature is 165°F.

**Proposed:**

Vary heating hot water supply temperature as building heating load decreases in relation to outside air temperature.

| Existing Boiler Efficiency      | 76% |
|---------------------------------|-----|
| Avg. Proposed Boiler Efficiency | 95% |

| A                | B                   | C            | D                 | E                                | F                          | G                                | H                          | I                              | J                              |
|------------------|---------------------|--------------|-------------------|----------------------------------|----------------------------|----------------------------------|----------------------------|--------------------------------|--------------------------------|
| Amb. Bin Temp °F | Avg. DB Bin Temp °F | Bin Hours    | Heating Bin HOURS | Existing Heat Loss In Piping MBH | Avg. HHW Temp @ OA Temp °F | Proposed Heat Loss In Piping MBH | Proposed Boiler Efficiency | Existing Utility Use Therms/Yr | Proposed Utility Use Therms/Yr |
| 100-104          | 102.0               | 0            | 0                 | 0                                | 0                          | 0                                | 0.0%                       | 0                              | 0                              |
| 95-99            | 97.0                | 3            | 0                 | 0                                | 0                          | 0                                | 0.0%                       | 0                              | 0                              |
| 90-94            | 92.0                | 34           | 0                 | 0                                | 0                          | 0                                | 0.0%                       | 0                              | 0                              |
| 85-89            | 87.0                | 131          | 0                 | 0                                | 0                          | 0                                | 0.0%                       | 0                              | 0                              |
| 80-84            | 82.0                | 500          | 0                 | 0                                | 0                          | 0                                | 0.0%                       | 0                              | 0                              |
| 75-79            | 77.0                | 620          | 0                 | 0                                | 0                          | 0                                | 0.0%                       | 0                              | 0                              |
| 70-74            | 72.0                | 664          | 0                 | 0                                | 0                          | 0                                | 0.0%                       | 0                              | 0                              |
| 65-69            | 67.0                | 854          | 0                 | 0                                | 0                          | 0                                | 0.0%                       | 0                              | 0                              |
| 60-64            | 62.0                | 927          | 927               | 10,145                           | 70                         | 5,340                            | 98.5%                      | 103                            | 54                             |
| 55-59            | 57.0                | 600          | 600               | 6,566                            | 78                         | 3,456                            | 98.0%                      | 67                             | 35                             |
| 50-54            | 52.0                | 610          | 610               | 6,676                            | 86                         | 3,514                            | 97.5%                      | 68                             | 36                             |
| 45-49            | 47.0                | 611          | 611               | 6,687                            | 94                         | 3,519                            | 96.5%                      | 69                             | 36                             |
| 40-44            | 42.0                | 656          | 656               | 7,179                            | 102                        | 3,779                            | 95.5%                      | 75                             | 40                             |
| 35-39            | 37.0                | 1,023        | 1,023             | 11,196                           | 110                        | 5,892                            | 94.5%                      | 118                            | 62                             |
| 30-34            | 32.0                | 734          | 734               | 8,033                            | 118                        | 4,228                            | 93.0%                      | 86                             | 45                             |
| 25-29            | 27.0                | 334          | 334               | 3,655                            | 125                        | 1,924                            | 91.7%                      | 40                             | 21                             |
| 20-24            | 22.0                | 252          | 252               | 2,758                            | 133                        | 1,452                            | 90.8%                      | 30                             | 16                             |
| 15-19            | 17.0                | 125          | 125               | 1,368                            | 141                        | 720                              | 89.2%                      | 15                             | 8                              |
| 10-14            | 12.0                | 47           | 47                | 514                              | 149                        | 271                              | 88.1%                      | 6                              | 3                              |
| 5-9              | 7.0                 | 22           | 22                | 241                              | 157                        | 127                              | 87.8%                      | 3                              | 1                              |
| 0-4              | 2.0                 | 13           | 13                | 142                              | 165                        | 75                               | 87.0%                      | 2                              | 1                              |
| -5--1            | -3.0                | 0            | 0                 | 0                                | 165                        | 0                                | 87.0%                      | 0                              | 0                              |
| -10--6           | -8.0                | 0            | 0                 | 0                                | 165                        | 0                                | 87.0%                      | 0                              | 0                              |
| <b>Totals</b>    |                     | <b>8,760</b> | <b>5,954</b>      | <b>65,161</b>                    |                            | <b>34,295</b>                    |                            | <b>684</b>                     | <b>360</b>                     |

| Annual Energy Savings | \$ | 324 | Therms/yr |
|-----------------------|----|-----|-----------|
| Annual Cost Savings   |    | 387 | /yr       |

**Comments:**

- A-C Newark, NJ weather bins
- D Based on building balance points and bin data.
- E Existing heat loss in piping system based on current average HHW temperature.
- F Estimated Average HHW temperature with HW reset based on OA temperature.
- G Proposed heat loss in piping system based on estimated average HW temperature. Return HHW temp min 60 deg F
- H Proposed boiler efficiency based return water temperature and boiler efficiency curve for Aerco Modulex MLX - 454 Boiler
- I-J Utility usage to overcome heat loss in HHW piping system based on boiler efficiency.

| Building HHW Piping System |  |        |           |
|----------------------------|--|--------|-----------|
| Heating On Temperature     |  |        | 65 °F     |
| Total Length of Pipe       |  |        | 960 LF    |
| Existing HHW Setpoint High |  |        | 175 °F    |
| Existing HHW Setpoint Low  |  |        | 155 °F    |
| Avg HHW Temp               |  |        | 165 °F    |
| Avg Pipe Size              |  | 1      | Inches    |
| Avg Insul Thickness        |  | 1      | Inches    |
| Existing Heat Loss         |  | 11.4   | Btu/Hr/LF |
| Percent in Uncond. Space   |  | 100%   |           |
| Existing System Heat Loss  |  | 10,944 | Btu/Hr    |
| Proposed Min HHW Return*   |  |        | 60 °F     |
| Avg Prop HHW Supply Temp   |  |        | 99 °F     |
| Proposed Heat Loss         |  | 6.0    | Btu/Hr/LF |
| Proposed System Heat Loss  |  | 5,760  | Btu/Hr    |

\*Refer to proposed boiler capabilities

| Size (in) | Length (ft) |
|-----------|-------------|
| 1/2       | 110         |
| 3/4       | 220         |
| 1         | 185         |
| 1 1/4     | 100         |
| 1 1/2     | 185         |
| 2         | 160         |
| 2 1/2     | 0           |
| 3         | 0           |
| 1         | Average     |

NJ BPU Energy Audit Saddle River  
CHA #21351  
Building: Public Safety Complex

| Multipliers |      |
|-------------|------|
| Material:   | 0.98 |
| Labor:      | 1.21 |
| Equipment:  | 1.09 |

**ECM-5 Boiler Replacement with HW Temperature Reset**

| Description                               | QTY | UNIT | UNIT COSTS |          |        | SUBTOTAL COSTS |          |        | TOTAL COST | REMARKS                      |
|-------------------------------------------|-----|------|------------|----------|--------|----------------|----------|--------|------------|------------------------------|
|                                           |     |      | MAT.       | LABOR    | EQUIP. | MAT.           | LABOR    | EQUIP. |            |                              |
| Boiler Removal                            | 1   | EA   |            | \$ 500   |        | \$ -           | \$ 605   | \$ -   | \$ 605     |                              |
| 1,000 MBH Gas-Fired Condensing HW Boiler* | 1   | EA   | \$ 9,500   | \$ 3,500 |        | \$ 9,310       | \$ 4,235 | \$ -   | \$ 13,545  | Includes freight and startup |
| Condensate Neutralization Kit             | 1   | EA   | \$ 300     | \$ 250   |        | \$ 294         | \$ 303   | \$ -   | \$ 597     |                              |
| Flue Replacement                          | 20  | LF   | \$ 8.5     | \$ 7.00  |        | \$ 167         | \$ 169   | \$ -   | \$ 336     | 4" PVC Piping                |
| Miscellaneous Electrical                  | 1   | LS   | \$ 250     | \$ 200   |        | \$ 245         | \$ 242   | \$ -   | \$ 487     |                              |
| Miscellaneous HW Piping                   | 1   | LS   | \$ 250     | \$ 200   |        | \$ 245         | \$ 242   | \$ -   | \$ 487     |                              |
| Miscellaneous Gas Piping                  | 1   | LS   | \$ 250     | \$ 200   |        | \$ 245         | \$ 242   | \$ -   | \$ 487     |                              |
|                                           |     |      |            |          |        | \$ -           | \$ -     | \$ -   | \$ -       |                              |
|                                           |     |      |            |          |        | \$ -           | \$ -     | \$ -   | \$ -       |                              |

\*Pricing based on Aerco Modulex MLX - 454 Boiler. Boiler comes equipped with HW temperature reset controls.

|           |                    |
|-----------|--------------------|
| \$ 16,544 | Subtotal           |
| \$ 1,654  | 10% Contingency    |
| \$ 1,820  | 10% Contractor O&P |
| \$ -      | 0% Engineering     |
| \$ 20,018 | Total              |

| New Jersey Smart Start Incentive Program | QTY   | UNIT | \$ / UNIT | TOTAL SAVINGS | Cost W/O INCENTIV | Cost W/ INCENTIVE |
|------------------------------------------|-------|------|-----------|---------------|-------------------|-------------------|
|                                          |       |      |           |               |                   |                   |
| NG Boilers ≥ 300 - 1500 MBH              | 1,000 | MBH  | \$1.75    | \$1,750       | \$ 13,545         | \$ 11,795         |
|                                          |       |      |           |               |                   |                   |
|                                          |       |      |           | \$1,750       | \$13,545          | \$11,795          |

Total ECM Cost w/ Incentives **\$18,268**

## **APPENDIX G**

### **ECM-6 Lighting Replacements**

**Cost of Electricity:**

| EXISTING CONDITIONS |                                                                                    |                 |                                                                                                                                                  |                   |                                               |                             |              |                                    |                                       | RETROFIT CONDITIONS   |                                                           |                   |                                               |                                                        |                                    |                                                       |                                                    |                                              |                                                                                       | COST & SAVINGS ANALYSIS                                                        |     |  |  |  |
|---------------------|------------------------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------------|-----------------------------|--------------|------------------------------------|---------------------------------------|-----------------------|-----------------------------------------------------------|-------------------|-----------------------------------------------|--------------------------------------------------------|------------------------------------|-------------------------------------------------------|----------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-----|--|--|--|
| Field Code          | Area Description of the location - Room number(s) and floor number (if applicable) | No. of Features | Standard Feature Code*<br>*Lighting Feature Code* Example: 28 34 R F 2 (MAG)<br>*Watts per Fixture Example: 72<br>*Watts per Fixture Example: 72 | Watts per Fixture | WWSpace*<br>(Watt/m <sup>2</sup> ) (Fut. No.) | Exist. Pre-inst. (Fut. No.) | Annual Hours | Annual kWh (WWSpace* Annual Hours) | Number of Features after the retrofit | Standard Feature Code | Fixture Code - Table of Standard Feature Code and Wattage | Watts per Fixture | WWSpace*<br>(Watt/m <sup>2</sup> ) (Fut. No.) | Retrofit Cost - Estimated cost for new lighting device | Annual kWh (WWSpace* Annual Hours) | Annual kWh Saved (Original Annual (kWh) - Annual kWh) | Annual \$ Saved (Original Annual (\$)) - Annual \$ | Retrofit Cost - Cost for new lighting device | NJ Lighting Incentive - Length of time (in months) for which the cost to be recovered | Simple Payback - Length of time (in months) for which the cost to be recovered |     |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         | 831                                | 1                                     | 21 TR F 2 (ELE)       | F22LL                                                     | 33                | 0.0                                           | SW                                                     | 8760                               | 249                                                   | 342.0                                              | \$ 51.34                                     | \$ 121.25                                                                             | 315                                                                            | 2.0 |  |  |  |
| 4                   | FINQ Vestibule                                                                     | 1               | 28 34 R F 2 (MAG)                                                                                                                                | 72                | 0.1                                           | SW                          | 8760         |                                    |                                       |                       |                                                           |                   |                                               |                                                        |                                    |                                                       |                                                    |                                              |                                                                                       |                                                                                |     |  |  |  |

## **APPENDIX H**

### **ECM-7 Install Occupancy Sensors**

**Cost of Electricity:**

[illegible]

## **APPENDIX I**

### **ECM-8 Lighting Replacements with Occupancy Sensors**

| EXISTING CONDITIONS |                                                                                                        |                                                                      |                                                                                        |                                                                         |                                                                        |                                  |                                 |                                                 |                                         | RETROFIT CONDITIONS                                                     |                                                                                        |                                                                  |                                                                        |                                  |                                                     |                                                 |                                         |                                                                 |                                      | COST & SAVINGS ANALYSIS                   |                                                                            |                                                                     |     |  |  |  |  |  |  |
|---------------------|--------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------------|----------------------------------|---------------------------------|-------------------------------------------------|-----------------------------------------|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------------------------|----------------------------------|-----------------------------------------------------|-------------------------------------------------|-----------------------------------------|-----------------------------------------------------------------|--------------------------------------|-------------------------------------------|----------------------------------------------------------------------------|---------------------------------------------------------------------|-----|--|--|--|--|--|--|
| Field Code          | Area Description<br>Unique description of the location. Room numbers and/or room names (if applicable) | No. of Features<br>No. of fixtures, room numbers, etc. (if retrofit) | Standard Feature Code<br>"Legacy Feature Code" Example: "F1000" (Floor 2 lamp U shape) | NYSEDA Feature Code<br>Code from "List of Standard Feature Wavelengths" | Watts per Fixture<br>Value from "List of Standard Feature Wavelengths" | kW/Space<br>(Watt/ft²) (ft² No.) | Exist. Fixt. (Pre-inst. device) | Annual Hours<br>Estimated data from image group | Annual kWh<br>(kWh/year) (Annual Hours) | Number of Features<br>No. of fixtures, room numbers, etc. (if retrofit) | Standard Feature Code<br>"Legacy Feature Code" Example: "F1000" (Floor 2 lamp U shape) | Feature Code<br>Code from "List of Standard Feature Wavelengths" | Watts per Fixture<br>Value from "List of Standard Feature Wavelengths" | kW/Space<br>(Watt/ft²) (ft² No.) | Retrofit Control<br>Retired fixture, control device | Annual Hours<br>Estimated data from image group | Annual kWh<br>(kWh/year) (Annual Hours) | Annual kWh Saved<br>(Original Annual kWh - Retrofit Annual kWh) | Annual \$ Saved<br>(kWh Saved) (kWh) | Retrofit Cost<br>Cost for lighting system | NJ Lighting Incentive<br>Length of time (months) that cost to be recovered | Simple Payback<br>Length of time (months) that cost to be recovered |     |  |  |  |  |  |  |
| 1                   | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 2                   | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 3                   | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 4                   | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 5                   | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 6                   | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 7                   | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 8                   | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 9                   | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 10                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 11                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 12                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 13                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 14                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 15                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 16                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 17                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 18                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 19                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 20                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 21                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 22                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 23                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 24                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 25                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 26                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 27                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 28                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 29                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 30                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 31                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 32                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 33                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 34                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 35                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 36                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 37                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 38                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 39                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 40                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 41                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 42                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 43                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 44                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 45                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 46                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 47                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 48                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 49                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 50                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 51                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 52                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 53                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 54                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 55                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 56                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 57                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |
| 58                  | F1000 (Floor 2 lamp U shape)                                                                           | 1                                                                    | F1000                                                                                  | F1000                                                                   | 60                                                                     | 0.1                              | SW                              | 8760                                            | 60                                      | 1                                                                       | F1000                                                                                  | F1000                                                            | 60                                                                     | 0.1                              | None                                                | 8760                                            | 288                                     | 34.08                                                           | \$ 3.54                              | \$ 101.25                                 | 15                                                                         | 2.0                                                                 | 1.7 |  |  |  |  |  |  |

## **APPENDIX J**

### **New Jersey Pay For Performance Incentive Program**

**NJ BPU Energy Audit Saddle River**  
**CHA #21351**  
**Building: Public Safety Complex**

**New Jersey Pay For Performance Incentive Program**

**Note:** The following calculation is based on the New Jersey Pay For Performance Incentive Program per April, 2010. Building must have a minimum average electric demand of 200 kW. This minimum is waived for buildings owned by local governments or non-profit organizations. The incentive values represented below are applicable through December 31, 2010.

|                                          |        |
|------------------------------------------|--------|
| Total Building Area (Square Feet)        | 16,816 |
| Is this audit funded by the NJ BPU (Y/N) | Yes    |

Bureau of Public Utilities (BPU)

| Incentive #1               |        |         |
|----------------------------|--------|---------|
| Audit not funded by NJ BPU | \$0.10 | \$/sqft |
| Audit is funded by NJ BPU  | \$0.05 | \$/sqft |

|                               | Annual Utilities |         |
|-------------------------------|------------------|---------|
|                               | kWh              | Therms  |
| Existing Cost (from utility)  | \$35,540         | \$4,630 |
| Existing Usage (from utility) | 224,080          | 4,110   |
| Proposed Savings              | 70,360           | 670     |
| Existing Total MMBtus         | 1,176            |         |
| Proposed Savings MMBtus       | 307              |         |
| % Energy Reduction            | 26.1%            |         |
| Proposed Annual Savings       | \$12,200         |         |

|              | ≥ %15  |          |
|--------------|--------|----------|
|              | \$/kWh | \$/therm |
| Incentive #2 | \$0.11 | \$1.10   |
| Incentive #3 | \$0.07 | \$0.70   |

|                      | Incentives \$ |         |          |
|----------------------|---------------|---------|----------|
|                      | Elec          | Gas     | Total    |
| Incentive #1         | \$0           | \$0     | \$841    |
| Incentive #2         | \$7,740       | \$737   | \$8,477  |
| Incentive #3         | \$4,925       | \$469   | \$5,394  |
| Total All Incentives | \$12,665      | \$1,206 | \$14,712 |

|                    |          |
|--------------------|----------|
| Total Project Cost | \$67,200 |
|--------------------|----------|

|                                   | Allowable Incentive |         |
|-----------------------------------|---------------------|---------|
| % Incentives #1 of Utility Cost*  | 2.1%                | \$841   |
| % Incentives #2 of Project Cost** | 12.6%               | \$8,477 |
| % Incentives #3 of Project Cost** | 8.0%                | \$5,394 |
| Total Eligible Incentives***      | \$14,712            |         |
| Project Cost w/ Incentives        | \$52,488            |         |

| Project Payback (years) |               |
|-------------------------|---------------|
| w/o Incentives          | w/ Incentives |
| 5.5                     | 4.3           |

\* Maximum allowable incentive is 50% of annual utility cost if not funded by NJ BPU, and %25 if it is.

\*\* Maximum allowable amount of Incentive #2 is 30% of total project cost.

Maximum allowable amount of Incentive #3 is 20% of total project cost.

\*\*\* Maximum allowable amount of Incentive #1 is \$50,000 if not funded by NJ BPU, and \$25,000 if it is.

Maximum allowable amount of Incentive #2 & #3 is \$1 million per gas account and \$1 million per electric account

## **APPENDIX K**

### **Photovoltaic (PV) Rooftop Solar Power Generation**

**Borough of Saddle River  
Public Safety Complex**

Cost of Electricity      \$0.159      \$/kWh  
System Capacity      30.0      kW

**Photovoltaic (PV) Rooftop Solar Power Generation**

| Budgetary<br>Cost | Annual Utility Savings |               |          |                | Estimated<br>Maintenance<br>Savings | Total<br>Savings | New Jersey<br>Renewable<br>* Energy<br>Incentive | New Jersey<br>Renewable<br>** SREC | Payback<br>(without<br>incentive) | Payback<br>(with<br>incentive) |
|-------------------|------------------------|---------------|----------|----------------|-------------------------------------|------------------|--------------------------------------------------|------------------------------------|-----------------------------------|--------------------------------|
|                   | kW                     | kWh           | therms   | \$             |                                     |                  |                                                  |                                    |                                   |                                |
| \$                | 0.0                    | 35,490        | 0        | \$5,600        | \$ 0                                | \$5,600          | \$                                               | \$                                 | Years                             | Years                          |
| <b>\$240,000</b>  | <b>0.0</b>             | <b>35,490</b> | <b>0</b> | <b>\$5,600</b> | <b>0</b>                            | <b>\$5,600</b>   | <b>\$22,500</b>                                  | <b>\$17,300</b>                    | <b>42.9</b>                       | <b>9.5</b>                     |

Note: Budgetary cost is based on \$8,000/kW.

\*Incentive based on New Jersey renewable energy program for non-residential applications(PV)= \$0.75/W of installed PV system

\*\* Estimated Solar Renewable Energy Certificate Program (SREC) SREC for 15 Years= \$487/1000kwh

Estimated Solar Renewable Energy Certificate Program (SREC) payments for 15 Years from RR Renewable Energy Consultants

| Year       | SREC       |
|------------|------------|
| 1          | 600        |
| 2          | 600        |
| 3          | 600        |
| 4          | 500        |
| 5          | 500        |
| 6          | 500        |
| 7          | 500        |
| 8          | 500        |
| 9          | 500        |
| 10         | 500        |
| 11         | 400        |
| 12         | 400        |
| 13         | 400        |
| 14         | 400        |
| 15         | 400        |
| <b>AVG</b> | <b>487</b> |



\*\*\*

# AC Energy & Cost Savings



(Type comments here to appear on printout; maximum 1 row of 80 characters.)

| Station Identification   |            |
|--------------------------|------------|
| City:                    | Newark     |
| State:                   | New_Jersey |
| Latitude:                | 40.70° N   |
| Longitude:               | 74.17° W   |
| Elevation:               | 9 m        |
| PV System Specifications |            |
| DC Rating:               | 30.0 kW    |
| DC to AC Derate Factor:  | 0.770      |
| AC Rating:               | 23.1 kW    |
| Array Type:              | Fixed Tilt |
| Array Tilt:              | 40.7°      |
| Array Azimuth:           | 180.0°     |
| Energy Specifications    |            |
| Cost of Electricity:     | 15.9 ¢/kWh |

| Results |                                              |                    |                      |
|---------|----------------------------------------------|--------------------|----------------------|
| Month   | Solar Radiation<br>(kWh/m <sup>2</sup> /day) | AC Energy<br>(kWh) | Energy Value<br>(\$) |
| 1       | 3.36                                         | 2483               | 394.80               |
| 2       | 4.05                                         | 2682               | 426.44               |
| 3       | 4.58                                         | 3253               | 517.23               |
| 4       | 4.84                                         | 3179               | 505.46               |
| 5       | 5.30                                         | 3503               | 556.98               |
| 6       | 5.33                                         | 3304               | 525.34               |
| 7       | 5.27                                         | 3336               | 530.42               |
| 8       | 5.25                                         | 3302               | 525.02               |
| 9       | 5.06                                         | 3203               | 509.28               |
| 10      | 4.46                                         | 3016               | 479.54               |
| 11      | 3.15                                         | 2153               | 342.33               |
| 12      | 2.87                                         | 2076               | 330.08               |
| Year    | 4.46                                         | 35490              | 5642.91              |

Output Hourly Performance Data

Output Results as Text

\*

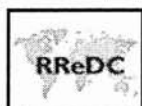
About the Hourly Performance Data

Saving Text from a Browser

Run PVWATTS v.1 for another US location or an International location  
Run PVWATTS v.2 (US only)

Please send questions and comments regarding PVWATTS to Webmaster

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## Cautions for Interpreting the Results

The monthly and yearly energy production are modeled using the PV system parameters you selected and weather data that are typical or representative of long-term averages. For reference, or comparison with local information, the solar radiation values modeled for the PV array are included in the performance results.

Because weather patterns vary from year-to-year, the values in the tables are better indicators of long-term performance than performance for a particular month or year. PV performance is largely proportional to the amount of solar radiation received, which may vary from the long-term average by  $\pm 30\%$  for monthly values and  $\pm 10\%$  for yearly values. How the solar radiation might vary for your location may be evaluated by examining the tables in the *Solar Radiation Data Manual for Flat-Plate and Concentrating Collectors* ([http://rredc.nrel.gov/solar/old\\_data/nsrdb/redbook/](http://rredc.nrel.gov/solar/old_data/nsrdb/redbook/)).

For these variations and the uncertainties associated with the weather data and the model used to model the PV performance, future months and years may be encountered where the actual PV performance is less than or greater than the values shown in the table. The variations may be as much as 40% for individual months and up to 20% for individual years. Compared to long-term performance over many years, the values in the table are accurate to within 10% to 12%.

If the default overall DC to AC derate factor is used, the energy values in the table will overestimate the actual energy production if nearby buildings, objects, or other PV modules and array structure shade the PV modules; if tracking mechanisms for one- and two-axis tracking systems do not keep the PV arrays at the optimum orientation with respect to the sun's position; if soiling or snow cover related losses exceed 5%; or if the system performance has degraded from new. (PV performance typically degrades 1% per year.) If any of these situations exist, an overall DC to AC derate factor should be used with PVWATTS that was calculated using system specific component derate factors for *shading, sun-tracking, soiling, and age*.

The PV system size is the nameplate DC power rating. The energy production values in the table are valid only for crystalline silicon PV systems.

The cost savings are determined as the product of the number of kilowatt hours (kWh) and the cost of electricity per kWh. These cost savings occur if the owner uses all the electricity produced by the PV system, or if the owner has a net-metering agreement with the utility. With net-metering, the utility bills the owner for the net electricity consumed. When electricity flows from the utility to the owner, the meter spins forward. When electricity flows from the PV system to the utility, the meter spins backwards.

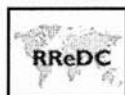
If net-metering isn't available and the PV system sends surplus electricity to the utility grid, the utility generally buys the electricity from the owner at a lower price than the owner pays the utility for electricity. In this case, the cost savings shown in the table should be reduced.

Besides the cost savings shown in the table, other benefits of PV systems include greater energy independence and a reduction in fossil fuel usage and air pollution. For commercial customers, additional cost savings may come from reducing demand charges. Homeowners can often include the cost of the PV system in their home mortgage as a way of accommodating the PV system's initial cost.

To accelerate the use of PV systems, many state and local governments offer financial incentives and programs. Go to <http://www.nrel.gov/stateandlocal> for more information.

Please send questions and comments to Webmaster

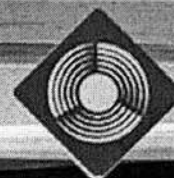
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## **APPENDIX L**

### **Solar Thermal Domestic Hot Water Plant**


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*Fire Headquarters*

### Solar Water Heating Calculator

Water heating is a major energy consumer. Although the energy consumed daily is often less than for air conditioning or heating, it is required year round, making it a good application of solar energy. Use this calculator to explore the energy usage of your water heater, and to estimate whether a solar water heater could save you money.

| Water Heater Characteristics                                         |       |                                                                     |     |
|----------------------------------------------------------------------|-------|---------------------------------------------------------------------|-----|
| Physical                                                             |       | Thermal                                                             |     |
| <input type="text" value="2"/> Diameter (feet)                       | 2     | <input type="text" value="50"/> Water Inlet Temperature (Degrees F) | 50  |
| <input type="text" value="40"/> Capacity (gallons)                   | 40    | <input type="text" value="68"/> Ambient Temperature (Degrees F)     | 68  |
| <input type="text" value="16.98"/> Surface Area (calculated - sq ft) | 16.98 | <input type="text" value="120"/> Hot Water Temperature (Degrees F)  | 120 |
| <input type="text" value="NaN"/> Effective R-value                   | NaN   | <input type="text" value="38"/> Hot Water Usage (Gallons per Day)   | 38  |
| Energy Use                                                           |       |                                                                     |     |
| <input type="text" value="909.9"/>                                   |       | <input type="text" value=""/> Heat Delivered in Hot Water (BTU/hr)  |     |
| <input type="text" value="0"/>                                       |       | <input type="text" value=""/> Heat loss through insulation (BTU/hr) |     |

| Gas vs. Electric Water Heating                                  |                                                             |                                                         |
|-----------------------------------------------------------------|-------------------------------------------------------------|---------------------------------------------------------|
| Gas                                                             |                                                             | Electric                                                |
| <input type="text" value="0.8"/>                                | <input type="text" value=""/> Overall Efficiency            | <input type="text" value="0.98"/>                       |
| <input type="text" value="0.8"/>                                | <input type="text" value=""/> Conversion Efficiency         | <input type="text" value="0.98"/>                       |
| <input type="text" value="1137"/> BTU/hr                        | <input type="text" value=""/> Power Into Water Heater       | <input type="text" value="928.5"/> BTU/hr               |
| Cost                                                            |                                                             |                                                         |
| <input type="text" value="\$ 1.128"/> /Therm                    | <input type="text" value=""/> Utility Rates                 | <input type="text" value="\$ 0.159"/> /kWh              |
| <input type="text" value="\$ 112.350"/>                         | <input type="text" value=""/> Yearly Water Heating Cost     | <input type="text" value="\$ 378.761"/>                 |
| How Does Solar Compare?                                         |                                                             |                                                         |
| <input type="text" value=""/> Solar Water Heater Cost: \$ 27100 |                                                             | <input type="text" value=""/> Percentage Solar: 70      |
| <input type="text" value="344.585"/> years for gas              | <input type="text" value=""/> Payback Time for Solar System | <input type="text" value="102.212"/> years for electric |

**NJBPU Energy Audits**  
**CHA #21351**  
**Borough of Saddle River - Public Safety Complex**  
**Fire Headquarters**

| Multipliers |      |
|-------------|------|
| Material:   | 0.98 |
| Labor:      | 1.21 |
| Equipment:  | 1.09 |

| Description                  | QTY | UNIT | UNIT COSTS |          |          | SUBTOTAL COSTS |          |          | TOTAL COST | REMARKS |
|------------------------------|-----|------|------------|----------|----------|----------------|----------|----------|------------|---------|
|                              |     |      | MAT.       | LABOR    | EQUIP.   | MAT.           | LABOR    | EQUIP.   |            |         |
| Synergy Solar Thermal System | 2   | ea   |            |          | \$ 3,600 | \$ -           | \$ -     | \$ 7,848 | \$ 7,848   |         |
| Piping modifications         | 1   | ls   | \$ 2,000   | \$ 3,500 |          | \$ 1,960       | \$ 4,235 | \$ -     | \$ 6,195   |         |
| Electrical modifications     | 1   | ls   | \$ 1,000   | \$ 1,000 |          | \$ 980         | \$ 1,210 | \$ -     | \$ 2,190   |         |
| 65 Gallon Storage Tanks      | 2   | ea   | \$ 200     | \$ 250   |          | \$ 400         | \$ 500   | \$ -     | \$ 900     |         |
| 10 Gallon Drip Tank          | 2   | ea   | \$ 100     | \$ 78    |          | \$ 200         | \$ 156   | \$ -     | \$ 356     |         |
|                              |     |      |            |          |          | \$ -           | \$ -     | \$ -     | \$ -       |         |

|                 |                    |
|-----------------|--------------------|
| \$17,489        | Subtotal           |
| \$ 2,623        | 15% Contingency    |
| \$ 2,623        | 15% Contractor O&P |
| \$ 4,372        | 25% Engineering    |
| <b>\$27,108</b> | <b>Total</b>       |


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*Police Headquarters*

### Solar Water Heating Calculator

Water heating is a major energy consumer. Although the energy consumed daily is often less than for air conditioning or heating, it is required year round, making it a good application of solar energy. Use this calculator to explore the energy usage of your water heater, and to estimate whether a solar water heater could save you money.

| Water Heater Characteristics                                         |       |                                                                     |     |
|----------------------------------------------------------------------|-------|---------------------------------------------------------------------|-----|
| Physical                                                             |       | Thermal                                                             |     |
| <input type="text" value="2"/> Diameter (feet)                       | 2     | <input type="text" value="50"/> Water Inlet Temperature (Degrees F) | 50  |
| <input type="text" value="40"/> Capacity (gallons)                   | 40    | <input type="text" value="68"/> Ambient Temperature (Degrees F)     | 68  |
| <input type="text" value="16.98"/> Surface Area (calculated - sq ft) | 16.98 | <input type="text" value="120"/> Hot Water Temperature (Degrees F)  | 120 |
| <input type="text" value="NaN"/> Effective R-value                   | NaN   | <input type="text" value="140"/> Hot Water Usage (Gallons per Day)  | 140 |
| Energy Use                                                           |       |                                                                     |     |
| <input type="text" value="3352"/>                                    |       | <input type="text" value=""/> Heat Delivered in Hot Water (BTU/hr)  |     |
| <input type="text" value="0"/>                                       |       | <input type="text" value=""/> Heat loss through insulation (BTU/hr) |     |

| Gas vs. Electric Water Heating                                  |                                                             |                                                         |
|-----------------------------------------------------------------|-------------------------------------------------------------|---------------------------------------------------------|
| Gas                                                             |                                                             | Electric                                                |
| <input type="text" value="0.8"/>                                | <input type="text" value=""/> Overall Efficiency            | <input type="text" value="0.98"/>                       |
| <input type="text" value="0.8"/>                                | <input type="text" value=""/> Conversion Efficiency         | <input type="text" value="0.98"/>                       |
| <input type="text" value="4190"/> BTU/hr                        | <input type="text" value=""/> Power Into Water Heater       | <input type="text" value="3420"/> BTU/hr                |
| Cost                                                            |                                                             |                                                         |
| <input type="text" value="\$ 1.128"/> /Therm                    | <input type="text" value=""/> Utility Rates                 | <input type="text" value="\$ 0.159"/> /kWh              |
| <input type="text" value="\$ 414.025"/>                         | <input type="text" value=""/> Yearly Water Heating Cost     | <input type="text" value="\$ 1395.11"/>                 |
| How Does Solar Compare?                                         |                                                             |                                                         |
| <input type="text" value=""/> Solar Water Heater Cost: \$ 27100 |                                                             | <input type="text" value=""/> Percentage Solar: 70      |
| <input type="text" value="93.5069"/> years for gas              | <input type="text" value=""/> Payback Time for Solar System | <input type="text" value="27.7499"/> years for electric |

**NJBPU Energy Audits**  
**CHA #21351**  
**Borough of Saddle River - Public Safety Complex**  
**Police Headquarters**

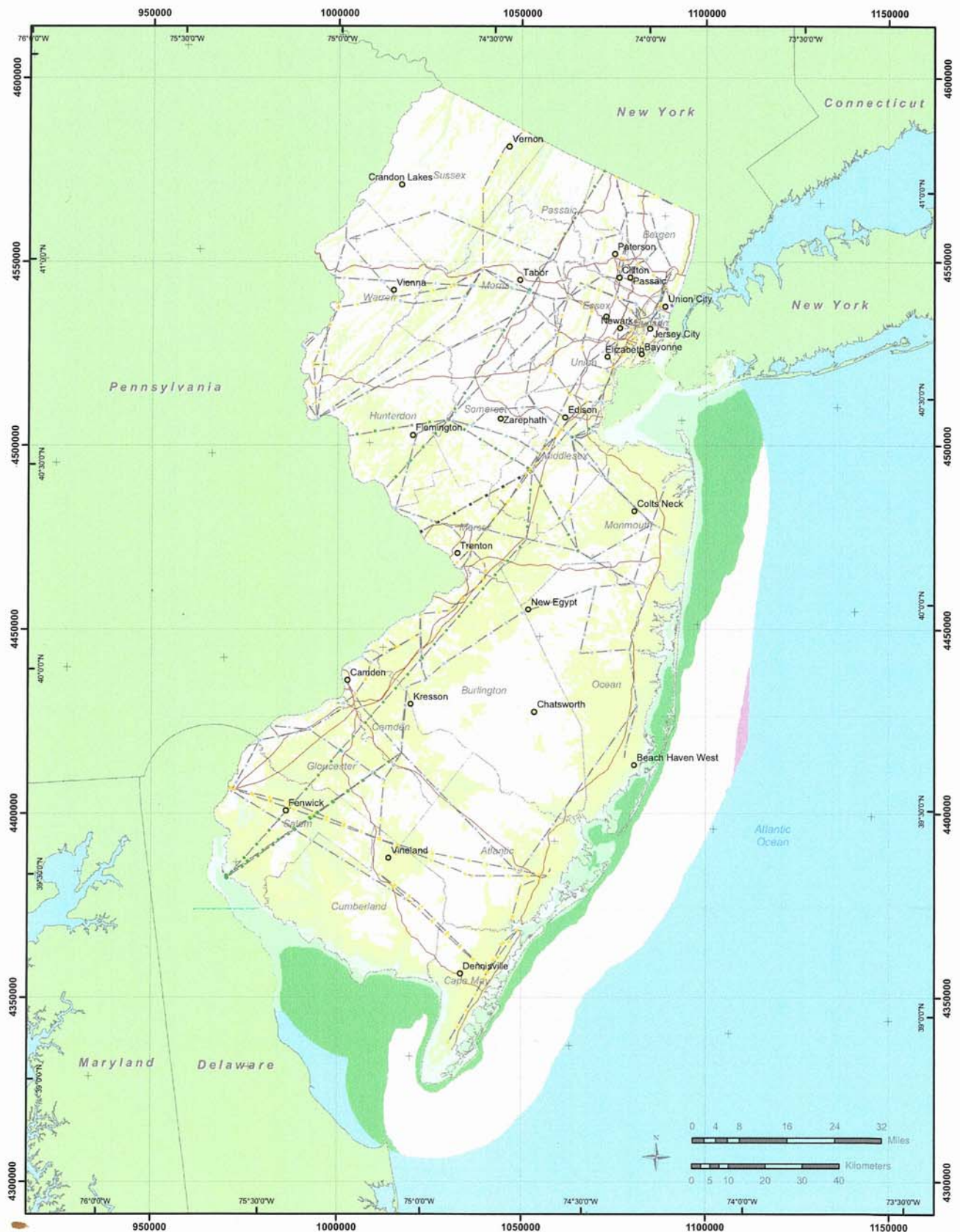
| Multipliers |      |
|-------------|------|
| Material:   | 0.98 |
| Labor:      | 1.21 |
| Equipment:  | 1.09 |

| Description                  | QTY | UNIT | UNIT COSTS |          |          | SUBTOTAL COSTS |          |          | TOTAL COST | REMARKS |
|------------------------------|-----|------|------------|----------|----------|----------------|----------|----------|------------|---------|
|                              |     |      | MAT.       | LABOR    | EQUIP.   | MAT.           | LABOR    | EQUIP.   |            |         |
| Synergy Solar Thermal System | 2   | ea   |            |          | \$ 3,600 | \$ -           | \$ -     | \$ 7,848 | \$ 7,848   |         |
| Piping modifications         | 1   | ls   | \$ 2,000   | \$ 3,500 |          | \$ 1,960       | \$ 4,235 | \$ -     | \$ 6,195   |         |
| Electrical modifications     | 1   | ls   | \$ 1,000   | \$ 1,000 |          | \$ 980         | \$ 1,210 | \$ -     | \$ 2,190   |         |
| 65 Gallon Storage Tanks      | 2   | ea   | \$ 200     | \$ 250   |          | \$ 400         | \$ 500   | \$ -     | \$ 900     |         |
| 10 Gallon Drip Tank          | 2   | ea   | \$ 100     | \$ 78    |          | \$ 200         | \$ 156   | \$ -     | \$ 356     |         |
|                              |     |      |            |          |          | \$ -           | \$ -     | \$ -     | \$ -       |         |

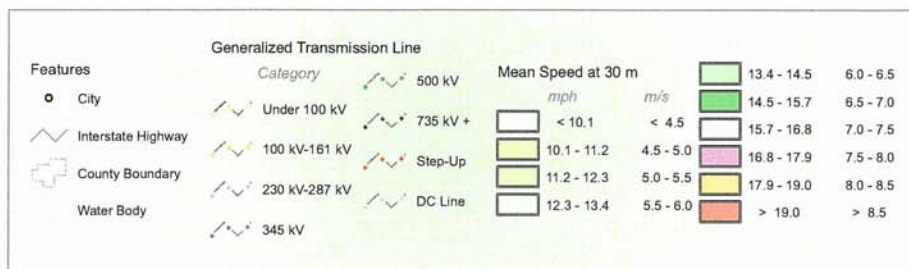
|                 |                    |
|-----------------|--------------------|
| \$17,489        | Subtotal           |
| \$ 2,623        | 15% Contingency    |
| \$ 2,623        | 15% Contractor O&P |
| \$ 4,372        | 25% Engineering    |
| <b>\$27,108</b> | <b>Total</b>       |

## **APPENDIX M**

### **Wind**



## Wind Resource of New Jersey Mean Annual Wind Speed at 30 Meters



**AWS Truewind**

Projection: Transverse Mercator,  
UTM Zone 17 WGS84

Spatial Resolution of Wind Resource Data: 200m

This map was created by AWS Truewind using the MesoMap system and historical weather data. Although it is believed to represent an accurate overall picture of the wind energy resource, estimates at any location should be confirmed by measurement.

The transmission line information was obtained by AWS Truewind from the Global Energy Decisions Velocity Suite. AWS does not warrant the accuracy of the transmission line information.

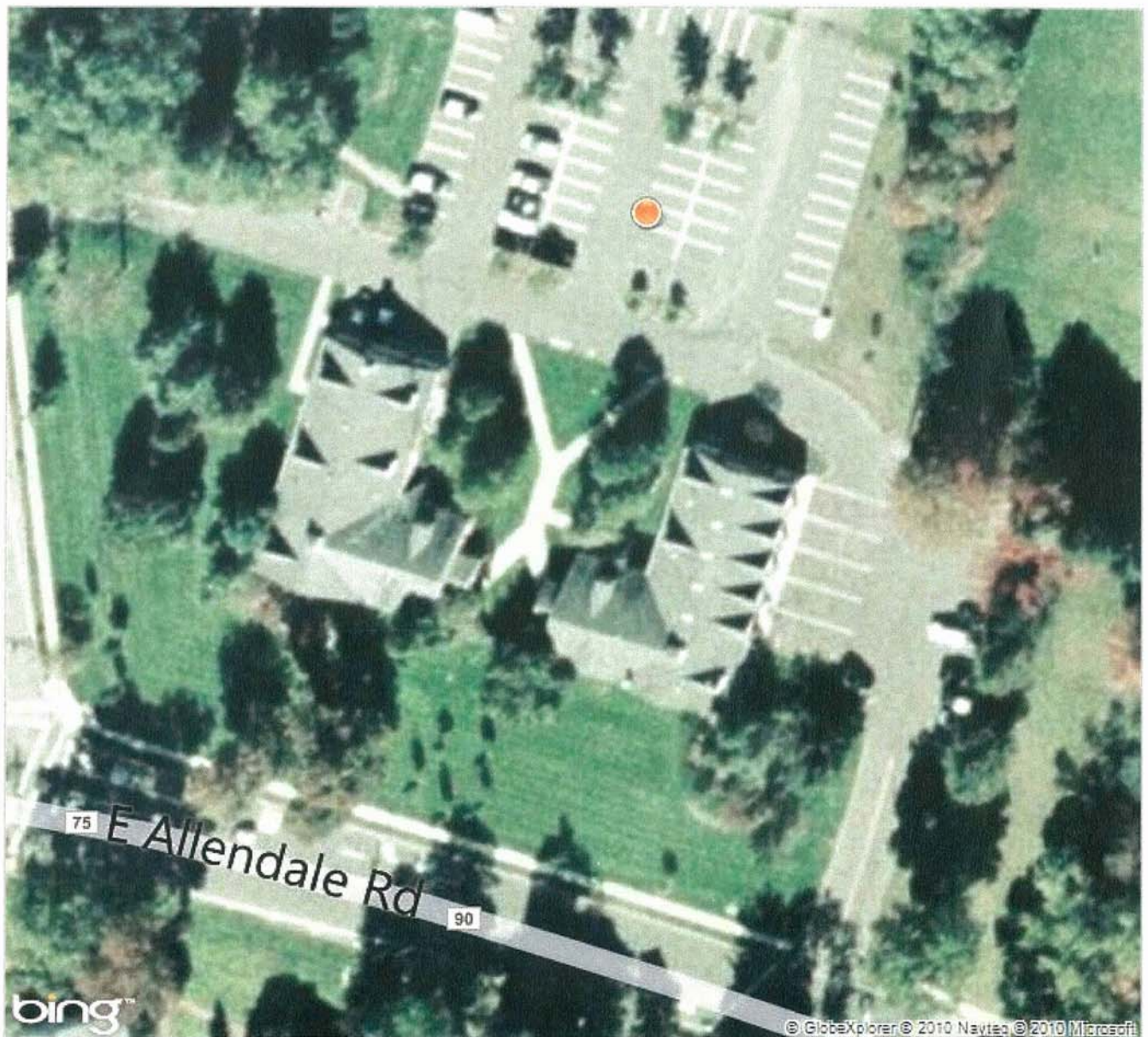
AWS Truewind, LLC

## Bing Maps

83 E Allendale Rd, Saddle River, NJ 07458-3058

My Notes

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## **APPENDIX N**

### **EPA Portfolio Manager**



# STATEMENT OF ENERGY PERFORMANCE

## Public Safety Complex

Building ID: 2439552

For 12-month Period Ending: December 31, 2009<sup>1</sup>

Date SEP becomes ineligible: N/A

Date SEP Generated: September 29, 2010

**Facility**

Public Safety Complex  
83 East Allendale Road  
Saddle River, NJ 07458

**Facility Owner**

Borough of Saddle River  
100 East Allendale Road  
Saddle River, NJ 07458

**Primary Contact for this Facility**

Charles Cuccia  
100 East Allendale Road  
Saddle River, NJ 07458

Year Built: 1989

Gross Floor Area (ft<sup>2</sup>): 16,816Energy Performance Rating<sup>2</sup> (1-100) N/A**Site Energy Use Summary<sup>3</sup>**

|                                   |           |
|-----------------------------------|-----------|
| Electricity - Grid Purchase(kBtu) | 764,561   |
| Natural Gas (kBtu) <sup>4</sup>   | 410,570   |
| Total Energy (kBtu)               | 1,175,131 |

**Energy Intensity<sup>5</sup>**

|                                   |     |
|-----------------------------------|-----|
| Site (kBtu/ft <sup>2</sup> /yr)   | 70  |
| Source (kBtu/ft <sup>2</sup> /yr) | 177 |

**Emissions (based on site energy use)**

|                                                     |     |
|-----------------------------------------------------|-----|
| Greenhouse Gas Emissions (MtCO <sub>2</sub> e/year) | 138 |
|-----------------------------------------------------|-----|

**Electric Distribution Utility**

Public Service Elec &amp; Gas Co

**National Average Comparison**

|                                               |      |
|-----------------------------------------------|------|
| National Average Site EUI                     | 78   |
| National Average Source EUI                   | 157  |
| % Difference from National Average Source EUI | 13%  |
| Building Type                                 | Fire |

Station/Police  
Station

**Stamp of Certifying Professional**

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

**Meets Industry Standards<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 |

**Certifying Professional**

N/A

**Notes:**

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

## ENERGY STAR® Data Checklist for Commercial Buildings

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

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

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

| CRITERION                     | VALUE AS ENTERED IN PORTFOLIO MANAGER          | VERIFICATION QUESTIONS                                                                                                                                                                                                                                                                                                                                                                                                                                                               | NOTES | <input checked="" type="checkbox"/> |
|-------------------------------|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------------------------------|
| <b>Building Name</b>          | Public Safety Complex                          | Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?                                                                                                                                                                                                                                                                                                                                                                                 |       | <input type="checkbox"/>            |
| <b>Type</b>                   | Fire Station/Police Station                    | Is this an accurate description of the space in question?                                                                                                                                                                                                                                                                                                                                                                                                                            |       | <input type="checkbox"/>            |
| <b>Location</b>               | 83 East Allendale Road, Saddle River, NJ 07458 | 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"/>            |
| Fire Headquarters (Other)     |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |                                     |
| CRITERION                     | VALUE AS ENTERED IN PORTFOLIO MANAGER          | VERIFICATION QUESTIONS                                                                                                                                                                                                                                                                                                                                                                                                                                                               | NOTES | <input checked="" type="checkbox"/> |
| <b>Gross Floor Area</b>       | 7,888 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>          | 6(Optional)                                    | Is this the number of personal computers in the space?                                                                                                                                                                                                                                                                                                                                                                                                                               |       | <input type="checkbox"/>            |
| <b>Weekly operating hours</b> | 168Hours(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>  | 4(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"/>            |
| Police Headquarters (Other)   |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |                                     |
| CRITERION                     | VALUE AS ENTERED IN PORTFOLIO MANAGER          | VERIFICATION QUESTIONS                                                                                                                                                                                                                                                                                                                                                                                                                                                               | NOTES | <input checked="" type="checkbox"/> |
| <b>Gross Floor Area</b>       | 8,928 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>          | 20(Optional)                                   | Is this the number of personal computers in the space?                                                                                                                                                                                                                                                                                                                                                                                                                               |       | <input type="checkbox"/>            |

|                               |                    |                                                                                                                                                                                                                                                                                                                                                                |                          |
|-------------------------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| <b>Weekly operating hours</b> | 168Hours(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>  | 10(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:** Public Service Elec & Gas Co

### Fuel Type: Electricity

**Meter:** PSE&G Electric (kWh (thousand Watt-hours))

**Space(s):** Entire Facility

**Generation Method:** Grid Purchase

| Start Date                                                                                                          | End Date   | Energy Use (kWh (thousand Watt-hours)) |
|---------------------------------------------------------------------------------------------------------------------|------------|----------------------------------------|
| 12/01/2009                                                                                                          | 12/31/2009 | 19,120.00                              |
| 11/01/2009                                                                                                          | 11/30/2009 | 17,360.00                              |
| 10/01/2009                                                                                                          | 10/31/2009 | 15,200.00                              |
| 09/01/2009                                                                                                          | 09/30/2009 | 15,360.00                              |
| 08/01/2009                                                                                                          | 08/31/2009 | 18,960.00                              |
| 07/01/2009                                                                                                          | 07/31/2009 | 19,200.00                              |
| 06/01/2009                                                                                                          | 06/30/2009 | 22,960.00                              |
| 05/01/2009                                                                                                          | 05/31/2009 | 22,480.00                              |
| 04/01/2009                                                                                                          | 04/30/2009 | 20,560.00                              |
| 03/01/2009                                                                                                          | 03/31/2009 | 18,240.00                              |
| 02/01/2009                                                                                                          | 02/28/2009 | 17,200.00                              |
| 01/01/2009                                                                                                          | 01/31/2009 | 17,440.00                              |
| <b>PSE&amp;G Electric Consumption (kWh (thousand Watt-hours))</b>                                                   |            | <b>224,080.00</b>                      |
| <b>PSE&amp;G Electric Consumption (kBtu (thousand Btu))</b>                                                         |            | <b>764,560.96</b>                      |
| <b>Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))</b>                                          |            | <b>764,560.96</b>                      |
| <b>Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?</b> |            | <input type="checkbox"/>               |

### Fuel Type: Natural Gas

**Meter:** PSE&G Natural Gas (therms)

**Space(s):** Entire Facility

| Start Date | End Date   | Energy Use (therms) |
|------------|------------|---------------------|
| 12/01/2009 | 12/31/2009 | 814.00              |
| 11/01/2009 | 11/30/2009 | 374.50              |
| 10/01/2009 | 10/31/2009 | 240.60              |
| 09/01/2009 | 09/30/2009 | 108.80              |
| 08/01/2009 | 08/31/2009 | 22.90               |
| 07/01/2009 | 07/31/2009 | 10.40               |
| 06/01/2009 | 06/30/2009 | 22.90               |
| 05/01/2009 | 05/31/2009 | 115.60              |
| 04/01/2009 | 04/30/2009 | 249.40              |
| 03/01/2009 | 03/31/2009 | 617.80              |

|                                                                                                     |            |                          |
|-----------------------------------------------------------------------------------------------------|------------|--------------------------|
| 02/01/2009                                                                                          | 02/28/2009 | 653.60                   |
| 01/01/2009                                                                                          | 01/31/2009 | 875.20                   |
| <b>PSE&amp;G Natural Gas Consumption (therms)</b>                                                   |            | <b>4,105.70</b>          |
| <b>PSE&amp;G Natural Gas Consumption (kBtu (thousand Btu))</b>                                      |            | <b>410,570.00</b>        |
| <b>Total Natural Gas Consumption (kBtu (thousand Btu))</b>                                          |            | <b>410,570.00</b>        |
| <b>Is this the total Natural Gas consumption at this building including all Natural Gas meters?</b> |            | <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 PE or RA that signed and stamped the SEP.)

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

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

Signature is required when applying for the ENERGY STAR.

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

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

## Facility

Public Safety Complex  
83 East Allendale Road  
Saddle River, NJ 07458

## Facility Owner

Borough of Saddle River  
100 East Allendale Road  
Saddle River, NJ 07458

## Primary Contact for this Facility

Charles Cuccia  
100 East Allendale Road  
Saddle River, NJ 07458

## General Information

| Public Safety Complex                                  |                   |
|--------------------------------------------------------|-------------------|
| Gross Floor Area Excluding Parking: (ft <sup>2</sup> ) | 16,816            |
| Year Built                                             | 1989              |
| For 12-month Evaluation Period Ending Date:            | December 31, 2009 |

## Facility Space Use Summary

| Fire Headquarters                  |                                     | Police Headquarters                |                                     |
|------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|
| Space Type                         | Other - Fire Station/Police Station | Space Type                         | Other - Fire Station/Police Station |
| Gross Floor Area(ft <sup>2</sup> ) | 7,888                               | Gross Floor Area(ft <sup>2</sup> ) | 8,928                               |
| Number of PCs*                     | 6                                   | Number of PCs*                     | 20                                  |
| Weekly operating hours*            | 168                                 | Weekly operating hours*            | 168                                 |
| Workers on Main Shift*             | 4                                   | Workers on Main Shift*             | 10                                  |

## Energy Performance Comparison

| Performance Metrics                       | Evaluation Periods                  |                                      | Comparisons  |        |                  |
|-------------------------------------------|-------------------------------------|--------------------------------------|--------------|--------|------------------|
|                                           | Current<br>(Ending Date 12/31/2009) | Baseline<br>(Ending Date 12/31/2009) | 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> )              | 70                                  | 70                                   | 0            | N/A    | 78               |
| Source (kBtu/ft <sup>2</sup> )            | 177                                 | 177                                  | 0            | N/A    | 157              |
| Energy Cost                               |                                     |                                      |              |        |                  |
| \$/year                                   | N/A                                 | N/A                                  | N/A          | N/A    | N/A              |
| \$/ft <sup>2</sup> /year                  | N/A                                 | N/A                                  | N/A          | N/A    | N/A              |
| Greenhouse Gas Emissions                  |                                     |                                      |              |        |                  |
| MtCO <sub>2</sub> e/year                  | 138                                 | 138                                  | 0            | N/A    | 154              |
| kgCO <sub>2</sub> e/ft <sup>2</sup> /year | 8                                   | 8                                    | 0            | N/A    | 9                |

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

### Notes:

- o - This attribute is optional.
- d - A default value has been supplied by Portfolio Manager.

## **APPENDIX O**

### **Equipment Inventory**

---

New Jersey BPU Energy Audit Program  
CHA #21351  
Borough of Saddle River - Public Safety Complex  
Fire Headquarters

| Description        | QTY | Manufacturer Name | Model No.             | Serial No. | Equipment Type / Utility                 | Capacity/Size                     | Location        | Areas Served          | Date Installed | Remaining Useful Life (years) | Other Info.         |
|--------------------|-----|-------------------|-----------------------|------------|------------------------------------------|-----------------------------------|-----------------|-----------------------|----------------|-------------------------------|---------------------|
| Generator          | 1   | Kohler            | Model 70              | -          | Emergency Backup Power / Natural Gas     | -                                 | Outside         | Public Safety Complex | 1989           | -                             | Fair Condition      |
| Furnace            | 1   | Carrier           | 58GP125-DA Series 100 | 4987AC2287 | Heating / Natural Gas                    | 125 MBH input, 100 MBH output     | Mechanical Room | First Floor           | 1989           | -3                            | Fair Condition      |
| Condenser #1       | 1   | Carrier           | 38ED060320            | -          | Cooling / Electric                       | 5 tons                            | Outside         | First Floor           | 1989           | -1                            | Fair Condition      |
| Fan Coil Unit      | 1   | Carrier           | FY4ANF042             | -          | Cooling / Electric                       | 3.5 tons                          | Attic           | First Floor           | 1989           | -1                            |                     |
| Condenser #2       | 1   | Carrier           | 24ABB342A300          | 2209E07381 | Cooling / Electric                       | 3.5 tons                          | Outside         | First Floor           | 2007           | 17                            | Excellent Condition |
| Furnace            | 1   | Amana             | 95 IIQ                | -          | Heating / Natural Gas Cooling / Electric | 115 MBH heating 5 tons cooling    | Attic           | Second Floor          | -              | -                             | Excellent Condition |
| Condenser #3       | 1   | Amana             | Ultron RSD60A2A       | 105123371  | Cooling / Electric                       | 5 tons                            | Outside         | Second Floor          | -              | -                             | Good Condition      |
| PTAC Heat Pump     | 2   | Carrier           | 52CQA312301RC         | -          | Heating & Cooling / Electric             | 14.5 MBH heating 11.7 MBH cooling | Offices         | Offices               | 1989           | -6                            | Good Condition      |
| Unit Heater        | 3   | Reznor            | XL 105-5              | -          | Heating / Natural Gas                    | 105 MBH input 81.9 MBH output     | Engine Room     | Engine Room           | 1989           | -8                            | Good Condition      |
| Air Compressor     | 1   | Ingersoll-Rand    | 2475                  | 01040794   | Compressed Air / Electric                | Vertical Tank                     | Mechanical Room | Engine Room           | -              | -                             | Excellent Condition |
| Domestic HW Heater | 1   | Bradford White    | MI40T6DS13            | NK7807847  | DHW / electric                           | 40 Gal / 4,500 watt               | Mechanical Room | Building              | 1996           | 0                             | Good Condition      |

New Jersey BPU Energy Audit Program  
CHA #21351  
Borough of Saddle River - Public Safety Complex  
Police Headquarters

| Description        | QTY | Manufacturer Name                    | Model No.                    | Serial No. | Equipment Type / Utility | Capacity/Size                 | Location            | Areas Served          | Date Installed | Remaining Useful Life (years) | Other Info.    |
|--------------------|-----|--------------------------------------|------------------------------|------------|--------------------------|-------------------------------|---------------------|-----------------------|----------------|-------------------------------|----------------|
| Boiler             | 1   | Multi-Temp                           | MR-500B                      | MNC-       | Heating / Natural Gas    | 500 MBH input, 380 MBH output | Mechanical Rm       | Bldg                  | 1989           | 4                             | Good Condition |
| HW Pump            | 2   | Armstrong (pump)<br>Marathon (motor) | AVL 56T17D2107B<br>P (motor) | -          | Heating / Electric       | 1/2 HP; 1725 RPM              | Mechanical Rm       | Bldg                  | 1989           | -11                           | Good Condition |
| Fan Coil #1        | 1   | Carrier                              | 40FS200310                   | 1288H02548 | HVAC / Electric          | 3/4 HP                        | Attic               | Booking               | 1989           | -1                            | Good Condition |
| Fan Coil #2        | 1   | Carrier                              | 40FS200310                   | 1288H02349 | HVAC / Electric          | 3/4 HP                        | Attic               | Locker/Baths          | 1989           | -1                            | Good Condition |
| Fan Coil #3        | 1   | Carrier                              | 40AQ036300BU                 | 2088A10226 | HVAC / Electric          | 1/3 HP                        | Attic               | Chief                 | 1989           | -1                            | Good Condition |
| Fan Coil #4        | 1   | Carrier                              | 40AQ036300BU                 | 1888A08278 | HVAC / Electric          | 1/3 HP                        | Attic               | Squad Room            | 1989           | -1                            | Good Condition |
| Fan Coil #5        | 1   | Carrier                              | 40AQ036300BU                 | 1688A09787 | HVAC / Electric          | 1/3 HP                        | Attic               | Front Desk / Security | 1989           | -1                            | Good Condition |
| Fan Coil #6        | 1   | Carrier                              | FB4ANF060                    | 2698A14569 | HVAC / Electric          | 3/4 HP                        | Attic               | Gym / Training        | 1989           | -1                            | Good Condition |
| Condenser #1       | 1   | Carrier                              | 38ED042310                   | 1788E39215 | Cooling / Electric       | 3.5 Tons; 24.1 Amps           | Outside             | Booking               | 1989           | -1                            | Good Condition |
| Condenser #2       | 1   | Carrier                              | 38ED042310                   | 1788E39119 | Cooling / Electric       | 3.5 Tons; 24.1 Amps           | Outside             | Locker/Baths          | 1989           | -1                            | Good Condition |
| Condenser #3       | 1   | Carrier                              | 38ED036310                   | 1888E86640 | Cooling / Electric       | 3 Tons; 18.0 Amps             | Outside             | Chief                 | 1989           | -1                            | Good Condition |
| Condenser #4       | 1   | Carrier                              | 38ED030310                   | 1888E55908 | Cooling / Electric       | 2.5 Tons; 17.1 Amps           | Outside             | Squad Room            | 1989           | -1                            | Good Condition |
| Condenser #5       | 1   | Heil                                 | CA5536UKA1                   | L942676009 | Cooling / Electric       | 3 Tons; 19.4 Amps             | Outside             | Front Desk / Security | 1994           | 4                             | Good Condition |
| Condenser #6       | 1   | Carrier                              | 38CKC048300                  | 3599E06780 | Cooling / Electric       | 4 Tons; 31.9 Amps             | Outside             | Gym / Training        | 1999           | 9                             | Good Condition |
| Unit Heater        | 3   | Sterling                             | HS-36                        | HS4423-88  | Heating / HW             | 26,100 Btuh; 0.6 Amps         | Garages / Sallyport | Garages / Sallyport   | 1989           | -1                            | Good Condition |
| Domestic HW Heater | 1   | Bradford White                       | MI40T6DS13                   | NK7807848  | DHW / electric           | 40 Gal / 4,500 watt           | Mechanical Room     | Building              | 1996           | 4                             | Good Condition |

New Jersey BPU Energy Audit Program  
CHA #21351  
Borough of Saddle River - Public Safety Complex  
Existing Lighting

Cost of Electricity: \$0.139 \$/kWh  
\$8.65 \$/kW

| EXISTING CONDITIONS |                                                                                          |                                     |                                                                                                  |                                              |                                               |                              |                          |                                            |                         |                                |       |
|---------------------|------------------------------------------------------------------------------------------|-------------------------------------|--------------------------------------------------------------------------------------------------|----------------------------------------------|-----------------------------------------------|------------------------------|--------------------------|--------------------------------------------|-------------------------|--------------------------------|-------|
| Area Description    |                                                                                          | No. of Fixtures                     | Standard Fixture Code                                                                            | NYSERDA Fixture Code                         | Watts per Fixture                             | kW/Space                     | Exist Control            | Annual Hours                               | Retrofit Control        | Annual kWh                     | Notes |
| Field Code          | Unique description of the location - Room number/Room name: Floor number (if applicable) | No. of fixtures before the retrofit | "Lighting Fixture Code" Example<br>2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape | Code from Table of Standard Fixture Wattages | Value from Table of Standard Fixture Wattages | (Watts/Fixt) *<br>(Fixt No.) | Pre-inst. control device | Estimated annual hours for the usage group | Retrofit control device | (kW/Space) *<br>(Annual Hours) |       |
| 3                   | PHQ Janitor's Closet                                                                     | 1                                   | W 34 W F 1 (MAG)                                                                                 | F41EE                                        | 43                                            | 0.0                          | SW                       | 365                                        | None                    | 16                             |       |
| 61                  | PHQ Break Room                                                                           | 8                                   | T 34 R F 3 (MAG)                                                                                 | F43EE                                        | 115                                           | 0.9                          | SW                       | 8760                                       | OCC                     | 8,059                          |       |
| 6                   | PHQ Evidence                                                                             | 2                                   | T 34 R F 4 (MAG)                                                                                 | F44EE                                        | 144                                           | 0.3                          | SW                       | 728                                        | None                    | 210                            |       |
| 61                  | PHQ Single Office                                                                        | 1                                   | T 34 R F 3 (MAG)                                                                                 | F43EE                                        | 115                                           | 0.1                          | SW                       | 3120                                       | OCC                     | 359                            |       |
| 6                   | PHQ Booking                                                                              | 4                                   | T 34 R F 4 (MAG)                                                                                 | F44EE                                        | 144                                           | 0.6                          | SW                       | 3120                                       | C-OCC                   | 1,797                          |       |
| 11                  | PHQ Holding Cells                                                                        | 4                                   | S 34 P F 2 (MAG)                                                                                 | F42EE                                        | 72                                            | 0.3                          | SW                       | 3120                                       | None                    | 899                            |       |
| 6                   | PHQ Men's Locker                                                                         | 3                                   | T 34 R F 4 (MAG)                                                                                 | F44EE                                        | 144                                           | 0.4                          | SW                       | 8760                                       | OCC                     | 3,784                          |       |
| 3                   | PHQ Men's Restroom                                                                       | 4                                   | W 34 W F 1 (MAG)                                                                                 | F41EE                                        | 43                                            | 0.2                          | SW                       | 8760                                       | C-OCC                   | 1,507                          |       |
| 3                   | PHQ Women's Restroom                                                                     | 4                                   | W 34 W F 1 (MAG)                                                                                 | F41EE                                        | 43                                            | 0.2                          | SW                       | 8760                                       | C-OCC                   | 1,507                          |       |
| 11                  | PHQ Sallyport 1                                                                          | 4                                   | S 34 P F 2 (MAG)                                                                                 | F42EE                                        | 72                                            | 0.3                          | SW                       | 1456                                       | OCC                     | 419                            |       |
| 11                  | PHQ Sallyport 2                                                                          | 4                                   | S 34 P F 2 (MAG)                                                                                 | F42EE                                        | 72                                            | 0.3                          | SW                       | 1456                                       | OCC                     | 419                            |       |
| 11                  | PHQ Utility Garage                                                                       | 5                                   | S 34 P F 2 (MAG)                                                                                 | F42EE                                        | 72                                            | 0.4                          | SW                       | 365                                        | None                    | 131                            |       |
| 3                   | PHQ Stairwell                                                                            | 3                                   | W 34 W F 1 (MAG)                                                                                 | F41EE                                        | 43                                            | 0.1                          | SW                       | 8760                                       | None                    | 1,130                          |       |
| 45                  | PHQ Weight Room (Recessed Floods)                                                        | 24                                  | SP 26 R CF 1                                                                                     | CFQ26/1-L                                    | 27                                            | 0.6                          | SW                       | 2920                                       | C-OCC                   | 1,892                          |       |
| 3                   | PHQ Weight Room                                                                          | 1                                   | W 34 W F 1 (MAG)                                                                                 | F41EE                                        | 43                                            | 0.0                          | SW                       | 1460                                       | None                    | 63                             |       |
| 45                  | PHQ Training Room (Recessed Floods)                                                      | 13                                  | SP 26 R CF 1                                                                                     | CFQ26/1-L                                    | 27                                            | 0.4                          | SW                       | 2920                                       | C-OCC                   | 1,025                          |       |
| 6                   | PHQ Training Room                                                                        | 2                                   | T 34 R F 4 (MAG)                                                                                 | F44EE                                        | 144                                           | 0.3                          | SW                       | 1460                                       | None                    | 420                            |       |
| 11                  | PHQ Training Room                                                                        | 2                                   | S 34 P F 2 (MAG)                                                                                 | F42EE                                        | 72                                            | 0.1                          | SW                       | 1460                                       | None                    | 210                            |       |
| 11                  | PHQ Boiler Room                                                                          | 2                                   | S 34 P F 2 (MAG)                                                                                 | F42EE                                        | 72                                            | 0.1                          | SW                       | 365                                        | None                    | 53                             |       |
| 6                   | PHQ 2nd Flr Storage                                                                      | 3                                   | T 34 R F 4 (MAG)                                                                                 | F44EE                                        | 144                                           | 0.4                          | SW                       | 365                                        | None                    | 158                            |       |
| 230                 | PHQ Exterior (Over Garage Doors)                                                         | 1                                   | WP400MH1                                                                                         | MH400/1                                      | 458                                           | 0.5                          | SW                       | 4380                                       | None                    | 2,006                          |       |
| 65                  | PHQ Exterior (Perimeter)                                                                 | 5                                   | I 100                                                                                            | 1100/1                                       | 100                                           | 0.5                          | SW                       | 4380                                       | None                    | 2,190                          |       |
| 226                 | PHQ Exterior (Sign Light)                                                                | 1                                   | 70 W MH                                                                                          | MH70/1                                       | 95                                            | 0.1                          | SW                       | 4380                                       | None                    | 416                            |       |
| Total               |                                                                                          | 299                                 |                                                                                                  |                                              |                                               | 25.8                         |                          |                                            |                         | 124,209                        |       |

New Jersey BPU Energy Audit Program  
CHA #21351  
Borough of Saddle River - Public Safety Complex  
Existing Lighting

Cost of Electricity: \$0.139 \$/kWh  
\$8.65 \$/kW

| EXISTING CONDITIONS |                                                                                          |                                     |                                                                                                  |                                              |                                               |                              |                          |                                            |                  |                                |                                       |
|---------------------|------------------------------------------------------------------------------------------|-------------------------------------|--------------------------------------------------------------------------------------------------|----------------------------------------------|-----------------------------------------------|------------------------------|--------------------------|--------------------------------------------|------------------|--------------------------------|---------------------------------------|
| Field Code          | Area Description                                                                         | No. of Fixtures                     | Standard Fixture Code                                                                            | NYSERDA Fixture Code                         | Watts per Fixture                             | kW/Space                     | Exist Control            | Annual Hours                               | Retrofit Control | Annual kWh                     | Notes                                 |
|                     | Unique description of the location - Room number/Room name; Floor number (if applicable) | No. of fixtures before the retrofit | "Lighting Fixture Code" Example<br>2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape | Code from Table of Standard Fixture Wattages | Value from Table of Standard Fixture Wattages | (Watts/Fixt) *<br>(Fixt No.) | Pre-inst. control device | Estimated annual hours for the usage group | Retrofit device  | (kW/Space) *<br>(Annual Hours) |                                       |
| 4                   | FHQ Vestibule                                                                            | 1                                   | 2B 34 R F 2 (u) (MAG)                                                                            | FU2EE                                        | 72                                            | 0.1                          | SW                       | 8760                                       | None             | 631                            |                                       |
| 4                   | FHQ Vestibule Closet                                                                     | 1                                   | 2B 34 R F 2 (u) (MAG)                                                                            | FU2EE                                        | 72                                            | 0.1                          | SW                       | 8760                                       | None             | 631                            |                                       |
| 4                   | FHQ Social Hall                                                                          | 12                                  | 2B 34 R F 2 (u) (MAG)                                                                            | FU2EE                                        | 72                                            | 0.9                          | SW                       | 7300                                       | OCC              | 6,307                          | Multi Stall                           |
| 4                   | FHQ Officers' Office                                                                     | 4                                   | 2B 34 R F 2 (u) (MAG)                                                                            | FU2EE                                        | 72                                            | 0.3                          | SW                       | 3120                                       | OCC              | 899                            | Multi Stall                           |
| 61                  | FHQ Chief's Office                                                                       | 4                                   | T 34 R F 3 (MAG)                                                                                 | F43EE                                        | 115                                           | 0.5                          | SW                       | 3120                                       | OCC              | 1,435                          | Multi Stall                           |
| 108                 | FHQ Chief's Office (Floods)                                                              | 2                                   | 165                                                                                              | 165/1                                        | 65                                            | 0.1                          | SW                       | 1560                                       | None             | 203                            | Multi Stall                           |
| 6                   | FHQ Kitchen                                                                              | 2                                   | T 34 R F 4 (MAG)                                                                                 | F44EE                                        | 144                                           | 0.3                          | SW                       | 1456                                       | None             | 419                            |                                       |
| 4                   | FHQ Hallway                                                                              | 4                                   | 2B 34 R F 2 (u) (MAG)                                                                            | FU2EE                                        | 72                                            | 0.3                          | SW                       | 8760                                       | None             | 2,523                          |                                       |
| 3                   | FHQ Janitor's Closet                                                                     | 1                                   | W 34 W F 1 (MAG)                                                                                 | F41EE                                        | 43                                            | 0.0                          | SW                       | 365                                        | None             | 16                             |                                       |
| 4                   | FHQ Men's Restroom                                                                       | 2                                   | 2B 34 R F 2 (u) (MAG)                                                                            | FU2EE                                        | 72                                            | 0.1                          | SW                       | 8760                                       | C-OCC            | 1,261                          |                                       |
| 3                   | FHQ Men's Restroom                                                                       | 1                                   | W 34 W F 1 (MAG)                                                                                 | F41EE                                        | 43                                            | 0.0                          | SW                       | 8760                                       | C-OCC            | 377                            |                                       |
| 4                   | FHQ Women's Restroom                                                                     | 2                                   | 2B 34 R F 2 (u) (MAG)                                                                            | FU2EE                                        | 72                                            | 0.1                          | SW                       | 8760                                       | C-OCC            | 1,261                          |                                       |
| 3                   | FHQ Women's Restroom                                                                     | 1                                   | W 34 W F 1 (MAG)                                                                                 | F41EE                                        | 43                                            | 0.0                          | SW                       | 8760                                       | C-OCC            | 377                            |                                       |
| 191                 | FHQ Engine Room                                                                          | 12                                  | S 60 C F 2 (ELE) 8'                                                                              | F82EE                                        | 123                                           | 1.5                          | SW                       | 8760                                       | C-OCC            | 12,930                         |                                       |
| 11                  | FHQ Engine Room                                                                          | 6                                   | S 34 P F 2 (MAG)                                                                                 | F42EE                                        | 72                                            | 0.4                          | SW                       | 8760                                       | C-OCC            | 3,784                          |                                       |
| 222                 | FHQ Stairwell #1                                                                         | 1                                   | W 20 C F 1 (MAG)                                                                                 | F21SS                                        | 28                                            | 0.0                          | SW                       | 8760                                       | None             | 245                            |                                       |
| 3                   | FHQ Stairwell #1                                                                         | 2                                   | W 34 W F 1 (MAG)                                                                                 | F41EE                                        | 43                                            | 0.1                          | SW                       | 8760                                       | None             | 753                            |                                       |
| 11                  | FHQ Stairwell #2                                                                         | 2                                   | S 34 P F 2 (MAG)                                                                                 | F42EE                                        | 72                                            | 0.1                          | SW                       | 8760                                       | None             | 1,261                          |                                       |
| 248                 | FHQ Lounge / Game Room (Track Lights)                                                    | 30                                  | I 25                                                                                             | 125/1                                        | 25                                            | 0.8                          | SW                       | 1456                                       | None             | 1,092                          |                                       |
| 249                 | FHQ Lounge / Game Room (Floods)                                                          | 15                                  | I 100 (Dimmable)                                                                                 | I100/1                                       | 100                                           | 1.5                          | Dimmer SW                | 1456                                       | None             | 2,184                          |                                       |
| 250                 | FHQ Lounge / Game Room (Over Bar)                                                        | 13                                  | I 50 (Dimmable)                                                                                  | I50/1                                        | 50                                            | 0.7                          | Dimmer SW                | 728                                        | None             | 473                            |                                       |
| 250                 | FHQ Lounge / Game Room (Trophy Case)                                                     | 5                                   | I 50 (Dimmable)                                                                                  | I50/1                                        | 50                                            | 0.3                          | Dimmer SW                | 728                                        | None             | 182                            |                                       |
| 136                 | FHQ Lounge / Game Room (Pool Table)                                                      | 3                                   | I 40 (Special)                                                                                   | I40/1                                        | 40                                            | 0.1                          | SW                       | 728                                        | None             | 87                             |                                       |
| 230                 | FHQ Exterior (Over Garage Doors)                                                         | 6                                   | WP400MH1                                                                                         | MH400/1                                      | 458                                           | 1.4                          | SW                       | 4380                                       | None             | 6,018                          |                                       |
| 65                  | FHQ Exterior (Perimeter)                                                                 | 1                                   | I 100                                                                                            | I100/1                                       | 100                                           | 0.6                          | SW                       | 4380                                       | None             | 2,628                          |                                       |
| 226                 | FHQ Exterior (Sign Light)                                                                | 1                                   | 70 W MH                                                                                          | MH70/1                                       | 95                                            | 0.1                          | SW                       | 4380                                       | None             | 416                            |                                       |
| 251                 | FHQ Exterior (Flag Light)                                                                | 2                                   | 1500 W MH                                                                                        | MH1500/1                                     | 1610                                          | 3.2                          | SW                       | 4380                                       | None             | 14,104                         |                                       |
| 4                   | FHQ Vestibule                                                                            | 1                                   | 2B 34 R F 2 (u) (MAG)                                                                            | FU2EE                                        | 72                                            | 0.1                          | SW                       | 8760                                       | None             | 631                            |                                       |
| 4                   | FHQ Vestibule Restroom                                                                   | 1                                   | 2B 34 R F 2 (u) (MAG)                                                                            | FU2EE                                        | 72                                            | 0.1                          | SW                       | 8760                                       | OCC              | 631                            |                                       |
| 4                   | FHQ Lobby                                                                                | 6                                   | 2B 34 R F 2 (u) (MAG)                                                                            | FU2EE                                        | 72                                            | 0.4                          | SW                       | 8760                                       | None             | 3,784                          |                                       |
| 4                   | FHQ Hallway                                                                              | 14                                  | 2B 34 R F 2 (u) (MAG)                                                                            | FU2EE                                        | 72                                            | 1.0                          | SW                       | 8760                                       | None             | 8,830                          |                                       |
| 61                  | FHQ Chief's Office                                                                       | 4                                   | T 34 R F 3 (MAG)                                                                                 | F43EE                                        | 115                                           | 0.5                          | SW                       | 3120                                       | OCC              | 1,435                          |                                       |
| 61                  | FHQ SE Corner Office                                                                     | 2                                   | T 34 R F 3 (MAG)                                                                                 | F43EE                                        | 115                                           | 0.2                          | SW                       | 3120                                       | OCC              | 718                            |                                       |
| 61                  | FHQ Admin Office                                                                         | 2                                   | T 34 R F 3 (MAG)                                                                                 | F43EE                                        | 115                                           | 0.2                          | SW                       | 3120                                       | OCC              | 718                            |                                       |
| 4                   | FHQ Admin Office                                                                         | 2                                   | 2B 34 R F 2 (u) (MAG)                                                                            | FU2EE                                        | 72                                            | 0.1                          | SW                       | 3120                                       | OCC              | 449                            |                                       |
| 250                 | FHQ Dispatch (Ship Light Floods)                                                         | 6                                   | I 50 (Dimmable)                                                                                  | I50/1                                        | 50                                            | 0.3                          | SW                       | 8760                                       | None             | 2,628                          |                                       |
| 108                 | FHQ Dispatch (Recessed Floods)                                                           | 2                                   | 165                                                                                              | 165/1                                        | 65                                            | 0.1                          | SW                       | 8760                                       | None             | 1,139                          |                                       |
| 5                   | FHQ Dispatch                                                                             | 4                                   | 2T 32 R F 2 (u) (ELE)                                                                            | FU2LL                                        | 60                                            | 0.2                          | SW                       | 8760                                       | None             | 2,102                          |                                       |
| 3                   | FHQ Storage                                                                              | 3                                   | W 34 W F 1 (MAG)                                                                                 | F41EE                                        | 43                                            | 0.1                          | SW                       | 728                                        | None             | 94                             |                                       |
| 4                   | FHQ Armory                                                                               | 1                                   | 2B 34 R F 2 (u) (MAG)                                                                            | FU2EE                                        | 72                                            | 0.1                          | SW                       | 728                                        | None             | 52                             |                                       |
| 4                   | FHQ Restroom                                                                             | 1                                   | 2B 34 R F 2 (u) (MAG)                                                                            | FU2EE                                        | 72                                            | 0.1                          | SW                       | 2920                                       | OCC              | 210                            | Exhaust fan connected to light switch |
| 61                  | FHQ Interview Room 1                                                                     | 1                                   | T 34 R F 3 (MAG)                                                                                 | F43EE                                        | 115                                           | 0.1                          | SW                       | 2184                                       | OCC              | 251                            |                                       |
| 61                  | FHQ Interview Room 2                                                                     | 1                                   | T 34 R F 3 (MAG)                                                                                 | F43EE                                        | 115                                           | 0.1                          | SW                       | 2184                                       | OCC              | 251                            |                                       |
| 61                  | FHQ Server Room                                                                          | 1                                   | T 34 R F 3 (MAG)                                                                                 | F43EE                                        | 115                                           | 0.1                          | SW                       | 365                                        | None             | 42                             |                                       |
| 6                   | FHQ Lieutenant's Office                                                                  | 4                                   | T 34 R F 4 (MAG)                                                                                 | F44EE                                        | 144                                           | 0.6                          | SW                       | 8760                                       | OCC              | 5,046                          |                                       |
| 61                  | FHQ Seargent's Office / Squad Room                                                       | 4                                   | T 34 R F 3 (MAG)                                                                                 | F43EE                                        | 115                                           | 0.5                          | SW                       | 8760                                       | OCC              | 4,30                           |                                       |