

**VOORHEES TOWNSHIP
BOARD OF EDUCATION
E.T. HAMILTON ELEMENTARY SCHOOL**

**23 NORTHGATE DRIVE
VOORHEES, NJ 08043**

FACILITY ENERGY REPORT

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I. HISTORIC ENERGY CONSUMPTION/COST

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

Electric Utility Provider:	Atlantic City Electric
Electric Utility Rate Structure:	Annual General Service (ASG)
Third Party Supplier:	Reliant Energy (Effective June 1, 2011) GDF Suez (Prior to June 1, 2011)

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

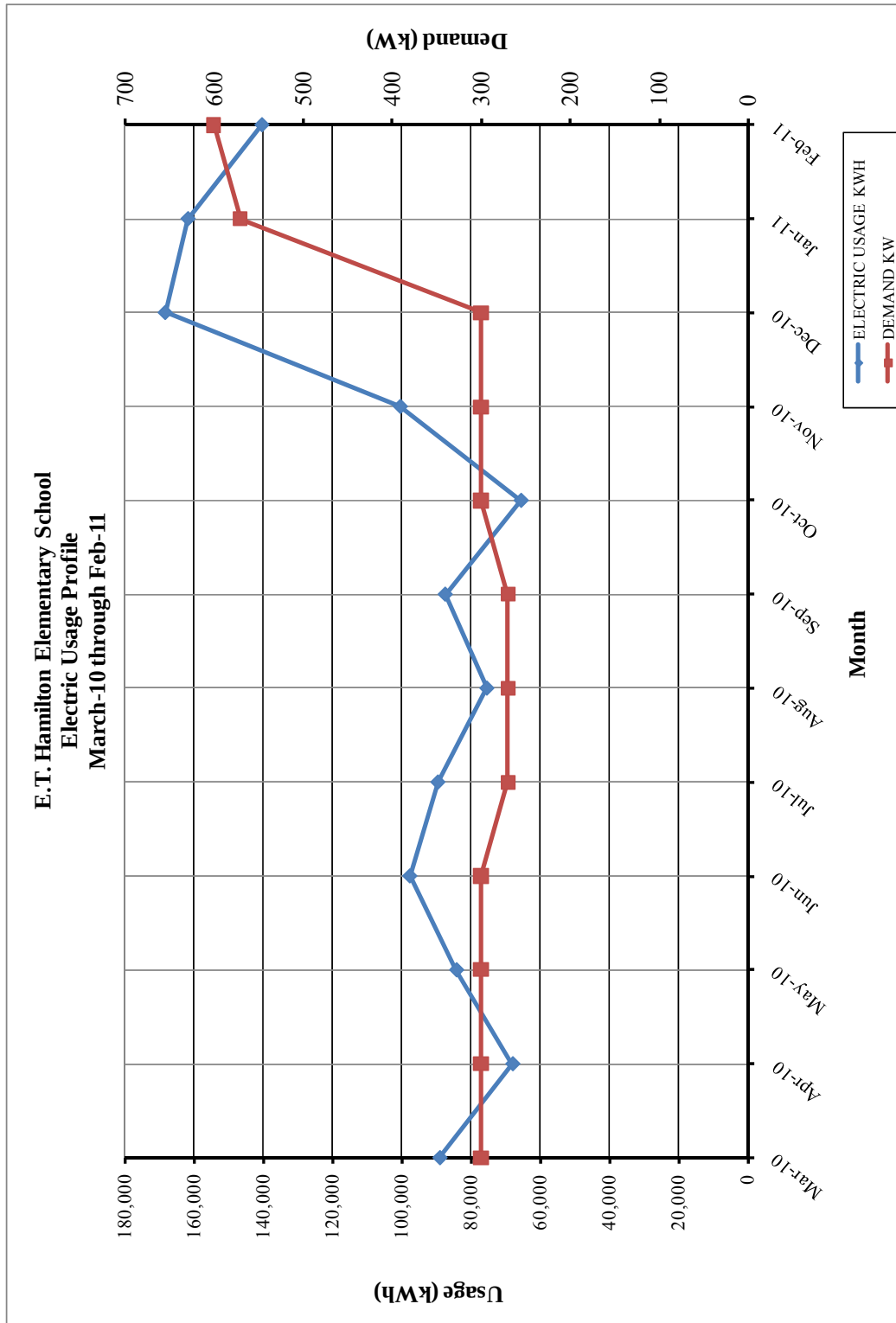
Natural gas service is not currently provided to the Kresson Elementary School.

Table 1
Electricity Billing Data

ELECTRIC USAGE SUMMARY			
Utility Provider: Atlantic City Electric Rate: Annual General Service (AGS) Meter No: 80029843 Account # 0265 5059 9992 Third Party Utility Provider: GDF Suez (during this study period) TPS Meter / Acct No: - / 60258-77003			
MONTH OF USE	CONSUMPTION KWH	DEMAND KW	TOTAL BILL
Mar-10	89,100	300.0	\$11,534
Apr-10	68,100	300.0	\$9,371
May-10	84,300	300.0	\$11,066
Jun-10	97,800	300.0	\$11,526
Jul-10	89,700	270.0	\$10,754
Aug-10	75,600	270.0	\$9,246
Sep-10	87,600	270.0	\$10,437
Oct-10	65,700	300.0	\$8,716
Nov-10	100,500	300.0	\$12,262
Dec-10	168,300	300.0	\$19,594
Jan-11	161,700	570.0	\$21,262
Feb-11	140,400	600.0	\$19,636
Totals	1,228,800	600.0 Max	\$155,403
AVERAGE DEMAND 340.0 KW average AVERAGE RATE \$0.126 \$/kWh			

Demand data was not available for this facility.

Figure 1
Electricity Usage Profile



II. FACILITY DESCRIPTION

Edward T. Hamilton Elementary School is located on 23 Northgate Drive in Voorhees, New Jersey. The 63,347 square foot elementary school was built in 1969 with an eight classroom addition in 1981, a six classroom and gymnasium addition in 1988 and a six classroom addition in 1992.

Occupancy Profile

The typical hours of operation for E.T. Hamilton Elementary School are Monday through Friday between 7:00 am and 3:00 pm from September through June. In addition the school is occupied at various times in the evenings and over the summer months for meetings and afterschool activities.

Building Envelope

Exterior walls of the elementary school are a 4" face brick exterior, 6" concrete block interior walls with 2" rigid foam insulation. The windows throughout the facility are 1/4" double pane insulated glass. The majority of the windows are aluminum exterior frames with blinds between the window panes and wood interior framing. The blinds are valuable because they help reduce the heat loss in the winter and reduce solar heat gain in the summer. The roof is a flat, EPDM rubber roof on a metal deck and approximately 2" of rigid insulation.

HVAC Systems

The HVAC Systems at E.T. Hamilton Elementary School is a combination of split system heat pump units, rooftop heat pumps and individual classroom heat pumps.

Classrooms 1 through 11 are served by Trane model heat pumps unit ventilators. These units are all rated for approximately 2-1/2 Tons of cooling and 33 MBH heating in heat pump mode. In addition, these units are equipped with supplementary electric resistance heating coils rated for 15 kW. These units were all installed in 2004.

Classrooms 12 through 20 are served by American Air Filter model heat pump unit ventilators. These units are rated for approximately 3-1/2 Tons of cooling with 9 kW supplementary electric resistance heating coils. These units were installed around 1981 as part of the eight classroom addition.

Classrooms 25 through 30 are served by Airedale upright self contained unit ventilator. These units are all rated for 4-Tons of cooling and 50 MBH heating with a 12 kW supplementary electric resistance heating coil. These units were installed in 1988.

Classrooms 31 through 36 are served by American Air Filter heat pump unit ventilators. These units are rated for 3-1/2 Tons of cooling with a 16.6 kW electric resistance heating coil. These units were installed in 1992 as part of the six classroom addition.

The Library/Learning Center is served by a 20-Ton packaged rooftop unit with D/X cooling and 56kW electric resistance heating. This unit was installed in 2004.

The Gymnasium and All Purpose Room/Cafeteria are served by a total of four (4) ceiling air conditioning units with remote, roof mounted condensing units. The remote condensing units that serve the All Purpose Room/Cafeteria are McQuay model 16-Ton units. The inside air-handling units are McQuay model air handling units with D/X cooling coils and electric resistance heating coils. These units were all installed in 1988.

Exhaust System

Air is exhausted from the toilet rooms through the roof exhausters and in-line exhaust fans. The fans are controlled by room mounted wall switches.

HVAC System Controls

The HVAC systems within the elementary school are individual, standalone unit controls. Each system is equipped with a remote temperature sensor and/or thermostat to control individual unit temperature and operation.

Domestic Hot Water

Domestic hot water for the restrooms in the 1988 addition is provided by a 40 gallon State model electric hot water heater, capacity of 6000 Watts. Domestic Hot water for the kitchen is provided by a 120 gallon, Bradford White model electric hot water heater with a heating capacity of 6000 Watts. Domestic hot water for the 3rd Grade wing restrooms and teachers lounge is provided by a 119 gallon Bradford White model electric hot water heater with a capacity of 4500 Watts.

Lighting

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

III. MAJOR EQUIPMENT LIST

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

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

IV. ENERGY CONSERVATION MEASURES

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

Table 1
ECM Financial Summary

ENERGY CONSERVATION MEASURES (ECM's)					
ECM NO.	DESCRIPTION	NET INSTALLATION COST^A	ANNUAL SAVINGS^B	SIMPLE PAYBACK (Yrs)	SIMPLE LIFETIME ROI
ECM #1	Lighting Upgrades	\$15,800	\$2,612	6.0	148.0%
ECM #2	Lighting Controls	\$9,130	\$3,175	2.9	421.6%
ECM #3	Heat Pump and AC Unit Upgrades	\$140,181	\$10,546	13.3	12.8%
ECM #4	Library Rooftop Unit Upgrade	\$24,420	\$1,677	14.6	3.0%
ECM #5	DDC Controls Upgrade	\$221,714	\$13,487	16.4	-8.8%
ECM #6	Water Conservation	\$54,456	\$3,196	17.0	-12.0%
ECM #7	Geothermal Heat Pump System	\$1,672,839	\$67,342	24.8	0.6%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	DESCRIPTION	NET INSTALLATION COST	ANNUAL SAVINGS	SIMPLE PAYBACK (Yrs)	SIMPLE LIFETIME ROI
REM #1	Rooftop Solar Array	\$530,783	\$56,857	9.3	60.7%

Notes: A. Cost takes into consideration applicable NJ Smart StartTM incentives.
B. Savings takes into consideration applicable maintenance savings.

Table 2
ECM Energy Summary

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
ECM #1	Lighting Upgrades	11.8	20,734	0
ECM #2	Lighting Controls	4.0	25,200	
ECM #3	Heat Pump and AC Unit Upgrades	35.6	85,701	0
ECM #4	Library Rooftop Unit Upgrade	3.3	13,307	0
ECM #5	DDC Controls Upgrade	-	107,043	0
ECM #6	Water Conservation	-	12,704	0
ECM #7	Geothermal Heat Pump System	-	526,110	0
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	Rooftop Solar Array	69.9	105,368	-

Table 3
Facility Project Summary

ENERGY SAVINGS IMPROVEMENT PROGRAM - POTENTIAL PROJECT					
ENERGY CONSERVATION MEASURES	ANNUAL ENERGY SAVINGS (\$)	PROJECT COST (\$)	SMART START INCENTIVES	CUSTOMER COST	SIMPLE PAYBACK
Lighting Upgrades	\$2,612	\$15,800	\$0	\$15,800	6.0
Lighting Controls	\$3,175	\$9,900	\$770	\$9,130	2.9
Heat Pump and AC Unit Upgrades	\$10,546	\$146,058	\$5,877	\$140,181	13.3
Library Rooftop Unit Upgrade	\$1,677	\$26,000	\$1,580	\$24,420	14.6
DDC Controls Upgrade	\$13,487	\$221,714	\$0	\$221,714	16.4
Water Conservation	\$3,196	\$54,456	\$0	\$54,456	17.0
<i>Geothermal Heat Pump System</i>	\$67,342	\$1,859,589	\$186,750	\$1,672,839	24.8
<i>Design / Construction Extras (15%)</i>		\$71,089		\$71,089	
Total Project	\$34,693	\$545,017	\$8,227	\$536,790	15.5

* Highlighted ECMs are not included in the Total Project costs

Design / Construction Extras is shown as an additional cost for the facility project summary. This cost is included to estimate the costs associated with construction management fees for a larger combined project.

ECM #1: Lighting Upgrade – Interior spaces

Description:

The majority of the interior lighting throughout E.T Hamilton Elementary School is provided with 32W T8 lamps with electronic ballasts. There are still a limited number of areas that utilize fluorescent fixtures with 32W T8 lamps and magnetic ballasts. In addition, the Gymnasium utilizes T5HO fixtures with reflective lenses. CEG recommends replacing the magnetic ballasts with new, more efficient electronic ballasts

The ECM also includes replacement of any incandescent lamps with compact fluorescent lamps. Compact fluorescent lamps (CFL's) were designed to be direct replacements for the standard incandescent lamps which are common to table lamps, spot lights, hi-hats, bathroom vanity lighting, etc. The light output of the CFL has been designed to resemble the incandescent lamp. The color rendering index (CRI) of the CFL is much higher than standard fluorescent lighting, and therefore provides a much "truer" light. The CFL is available in a myriad of shapes and sizes depending on the specific application. Typical replacements are: a 13-Watt CFL for a 60-Watt incandescent lamp, an 18-Watt CFL for a 75-Watt incandescent lamp, and a 26-Watt CFL for a 100-Watt incandescent lamp. The CFL is also available for a number of "brightness colors" that is indicated by the Kelvin rating. A 2700K CFL is the "warmest" color available and is closest in color to the incandescent lamp. CFL's are also available in 3000K, 3500K, and 4100K. The 4100K would be the "brightest" or "coolest" output. A CFL can be chosen to screw right into your existing fixtures, or hardwired into your existing fixtures. Where the existing fixture is controlled by a dimmer switch, the CFL bulb must be compatible with a dimmer switch. In some locations the bulb replacement will need to be tested to make sure the larger base of the CFL will fit into the existing fixture. The energy usage of an incandescent compared to a compact fluorescent approximately 3 to 4 times greater. In addition to the energy savings, compact fluorescent fixtures burn-hours are 8 to 15 times longer than incandescent fixtures ranging from 6,000 to 15,000 burn-hours compared to incandescent fixtures ranging from 750 to 1000 burn-hours. However, the maintenance savings due to reduced lamp replacement is offset by the higher cost of the CFL's compared to the incandescent lamps.

Energy Savings Calculations:

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

Rebates and Incentives:

There are no Smart Start Rebates or Incentives for this ECM.

Replacement and Maintenance Savings:

There is no replacement or maintenance savings for this ECM.

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$15,800
NJ Smart Start Equipment Incentive (\$):	\$0
Net Installation Cost (\$):	\$15,800
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$2,612
Total Yearly Savings (\$/Yr):	\$2,612
Estimated ECM Lifetime (Yr):	15
Simple Payback	6.0
Simple Lifetime ROI	148.0%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$39,180
Internal Rate of Return (IRR)	14%
Net Present Value (NPV)	\$15,381.89

ECM #2: Lighting Controls Upgrade – Occupancy Sensors

Description:

While the lights in many of the areas of the School are controlled by occupancy sensors, both wall and remote mounted, some of the lights in the school building are still left on unnecessarily. In many cases the lights are left on because of the inconvenience to manually switch lights off when a room is left or on when a room is first occupied. This is common in rooms that are occupied for only short periods and only a few times per day. In some instances lights are left on due to the misconception that it is better to keep the lights on rather than to continuously switch lights on and off. Although increased switching reduces lamp life, the energy savings outweigh the lamp replacement costs. The payback timeframe for when to turn the lights off is approximately two minutes. If the lights are expected to be off for at least a two minute interval, then it pays to shut them off.

Lighting controls come in many forms. Sometimes an additional switch is adequate to provide reduced lighting levels when full light output is not needed. Occupancy sensors detect motion and will switch the lights on when the room is occupied. Occupancy sensors can either be mounted in place of a current wall switch, or on the ceiling to cover large areas.

The U.S. Department of Energy sponsored a study to analyze energy savings achieved through various types of building system controls. The referenced savings is based on the “Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways,” document posted for public use April 2005. The study has found that commercial buildings have the potential to achieve significant energy savings through the use of building controls. The average energy savings are as follows based on the report:

- Occupancy Sensors for Lighting Control 20% - 28% energy savings.

Savings resulting from the implementation of this ECM for energy management controls are estimated to be 20% of the total light energy controlled by occupancy sensors and daylight sensors (The majority of the savings is expected to be after school hours when rooms are left with lights on)

This ECM includes installation of ceiling or switch mount sensors for individual offices, classrooms, large bathrooms, and libraries. Sensors shall be manufactured by SensorSwitch, Watt Stopper or equivalent. The **Investment Grade Lighting Audit Appendix** of this report includes the summary of lighting controls implemented in this ECM and outlines the proposed controls, costs, savings, and payback periods. The calculations adjust the lighting power usage by the applicable percent savings for each area that includes lighting controls.

Energy Savings Calculations:

$$\text{Energy Savings} = (\% \text{ Savings} \times \text{Controlled Light Energy (kWh/Yr)})$$

$$\text{Savings} = \text{Energy Savings (kWh)} \times \text{Ave Elec Cost} \left(\frac{\$}{\text{kWh}} \right)$$

Rebates and Incentives:

From the **NJ Smart Start® Program Incentives Appendix**, the installation of a lighting control device warrants the following incentive:

Smart Start Incentive

$$= (\# \text{ Wall mount sensors} \times \$20 \text{ per sensor}) \\ + (\# \text{ Ceiling mount sensors} \times \$35 \text{ per sensor})$$

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$9,900
NJ Smart Start Equipment Incentive (\$):	\$770
Net Installation Cost (\$):	\$9,130
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$3,175
Total Yearly Savings (\$/Yr):	\$3,175
Estimated ECM Lifetime (Yr):	15
Simple Payback	2.9
Simple Lifetime ROI	421.6%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$47,625
Internal Rate of Return (IRR)	34%
Net Present Value (NPV)	\$28,772.94

ECM #3: Heat Pump and AC Unit Upgrades

Description:

E.T. Hamilton Elementary School is air conditioned by rooftop heat pumps, split system heat pump units and split system air conditioning only units. There are a total of ten (10) units that are in fair to poor condition and have reached or are reaching the end of their useful service life as defined by ASHRAE. In addition, the units currently installed are inefficient compared to modern equipment and can be replaced with new high efficiency units. New heat pumps and AC units provide higher full load and part load efficiencies due to advances in inverter motor technologies, heat exchangers and refrigerants.

This ECM includes one-for-one replacement of the older units with new higher efficiency systems. It is recommended to fully evaluate the capacity needed for all new systems prior to moving forward with this ECM. A summary of the unit replacements for this ECM can be found in the table below:

IMPLEMENTATION SUMMARY					
SYSTEM TYPE	UNIT NO.	NUMBER OF UNITS	COOLING CAPACITY, BTU/HR	TOTAL CAPACITY, TONS	REPLACE UNIT WITH
SS	CU-1, 7 & 8	3	192,000	48.0	Carrier - 38AUZ16
SS	CU-2	1	156,000	13.0	Carrier - 38AUZ14
SS	CU-3, 4 & 6	3	18,000	4.5	Carrier - 25HPA5
SS	CU-5	1	24,000	2.0	Carrier - 25HPA5
RTU	RTU-1	1	18,000	2.0	Carrier - 50XT-A
RTU	RTU-3	1	36,000	3.0	Carrier - 50XT-A
Total		10	444,000	72.5	

The manufacturers used as the basis for design are Carrier. All units are one for one style replacements with matching capacity of the new units to the old units.

Energy Savings Calculations:

Cooling Energy Savings:

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

Cooling Energy Savings, kWh

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

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

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

Heating Energy Savings, kWh (Heat Pumps Only)

$$= \text{Heating Capacity, } \frac{\text{MBH}}{293.07 \frac{\text{MBH}}{\text{kW}}} \times \text{Operation Hours} \times \left(\frac{1}{\text{COP}_{\text{Old}}} - \frac{1}{\text{COP}_{\text{New}}} \right)$$

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

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

ENERGY SAVINGS CALCULATIONS											
ECM INPUTS	COOLING CAPACITY, BTU/Hr	ANNUAL COOLING HOURS	ANNUAL HEATING HOURS	EXISTING UNITS EER	NEW UNITS EER	EXISTING UNITS COP	SPLIT UNITS COP	# OF UNITS	ENERGY SAVINGS COOLING KWH	ENERGY SAVINGS HEATING KWH	DEMAND SAVINGS kW
SS	192,000	1,800	1,200	9.7 EER	13.2 EER	COP	COP	3	28,341	N/A	15.7
SS	156,000	1,800	1,200	9.7 EER	12 EER	COP	COP	1	5,548	N/A	3.1
SS	18,000	1,800	1,200	9.4 EER	14 EER	2.5 COP	3 COP	3	3,398	4,914	2.8
SS	24,000	1,800	1,200	9.2 EER	14 EER	2.5 COP	3 COP	1	1,610	6,551	2.7
RTU	18,000	1,800	1,200	9 EER	11.4 EER	2.25 COP	3.3 COP	1	758	10,423	3.7
RTU	36,000	2,000	1,200	9 EER	12 EER	2.25 COP	3.4 COP	1	2,000	22,159	7.5
Total								10	41,655	44,046	35.6

Project Cost, Incentives and Maintenance Savings

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

$$\text{SmartStart}^{\text{®}} \text{ Incentive} = (\text{Cooling Tons} \times \$/\text{Ton Incentive})$$

SPLIT SYSTEM UNITS REBATE SUMMARY				
UNIT DESCRIPTION	UNIT EFFICIENCY	REBATE \$/TON	PROPOSED CAPACITY TONS (TOTAL)	TOTAL REBATE \$
5.4 tons or less Unitary AC and Split System	≥14 SEER	\$92	11.5	\$1,058
≥ 11.25 to < 20 tons	11.5 EER	79	61	\$4,819
TOTAL			72.5	\$5,877

Summary of cost, savings and payback for this ECM is below.

COST & SAVINGS SUMMARY							
ECM INPUTS	INSTALLED COST	# OF UNITS	TOTAL COST	REBATES	NET COST	ENERGY SAVING	PAY BACK YEARS
SS	\$23,288	3	\$80,342	\$3,792	\$76,550	\$3,571	21.4
SS	\$20,700	1	\$23,805	\$1,027	\$22,778	\$699	32.6
SS	\$4,667	3	\$16,101	\$414	\$15,687	\$1,047	15.0
SS	\$6,900	1	\$7,935	\$184	\$7,751	\$1,028	7.5
RTU	\$7,500	1	\$8,625	\$184	\$8,441	\$1,409	6.0
RTU	\$9,250	1	\$9,250	\$276	\$8,974	\$2,792	0.0
Total	\$63,055	9	\$146,058	\$5,877	\$140,181	\$10,546	13.3

There is no significant maintenance savings due to implementation of this ECM.

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$146,058
NJ Smart Start Equipment Incentive (\$):	\$5,877
Net Installation Cost (\$):	\$140,181
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$10,546
Total Yearly Savings (\$/Yr):	\$10,546
Estimated ECM Lifetime (Yr):	15
Simple Payback	13.3
Simple Lifetime ROI	12.8%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$158,190
Internal Rate of Return (IRR)	2%
Net Present Value (NPV)	(\$14,283.54)

ECM #4: Library Rooftop Unit Upgrade

Description:

The Library of the school is air conditioned by a single, packaged rooftop unit with D/X cooling and electric resistance heating. This unit is in fair condition, is approximately 9 years old, and is within its useful service life as defined by ASHRAE. However, this unit is inefficient compared to modern equipment and can be replaced with a new high efficiency unit. New air conditioners provide higher full load and part load efficiencies due to advances in inverter motor technologies, heat exchangers and refrigerants.

This ECM includes one-for-one replacement of the older rooftop unit with a new higher efficiency unit. A summary of the unit replacement for this ECM can be found in the table below:

IMPLEMENTATION SUMMARY					
ECM INPUTS	SERVICE FOR	NUMBER OF UNITS	COOLING CAPACITY, BTU/HR	TOTAL CAPACITY, TONS	REPLACE UNIT WITH
RTU	Library	1	240,000	20.0	Carrier - Model 50TC
Total		1	240,000	20.0	

Energy Savings Calculations:

Cooling Energy Savings:

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

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

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

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

ENERGY SAVINGS CALCULATIONS										
ECM INPUTS	COOLING CAPACITY, BTU/Hr	ANNUAL COOLING HOURS	ANNUAL HEATING HOURS	EXISTING UNITS (S)EER	UPGRADED UNIT (S)EER	EXISTING UNIT NOMINAL KW	UPGRADED UNIT NOMINAL KW	# OF UNITS	ENERGY SAVINGS kWh	DEMAND SAVINGS kW
RTU	240,000	1,800	2,200	9.73 EER	10.95 EER	56	52.2	1	13,307	3.3
Total								1	13,307	3.3

Project Cost, Incentives and Maintenance Savings

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

$$\text{SmartStart® Incentive} = (\text{CoolingTons} \times \$/\text{Ton Incentive})$$

SPLIT SYSTEM AC UNITS REBATE SUMMARY				
UNIT DESCRIPTION	UNIT EFFICIENCY	REBATE \$/TON	PROPOSED CAPACITY TONS	TOTAL REBATE \$
≥20 to 30 tons	10.5 EER	79	20	\$1,580
TOTAL			20	\$1,580

Summary of cost, savings and payback for this ECM is below.

COST & SAVINGS SUMMARY							
ECM INPUTS	INSTALLED COST	# OF UNITS	TOTAL COST	REBATES	NET COST	ENERGY SAVING	PAY BACK YEARS
RTU	\$26,000	1	\$26,000	\$1,580	\$24,420	\$1,677	14.6
Total	\$26,000	1	\$26,000	\$1,580	\$24,420	\$1,677	14.6

There is no significant maintenance savings due to implementation of this ECM.

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$26,000
NJ Smart Start Equipment Incentive (\$):	\$1,580
Net Installation Cost (\$):	\$24,420
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$1,677
Total Yearly Savings (\$/Yr):	\$1,677
Estimated ECM Lifetime (Yr):	15
Simple Payback	14.6
Simple Lifetime ROI	3.0%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$25,155
Internal Rate of Return (IRR)	0%
Net Present Value (NPV)	(\$4,400.08)

ECM #5: DDC Controls Upgrade

Description:

The majority HVAC systems within the facility are controlled manually via electronic local thermostats. The units in the system have individual room thermostats that are controlled by building operators and occupants.

The typical hours of operation for this facility are Monday through Friday approximately 40 hours per week, dependent on after school activities and holidays. The building is typically closed on weekends.

There is no thermostat adjustments made and set back/set up functions are not employed. Therefore, a DDC system providing the Township and building maintenance personnel with full control over the HVAC equipment within the building appears to be an energy saving opportunity.

The installation of a Building Automation system with Direct Digital Controls (DDC) wired through an Ethernet backbone and front end controller is the typical solution to gain control over the HVAC systems and to minimize the system energy use.

In the long term, all equipment replacement should include for each unit being replaced a unit DDC controller. The system replacements should include new thermostat controllers for all air conditioning systems and the rooftop units, in addition to each piece of equipment being wired back to a front end controller and computer interface. With the communication between the devices and the front end computer interface, the Owner will be able to take advantage of equipment scheduling for occupied and unoccupied periods based on the actual occupancy of the facility. The DDC system will also aid in the response time to service / maintenance issues when the facility is not under normal maintenance supervision, i.e. after-hours and week-ends.

A new DDC system has the potential to provide substantial savings by controlling the HVAC systems as a whole and provide operating schedules and features such as space averaging, night set-back, temperature override control, etc. The U.S. Department of Energy sponsored a study to analyze energy savings achieved through various types of building system controls. The referenced savings is based on the “Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways,” document posted for public use April 2005. The study has found that commercial buildings have the potential to achieve significant energy savings through the use of building controls. The average energy savings are as follows based on the referenced report:

- Typical Energy Management and Control System Savings: 5%-15%.

Savings resulting from the implementation of this ECM for energy management controls are estimated to be 10% of the total energy cost for the facility.

The cost of a full DDC system with new field devices, controllers, computer, software, programming, etc. is approximately \$3.50 per SF in accordance with recent Contractor pricing for systems of this magnitude. Savings from the implementation of this ECM will be from the reduced energy consumption currently used by the HVAC system by proper control of schedule and temperatures via the DDC system. The total cost of a complete DDC system is estimated to be **\$221,714**.

Energy Savings Calculations:

10% Savings on Heating and Cooling Calculations:

$$\text{Savings} = \text{Heating \& Cooling Cons. (kWh)} \times 10\% \text{ Savings} \times \text{Ave Elec Cost} \left(\frac{\$}{\text{kWh}} \right)$$

The calculations are summarized in the table below.

ECM - DDC CONTROLS			
ECM INPUTS	EXISTING	PROPOSED	SAVINGS
Building Total Area (Sq.Ft.)	63,347	63,347	-
Lighting Load (w/Sq.Ft.)	1.5	1.5	-
Plug Load (w/Sq.Ft.)	1	1	-
Annual Electrical Consumption (kWh/yr.)	1,228,800	1,228,800	-
Net Annual Mechanical Electrical Consumption (kWh/yr.)	1,070,433	1,070,433	-
Energy Savings	0%	10%	-
Electricity Cost (\$/kWh)	\$0.126	\$0.126	-
Natural Gas Cost (\$/Therm)	-	-	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	EXISTING	PROPOSED	SAVINGS
Annual Mechanical Electricity Energy (kWh/yr.)	1,070,433	963,389	107,043
Annual Electricity Cost (\$)	\$134,874.50	\$121,387.05	\$13,487
Total Annual Savings (\$/yr.)	\$134,874	\$121,387	\$13,487

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$221,714
NJ Smart Start Equipment Incentive (\$):	\$0
Net Installation Cost (\$):	\$221,714
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$13,487
Total Yearly Savings (\$/Yr):	\$13,487
Estimated ECM Lifetime (Yr):	15
Simple Payback	16.4
Simple Lifetime ROI	-8.8%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$202,305
Internal Rate of Return (IRR)	-1%
Net Present Value (NPV)	(\$60,707.07)

ECM #6: Water Conservation

Description:

E.T. Hamilton Elementary School utilizes standard plumbing fixtures. The typical water closet and urinal water consumption only meet the minimum federally required standard for water efficiency. New fixtures are available that use less water than today's requirements and can add up to significant water reduction over a long period.

This ECM includes the replacement of the existing sink faucets within the bathrooms. The estimated usage of the plumbing fixtures is based on the total population of the facility. The number of plumbing fixtures to be replaced is based on site survey of the facilities.

The proposed retrofit includes installation of auto flow sink faucets and low flow aerators. For the basis of this calculation the LEED rating system was used to estimate the occupancy usage for students within the school. When water consumption information was not available, the GPF values were estimated for the existing fixtures.

Energy Savings Calculations:

Faucets:

$$\text{Water Consumption} = \text{Occupancy} \left(\frac{\text{Days}}{\text{Yr}} \right) \times \text{Use} \left(\frac{\text{Use}}{\text{Person per Day}} \right) \times \text{Use Time} \left(\frac{\text{Sec}}{\text{Use}} \right) \times \text{Fixture} \left(\frac{\text{Gal}}{\text{Min}} \right)$$

$$\text{Water Cost} = \frac{\text{Water Consumption (Gallons)} \times \text{Ave Cost} \left(\frac{\$}{1000 \text{ Gal}} \right)}{1000(\text{Gal})}$$

WATER CONSERVATION CALCULATIONS			
ECM INPUTS	EXISTING	PROPOSED	SAVINGS
ECM INPUTS	Existing Fixtures	Low Flow / Auto Flow Fixtures	-
Total Number of Students	504	504	-
% Male to Female	50%	50%	-
Estimated % Floor Area Served by Older Bathrooms	100%	100%	-
Occupied Days Per Year	250	250	-
Lavatory Uses per Day per Person	3	3	-
Sink flow time per use, sec	15	12	-
Sink Aerator Flow, GPM	1.5	0.5	-
WC Uses per Day per Person	2.0	2.0	-
Urinal Uses per Day per Person	1.0	1.0	-
Total Urinal Flushes Per Day	252	252	-
Total WC Flushes Per Day	504	504	-
Urinal Gallons Per Flush (GPF)	1.0	0.125	0.875
WC Gallons Per Flush (GPF)	1.6	1.28	0.32
** Water Cost (\$/1000 Gal)	\$8.00	\$8.00	-
Electric Cost (\$/Kwh)	\$0.126	\$0.126	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	EXISTING	PROPOSED	SAVINGS
Water Consumption, Urinal and WC (Gal)	264,600	169,155	95,445
Water Consumption, Faucets (Gal)	141,750	37,800	103,950
Total Water Consumption, (Gal)	406,350	206,955	199,395
Water Cost (\$)	\$3,251	\$1,656	\$1,595
Electric Consumption (Kwh)	17,323	4,620	12,704
Electric Cost (\$/Year)	\$2,183	\$582	\$1,601
TOTAL SAVINGS			\$3,196
COMMENTS:	*Savings are based on LEED Reference Guide for Green Building Design and Construction - 2009 Edition for WC and Urinal water usage. ** Cost of Water estimated.		

There are no Smart Start rebates for installation of low flow plumbing fixtures.

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$54,456
NJ Smart Start Equipment Incentive (\$):	\$0
Net Installation Cost (\$):	\$54,456
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$3,196
Total Yearly Savings (\$/Yr):	\$3,196
Estimated ECM Lifetime (Yr):	15
Simple Payback	17.0
Simple Lifetime ROI	-12.0%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	\$47,940
Internal Rate of Return (IRR)	-2%
Net Present Value (NPV)	(\$16,302.36)

ECM #7: Geothermal Heat Pump System Installation

Description:

The HVAC Systems at E.T. Hamilton Elementary School is a combination of split system heat pump units, rooftop heat pumps and individual classroom heat pumps.

A geothermal heat pump system utilizes the ground as a heat sink to extract and reject heat to depending on the season. Due to the large thermal mass provided by the ground, the HVAC equipment is able to take advantage of cooler temperatures in the summer and warmer temperatures in the winter compared to the ambient air. The benefits include substantial energy efficiency increase with respect to air source systems. In addition, no electrical resistance heat is required in the heating season also reducing electric usage. A geothermal system sized properly requires no additional heat production equipment (such as a boiler) or heat rejection equipment (such as a cooling tower). All loads are handled by the heat pumps and the geothermal water loop. Due to the inefficiency of the boiler and poor operational characteristics of the air to air heat pumps, a geothermal system energy costs become very appealing.

This ECM includes the installation of ground source heat pumps installed above the ceilings of each classroom, or mounted upright in a closet style configuration. This is in place of the existing unit ventilators in the classrooms and offices. Outside air would be provided by a dedicated central outside air heat pump distributed by ductwork above the corridor to each occupied zone. This system would provide ventilation air to replace the outside air openings currently ducted to each unit ventilator. The air to air heat pumps would be replaced with packaged rooftop ground source heat pumps. The proposed outside air unit would include an energy recovery wheel for additional savings on ventilation air. This ECM also includes installation of new ground loop water pumps with VFD drives. The pumping system is included to pump transfer fluid from the building to the well field and back. The geothermal system would require (not limited to) the following major components:

1. 415-Ton (Heating Dominant) bore field located Southwest end of the building. (138 bores, 450 ft deep each). Bore field sizing is based on 150 linear feet of bore per ton of cooling. A complete geotechnical analysis will have to be performed in order to confirm the actual soil thermal conductivity at the site.
2. (3) Loop condenser water pumps.
3. Condenser water piping distribution system from the well field to the roof top units and indoor heat pumps.
4. Installation of high-efficiency (16 EER) geothermal rooftop units to provide heated and cooled ventilation air and (18 EER) geothermal indoor heat pumps to replace the classroom unit ventilators.
5. Removal all existing AC units, air handlers and air to air heat pumps.

This ECM is based on Climate Master Tranquility Series water source heat pumps model TRE for the rooftop units, and model TS or TV for the horizontal / vertical units or equal. **Note:** Sizing indicated within the calculation of this ECM is based on a one for one replacement of the

existing equipment. Owner should have a Professional Engineer verify heating and cooling loads prior to moving forward with this ECM.

Energy Savings Calculations:

The energy savings calculations are based on the energy analysis performed on the energy modeling software by Trane (Trace 700 ver. 6.2.4). The energy consumption of the baseline is compared to the proposed model to determine energy savings for each utility. The savings are applied to the average energy costs based on the facilities actual usage. Note: Heating and cooling is provided for the entire building the geothermal system model. Heating and cooling is only provided for the new addition in the baseline model with heating only provided for the original building. This ECM represents a significant upgrade to the building's HVAC system.

ECM #7 GEOTHERMAL SYSTEM CALCULATIONS			
ECM INPUTS	EXISTING	PROPOSED	SAVINGS
ECM INPUTS	Existing Energy Consumption	Proposed Energy Consumption	
Elec Usage (KWH)	1,228,800	702,690	526,110
Electric Cost (\$/KWH)	\$0.128	\$0.128	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	EXISTING	PROPOSED	SAVINGS
Electric Energy Cost (\$)	\$157,286	\$89,944	\$67,342
Total Energy Cost (\$)	\$157,286	\$89,944	\$67,342
COMMENTS:	This ECM is based on energy models performed on energy analysis software by Trane (Trace 700).		

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$1,859,589
NJ Smart Start Equipment Incentive (\$):	\$186,750
Net Installation Cost (\$):	\$1,672,839
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$67,342
Total Yearly Savings (\$/Yr):	\$67,342
Estimated ECM Lifetime (Yr):	25
Simple Payback	24.8
Simple Lifetime ROI	0.6%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$1,683,550
Internal Rate of Return (IRR)	0%
Net Present Value (NPV)	(\$500,203.18)

***Note:** ECM #7 – Geothermal System Installation is an alternate ECM. Implementation of ECM #7 would eliminate the potential for ECM #s – 3, 4, & 5.

REM #1: Rooftop Solar Array

Description:

E.T. Hamilton Elementary School has approximately 9,000 square-foot of available roof space that can accommodate a 69.9 KW solar array, assuming the existing roof structure is capable of supporting such an array.

The array will produce approximately 105,368 kilowatt-hours annually that will reduce the overall electric usage of the facility by 8.57%.

Energy Savings Calculations:

See **LGEA Solar Financials Appendix F** for detailed financial summary and proposed solar layout areas.

Energy Savings Summary:

REM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$530,783
NJ Smart Start Equipment Incentive (\$):	\$0
Net Installation Cost (\$):	\$530,783
Maintenance Savings (\$/Yr):	\$40,630
Energy Savings (\$/Yr):	\$16,227
Total Yearly Savings (\$/Yr):	\$56,857
Estimated ECM Lifetime (Yr):	15
Simple Payback	9.3
Simple Lifetime ROI	60.7%
Simple Lifetime Maintenance Savings	\$609,450
Simple Lifetime Savings	\$852,855
Internal Rate of Return (IRR)	7%
Net Present Value (NPV)	\$147,972.18

V. ADDITIONAL RECOMMENDATIONS

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

- A. Chemically clean the condenser and evaporator coils periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.
- B. Maintain all weather stripping on windows and doors.
- C. Clean all light fixtures to maximize light output.
- D. Provide more frequent air filter changes to decrease overall system power usage and maintain better IAQ.
- E. Turn off computers when not in use. Ensure computers are not running in screen saver mode which saves the monitor screen not energy.
- F. Ensure outside air dampers are functioning properly and only open during occupied mode.

APPENDIX A

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Voorhees Township Public Schools – E.T. Hamilton Elementary School

ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Saving * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)		
		(\$)	(\$)	(\$)	(\$)	(\$/Yr)	(\$/Yr)	(\$/Yr)		(\$)	(\$)	(%)	(Yr)	(\$)	(\$)
ECM #1	Lighting Upgrades	\$6,320	\$9,480	\$0	\$15,800	\$2,612	\$0	\$2,612	15	\$39,180	\$0	148.0%	6.0	14.31%	\$15,381.89
ECM #2	Lighting Controls	\$3,960	\$5,940	\$770	\$9,130	\$3,175	\$0	\$3,175	15	\$47,625	\$0	421.6%	2.9	34.36%	\$28,772.94
ECM #3	Heat Pump and AC Unit Upgrades	\$73,029	\$73,029	\$5,877	\$140,181	\$10,546	\$0	\$10,546	15	\$158,190	\$0	12.8%	13.3	1.55%	(\$14,283.54)
ECM #4	Library Rooftop Unit Upgrade	\$15,600	\$10,400	\$1,580	\$24,420	\$1,677	\$0	\$1,677	15	\$25,155	\$0	3.0%	14.6	0.37%	(\$4,400.08)
ECM #5	DDC Controls Upgrade	\$88,686	\$133,028	\$0	\$221,714	\$13,487	\$0	\$13,487	15	\$202,305	\$0	-8.8%	16.4	-1.12%	(\$60,707.07)
ECM #6	Water Conservation	\$27,228	\$27,228	\$0	\$54,456	\$3,196	\$0	\$3,196	15	\$47,940	\$0	-12.0%	17.0	-1.55%	(\$16,302.36)
ECM #7	Geothermal Heat Pump System	\$763,821	\$1,095,769	\$186,750	\$1,672,839	\$67,342	\$0	\$67,342	25	\$1,683,550	\$0	0.6%	24.8	0.05%	(\$500,203.18)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	Rooftop Solar Array	\$530,783	\$0	\$0	\$530,783	\$16,227	\$40,630	\$56,857	15	\$852,855	\$609,450	60.7%	9.3	6.61%	\$147,972.18

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

APPENDIX B

Concord Engineering Group, Inc.

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



SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives as of February, 2010:

Electric Chillers

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

Energy Efficiency must comply with ASHRAE 90.1-2004

Gas Cooling

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

Desiccant Systems

\$1.00 per cfm – gas or electric

Electric Unitary HVAC

Unitary AC and Split Systems	\$73 - \$93 per ton
Air-to-Air Heat Pumps	\$73 - \$92 per ton
Water-Source Heat Pumps	\$81 per ton
Packaged Terminal AC & HP	\$65 per ton
Central DX AC Systems	\$40- \$72 per ton
Dual Enthalpy Economizer Controls	\$250
Occupancy Controlled Thermostat (Hospitality & Institutional Facility)	\$75 per thermostat

Energy Efficiency must comply with ASHRAE 90.1-2004

Ground Source Heat Pumps

Closed Loop & Open Loop	\$450 per ton, EER $\geq$ 16
	\$600 per ton, EER $\geq$ 18
	\$750 per ton, EER $\geq$ 20

Energy Efficiency must comply with ASHRAE 90.1-2004

Gas Heating

Gas Fired Boilers < 300 MBH	\$300 per unit
Gas Fired Boilers $\geq$ 300 - 1500 MBH	\$1.75 per MBH
Gas Fired Boilers $\geq$ 1500 - $\leq$ 4000 MBH	\$1.00 per MBH
Gas Fired Boilers > 4000 MBH	(Calculated through Custom Measure Path)
Gas Furnaces	\$300 - \$400 per unit, AFUE $\geq$ 92%

Variable Frequency Drives

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

Natural Gas Water Heating

Gas Water Heaters $\leq$ 50 gallons	\$50 per unit
Gas-Fired Water Heaters > 50 gallons	\$1.00 - \$2.00 per MBH
Gas-Fired Booster Water Heaters	\$17 - \$35 per MBH
Gas Fired Tankless Water Heaters	\$300 per unit

Prescriptive Lighting

Retro fit of T12 to T-5 or T-8 Lamps w/Electronic Ballast in Existing Facilities	\$10 per fixture (1-4 lamps)
Replacement of T12 with new T-5 or T-8 Lamps w/Electronic Ballast in Existing Facilities	\$25 per fixture (1-2 lamps) \$30 per fixture (3-4 lamps)
Replacement of incandescent with screw-in PAR 38 or PAR 30 (CFL) bulb	\$7 per bulb
T-8 reduced Wattage (28w/25w 4', 1-4 lamps) Lamp & ballast replacement	\$10 per fixture
Hard-Wired Compact Fluorescent	\$25 - \$30 per fixture
Metal Halide w/Pulse Start	\$25 per fixture
LED Exit Signs	\$10 - \$20 per fixture
T-5 and T-8 High Bay Fixtures	\$16 - \$284 per fixture
HID $\geq$ 100w Retrofit with induction lamp, power coupler and generator (must be 30% less watts/fixture than HID system)	\$50 per fixture
HID $\geq$ 100w Replacement with new HID $\geq$ 100w	\$70 per fixture
LED Refrigerator/Freezer case lighting replacement of fluorescent in medium and low temperature display case	\$42 per 5 foot \$65 per 6 foot

Lighting Controls – Occupancy Sensors

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

Lighting Controls – HID or Fluorescent Hi-Bay Controls

Occupancy hi-low	\$75 per fixture controlled
Daylight Dimming	\$75 per fixture controlled
Daylight Dimming - office	\$50 per fixture controlled

Premium Motors

Three-Phase Motors	\$45 - \$700 per motor
Fractional HP Motors Electronic Communicated Motors (replacing shaded pole motors in refrigerator/freezer cases)	\$40 per electronic communicated motor

Other Equipment Incentives

Performance Lighting	\$1.00 per watt per SF below program incentive threshold, currently 5% more energy efficient than ASHRAE 90.1- 2004 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive
Custom Measures	\$0.16 KWh and \$1.60/Therm of 1st year savings, or a buy down to a 1 year payback on estimated savings. Minimum required savings of 75,000 KWh or 1,500 Therms and a IRR of at least 10%.
Multi Measures Bonus	15%

APPENDIX C



STATEMENT OF ENERGY PERFORMANCE

E.T. Hamilton Elementary School

Building ID: 2820749

For 12-month Period Ending: February 28, 2011¹

Date SEP becomes ineligible: N/A

Date SEP Generated: August 03, 2011

Facility

E.T. Hamilton Elementary School
23 Northgate Drive
Voorhees, NJ 08043

Facility Owner

Voorhees Township Board of Education
329 Route 73
Voorhees, NJ 08043

Primary Contact for this Facility

Frank DeBerardinis
329 Route 73
Voorhees, NJ 08043

Year Built: 1969

Gross Floor Area (ft²): 63,347Energy Performance Rating² (1-100) 15**Site Energy Use Summary³**

Electricity - Grid Purchase(kBtu)	4,192,666
Natural Gas - (kBtu) ⁴	0
Total Energy (kBtu)	4,192,666

Energy Intensity⁵

Site (kBtu/ft ² /yr)	66
Source (kBtu/ft ² /yr)	221

Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO ₂ e/year)	594
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Electric Distribution Utility

Atlantic City Electric Co [Pepco Holdings Inc]

National Average Comparison

National Average Site EUI	47
National Average Source EUI	156
% Difference from National Average Source EUI	42%
Building Type	K-12 School

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 Standards⁶ for Indoor Environmental Conditions:

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

Certifying Professional

Michael Fischette
520 South Burnt Mill Road
Voorhees, NJ 08043

Notes:

1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Values represent energy intensity, annualized to a 12-month period.
5. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

ENERGY STAR® Data Checklist for Commercial Buildings

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

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

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

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☒
Building Name	E.T. Hamilton Elementary School	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	K-12 School	Is this an accurate description of the space in question?		☐
Location	23 Northgate Drive, Voorhees, NJ 08043	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	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		☐
E.T. Hamilton Elementary School (K-12 School)				
CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☒
Gross Floor Area	63,347 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.		☐
Open Weekends?	No	Is this building normally open at all on the weekends? This includes activities beyond the work conducted by maintenance, cleaning, and security personnel. Weekend activity could include any time when the space is used for classes, performances or other school or community activities. If the building is open on the weekend as part of the standard schedule during one or more seasons, the building should select ?yes? for open weekends. The ?yes? response should apply whether the building is open for one or both of the weekend days.		☐
Number of PCs	111 (Default)	Is this the number of personal computers in the K12 School?		☐
Number of walk-in refrigeration/freezer units	1 (Default)	Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas.		☐
Presence of cooking facilities	Yes	Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no".		☐
Percent Cooled	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐
Months	10(Optional)	Is this school in operation for at least 8 months of the year?		☐

High School?	No	Is this building a high school (teaching grades 10, 11, and/or 12)? If the building teaches to high school students at all, the user should check 'yes' to 'high school'. For example, if the school teaches to grades K-12 (elementary/middle and high school), the user should check 'yes' to 'high school'.	☐
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ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: Atlantic City Electric Co [Pepco Holdings Inc]

Fuel Type: Electricity		
Meter: Electric (kWh (thousand Watt-hours)) Space(s): Entire Facility Generation Method: Grid Purchase		
Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
02/01/2011	02/28/2011	140,400.00
01/01/2011	01/31/2011	161,700.00
12/01/2010	12/31/2010	168,300.00
11/01/2010	11/30/2010	100,500.00
10/01/2010	10/31/2010	65,700.00
09/01/2010	09/30/2010	87,600.00
08/01/2010	08/31/2010	75,600.00
07/01/2010	07/31/2010	89,700.00
06/01/2010	06/30/2010	97,800.00
05/01/2010	05/31/2010	84,300.00
04/01/2010	04/30/2010	68,100.00
03/01/2010	03/31/2010	89,100.00
Electric Consumption (kWh (thousand Watt-hours))		1,228,800.00
Electric Consumption (kBtu (thousand Btu))		4,192,665.60
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		4,192,665.60
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Additional Fuels	
Do the fuel consumption totals shown above represent the total energy use of this building? Please confirm there are no additional fuels (district energy, generator fuel oil) used in this facility.	☐

On-Site Solar and Wind Energy	
Do the fuel consumption totals shown above include all on-site solar and/or wind power located at your facility? Please confirm that no on-site solar or wind installations have been omitted from this list. All on-site systems must be reported.	☐

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

E.T. Hamilton Elementary School
23 Northgate Drive
Voorhees, NJ 08043

Facility Owner

Voorhees Township Board of Education
329 Route 73
Voorhees, NJ 08043

Primary Contact for this Facility

Frank DeBerardinis
329 Route 73
Voorhees, NJ 08043

General Information

E.T. Hamilton Elementary School	
Gross Floor Area Excluding Parking: (ft ²)	63,347
Year Built	1969
For 12-month Evaluation Period Ending Date:	February 28, 2011

Facility Space Use Summary

E.T. Hamilton Elementary School	
Space Type	K-12 School
Gross Floor Area(ft ²)	63,347
Open Weekends?	No
Number of PCs ^d	111
Number of walk-in refrigeration/freezer units ^d	1
Presence of cooking facilities	Yes
Percent Cooled	100
Percent Heated	100
Months ^o	10
High School?	No
School District ^o	N/A

Energy Performance Comparison

Performance Metrics	Evaluation Periods		Comparisons		
	Current (Ending Date 02/28/2011)	Baseline (Ending Date 02/28/2011)	Rating of 75	Target	National Average
Energy Performance Rating	15	15	75	N/A	50
Energy Intensity					
Site (kBtu/ft ²)	66	66	37	N/A	47
Source (kBtu/ft ²)	221	221	122	N/A	156
Energy Cost					
\$/year	N/A	N/A	N/A	N/A	N/A
\$/ft ² /year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
MtCO ₂ e/year	594	594	328	N/A	420
kgCO ₂ e/ft ² /year	9	9	5	N/A	6

More than 50% of your building is defined as K-12 School. Please note that your rating accounts for all of the spaces listed. The National Average column presents energy performance data your building would have if your building had an average rating of 50.

Notes:

o - This attribute is optional.

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

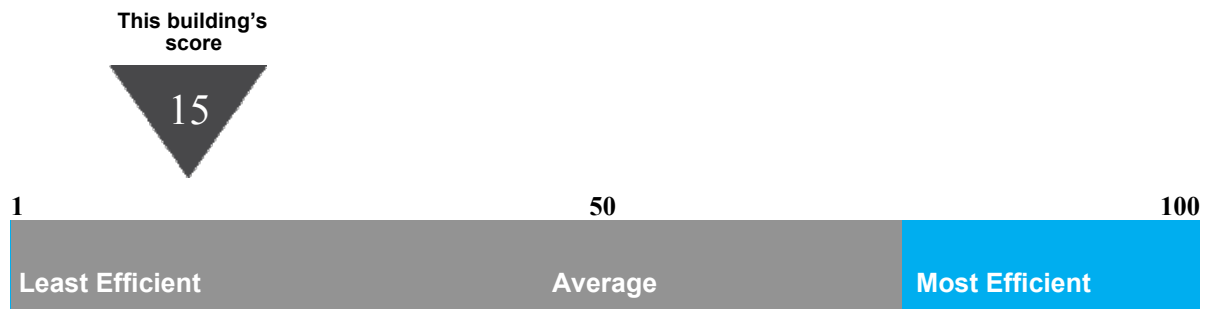
Statement of Energy Performance

2011

E.T. Hamilton Elementary School
23 Northgate Drive
Voorhees, NJ 08043

Portfolio Manager Building ID: 2820749

The energy use of this building has been measured and compared to other similar buildings using the Environmental Protection Agency's (EPA's) Energy Performance Scale of 1–100, with 1 being the least energy efficient and 100 the most energy efficient. For more information, visit energystar.gov/benchmark.



This building uses 221 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending February 2011

Buildings with a score of 75 or higher may qualify for EPA's ENERGY STAR.

I certify that the information contained within this statement is accurate and in accordance with U.S. Environmental Protection Agency's measurement standards, found at energystar.gov

Date of certification



APPENDIX D

MAJOR EQUIPMENT LIST

Concord Engineering Group

E.T. Hamilton Elementary School

AC Units

Tag	RTU-1	RTU-2	RTU-3
Unit Type	Rooftop Heat Pump	Rooftop Unit	Rooftop Heat Pump
Qty	1	1	1
Location	Roof	Roof	Roof
Area Served		Library	Main Office
Manufacturer	Rheem	Carrier	Rheem
Model #	RPNC-019J000	50TM-025	RPNC-036D000
Serial #	4453F35889823	2304F38291	4066F3388 8492
Cooling Type	R22, DX	R22, DX	R22, DX
Cooling Capacity (Tons)	1.5	20.0	3.0
Cooling Efficiency (SEER/EER)	9	9.7	9
Heating Type	Heat Pump	Electric Heat	Heat Pump
Heating Input (MBH)	5.6 kW Aux Heat	56KW @ 208V	15.2 kW Aux Heat
Efficiency	100%	100%	100%
Fuel	Electric	Electric	Electric
Approx Age	23	7	23
ASHRAE Service Life	15	15	15
Remaining Life	(8)	8	(8)
Comments	Economizer & Electric Heater	Unit is in fair condition	Economizer & Electric Heater

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

AC Units

Tag	CU-1	CU-2	CU-3
Unit Type	Condensing Unit	Condensing Unit	Condensing Unit
Qty	1	1	1
Location	Roof	Roof	Roof
Area Served	AHU-1	AHU-1	Classroom 27 - Computer
Manufacturer	McQuay	McQuay	EMI
Model #	ALP016C	ALP013C	SCC18DF0000AA0A
Serial #	5TJ0500600	5TJ0500300	1-00-E-5879-21
Cooling Type	R22, DX	R22, DX	R22, DX
Cooling Capacity (Tons)	16.0	13.0	1.5
Cooling Efficiency (SEER/EER)	9.7	9.7	9.4
Heating Type	N/A	N/A	N/A
Heating Input (MBH)	N/A	N/A	N/A
Efficiency	N/A	N/A	N/A
Fuel	N/A	N/A	N/A
Approx Age	23	23	11
ASHRAE Service Life	15	15	15
Remaining Life	(8)	(8)	4
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

AC Units

Tag	CU-4	CU-5	CU-6
Unit Type	Heat Pump	Heat Pump	Heat Pump
Qty	1	1	1
Location	Roof	Roof	Roof
Area Served			
Manufacturer	Payne	Payne	Payne
Model #	PH10JA018-C	PH10JA024-E	PH10JA018-C
Serial #	0502E07637	1702E18422	0502E07639
Cooling Type	R22, DX	R22, DX	R22, DX
Cooling Capacity (Tons)	1.5	2.0	1.5
Cooling Efficiency (SEER/EER)	9.4	9.2	9.4
Heating Type	N/A	N/A	N/A
Heating Input (MBH)	N/A	N/A	N/A
Efficiency	2.5 (est)	2.5 (est)	2.5 (est)
Fuel	N/A	N/A	N/A
Approx Age	9	9	9
ASHRAE Service Life	15	15	15
Remaining Life	6	6	6
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

AC Units

Tag	CU-7	CU-8
Unit Type	Condensing Unit	Condensing Unit
Qty	1	1
Location	Roof	Roof
Area Served	AHU-2	AHU-2
Manufacturer	McQuay	McQuay
Model #	ALP016C	ALP016C
Serial #	5TF0501100	5TF0501000
Cooling Type	R22, DX	R22, DX
Cooling Capacity (Tons)	16.0	16.0
Cooling Efficiency (SEER/EER)	9.7	9.7
Heating Type	N/A	N/A
Heating Input (MBH)	N/A	N/A
Efficiency	N/A	N/A
Fuel	N/A	N/A
Approx Age	23	23
ASHRAE Service Life	15	15
Remaining Life	(8)	(8)
Comments		

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

E.T. Hamilton Elementary School

AHUs

Tag	AHU-1	AHU-2	
Unit Type	Ceiling mounted heating and cooling unit	Ceiling mounted heating and cooling unit	
Qty	2	2	
Location	Ceiling	Ceiling	
Area Served	Gymnasium	Multipurpose Room	
Manufacturer	McQuay	McQuay	
Model #	LSL108	LSL108	
Serial #	-	-	
Cooling Type	D/X	D/X	
Cooling Capacity (MBH)	187.8	155.5	
Cooling Efficiency (SEER/EER)	See CU-1 & 2	See CU-7 & 8	
Heating Type	Electric Resistance	Electric Resistance	
Heating Input (kW)	65.5	42	
Efficiency	-	-	
Fuel	Electricity	Electricity	
Approx Age	23	23	
ASHRAE Service Life	15	15	
Remaining Life	(8)	(8)	
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

E.T. Hamilton Elementary School

Domestic Water Heaters

Tag	HWH-1	HWH-2	HWH-3
Unit Type	Electric Storage type	Electric Storage type	Electric Storage type
Qty	1	1	1
Location	4th grade wing storage closet	Kitchen Storage Closet	3rd grade wing closet
Area Served	Restrooms	Kitchen	Restrooms and Faculty Break Room
Manufacturer	State	Bradford White	Bradford White
Model #	SB6-40-6-IFE	MII 120-18-3SF	LP230R33
Serial #	-	OD-01-0727	AC4381075
Size (Gallons)	40	120	119
Input Capacity (MBH/KW)	6	6	4.5
Recovery (Gal/Hr)	-	-	-
Efficiency %	-	-	-
Fuel	Electricity	Electricity	Electricity
Approx Age	23	14	7
ASHRAE Service Life	12	12	12
Remaining Life	(11)	(2)	5
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

APPENDIX E

Investment Grade Lighting Audit

APPENDIX E
1 of 15

CEG Job #: 9C11026

Project: Voorhees Township BOE LGEA

23 Northgate Drive

Voorhees, NJ 08043

Bldg. Sq. Ft. 65,000

E.T. Hamilton Elementary School

KWH COST: \$0.126

ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING									SAVINGS					
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback		
222.21	Main Office	1800	6	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.37	669.6	\$84.37	6	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	1	1800	11	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.18	2,118.6	\$266.94	11	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
612	1 Toilet	1800	1	1	Surface Mnt., 100w A19 Lamp	100	0.10	180.0	\$22.68	1	1	(1) 26w CFL Lamp	26	0.03	46.8	\$5.90	\$20.00	\$20.00	0.07	133.2	\$16.78	1.19		
242.21	2	1800	11	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.18	2,118.6	\$266.94	11	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
221.11		1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.25	446.4	\$56.25	4	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
612	2 Toilet	1800	1	1	Surface Mnt., 100w A19 Lamp	100	0.10	180.0	\$22.68	1	1	(1) 26w CFL Lamp	26	0.03	46.8	\$5.90	\$20.00	\$20.00	0.07	133.2	\$16.78	1.19		
242.21	3	1800	11	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.18	2,118.6	\$266.94	11	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
221.11		1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.25	446.4	\$56.25	4	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
612	3 Toilet	1800	1	1	Surface Mnt., 100w A19 Lamp	100	0.10	180.0	\$22.68	1	1	(1) 26w CFL Lamp	26	0.03	46.8	\$5.90	\$20.00	\$20.00	0.07	133.2	\$16.78	1.19		
142.21	4	1800	11	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	1.72	3,088.8	\$389.19	11	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	0.95	1702.8	\$214.55	\$100.00	\$1,100.00	0.77	1386	\$174.64	6.30		
221.11		1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.25	446.4	\$56.25	4	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
142.21	5	1800	16	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	2.50	4,492.8	\$566.09	16	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	1.38	2476.8	\$312.08	\$100.00	\$1,600.00	1.12	2016	\$254.02	6.30		
221.11		1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.25	446.4	\$56.25	4	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
142.21	6	1800	12	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	1.87	3,369.6	\$424.57	12	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	1.03	1857.6	\$234.06	\$100.00	\$1,200.00	0.84	1512	\$190.51	6.30		
221.11		1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.25	446.4	\$56.25	4	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	Girl's Room Library	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	385.2	\$48.54	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	Boy's Room Library	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	385.2	\$48.54	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		

Investment Grade Lighting Audit

APPENDIX E
2 of 15

ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING										SAVINGS					
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback			
142.21	7	1800	12	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	1.87	3,369.6	\$424.57	12	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	1.03	1857.6	\$234.06	\$100.00	\$1,200.00	0.84	1512	\$190.51	6.30			
221.11		1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.25	446.4	\$56.25	4	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
142.21	8	1800	16	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	2.50	4,492.8	\$566.09	16	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	1.38	2476.8	\$312.08	\$100.00	\$1,600.00	1.12	2016	\$254.02	6.30			
221.11		1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.25	446.4	\$56.25	4	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
142.21	9	1800	12	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	1.87	3,369.6	\$424.57	12	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	1.03	1857.6	\$234.06	\$100.00	\$1,200.00	0.84	1512	\$190.51	6.30			
221.11		1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.25	446.4	\$56.25	4	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
142.21	10	1800	12	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	1.87	3,369.6	\$424.57	12	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	1.03	1857.6	\$234.06	\$100.00	\$1,200.00	0.84	1512	\$190.51	6.30			
221.11		1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.25	446.4	\$56.25	4	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
142.21	11	1800	12	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	1.87	3,369.6	\$424.57	12	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	1.03	1857.6	\$234.06	\$100.00	\$1,200.00	0.84	1512	\$190.51	6.30			
612	11 Storage	500	1	1	Surface Mnt., 100w A19 Lamp	100	0.10	50.0	\$6.30	1	1	(1) 26w CFL Lamp	26	0.03	13	\$1.64	\$20.00	\$20.00	0.07	37	\$4.66	4.29			
612	11 Toilet	1800	2	1	Surface Mnt., 100w A19 Lamp	100	0.20	360.0	\$45.36	2	1	(1) 26w CFL Lamp	26	0.05	93.6	\$11.79	\$20.00	\$40.00	0.15	266.4	\$33.57	1.19			
242.21	Library	1800	40	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	4.28	7,704.0	\$970.70	40	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
232.22	Library Office	1800	2	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.17	309.6	\$39.01	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
211.37	Library Office Storage	500	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	30	0.03	15.0	\$1.89	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
232.21	Library BSIP	1800	2	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.17	309.6	\$39.01	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
242.21	Library Corridor	3600	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	770.4	\$97.07	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
612	Storage	500	1	1	Surface Mnt., 100w A19 Lamp	100	0.10	50.0	\$6.30	1	1	(1) 26w CFL Lamp	26	0.03	13	\$1.64	\$20.00	\$20.00	0.07	37	\$4.66	4.29			
242.21	13	1800	8	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.86	1,540.8	\$194.14	8	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
227.21	Toilet Room Corridor	3600	2	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.13	468.0	\$58.97	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			

Investment Grade Lighting Audit

APPENDIX E
3 of 15

ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING									SAVINGS					
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback		
221.11	13A	1800	8	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.50	892.8	\$112.49	8	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
6120	Electrical Storage	500	2	2	Ceiling Mount White Globe, 11w CFL Lamp	52	0.10	52.0	\$6.55	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
222.21	Xerox Room	1800	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.12	223.2	\$28.12	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	Ladie's Room	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	385.2	\$48.54	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	Men's Room	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	385.2	\$48.54	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	12	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$291.21	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
612	12 Toilet	1800	1	1	Surface Mnt., 100w A19 Lamp	100	0.10	180.0	\$22.68	1	1	(1) 26w CFL Lamp	26	0.03	46.8	\$5.90	\$20.00	\$20.00	0.07	133.2	\$16.78	1.19		
362.34	APR	1800	14	6	2x4, 4 Lamp, 54w T5HO Fixture	354	4.96	8,920.8	\$1,124.02	14	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
221.11	Stage	1800	9	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.56	1,004.4	\$126.55	9	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
745		1800	2	1	250w MH Down Light w/Prismatic Lens	295	0.59	1,062.0	\$133.81	2	6	2x4, 6 Lamp, 32w T8, Elect. Ballast, Lo Bay	168	0.34	604.8	\$76.20	\$220.00	\$440.00	0.25	457.2	\$57.61	7.64		
221.11	Kitchen	1800	14	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.87	1,562.4	\$196.86	14	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
221.11	Kitchen Storage	500	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.06	31.0	\$3.91	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
612	Kitchen Toilet	1800	1	1	Surface Mnt., 100w A19 Lamp	100	0.10	180.0	\$22.68	1	1	(1) 26w CFL Lamp	26	0.03	46.8	\$5.90	\$20.00	\$20.00	0.07	133.2	\$16.78	1.19		
221.13	P-5 Storage	500	5	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	58	0.29	145.0	\$18.27	5	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	APR Boy's Room	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	385.2	\$48.54	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
221.11		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.06	111.6	\$14.06	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
242.21	APR Girl's Room	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	385.2	\$48.54	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
221.11		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.06	111.6	\$14.06	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
221.11	APR Corridor	3600	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.06	223.2	\$28.12	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00		

Investment Grade Lighting Audit

APPENDIX E
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ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING								SAVINGS					
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback	
242.21	Nurse's Room	1800	6	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.64	1,155.6	\$145.61	6	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
221.15	JC	500	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.06	29.0	\$3.65	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
222.21	Main Office Copy Room	1800	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	111.6	\$14.06	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
232.21	Principal	1800	6	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.52	928.8	\$117.03	6	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
242.21	Conference Room	3600	6	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.64	2,311.2	\$291.21	6	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
242.21	Conference Room Toilet Room	1800	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.11	192.6	\$24.27	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
612		1800	1	1	Surface Mnt., 100w A19 Lamp	100	0.10	180.0	\$22.68	1	1	(1) 26w CFL Lamp	26	0.03	46.8	\$5.90	\$20.00	\$20.00	0.07	133.2	\$16.78	1.19	
232.21	Conference Break Room	1800	2	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.17	309.6	\$39.01	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
227.21	Nurse's Room Toilet	1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.07	117.0	\$14.74	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
227.21	Nurse's Room Storage	500	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.07	32.5	\$4.10	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
232.21	Nurse's Room Exam	1800	2	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.17	309.6	\$39.01	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
232.21	Nurse's Room Corridor	3600	1	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.09	309.6	\$39.01	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
227.21	Teacher's Lounge	1800	4	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.26	468.0	\$58.97	4	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
222.22		1800	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.12	208.8	\$26.31	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
221.15	Storage	500	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.06	29.0	\$3.65	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
227.21	Small Group	1800	6	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.39	702.0	\$88.45	6	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
200	Faculty Rest Room	1800	1	2	1x2, 2 Lamp, 17w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	34	0.03	61.2	\$7.71	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
221.15	Electrical Closet	500	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.12	58.0	\$7.31	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
200	Staff Rest Room	1800	1	2	1x2, 2 Lamp, 17w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	34	0.03	61.2	\$7.71	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	

Investment Grade Lighting Audit

APPENDIX E
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ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING										SAVINGS					
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback			
232.22	19	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.77	1,393.2	\$175.54	9	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
232.22	18	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.77	1,393.2	\$175.54	9	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
232.22	16	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.77	1,393.2	\$175.54	9	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
232.22	17	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.77	1,393.2	\$175.54	9	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
232.22	15	1800	7	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.60	1,083.6	\$136.53	7	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
232.22	14	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.77	1,393.2	\$175.54	9	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
232.22	20	1800	17	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	1.46	2,631.6	\$331.58	17	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
242.21	Girl's Room	1800	3	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.32	577.8	\$72.80	3	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
221.15	JC	500	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.06	29.0	\$3.65	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
242.21	Boy's Room	1800	3	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.32	577.8	\$72.80	3	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
232.22	Corridor 19 - Boy's Room	3600	8	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.69	2,476.8	\$312.08	8	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
232.22	Music Room	1800	16	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	1.38	2,476.8	\$312.08	16	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
221.15	Music Storage	500	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.12	58.0	\$7.31	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
221.21	Music Storage #2	500	3	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	93.0	\$11.72	3	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
242.21	22	1800	6	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.64	1,155.6	\$145.61	6	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
242.21	23	1800	6	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.64	1,155.6	\$145.61	6	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
242.21	24	1800	6	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.64	1,155.6	\$145.61	6	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
242.21	33	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$291.21	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			
242.21	34	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$291.21	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00			

Investment Grade Lighting Audit

APPENDIX E
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ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING									SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback
142.21	35	1800	12	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	1.87	3,369.6	\$424.57	12	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	1.03	1857.6	\$234.06	\$100.00	\$1,200.00	0.84	1512	\$190.51	6.30
142.21	32	1800	12	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	1.87	3,369.6	\$424.57	12	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	1.03	1857.6	\$234.06	\$100.00	\$1,200.00	0.84	1512	\$190.51	6.30
142.21	36	1800	12	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	1.87	3,369.6	\$424.57	12	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	1.03	1857.6	\$234.06	\$100.00	\$1,200.00	0.84	1512	\$190.51	6.30
142.21	31	1800	12	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	1.87	3,369.6	\$424.57	12	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	1.03	1857.6	\$234.06	\$100.00	\$1,200.00	0.84	1512	\$190.51	6.30
242.21	26	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$291.21	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00
242.21	27	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	2,311.2	\$291.21	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00
242.21	Corridor 34 - 25	3600	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.28	4,622.4	\$582.42	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00
222.21	25	1800	12	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.74	1,339.2	\$168.74	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00
221.15	P-9 Storage	500	6	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.35	174.0	\$21.92	6	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00
362.34	GYM	1800	18	6	2x4, 4 Lamp, 54w T5HO Fixture	354	6.37	11,469.6	\$1,445.17	18	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00
222.21	30	1800	12	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.74	1,339.2	\$168.74	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00
222.21	29	1800	12	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.74	1,339.2	\$168.74	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00
222.21	28	1800	12	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.74	1,339.2	\$168.74	12	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00
221.15	Storage	500	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.12	58.0	\$7.31	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00
612	P-7 Electrical	500	2	1	Surface Mnt., 100w A19 Lamp	100	0.20	100.0	\$12.60	2	1	(1) 26w CFL Lamp	26	0.05	26	\$3.28	\$20.00	\$40.00	0.15	74	\$9.32	4.29
242.21	Corridor 30 - GYM	3600	9	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.96	3,466.8	\$436.82	9	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00
222.21	GYM Office	1800	3	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	334.8	\$42.18	3	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00
227.21	Gym Office Toilet	1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.07	117.0	\$14.74	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00
612	GYM Office Closet	500	1	1	Surface Mnt., 100w A19 Lamp	100	0.10	50.0	\$6.30	1	1	(1) 26w CFL Lamp	26	0.03	13	\$1.64	\$20.00	\$20.00	0.07	37	\$4.66	4.29

Investment Grade Lighting Audit

APPENDIX E
7 of 15

ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING								SAVINGS					
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback	
242.21	Boy's Room	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	385.2	\$48.54	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
221.11		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.06	111.6	\$14.06	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
242.21	Girl's Room	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.21	385.2	\$48.54	2	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
221.11		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.06	111.6	\$14.06	1	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
242.21	APR Corridor	3600	35	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	3.75	13,482.0	\$1,698.73	35	0	No Change	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00	
Totals			736	328				162,366	\$20,458	736	53			13.7	24,419	\$3,077		\$15,800	11.8	20,734	\$2,612	6.05	

CEG Job #: 9C11026
Project: Voorhees Township BOE LGEA
Address: 23 Northgate Drive
Voorhees, NJ 08043
Building SF: 46,743

E.T. Hamilton Elementary School

KWH COST: \$0.126

FALSE

ECM #2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS										SAVINGS					
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback		
222.21	Main Office	1800	6	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.372	669.6	84.3696	6	2	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	62	0.30	20%	535.68	\$67.50	\$450.00	\$900.00	0.07	133.92	\$16.87	53.34		
242.21	1	1800	11	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.177	2118.6	266.9436	11		Existing Occupancy Sensor - Remote Mnt.	107	0.94	20%	1694.88	\$213.55		\$0.00	0.00	423.72	\$53.39	0.00		
612	1 Toilet	1800	1	1	Surface Mnt., 100w A19 Lamp	100	0.1	180	22.68	1		No Change	100	0.10	0%	180	\$22.68		\$0.00	0.00	0	\$0.00	0.00		
242.21	2	1800	11	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.177	2118.6	266.9436	11		Existing Occupancy Sensor - Remote Mnt.	107	0.94	20%	1694.88	\$213.55		\$0.00	0.00	423.72	\$53.39	0.00		
221.11		1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.248	446.4	56.2464	4		No Change	62	0.25	0%	446.4	\$56.25		\$0.00	0.00	0	\$0.00	0.00		
612	2 Toilet	1800	1	1	Surface Mnt., 100w A19 Lamp	100	0.1	180	22.68	1		No Change	100	0.10	0%	180	\$22.68		\$0.00	0.00	0	\$0.00	0.00		
242.21	3	1800	11	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.177	2118.6	266.9436	11		Existing Occupancy Sensor - Remote Mnt.	107	0.94	20%	1694.88	\$213.55		\$0.00	0.00	423.72	\$53.39	0.00		
221.11		1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.248	446.4	56.2464	4		No Change	62	0.25	0%	446.4	\$56.25		\$0.00	0.00	0	\$0.00	0.00		
612	3 Toilet	1800	1	1	Surface Mnt., 100w A19 Lamp	100	0.1	180	22.68	1		No Change	100	0.10	0%	180	\$22.68		\$0.00	0.00	0	\$0.00	0.00		
142.21	4	1800	11	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	1.716	3088.8	389.1888	11		Existing Occupancy Sensor - Remote Mnt.	156	1.37	20%	2471.04	\$311.35		\$0.00	0.00	617.76	\$77.84	0.00		
221.11		1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.248	446.4	56.2464	4		No Change	62	0.25	0%	446.4	\$56.25		\$0.00	0.00	0	\$0.00	0.00		
142.21	5	1800	16	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	2.496	4492.8	566.0928	16		Existing Occupancy Sensor - Remote Mnt.	156	2.00	20%	3594.24	\$452.87		\$0.00	0.00	898.56	\$113.22	0.00		
221.11		1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.248	446.4	56.2464	4		No Change	62	0.25	0%	446.4	\$56.25		\$0.00	0.00	0	\$0.00	0.00		
142.21	6	1800	12	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	1.872	3369.6	424.5696	12		Existing Occupancy Sensor - Remote Mnt.	156	1.50	20%	2695.68	\$339.66		\$0.00	0.00	673.92	\$84.91	0.00		
221.11		1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.248	446.4	56.2464	4		No Change	62	0.25	0%	446.4	\$56.25		\$0.00	0.00	0	\$0.00	0.00		

ECM #2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS											SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback	
242.21	Girl's Room Library	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.214	385.2	48.5352	2	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	107	0.17	20%	308.16	\$38.83	\$450.00	\$450.00	0.04	77.04	\$9.71	46.36	
242.21	Boy's Room Library	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.214	385.2	48.5352	2	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	107	0.17	20%	308.16	\$38.83	\$450.00	\$450.00	0.04	77.04	\$9.71	46.36	
142.21	7	1800	12	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	1.872	3369.6	424.5696	12		Existing Occupancy Sensor - Remote Mnt.	156	1.50	20%	2695.68	\$339.66		\$0.00	0.00	673.92	\$84.91	0.00	
221.11		1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.248	446.4	56.2464	4		No Change	62	0.25	0%	446.4	\$56.25		\$0.00	0.00	0	\$0.00	0.00	
142.21	8	1800	16	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	2.496	4492.8	566.0928	16		Existing Occupancy Sensor - Remote Mnt.	156	2.00	20%	3594.24	\$452.87		\$0.00	0.00	898.56	\$113.22	0.00	
221.11		1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.248	446.4	56.2464	4		No Change	62	0.25	0%	446.4	\$56.25		\$0.00	0.00	0	\$0.00	0.00	
142.21	9	1800	12	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	1.872	3369.6	424.5696	12		Existing Occupancy Sensor - Remote Mnt.	156	1.50	20%	2695.68	\$339.66		\$0.00	0.00	673.92	\$84.91	0.00	
221.11		1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.248	446.4	56.2464	4		No Change	62	0.25	0%	446.4	\$56.25		\$0.00	0.00	0	\$0.00	0.00	
142.21	10	1800	12	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	1.872	3369.6	424.5696	12		Existing Occupancy Sensor - Remote Mnt.	156	1.50	20%	2695.68	\$339.66		\$0.00	0.00	673.92	\$84.91	0.00	
221.11		1800	4	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.248	446.4	56.2464	4		No Change	62	0.25	0%	446.4	\$56.25		\$0.00	0.00	0	\$0.00	0.00	
142.21	11	1800	12	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	1.872	3369.6	424.5696	12		Existing Occupancy Sensor - Remote Mnt.	156	1.50	20%	2695.68	\$339.66		\$0.00	0.00	673.92	\$84.91	0.00	
612	11 Storage	500	1	1	Surface Mnt., 100w A19 Lamp	100	0.1	50	6.3	1		No Change	100	0.10	0%	50	\$6.30		\$0.00	0.00	0	\$0.00	0.00	
612	11 Toilet	1800	2	1	Surface Mnt., 100w A19 Lamp	100	0.2	360	45.36	2		No Change	100	0.20	0%	360	\$45.36		\$0.00	0.00	0	\$0.00	0.00	
242.21	Library	1800	40	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	4.28	7704	970.704	40	2	Dual Tech. Occupancy Sensor w/ (2) 2 Pole Powerpacks - Remote Mnt.	107	3.42	20%	6163.2	\$776.56	\$450.00	\$900.00	0.86	1540.8	\$194.14	4.64	
232.22	Library Office	1800	2	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.172	309.6	39.0096	2	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	86	0.14	20%	247.68	\$31.21	\$450.00	\$450.00	0.03	61.92	\$7.80	57.68	
211.37	Library Office Storage	500	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	30	0.03	15	1.89	1		No Change	30	0.03	0%	15	\$1.89		\$0.00	0.00	0	\$0.00	0.00	

ECM #2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS											SAVINGS					
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Cont.	Controls Description	Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback			
232.21	Library BSIP	1800	2	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.172	309.6	39.0096	2		No Change	86	0.17	0%	309.6	\$39.01		\$0.00	0.00	0	\$0.00	0.00			
242.21	Library Corridor	3600	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.214	770.4	97.0704	2		No Change	107	0.21	0%	770.4	\$97.07		\$0.00	0.00	0	\$0.00	0.00			
612	Storage	500	1	1	Surface Mnt., 100w A19 Lamp	100	0.1	50	6.3	1		No Change	100	0.10	0%	50	\$6.30		\$0.00	0.00	0	\$0.00	0.00			
242.21	13	1800	8	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.856	1540.8	194.1408	8		No Change	107	0.86	0%	1540.8	\$194.14		\$0.00	0.00	0	\$0.00	0.00			
227.21	Toilet Room Corridor	3600	2	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.13	468	58.968	2		No Change	65	0.13	0%	468	\$58.97		\$0.00	0.00	0	\$0.00	0.00			
221.11	13A	1800	8	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.496	892.8	112.4928	8		Existing Occupancy Sensor - Remote Mnt.	62	0.40	20%	714.24	\$89.99		\$0.00	0.00	178.56	\$22.50	0.00			
6120	Electrical Storage	500	2	2	Ceiling Mount White Globe, 11w CFL Lamp	52	0.104	52	6.552	2		No Change	52	0.10	0%	52	\$6.55		\$0.00	0.00	0	\$0.00	0.00			
222.21	Xerox Room	1800	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.124	223.2	28.1232	2		Existing Occupancy Sensor - Remote Mnt.	62	0.10	20%	178.56	\$22.50		\$0.00	0.00	44.64	\$5.62	0.00			
242.21	Ladie's Room	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.214	385.2	48.5352	2		Existing Occupancy Sensor - Remote Mnt.	107	0.17	20%	308.16	\$38.83		\$0.00	0.00	77.04	\$9.71	0.00			
242.21	Men's Room	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.214	385.2	48.5352	2		Existing Occupancy Sensor - Remote Mnt.	107	0.17	20%	308.16	\$38.83		\$0.00	0.00	77.04	\$9.71	0.00			
242.21	12	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	291.2112	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$232.97		\$0.00	0.00	462.24	\$58.24	0.00			
612	12 Toilet	1800	1	1	Surface Mnt., 100w A19 Lamp	100	0.1	180	22.68	1		No Change	100	0.10	0%	180	\$22.68		\$0.00	0.00	0	\$0.00	0.00			
362.34	APR	1800	14	6	2x4, 4 Lamp, 54w T5HO Fixture	354	4.956	8920.8	1124.0208	14	2	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	354	3.96	20%	7136.64	\$899.22	\$450.00	\$900.00	0.99	1784.16	\$224.80	4.00			
221.11	Stage	1800	9	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.558	1004.4	126.5544	9		No Change	62	0.56	0%	1004.4	\$126.55		\$0.00	0.00	0	\$0.00	0.00			
745		1800	2	1	250w MH Down Light w/Prismatic Lens	295	0.59	1062	133.812	2		No Change	295	0.59	0%	1062	\$133.81		\$0.00	0.00	0	\$0.00	0.00			
221.11	Kitchen	1800	14	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.868	1562.4	196.8624	14		No Change	62	0.87	0%	1562.4	\$196.86		\$0.00	0.00	0	\$0.00	0.00			

ECM #2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS									SAVINGS					
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Cont.	Controls Description	Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback	
221.11	Kitchen Storage	500	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.062	31	3.906	1		No Change	62	0.06	0%	31	\$3.91		\$0.00	0.00	0	\$0.00	0.00	
612	Kitchen Toilet	1800	1	1	Surface Mnt., 100w A19 Lamp	100	0.1	180	22.68	1		No Change	100	0.10	0%	180	\$22.68		\$0.00	0.00	0	\$0.00	0.00	
221.13	P-5 Storage	500	5	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	58	0.29	145	18.27	5		No Change	58	0.29	0%	145	\$18.27		\$0.00	0.00	0	\$0.00	0.00	
242.21	APR Boy's Room	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.214	385.2	48.5352	2	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	107	0.17	20%	308.16	\$38.83	\$450.00	\$450.00	0.04	77.04	\$9.71	46.36	
221.11		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.062	111.6	14.0616	1		No Change	62	0.06	0%	111.6	\$14.06		\$0.00	0.00	0	\$0.00	0.00	
242.21	APR Girl's Room	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.214	385.2	48.5352	2	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	107	0.17	20%	308.16	\$38.83	\$450.00	\$450.00	0.04	77.04	\$9.71	46.36	
221.11		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.062	111.6	14.0616	1		No Change	62	0.06	0%	111.6	\$14.06		\$0.00	0.00	0	\$0.00	0.00	
221.11	APR Corridor	3600	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.062	223.2	28.1232	1		No Change	62	0.06	0%	223.2	\$28.12		\$0.00	0.00	0	\$0.00	0.00	
242.21	Nurse's Room	1800	6	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.642	1155.6	145.6056	6		No Change	107	0.64	0%	1155.6	\$145.61		\$0.00	0.00	0	\$0.00	0.00	
221.15	JC	500	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.058	29	3.654	1		No Change	58	0.06	0%	29	\$3.65		\$0.00	0.00	0	\$0.00	0.00	
222.21	Main Office Copy Room	1800	1	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.062	111.6	14.0616	1	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	62	0.05	20%	89.28	\$11.25	\$450.00	\$450.00	0.01	22.32	\$2.81	160.01	
232.21	Principal	1800	6	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.516	928.8	117.0288	6	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	86	0.41	20%	743.04	\$93.62	\$450.00	\$450.00	0.10	185.76	\$23.41	19.23	
242.21	Conference Room	1800	6	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.642	2311.2	291.2112	6	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	107	0.51	20%	924.48	\$116.48	\$450.00	\$450.00	0.13	1386.72	\$174.73	2.58	
242.21	Conference Room Toilet Room	1800	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.107	192.6	24.2676	1	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	107	0.09	20%	154.08	\$19.41	\$450.00	\$450.00	0.02	38.52	\$4.85	92.72	
612		1800	1	1	Surface Mnt., 100w A19 Lamp	100	0.1	180	22.68	1		No Change	100	0.10	0%	180	\$22.68		\$0.00	0.00	0	\$0.00	0.00	
232.21	Conference Break Room	1800	2	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.172	309.6	39.0096	2	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	86	0.14	20%	247.68	\$31.21	\$450.00	\$450.00	0.03	61.92	\$7.80	57.68	

ECM #2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS											SAVINGS		Yearly	Yearly Simple
CEG	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly	Yearly Simple
227.21	Nurse's Room Toilet	1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.065	117	14.742	1		No Change	65	0.07	0%	117	\$14.74		\$0.00	0.00	0	\$0.00	0.00	
227.21	Nurse's Room Storage	500	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.065	32.5	4.095	1		No Change	65	0.07	0%	32.5	\$4.10		\$0.00	0.00	0	\$0.00	0.00	
232.21	Nurse's Room Exam	1800	2	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.172	309.6	39.0096	2		No Change	86	0.17	0%	309.6	\$39.01		\$0.00	0.00	0	\$0.00	0.00	
232.21	Nurse's Room Corridor	3600	1	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.086	309.6	39.0096	1		No Change	86	0.09	0%	309.6	\$39.01		\$0.00	0.00	0	\$0.00	0.00	
227.21	Teacher's Lounge	1800	4	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.26	468	58.968	4		Existing Occupancy Sensor - Remote Mnt.	65	0.21	20%	374.4	\$47.17		\$0.00	0.00	93.6	\$11.79	0.00	
222.22		1800	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.116	208.8	26.3088	2		No Change	58	0.12	0%	208.8	\$26.31		\$0.00	0.00	0	\$0.00	0.00	
221.15	Storage	500	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.058	29	3.654	1		No Change	58	0.06	0%	29	\$3.65		\$0.00	0.00	0	\$0.00	0.00	
227.21	Small Group	1800	6	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.39	702	88.452	6		No Change	65	0.39	0%	702	\$88.45		\$0.00	0.00	0	\$0.00	0.00	
200	Faculty Rest Room	1800	1	2	1x2, 2 Lamp, 17w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	34	0.034	61.2	7.7112	1		No Change	34	0.03	0%	61.2	\$7.71		\$0.00	0.00	0	\$0.00	0.00	
221.15	Electrical Closet	500	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.116	58	7.308	2		No Change	58	0.12	0%	58	\$7.31		\$0.00	0.00	0	\$0.00	0.00	
200	Staff Rest Room	1800	1	2	1x2, 2 Lamp, 17w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	34	0.034	61.2	7.7112	1		No Change	34	0.03	0%	61.2	\$7.71		\$0.00	0.00	0	\$0.00	0.00	
232.22	19	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.774	1393.2	175.5432	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	\$140.43		\$0.00	0.00	278.64	\$35.11	0.00	
232.22	18	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.774	1393.2	175.5432	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	\$140.43		\$0.00	0.00	278.64	\$35.11	0.00	
232.22	16	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.774	1393.2	175.5432	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	\$140.43		\$0.00	0.00	278.64	\$35.11	0.00	
232.22	17	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.774	1393.2	175.5432	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	\$140.43		\$0.00	0.00	278.64	\$35.11	0.00	
232.22	15	1800	7	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.602	1083.6	136.5336	7		Existing Occupancy Sensor - Remote Mnt.	86	0.48	20%	866.88	\$109.23		\$0.00	0.00	216.72	\$27.31	0.00	

ECM #2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS									SAVINGS					
CEG	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Cont.	Controls Description	Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback	
232.22	14	1800	9	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.774	1393.2	175.5432	9		Existing Occupancy Sensor - Remote Mnt.	86	0.62	20%	1114.56	\$140.43		\$0.00	0.00	278.64	\$35.11	0.00	
232.22	20	1800	17	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	1.462	2631.6	331.5816	17		Existing Occupancy Sensor - Remote Mnt.	86	1.17	20%	2105.28	\$265.27		\$0.00	0.00	526.32	\$66.32	0.00	
242.21	Girl's Room	1800	3	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.321	577.8	72.8028	3	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	107	0.26	20%	462.24	\$58.24	\$450.00	\$450.00	0.06	115.56	\$14.56	30.91	
221.15	JC	500	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.058	29	3.654	1		No Change	58	0.06	0%	29	\$3.65		\$0.00	0.00	0	\$0.00	0.00	
242.21	Boy's Room	1800	3	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.321	577.8	72.8028	3	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	107	0.26	20%	462.24	\$58.24	\$450.00	\$450.00	0.06	115.56	\$14.56	30.91	
232.22	Corridor 19 - Boy's Room	3600	8	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.688	2476.8	312.0768	8		No Change	86	0.69	0%	2476.8	\$312.08		\$0.00	0.00	0	\$0.00	0.00	
232.22	Music Room	1800	16	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	1.376	2476.8	312.0768	16		Existing Occupancy Sensor - Remote Mnt.	86	1.10	20%	1981.44	\$249.66		\$0.00	0.00	495.36	\$62.42	0.00	
221.15	Music Storage	500	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.116	58	7.308	2		No Change	58	0.12	0%	58	\$7.31		\$0.00	0.00	0	\$0.00	0.00	
221.21	Music Storage #2	500	3	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.186	93	11.718	3		No Change	62	0.19	0%	93	\$11.72		\$0.00	0.00	0	\$0.00	0.00	
242.21	22	1800	6	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.642	1155.6	145.6056	6		Existing Occupancy Sensor - Remote Mnt.	107	0.51	20%	924.48	\$116.48		\$0.00	0.00	231.12	\$29.12	0.00	
242.21	23	1800	6	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.642	1155.6	145.6056	6		Existing Occupancy Sensor - Remote Mnt.	107	0.51	20%	924.48	\$116.48		\$0.00	0.00	231.12	\$29.12	0.00	
242.21	24	1800	6	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.642	1155.6	145.6056	6		Existing Occupancy Sensor - Remote Mnt.	107	0.51	20%	924.48	\$116.48		\$0.00	0.00	231.12	\$29.12	0.00	
242.21	33	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	291.2112	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$232.97		\$0.00	0.00	462.24	\$58.24	0.00	
242.21	34	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	291.2112	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$232.97		\$0.00	0.00	462.24	\$58.24	0.00	
142.21	35	1800	12	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	1.872	3369.6	424.5696	12		Existing Occupancy Sensor - Remote Mnt.	156	1.50	20%	2695.68	\$339.66		\$0.00	0.00	673.92	\$84.91	0.00	
142.21	32	1800	12	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	1.872	3369.6	424.5696	12		Existing Occupancy Sensor - Remote Mnt.	156	1.50	20%	2695.68	\$339.66		\$0.00	0.00	673.92	\$84.91	0.00	

ECM #2: Lighting Controls

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS											SAVINGS					
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Cont.	Controls Description	Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback			
142.21	36	1800	12	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	1.872	3369.6	424.5696	12		Existing Occupancy Sensor - Remote Mnt.	156	1.50	20%	2695.68	\$339.66		\$0.00	0.00	673.92	\$84.91	0.00			
142.21	31	1800	12	4	2x4, 4 Lamp, 34w T8, Mag. Ballast, Recessed Mnt., Prismatic Lens	156	1.872	3369.6	424.5696	12		Existing Occupancy Sensor - Remote Mnt.	156	1.50	20%	2695.68	\$339.66		\$0.00	0.00	673.92	\$84.91	0.00			
242.21	26	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	291.2112	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$232.97		\$0.00	0.00	462.24	\$58.24	0.00			
242.21	27	1800	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	2311.2	291.2112	12		Existing Occupancy Sensor - Remote Mnt.	107	1.03	20%	1848.96	\$232.97		\$0.00	0.00	462.24	\$58.24	0.00			
242.21	Corridor 34 - 25	3600	12	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	1.284	4622.4	582.4224	12		No Change	107	1.28	0%	4622.4	\$582.42		\$0.00	0.00	0	\$0.00	0.00			
222.21	25	1800	12	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.744	1339.2	168.7392	12	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	62	0.60	20%	1071.36	\$134.99	\$450.00	\$450.00	0.15	267.84	\$33.75	13.33			
221.15	P-9 Storage	500	6	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.348	174	21.924	6		No Change	58	0.35	0%	174	\$21.92		\$0.00	0.00	0	\$0.00	0.00			
362.34	GYM	1800	18	6	2x4, 4 Lamp, 54w T5HO Fixture	354	6.372	11469.6	1445.1696	18	2	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	354	5.10	20%	9175.68	\$1,156.14	\$450.00	\$900.00	1.27	2293.92	\$289.03	3.11			
222.21	30	1800	12	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.744	1339.2	168.7392	12		Existing Occupancy Sensor - Remote Mnt.	62	0.60	20%	1071.36	\$134.99		\$0.00	0.00	267.84	\$33.75	0.00			
222.21	29	1800	12	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.744	1339.2	168.7392	12		Existing Occupancy Sensor - Remote Mnt.	62	0.60	20%	1071.36	\$134.99		\$0.00	0.00	267.84	\$33.75	0.00			
222.21	28	1800	12	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.744	1339.2	168.7392	12		Existing Occupancy Sensor - Remote Mnt.	62	0.60	20%	1071.36	\$134.99		\$0.00	0.00	267.84	\$33.75	0.00			
221.15	Storage	500	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	58	0.116	58	7.308	2		No Change	58	0.12	0%	58	\$7.31		\$0.00	0.00	0	\$0.00	0.00			
612	P-7 Electrical	500	2	1	Surface Mnt., 100w A19 Lamp	100	0.2	100	12.6	2		No Change	100	0.20	0%	100	\$12.60		\$0.00	0.00	0	\$0.00	0.00			
242.21	Corridor 30 - GYM	3600	9	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.963	3466.8	436.8168	9		No Change	107	0.96	0%	3466.8	\$436.82		\$0.00	0.00	0	\$0.00	0.00			
222.21	GYM Office	1800	3	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.186	334.8	42.1848	3	1	Dual Tech. Occupancy Sensor w/ (1) 2 Pole Powerpack - Remote Mnt.	62	0.15	20%	267.84	\$33.75	\$450.00	\$450.00	0.04	66.96	\$8.44	53.34			
227.21	Gym Office Toilet	1800	1	2	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	65	0.065	117	14.742	1		No Change	65	0.07	0%	117	\$14.74		\$0.00	0.00	0	\$0.00	0.00			

ECM #2: Lighting Controls

EXISTING LIGHTING											PROPOSED LIGHTING CONTROLS										SAVINGS			
CEG	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback	
612	GYM Office Closet	500	1	1	Surface Mnt., 100w A19 Lamp	100	0.1	50	6.3	1		No Change	100	0.10	0%	50	\$6.30		\$0.00	0.00	0	\$0.00	0.00	
242.21	Boy's Room	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.214	385.2	48.5352	2		Existing Occupancy Sensor-Remote Mnt.	107	0.17	20%	308.16	\$38.83		\$0.00	0.00	77.04	\$9.71	0.00	
221.11		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.062	111.6	14.0616	1		No Change	62	0.06	0%	111.6	\$14.06		\$0.00	0.00	0	\$0.00	0.00	
242.21	Girl's Room	1800	2	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	0.214	385.2	48.5352	2		Existing Occupancy Sensor-Remote Mnt.	107	0.17	20%	308.16	\$38.83		\$0.00	0.00	77.04	\$9.71	0.00	
221.11		1800	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	62	0.062	111.6	14.0616	1		No Change	62	0.06	0%	111.6	\$14.06		\$0.00	0.00	0	\$0.00	0.00	
242.21	APR Corridor	3600	35	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	107	3.745	13482	1698.732	35		No Change	107	3.75	0%	13482	\$1,698.73		\$0.00	0.00	0	\$0.00	0.00	
	Totals		736	328			83.9	162,365.9	\$20,458	736	22			70.6		137,165.9	\$17,282.90		\$9,900	4.02	25,200	\$3,175	3.12	

APPENDIX F

Location Description	Area (Sq FT)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW _{DC}	Total Annual kWh	Total KW _{AC}	Panel Weight (41.9 lbs)	W/SQFT
Hamilton Elementary School	12475	SHARP NU-U235F2	541	17.5	9,490	127.14	157,897	103.0	22,668	13.40



 = Proposed PV Layout

Notes:

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

Flat Roof Array

Station Identification	
City:	Atlantic_City
State:	New_Jersey
Latitude:	39.45° N
Longitude:	74.57° W
Elevation:	20 m
PV System Specifications	
DC Rating:	93.5 kW
DC to AC Derate Factor:	0.810
AC Rating:	75.8 kW
Array Type:	Fixed Tilt
Array Tilt:	10.0°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	12.6 ¢/kWh

Results			
Month	Solar Radiation (kWh/m ² /day)	AC Energy (kWh)	Energy Value (\$)
1	2.58	6075	765.45
2	3.33	7174	903.92
3	4.31	10019	1262.39
4	5.20	11413	1438.04
5	5.85	13034	1642.28
6	6.14	12687	1598.56
7	6.06	12816	1614.82
8	5.54	11778	1484.03
9	4.85	10127	1276.00
10	3.76	8269	1041.89
11	2.65	5794	730.04
12	2.23	5074	639.32
Year	4.38	114261	14396.89

Pitched Roof Array

Station Identification	
City:	Atlantic_City
State:	New_Jersey
Latitude:	39.45° N
Longitude:	74.57° W
Elevation:	20 m
PV System Specifications	
DC Rating:	33.6 kW
DC to AC Derate Factor:	0.810
AC Rating:	27.2 kW
Array Type:	Fixed Tilt
Array Tilt:	22.5°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	12.6 ¢/kWh

Results			
Month	Solar Radiation (kWh/m ² /day)	AC Energy (kWh)	Energy Value (\$)
1	3.10	2687	338.56
2	3.80	2969	374.09
3	4.62	3860	486.36
4	5.34	4199	529.07
5	5.81	4638	584.39
6	5.99	4449	560.57
7	5.98	4537	571.66
8	5.62	4278	539.03
9	5.14	3856	485.86
10	4.23	3360	423.36
11	3.13	2523	317.90
12	2.70	2279	287.15
Year	4.63	43636	5498.14

APPENDIX G

MONTHLY ENERGY CONSUMPTION

By CONCORD ENGINEERING GROUP

----- Monthly Energy Consumption -----

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Alternative: 1 ET Hamilton ES													
Electric													
On-Pk Cons. (kWh)	146,506	201,906	126,193	56,755	69,805	54,049	80,616	91,827	77,044	63,748	95,861	138,143	1,202,454
On-Pk Demand (kW)	1,451	1,524	1,285	855	887	830	833	826	800	782	1,250	1,373	1,524
Energy Consumption			Environmental Impact Analysis										
Building	64,786 Btu/(ft2-year)			CO2 857,104 lbm/year									
Source	194,376 Btu/(ft2-year)			SO2 2,329 gm/year									
				NOX 1,201 gm/year									
Floor Area	63,347 ft2												
Alternative: 2 ET Hamilton ES													
Electric													
On-Pk Cons. (kWh)	79,171	84,153	77,324	46,453	49,902	32,672	41,748	46,984	49,920	53,063	64,624	76,677	702,690
On-Pk Demand (kW)	538	515	515	515	450	431	463	468	447	515	515	536	538
Energy Consumption			Environmental Impact Analysis										
Building	37,859 Btu/(ft2-year)			CO2 500,874 lbm/year									
Source	113,590 Btu/(ft2-year)			SO2 1,361 gm/year									
				NOX 702 gm/year									
Floor Area	63,347 ft2												