

**GLOUCESTER TOWNSHIP
BOARD OF EDUCATION**

BLACKWOOD ELEMENTARY SCHOOL

**260 BLENHEIM/ ERIAL ROAD
BLACKWOOD, NJ 08012**

FACILITY ENERGY REPORT

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I. HISTORIC ENERGY CONSUMPTION/COST

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

Electric Utility Provider:	Public Service Electric & Gas
Electric Utility Rate Structure:	Large Power & Lighting Service (LPLS) General Lighting & Power (GLP)
Third Party Supplier:	South Jersey Energy Co.
Natural Gas Utility Provider:	South Jersey Gas
Utility Rate Structure:	Firm Transportation
Third Party Supplier:	Hess

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.

The gas usage profile within each facility report shows the actual natural gas energy usage for the facility. The gas utility measures consumption in cubic feet x 100 (CCF), and converts the quantity into Therms of energy. One Therm is equivalent to 100,000 BTUs of energy.

Table 1
Electricity Billing Data

ELECTRIC USAGE SUMMARY			
Utility Provider: PSE&G Rate: LPLS / GLP Meter No: 778009117 / Unmetered Account # 4200399709 / 6937180306 Third Party Utility Provider: South Jersey Energy Company TPS Meter / Acct No: 4200399709			
MONTH OF USE	CONSUMPTION KWH	DEMAND KW	TOTAL BILL
Jan-11	49,445	146	\$7,420
Feb-11	49,285	149	\$7,326
Mar-11	53,125	149	\$7,827
Apr-11	45,125	144	\$6,786
May-11	39,045	147	\$5,583
Jun-11	48,805	171	\$8,235
Jul-11	40,805	176	\$7,328
Aug-11	33,285	111	\$5,682
Sep-11	36,325	128	\$6,274
Oct-11	50,085	173	\$7,026
Dec-11	41,925	138	\$5,942
Jan-12	42,245	139	\$5,991
Totals	529,500	176 Max	\$81,419
AVERAGE DEMAND 147.6 KW average AVERAGE RATE \$0.154 \$/kWh			

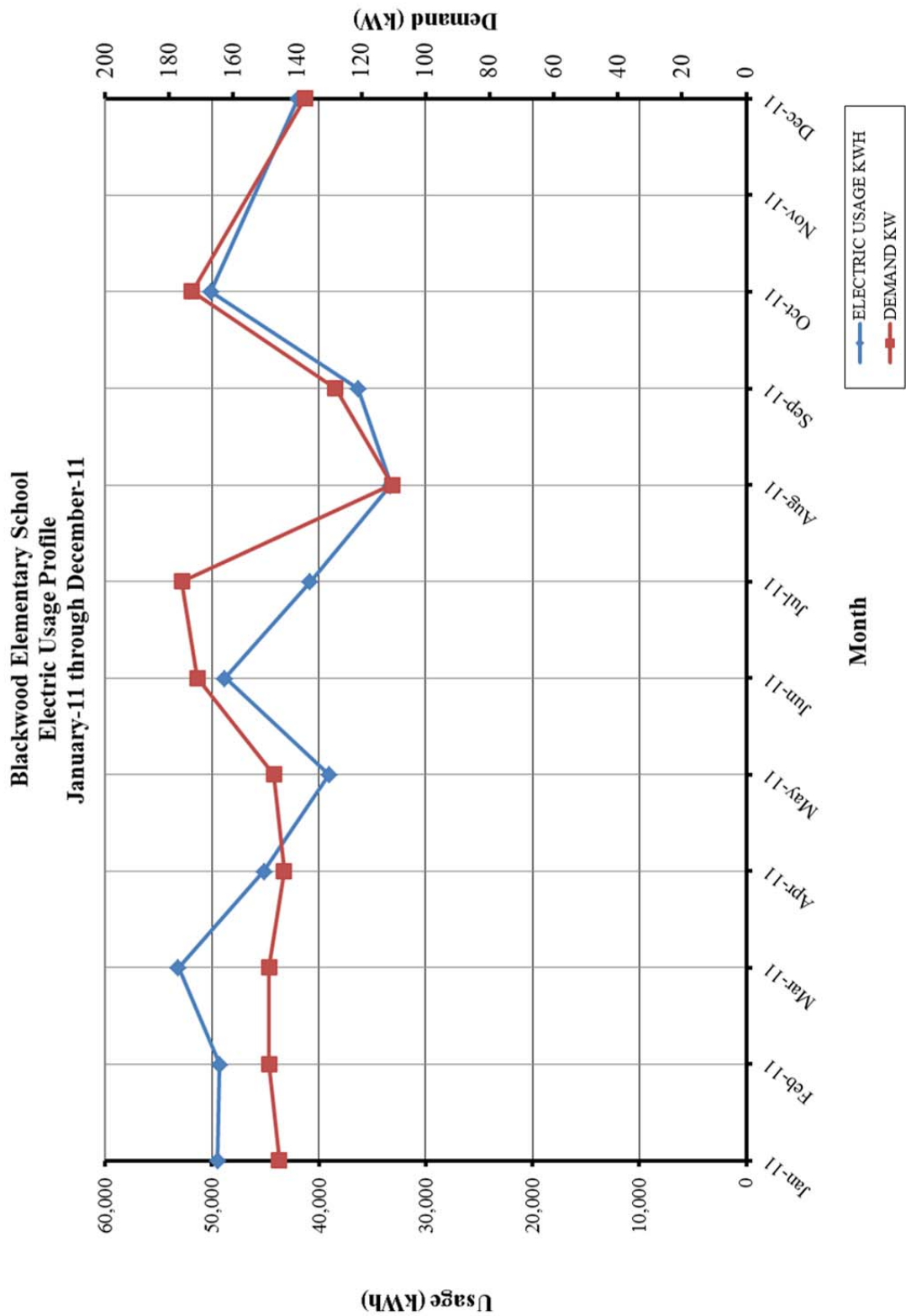


Figure 1
Electric Usage Profile
Table 4
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY

Utility Provider: South Jersey Gas

Rate: Firm Transportation

Meter No: 232163

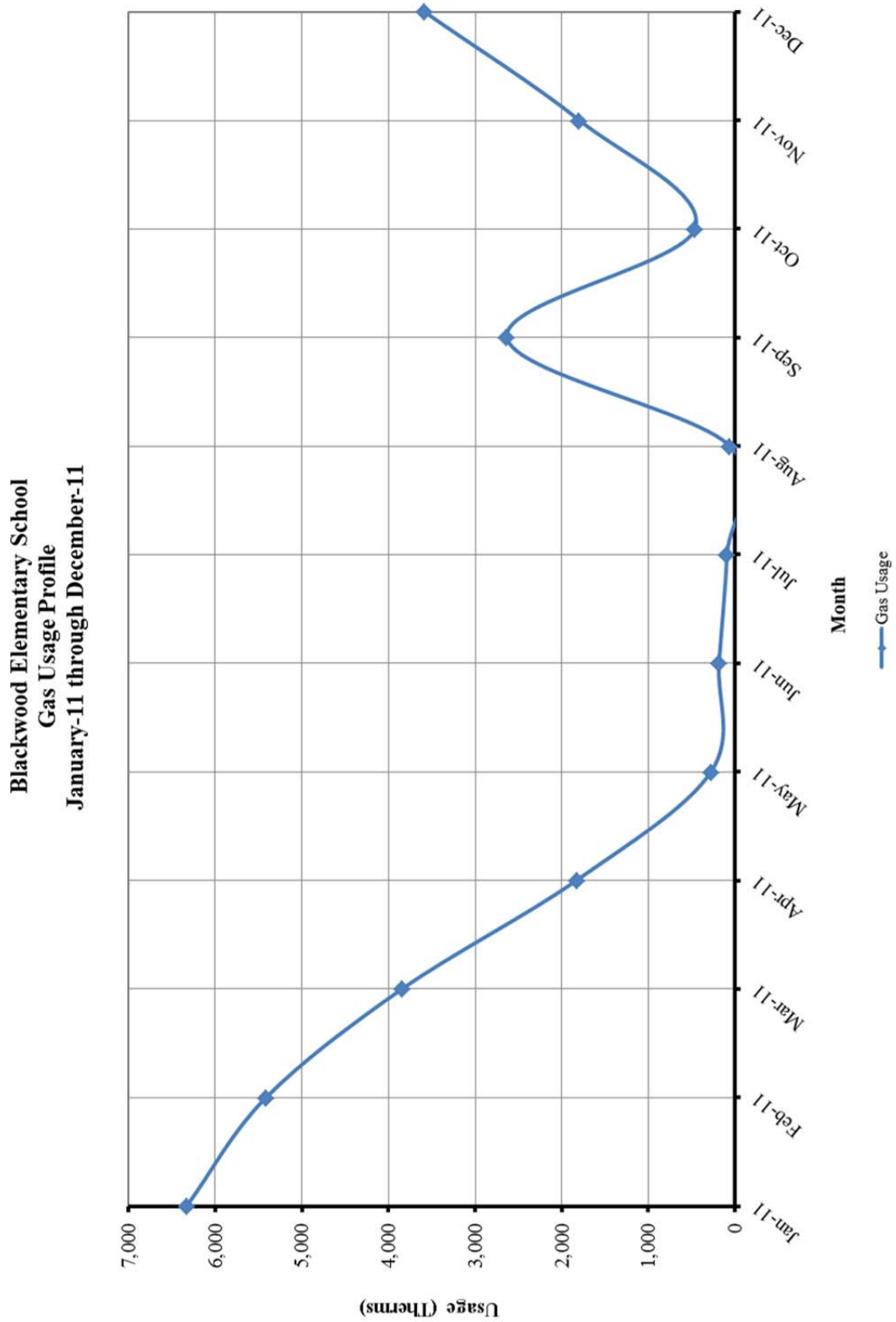
Account Number 20537008300

Third Party Utility Provider: Hess Corporation

TPS Account No: 20537008300

MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
Jan-11	6,328	\$6,790
Feb-11	5,412	\$5,807
Mar-11	3,841	\$4,130
Apr-11	1,828	\$1,977
May-11	277	\$312
Jun-11	186	\$219
Jul-11	93	\$121
Aug-11	62	\$87
Sep-11	2,634	\$2,431
Oct-11	463	\$505
Nov-11	1,801	\$1,817
Dec-11	3,591	\$3,614
TOTALS	26,516	\$27,810
AVERAGE RATE: \$1.05 \$/THERM		

**Figure 2
Natural Gas
Usage Profile**



II. FACILITY DESCRIPTION

The Blackwood Elementary School is located on 260 Blenheim/Erial Road in Blackwood, New Jersey. The 67,565 SF school was built in 1958 with additions in 1960, 1980 and 1995. The building is a single story facility comprised of classrooms, gymnasium, cafeteria, kitchen, library, mechanical room and offices.

Occupancy Profile

The typical hours of operation for the Elementary School are Monday through Friday between 8:30 am and 3:30 pm. Blackwood Elementary School employs approximately 46 people, with student enrollment estimated at 709.

Building Envelope

Exterior walls for the Elementary School are masonry brick faced with a concrete block construction. The windows throughout the school are in good condition and appear to be maintained. Typical windows are double pane, operable, 1/4" with aluminum frames. Most of the roof is flat mineral surface modified bitumen, except the gymnasium roof is standing seam metal.

HVAC Systems

The majority of classrooms consist of heating only unit ventilators with hot water heating coils. Some of the classrooms have cooling provided by window air conditioning units.

The new gymnasium addition is conditioned by two McQuay heating only air handling units with reclaim coils.

The classrooms associated with the gymnasium addition are conditioned by self-contained unit ventilators equipped with hot water coils for heating.

The Cafeteria is conditioned by a Trane 25 ton rooftop unit with direct expansion cooling and hot water heating within the space.

The room 9 is conditioned by ceiling mounted unit ventilator with a remote Inter-City 1.5 ton split system unit.

The main office areas are conditioned by hot water heating only unit ventilators and have an additional Carrier 8 ton split system unit.

The faculty lounge is conditioned by a 3 ton Trane cooling only rooftop unit.

Heating Hot Water is generated by a two boiler plants, one for the original building and one for the latest addition. The older boiler room is fitted with two H.B. Smith 28A Series cast iron sectional boilers. These boilers are natural gas fired both rated at 2,027 MBH, and one is equipped with a Power Flame Burner while the other is equipped with a Gordon Piatt burner. The newer boiler room is fitted with one H.B. Smith 28A Series cast iron sectional boiler. This boiler is natural gas fired rated at 2,172 MBH and is fit with a Power Flame Burner. The older

boiler plant has two 10 horsepower pumps rated at 225 GPM and 75 feet of head. The newer boiler room has two sets of base mounted pumps and one set of inline pumps; Base mounted pumps are all 10 horsepower Aurora pumps rated at 200 GPM and 150 GPM at 70 feet and 100 feet of head, respectively; inline pumps are 1 horsepower Aurora pumps rated at 72 GPM at 20 feet of head.

Exhaust System

Air is exhausted from the toilet rooms through the roof exhausters.

HVAC System Controls

The building has pneumatic thermostats and control valves in the unit ventilators. Supplemental cooling systems are controlled by individual thermostat.

Domestic Hot Water

There are three separate heaters for domestic hot water in the facility. There is an A.O. Smith 360 MBH gas fired heater with an integrated 65 gallon tank that serves the original building. Secondly, there is an A.O. Smith 199 MBH gas fired heater with an integrated 30 gallon tank which also serves the original building. Lastly, there is a Rheem 2000 watt electric water heater with an integrated 17 gallon tank which serves the 1993 addition. These heaters are circulated by a small horsepower motors.

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	General Lighting Upgrade	\$12,118	\$6,362	1.9	687.5%
ECM #2	Gym/Cafeteria Lighting Upgrade	\$11,440	\$2,311	5.0	203.0%
ECM #3	Lighting Controls Upgrade	\$16,470	\$2,214	7.4	101.7%
ECM #4	NEMA Premium Motor Replacements	\$16,076	\$2,192	7.3	172.8%
ECM #5	Condensing Boiler Replacements	\$154,679	\$4,941	31.3	-20.1%
ECM #6	Split System Replacements	\$17,460	\$954	18.3	-18.0%
ECM #7	Domestic Hot Water Heater Upgrade	\$27,075	\$677	40.0	-70.0%
ECM #8	DDC Controls Upgrade	\$253,000	\$5,785	43.7	-65.7%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	DESCRIPTION	NET INSTALLATION COST	ANNUAL SAVINGS	SIMPLE PAYBACK (Yrs)	SIMPLE LIFETIME ROI
REM #1	205.86 KW PV System	\$1,327,167	\$85,887	15.5	-2.9%
Notes:	A. Cost takes into consideration applicable NJ Smart Start TM 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	General Lighting Upgrade	16.1	41,309	0
ECM #2	Gym/Cafeteria Lighting Upgrade	6	15,007	0
ECM #3	Lighting Controls Upgrade	0.0	14,379	0
ECM #4	NEMA Premium Motor Replacements	4.2	14,236	0
ECM #5	Condensing Boiler Replacements	0.0	0	4,706
ECM #6	Split System Replacements	2.3	4,529	0
ECM #7	Domestic Hot Water Heater Upgrade	0.0	0	645
ECM #8	DDC Controls Upgrade	0.0	21,877	2,301
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	205.86 KW PV System	248888.0	167	0

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
General Lighting Upgrade	\$6,362	\$18,778	\$6,660	\$12,118	1.9
Gym/Cafeteria Lighting Upgrade	\$2,311	\$16,640	\$5,200	\$11,440	5.0
Lighting Controls Upgrade	\$2,214	\$18,100	\$1,630	\$16,470	7.4
NEMA Premium Motor Replacements	\$2,192	\$16,776	\$700	\$16,076	7.3
Condensing Boiler Replacements	\$4,941	\$158,679	\$4,000	\$154,679	31.3
Split System Replacements	\$954	\$18,058	\$598	\$17,460	18.3
Domestic Hot Water Heater Upgrade	\$677	\$28,000	\$925	\$27,075	40.0
DDC Controls Upgrade	\$5,785	\$253,000	\$0	\$253,000	43.7
<i>Design / Construction Extras (15%)</i>	<i>\$0</i>	<i>\$79,205</i>	<i>\$0</i>	<i>\$79,205</i>	
Total Project	\$25,436	\$607,236	\$19,713	\$587,523	23

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 – General

Description:

The majority of the interior lighting throughout Blackwood Elementary School is provided with fluorescent fixtures with older generation, 700 series and 741/ECO 32W T8 lamps and electronic ballasts. Although these T8 lamps are considered fairly efficient, further energy savings can be achieved by replacing the existing T8 lamps with new generation, 800 series 28W T8 lamps without compromising light output. CE recommends, re-lamping all of the fixtures with 28W T8 lamps and in some cases removing a lamp from the fixture due to excessive foot candle levels in specific areas. In addition, there are a number of older and outdated fixtures with T12 lamps and magnetic ballasts. It is recommended to replace all of the T12 and 700 series T8 fixtures in these areas with higher efficiency fluorescent T8 fixtures with electronic ballasts.

This ECM includes re-lamping of the existing fluorescent fixtures with 800 series, 28W T8 lamps. The ECM also includes retrofit of all older fluorescent fixtures with T8 or T5 fluorescent fixtures with electronic ballasts in the building. The new, energy efficient T8 fixtures will provide adequate lighting and will save on electrical costs due to better performance of the lamp and 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.

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$18,778
NJ Smart Start Equipment Incentive (\$):	\$6,660
Net Installation Cost (\$):	\$12,118
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$6,362
Total Yearly Savings (\$/Yr):	\$6,362
Estimated ECM Lifetime (Yr):	15
Simple Payback	1.9
Simple Lifetime ROI	687.5%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$95,423
Internal Rate of Return (IRR)	52%
Net Present Value (NPV)	\$63,825.91

ECM #2: Lighting Upgrade – Gymnasium/Cafeteria

Description:

The gymnasium and cafeteria at Blackwood Elementary School are currently lit via 400 watt Metal Halide HID fixtures. The space would be better served with a more efficient, fluorescent lighting system. CE recommends upgrading the lighting to an energy-efficient T5 high output system that includes new six lamp 54 watt high output fixtures.

This measure replaces all the HID, 400 watt HID MH fixtures with a well-designed T5 high output (HO) system. T5 High output fixtures with reflectors and wire guards will be required in order to meet the mandated 50 foot-candle average within the spaces.

Energy Savings Calculations:

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

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$16,640
NJ Smart Start Equipment Incentive (\$):	\$5,200
Net Installation Cost (\$):	\$11,440
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$2,311
Total Yearly Savings (\$/Yr):	\$2,311
Estimated ECM Lifetime (Yr):	15
Simple Payback	5.0
Simple Lifetime ROI	203.0%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$34,667
Internal Rate of Return (IRR)	19%
Net Present Value (NPV)	\$16,149.87

ECM #3: Lighting Controls Upgrade – Occupancy Sensors

Description:

Some of the lights in the Blackwood Elementary School are 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 (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 Media Centers. 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 #3 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$18,100
NJ Smart Start Equipment Incentive (\$):	\$1,630
Net Installation Cost (\$):	\$16,470
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$2,214
Total Yearly Savings (\$/Yr):	\$2,214
Estimated ECM Lifetime (Yr):	15
Simple Payback	7.4
Simple Lifetime ROI	101.7%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$33,215
Internal Rate of Return (IRR)	10%
Net Present Value (NPV)	\$9,964.48

ECM #4: Install NEMA Premium® Efficiency Motors**Description:**

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

The electric motors driving the hot pumps are candidates for replacing with premium efficiency motors. These standard efficiency motors run considerable amount of time over a year.

This energy conservation measure replaces existing inefficient electric motors with NEMA Premium® efficiency motors. NEMA Premium® is the most efficient motor designation in the marketplace today.

IMPLEMENTATION SUMMARY					
EQMT ID	FUNCTION	MOTOR HP	HOURS OF OPERATION	EXISTING EFFICIENCY	NEMA PREMIUM EFFICIENCY
P-1	Old Boiler Pump	10	3,732	83.0%	92.4%
P-2	Old Boiler Pump	10	3,732	83.0%	92.4%
P-1	New Hot Water Pump	10	2,745	83.0%	92.4%
P-2	New Hot Water Pump	10	2,745	83.0%	92.4%
P-3	New Hot Water Pump	1	3,732	85.5%	87.5%
P-4	New Hot Water Pump	1	3,732	85.5%	87.5%
P-5	New Hot Water Pump	10	3,732	87.0%	92.4%
P-6	New Hot Water Pump	10	3,732	87.0%	92.4%

Energy Savings Calculations:

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

where, HP = Motor Nameplate Horsepower Rating

LF = Load Factor

Motor Efficiency = Motor Nameplate Efficiency

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

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

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

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

PREMIUM EFFICIENCY MOTOR CALCULATIONS							
EQMT ID	MOTOR HP	LOAD FACTOR	EXISTING EFFICIENCY	NEMA PREMIUM EFFICIENCY	POWER SAVINGS kW	ENERGY SAVINGS kWh	COST SAVINGS
P-1	10	90%	83.0%	92.4%	0.82	3,088	\$475
P-2	10	90%	83.0%	92.4%	0.82	3,088	\$475
P-1	10	90%	83.0%	92.4%	0.82	2,271	\$350
P-2	10	90%	83.0%	92.4%	0.82	2,271	\$350
P-3	1	90%	85.5%	87.5%	0.02	67	\$10
P-4	1	90%	85.5%	87.5%	0.02	67	\$10
P-5	10	90%	87.0%	92.4%	0.45	1,692	\$261
P-6	10	90%	87.0%	92.4%	0.45	1,692	\$261
TOTAL					4.2	14,236	\$2,192

Equipment Cost and Incentives

Below is a summary of SmartStart Building® incentives for premium efficiency motors:

INCENTIVES	
HORSE POWER	NJ SMART START INCENTIVE
5	\$60
7.5	\$90
10	\$100
15	\$115
20	\$125
25	\$130
30	\$150
40	\$180

The following table outlines the summary of motor replacement costs and incentives:

MOTOR REPLACEMENT SUMMARY						
EQMT ID	MOTOR POWER HP	INSTALLED COST	SMART START INCENTIVE	NET COST	TOTAL SAVINGS	SIMPLE PAYBACK
P-1	10	\$2,560	\$100	\$2,460	\$475	5.2
P-2	10	\$2,560	\$100	\$2,460	\$475	5.2
P-1	10	\$2,560	\$100	\$2,460	\$350	7.0
P-2	10	\$2,560	\$100	\$2,460	\$350	7.0
P-3	1	\$708	\$50	\$658	\$10	63.4
P-4	1	\$708	\$50	\$658	\$10	63.4
P-5	10	\$2,560	\$100	\$2,460	\$261	9.4
P-6	10	\$2,560	\$100	\$2,460	\$261	9.4
TOTAL	Totals:	\$16,776	\$700	\$16,076	\$2,192	7.3

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$16,776
NJ Smart Start Equipment Incentive (\$):	\$700
Net Installation Cost (\$):	\$16,076
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$2,192
Total Yearly Savings (\$/Yr):	\$2,192
Estimated ECM Lifetime (Yr):	20
Simple Payback	7.3
Simple Lifetime ROI	172.8%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$43,848
Internal Rate of Return (IRR)	12%
Net Present Value (NPV)	\$16,541.37

ECM #5: Condensing Boiler Installation

Description:

The existing boiler plant consists of three cast iron boilers which are used as the primary source of heat for Blackwood Elementary School. Two of the existing boilers are approaching their life expectancy of a typical cast iron boiler and could be considered for replacement. With the increased efficiency of the condensing boilers, the savings can be substantial.

New condensing boilers could substantially improve the operating efficiency of the heating system of the building. Condensing boiler's peak efficiency tops out at 99% depending on return water temperature. Due to the operating conditions of the building, the annual average operating efficiency of the proposed condensing boiler is expected to be 88%. The existing boiler's efficiency is approximately 70%, which makes the condensing boilers an 18% increase in efficiency. This ECM is based on variable supply water temperature adjusted based on outdoor temperature.

This ECM includes installation of two condensing gas fired boilers to replace the existing H.B. Smith Series 28-10 cast iron boilers. The basis for this ECM is Aerco condensing boiler; model number BMK – 2.0. The boiler installation is based on a one for one replacement based on capacity of the existing boiler.

Energy Savings Calculations:

Baseline Hot Water Gas Use: 3,511 Therms

Existing Heating Natural Gas: 26,516 Therms – 3,511 Domestic HW = 23,005 Therms

$$\text{Bldg Heat Required} = \text{Existing Nat Gas (Therms)} \times \text{Heating Eff. (\%)} \times \text{Fuel Heat Value} \left(\frac{\text{BTU}}{\text{Therm}} \right)$$

$$\text{Proposed Heating Gas Usage} = \frac{\text{Bldg Heat Required (BTU)}}{\text{Heating Eff. (\%)} \times \text{Fuel Heat Value} \left(\frac{\text{BTU}}{\text{Therm}} \right)}$$

$$\text{Energy Cost} = \text{Heating Gas Usage (Therms)} \times \text{Ave Fuel Cost} \left(\frac{\$}{\text{Therm}} \right)$$

CONDENSING BOILER CALCULATIONS			
ECM INPUTS	EXISTING	PROPOSED	SAVINGS
ECM INPUTS	Existing Cast Iron Boilers	New Condensing Boilers	
Existing Nat Gas (Therms)	23,005	0	
Boiler Efficiency (%)	70%	88%	18%
Nat Gas Heat Value (BTU/Therm)	100,000	100,000	
Equivalent Building Heat Usage (MMBTUs)	1,610	1,610	
Gas Cost (\$/Therm)	1.05	1.05	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	EXISTING	PROPOSED	SAVINGS
Natural Gas Usage (Therms)	23,005	18,299	4,706
Energy Cost (\$)	\$24,155	\$19,214	\$4,941
COMMENTS:			

From the **NJ Smart Start Appendix**, the installation of new condensing boilers warrants the following incentive: \$1.00 per MBH.

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$158,679
NJ Smart Start Equipment Incentive (\$):	\$4,000
Net Installation Cost (\$):	\$154,679
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$4,941
Total Yearly Savings (\$/Yr):	\$4,941
Estimated ECM Lifetime (Yr):	25
Simple Payback	31.3
Simple Lifetime ROI	-20.1%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$123,521
Internal Rate of Return (IRR)	-2%
Net Present Value (NPV)	(\$68,643.53)

ECM #6: Replace Split System Units with High Efficiency Units

Description:

Cooling for a few of the classrooms of Blackwood Elementary School are served by one 5 ton, one 1 ton cooling only split system units.

These units are in average condition though the current units in operation are not high efficiency units. These units are approximately eighteen and twenty-one years old and have surpassed their ASHRAE service life of fifteen years.

These units can be replaced with new higher efficiency units. New split system units provide higher full load and part load efficiencies due to advances in inverter motor technologies, heat exchangers and higher efficiency refrigerants such as R410A which would be used in place of R22 that is currently used in the units.

This ECM includes one-for-one replacement of the older split system units with new higher efficiency systems which include new evaporator coils and refrigerant lines. 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					
ECM INPUTS	SERVICE FOR	NUMBER OF UNITS	COOLING CAPACITY, BTU/HR	TOTAL CAPACITY, TONS	REPLACE UNIT WITH
SS	CU - 1	1	60,000	5.0	Trane 4TTA3060
SS	CU -2	1	18,000	1.5	Trane 4TTB018
Total		2	156,000	6.5	

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

Energy Savings Calculations:

Cooling Energy Savings:

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

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

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

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

ENERGY SAVINGS CALCULATIONS							
ECM INPUTS	COOLING CAPACITY, BTU/Hr	ANNUAL COOLING HOURS	EXISTING UNITS EER	SPLIT UNITS EER	# OF UNITS	ENERGY SAVINGS kWh	DEMAND SAVINGS kW
SS	60,000	2,001	9 SEER	14 SEER	1	4,764	2.4
SS	18,000	2,002	9 SEER	14 SEER	1	1,430	0.7
Total					2	6,194	3.1

Project Cost, Incentives and Maintenance Savings

From the NJ Smart Start[®] Program appendix, the rebate are \$92 per ton for units below 5.4 tons & \$73 per ton for units ranging from 5.4 tons to 11.25 tons..

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	\$11,500	1	\$11,500	\$460	\$11,040	\$734	15.0
SS	\$6,558	1	\$6,558	\$138	\$6,420	\$220	29.2
Total	\$18,058	2	\$18,058	\$598	\$17,460	\$954	18.3

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$18,058
NJ Smart Start Equipment Incentive (\$):	\$598
Net Installation Cost (\$):	\$17,460
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$954
Total Yearly Savings (\$/Yr):	\$954
Estimated ECM Lifetime (Yr):	15
Simple Payback	18.3
Simple Lifetime ROI	-18.0%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	\$14,309
Internal Rate of Return (IRR)	-2%
Net Present Value (NPV)	(\$6,072.50)

ECM #7: High Efficiency Gas Hot Water Heater**Description:**

The Blackwood Elementary School has two separate domestic hot water systems, one Rheem electric heater that serves the 1993 addition and two A.O. Smith gas-fired hot water heaters serve the entirety of the original building. The gas fired heaters have surpassed their life expectancy of a typical hot water heater. The electric heater is too small a system to warrant any savings in replacing it with a gas fired alternative.

This ECM will replace the original gas fired domestic water heaters with Natural Gas fired 98.5% thermal efficient Bradford White eF Series. The larger unit will be replaced with a 300 MBH and 100 gallon heater and the smaller unit will be replaced with a 150 MBH and 60 gallon domestic water heater

Energy Savings Calculations:

DOM. HOT WATER HEATER CALCULATIONS			
ECM INPUTS	EXISTING	PROPOSED	SAVINGS
ECM INPUTS	Existing Gas Hot Water Heater	High Efficiency Heater	
Building Type	Education		
Building Square-foot	54,018	54,018	
Domestic Water Usage, kBtu	280,893.60	280,893.60	
DHW Heating Fuel Type	Gas	Gas	
Heating Efficiency	80%	98%	18%
Total Usage (kBtu)	351,117	286,626	64,491
Nat Gas Cost (\$/Therm)	\$ 1.050	\$ 1.050	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	EXISTING	PROPOSED	SAVINGS
Natural Gas Usage (Therms)	3,511	2,866	645
Energy Cost (\$)	\$3,687	\$3,010	\$677
COMMENTS:	Savings are based on Energy Information Administration Commercial Building Energy Consumption Survey 2003 Information		

Energy Density for “Education” type building = 5.2 kBtu / SF / year

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

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

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

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$28,000
NJ Smart Start Equipment Incentive (\$):	\$925
Net Installation Cost (\$):	\$27,075
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$677
Total Yearly Savings (\$/Yr):	\$677
Estimated ECM Lifetime (Yr):	12
Simple Payback	40.0
Simple Lifetime ROI	-70.0%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$8,126
Internal Rate of Return (IRR)	-15%
Net Present Value (NPV)	(\$20,334.60)

ECM #8: Digital Energy Management System (DDC EMS)

Description:

The unit ventilators are controlled locally via central pneumatic control systems. The remainder of the HVAC systems throughout the school is controlled via manual thermostats within rooms which are connected to a BMS system for that area.

The unit ventilator fans throughout the spaces are manually enabled with the hot water control valve and outside air damper controlled by a pneumatic thermostat. The window air conditioners are controlled manually via on board controls or remote controllers.

Concord Engineering recommends installing a DDC system throughout the school to control the entire HVAC systems including the unit ventilators in the classrooms, indoor air handling units, rooftop units and roof exhaust fans.

The system will include new temperature sensors and new local thermostats with limited override capability, a front end computer and main controller. The system will also include central controls for lighting. With the communication between the control devices and the front end computer interface, the facility manager will be able to take advantage of scheduling for occupied and unoccupied periods based on the actual occupancy of each space in the facility. Due to the fact that the building may have diverse hours of occupancy, including evening and weekend activities, having supervisory control over all of the equipment makes sense. 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.

The new DDC system has the potential to provide significant 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:

- 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 electricity and 10% for the fuel oil utility in this building.

The basis for the DDC system expansion is the Automated Logic Energy Management System or similar.

Energy Savings Calculations:

Energy savings for each utility is calculated with the equation below.

$$\text{Energy Savings (Utility)} = \text{Current Energy Consumption} \times \text{Estimated Savings, \%}$$

Following table summarizes energy savings for this facility via implementation of an Energy Management System:

DDC ENERGY MANAGEMENT SYSTEM CALCULATIONS			
ECM INPUTS	EXISTING	PROPOSED	SAVINGS
ECM INPUTS	Existing Controls w/ Local Thermostats	DDC Controls	
Existing Nat Gas Usage (Therms)	23,005	-	
Existing Electricity Usage (kWh)	218,768	-	
Energy Savings, Nat Gas	-	10%	
Energy Savings, Electricity	-	10%	
Gas Cost (\$/Therm)	\$1.05	\$1.05	
Electricity Cost (\$/kWh)	\$0.154	\$0.154	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	EXISTING	PROPOSED	SAVINGS
Nat Gas Usage (Therms)	23,005	20,705	2,301
Electricity Usage (kWh)	218,768	196,891	21,877
Nat Gas Cost (\$)	\$24,155	\$21,740	\$2,416
Electricity Cost (\$)	\$33,690	\$30,321	\$3,369
Energy Cost (\$)	\$57,846	\$52,061	\$5,785
COMMENTS:			

Demand savings due to implementation of this ECM is minimal.

The cost of a full DDC system with new field devices, controllers, computer, software, programming, etc. is approximately \$3.75 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.

Cost of complete DDC System = $(\$3.75/\text{SF} \times 67,565 \text{ SF}) = \underline{\$253,000}$

Currently, there are no prequalified NJ SmartSmart Incentives for installation of the DDC system.

Energy Savings Summary:

ECM #8 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$253,000
NJ Smart Start Equipment Incentive (\$):	\$0
Net Installation Cost (\$):	\$253,000
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$5,785
Total Yearly Savings (\$/Yr):	\$5,785
Estimated ECM Lifetime (Yr):	15
Simple Payback	43.7
Simple Lifetime ROI	-65.7%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$86,775
Internal Rate of Return (IRR)	-11%
Net Present Value (NPV)	(\$183,939.05)

REM #1: 205.86 kW Solar System**Description:**

The Blackwood Elementary School has available roof and parking lot space that could accommodate a significant amount of solar generation. Based on the available areas a 205.86 kilowatt solar array could be installed, assuming the existing roof structure is capable of supporting an array. The array will produce approximately 248,888 kilowatt-hours annually that will reduce the overall electric usage of the facility by 47%.

Energy Savings Calculations:

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

Energy Savings Summary:

REM #1 - ENERGY SAVINGS SUMMARY	
System Size (KW_{DC}):	205.86
Electric Generation (KWH/Yr):	248,888
Installation Cost (\$):	\$1,327,167
SREC Revenue (\$/Yr):	\$47,559
Energy Savings (\$/Yr):	\$38,329
Total Yearly Savings (\$/Yr):	\$85,887
ECM Analysis Period (Yr):	15
Simple Payback (Yrs):	15.5
Analysis Period Electric Savings (\$):	\$712,873
Analysis Period SREC Revenue (\$):	\$688,944
Net Present Value (NPV)	(\$469,776.15)

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

Gloucester Township BOE - Blackwood 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)	$\sum_{n=0}^N \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^N \frac{C_n}{(1+DR)^n}$
		(\$)	(\$)	(\$)	(\$)	(\$/yr)	(\$/yr)	(\$/yr)		(\$)	(\$)	(%)	(Yr)	(\$)	(\$)
ECM #1	General Lighting Upgrade	\$18,778	\$0	\$6,660	\$12,118	\$6,362	\$0	\$6,362	15	\$95,423	\$0	687.5%	1.9	52.40%	\$63,825.91
ECM #2	Gym/Cafeteria Lighting Upgrade	\$16,640	\$0	\$5,200	\$11,440	\$2,311	\$0	\$2,311	15	\$34,667	\$0	203.0%	5.0	18.65%	\$16,149.87
ECM #3	Lighting Controls Upgrade	\$15,300	\$2,800	\$1,630	\$16,470	\$2,214	\$0	\$2,214	15	\$33,215	\$0	101.7%	7.4	10.39%	\$9,964.48
ECM #4	NEMA Premium Motor Replacements	\$16,776	\$0	\$700	\$16,076	\$2,192	\$0	\$2,192	20	\$43,848	\$0	172.8%	7.3	12.30%	\$16,541.37
ECM #5	Condensing Boiler Replacements	\$82,010	\$76,669	\$4,000	\$154,679	\$4,941	\$0	\$4,941	25	\$123,521	\$0	-20.1%	31.3	-1.66%	(\$68,643.53)
ECM #6	Split System Replacements	\$8,933	\$9,125	\$598	\$17,460	\$954	\$0	\$954	15	\$14,309	\$0	-18.0%	18.3	-2.39%	(\$6,072.50)
ECM #7	Domestic Hot Water Heater Upgrade	\$20,000	\$8,000	\$925	\$27,075	\$677	\$0	\$677	12	\$8,126	\$0	-70.0%	40.0	-14.94%	(\$20,334.60)
ECM #8	DDC Controls Upgrade	\$253,000	\$0	\$0	\$253,000	\$5,785	\$0	\$5,785	15	\$86,775	\$0	-65.7%	43.7	-11.12%	(\$183,939.05)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	205.86 KW PV System	\$1,327,167	\$0	\$0	\$1,327,167	\$38,329	\$47,559	\$85,887	15	\$1,288,311	\$713,380	-2.9%	15.5	-0.37%	(\$301,848.35)

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 15, 2011:

Electric Chillers

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

Energy Efficiency must comply with ASHRAE 90.1-2007

Gas Cooling

Gas Absorption Chillers	\$185 - \$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 - \$92 per ton
Air-to-Air Heat Pumps	\$73 - \$92 per ton
Water-Source Heat Pumps	\$81 per ton
Packaged Terminal AC & HP	\$65 per ton
Central DX AC Systems	\$40- \$72 per ton
Dual Enthalpy Economizer Controls	\$250
Occupancy Controlled Thermostat (Hospitality & Institutional Facility)	\$75 per thermostat

Energy Efficiency must comply with ASHRAE 90.1-2007

Gas Heating

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

Ground Source Heat Pumps

Closed Loop	\$450 per ton, EER $\geq$ 16 \$600 per ton, EER $\geq$ 18 \$750 per ton, EER $\geq$ 20
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Energy Efficiency must comply with ASHRAE 90.1-2007

Variable Frequency Drives

Variable Air Volume	\$65 - \$155 per hp
Chilled-Water Pumps	\$60 per VFD rated hp
Compressors	\$5,250 to \$12,500 per drive
Cooling Towers $\geq$ 10 hp	\$60 per VFD rated hp

Natural Gas Water Heating

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

Prescriptive Lighting

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 (1-4 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 Including Parking Lot	\$25 per fixture
T-5 and T-8 High Bay Fixtures	\$16 - \$200 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

Prescriptive Lighting - LED

LED New Exit Sign Fixture Existing Facility < 75 kw Existing Facility > 75 kw	\$20 per fixture \$10 per fixture
LED Display Case Lighting	\$30 per display case
LED Shelf-Mtd. Display & Task Lights	\$15 per linear foot
LED Portable Desk Lamp	\$20 per fixture
LED Wall-wash Lights	\$30 per fixture
LED Recessed Down Lights	\$35 per fixture
LED Outdoor Pole/Arm-Mounted Area and Roadway Luminaries	\$175 per fixture
LED Outdoor Pole/Arm-Mounted Decorative Luminaries	\$175 per fixture
LED Outdoor Wall-Mounted Area Luminaries	\$100 per fixture
LED Parking Garage Luminaries	\$100 per fixture
LED Track or Mono-Point Directional Lighting Fixtures	\$50 per fixture
LED High-Bay and Low-Bay Fixtures for Commercial & Industrial Bldgs.	\$150 per fixture
LED High-Bay-Aisle Lighting	\$150 per fixture
LED Bollard Fixtures	\$50 per fixture
LED Linear Panels (2x2 Troffers only)	\$100 per fixture
LED Fuel Pump Canopy	\$100 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- 2007 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive
Custom Measures	\$0.16 KWh and \$1.60/Therm of 1st year savings, or a buy down to a 1 year payback on estimated savings. Minimum required savings of 75,000 KWh or 1,500 Therms and a IRR of at least 10%.
Multi Measures Bonus	15%

APPENDIX C



STATEMENT OF ENERGY PERFORMANCE

4-Blackwood Elementary School

Building ID: 3100692

For 12-month Period Ending: December 31, 2011¹

Date SEP becomes ineligible: N/A

Date SEP Generated: July 03, 2012

Facility

4-Blackwood Elementary School
260 Blenheim/Erial Road
Blackwood, NJ 08012

Facility Owner

Gloucester Township Public Schools
17 Erial Road
Blackwood, NJ 08012

Primary Contact for this Facility

John Bilodeau
17 Erial Road
Blackwood, NJ 08012

Year Built: 1960

Gross Floor Area (ft²): 67,565Energy Performance Rating² (1-100) 61**Site Energy Use Summary³**

Electricity - Grid Purchase(kBtu)	1,806,654
Natural Gas (kBtu) ⁴	2,651,600
Total Energy (kBtu)	4,458,254

Energy Intensity⁴

Site (kBtu/ft ² /yr)	66
Source (kBtu/ft ² /yr)	130

Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO ₂ e/year)	397
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Electric Distribution Utility

Public Service Electric & Gas Co

National Median Comparison

National Median Site EUI	73
National Median Source EUI	145
% Difference from National Median Source EUI	-10%
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 Standards⁵ 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	4-Blackwood 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	260 Blenheim/Erial Road, Blackwood, NJ 08012	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 a hospital, k-12 school, hotel and senior care facility) nor can they be submitted as representing only a portion of a building.		☐
Blackwood (K-12 School)				
CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☒
Gross Floor Area	67,565 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	40	Is this the number of personal computers in the K12 School?		☐
Number of walk-in refrigeration/freezer units	2	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	80 %	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: Public Service Electric & Gas Co

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))
12/01/2011	12/31/2011	42,245.00
11/01/2011	11/30/2011	41,925.00
10/01/2011	10/31/2011	50,085.00
09/01/2011	09/30/2011	36,325.00
08/01/2011	08/31/2011	33,285.00
07/01/2011	07/31/2011	40,805.00
06/01/2011	06/30/2011	48,805.00
05/01/2011	05/31/2011	39,045.00
04/01/2011	04/30/2011	45,125.00
03/01/2011	03/31/2011	53,125.00
02/01/2011	02/28/2011	49,285.00
01/01/2011	01/31/2011	49,445.00
Electric Consumption (kWh (thousand Watt-hours))		529,500.00
Electric Consumption (kBtu (thousand Btu))		1,806,654.00
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		1,806,654.00
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐
Fuel Type: Natural Gas		
Meter: Gas (therms) Space(s): Entire Facility		
Start Date	End Date	Energy Use (therms)
12/01/2011	12/31/2011	3,591.00
11/01/2011	11/30/2011	1,801.00
10/01/2011	10/31/2011	463.00
09/01/2011	09/30/2011	2,634.00
08/01/2011	08/31/2011	62.00
07/01/2011	07/31/2011	93.00
06/01/2011	06/30/2011	186.00
05/01/2011	05/31/2011	277.00
04/01/2011	04/30/2011	1,828.00
03/01/2011	03/31/2011	3,841.00

02/01/2011	02/28/2011	5,412.00
01/01/2011	01/31/2011	6,328.00
Gas Consumption (therms)		26,516.00
Gas Consumption (kBtu (thousand Btu))		2,651,600.00
Total Natural Gas Consumption (kBtu (thousand Btu))		2,651,600.00
Is this the total Natural Gas consumption at this building including all Natural Gas 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

4-Blackwood Elementary School
260 Blenheim/Erial Road
Blackwood, NJ 08012

Facility Owner

Gloucester Township Public Schools
17 Erial Road
Blackwood, NJ 08012

Primary Contact for this Facility

John Bilodeau
17 Erial Road
Blackwood, NJ 08012

General Information

4-Blackwood Elementary School	
Gross Floor Area Excluding Parking: (ft ²)	67,565
Year Built	1960
For 12-month Evaluation Period Ending Date:	December 31, 2011

Facility Space Use Summary

Blackwood	
Space Type	K-12 School
Gross Floor Area (ft ²)	67,565
Open Weekends?	No
Number of PCs	40
Number of walk-in refrigeration/freezer units	2
Presence of cooking facilities	Yes
Percent Cooled	80
Percent Heated	100
Months °	10
High School?	No
School District °	N/A

Energy Performance Comparison

Performance Metrics	Evaluation Periods		Comparisons		
	Current (Ending Date 12/31/2011)	Baseline (Ending Date 12/31/2011)	Rating of 75	Target	National Median
Energy Performance Rating	61	61	75	N/A	50
Energy Intensity					
Site (kBtu/ft ²)	66	66	57	N/A	73
Source (kBtu/ft ²)	130	130	113	N/A	145
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	397	397	345	N/A	441
kgCO ₂ e/ft ² /year	6	6	5	N/A	7

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 Median column presents energy performance data your building would have if your building had a median rating of 50.

Notes:

o - This attribute is optional.

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

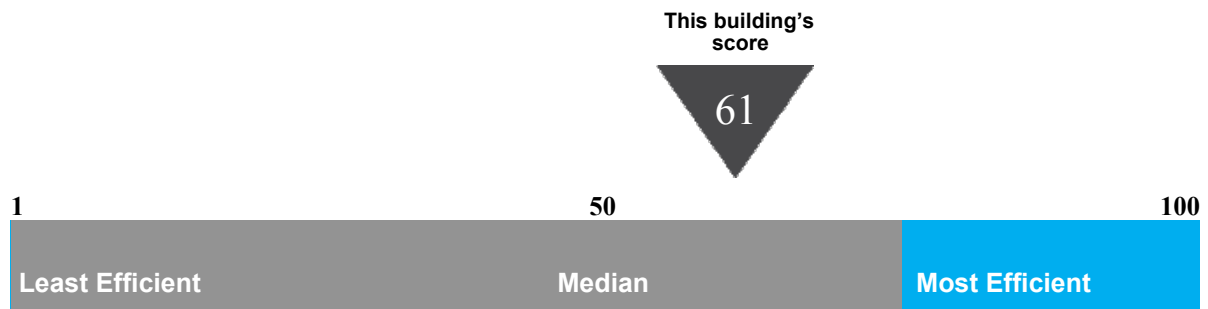
Statement of Energy Performance

2011

4-Blackwood Elementary School
260 Blenheim/Erial Road
Blackwood, NJ 08012

Portfolio Manager Building ID: 3100692

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 130 kBtu per square foot per year.*

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

Blackwood Elementary School

AC Units

Tag	CU-1	CU-2	RTU-1
Unit Type	Split System	Split System	Packaged Rooftop
Qty	1	1	1
Location	Roof	Roof	Roof
Area Served	Classroom	-	-
Manufacturer	Snyder General	Inter-City	Carrier
Model #	AD060G	AG018G1	38ARZ008-511
Serial #	R912600328	L942929737	2408G1023L
Cooling Type	DX, R-22	DX, R-22	DX, R-22
Cooling Capacity (Tons)	5 Tons	1.5 Tons	8 Tons
Cooling Efficiency (SEER/EER)	9 SEER	9 SEER	12.7 EER
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	21	18	3
ASHRAE Service Life	15	15	15
Remaining Life	(6)	(3)	12
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

AC Units

Tag	RTU-2	RTU-3	
Unit Type	Packaged Rooftop	Packaged Rooftop	
Qty	1	1	
Location	Roof	Roof	
Area Served	Cafeteria	Staff Lounge	
Manufacturer	Trane	Trane	
Model #	TCH301C400CD	THC036A4R	
Serial #	326101508D	3281007746	
Cooling Type	DX, R-22	DX, R-22	
Cooling Capacity (Tons)	25 Tons	3 Tons	
Cooling Efficiency (SEER/EER)	10.4 EER	12.5 SEER	
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	9	9	
ASHRAE Service Life	15	15	
Remaining Life	6	6	
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Blackwood Elementary School

Boilers

Tag	B-1,2	B-3	
Unit Type	Cast Iron Sectional	Cast Iron Sectional	
Qty	2	1	
Location	Main Boiler Room	Secondary Boiler Room	
Area Served	Original Building	1993 Addition including gym	
Manufacturer	H.B. Smith	Smith	
Model #	Series 28-10	Series 28A-10	
Serial #	6866;6867	N94-617	
Input Capacity (Btu/Hr)	2,027	3,172	
Rated Output Capacity (Btu/Hr)		2,172	
Approx. Efficiency %	70.0%	75.0%	
Fuel	Nat Gas	Nat Gas	
Approx Age	31	19	
ASHRAE Service Life	35	35	
Remaining Life	4	16	
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Blackwood Elementary School

Domestic Water Heaters

Tag	HWH-1	HWH-2	HWH-3
Unit Type	Domestic Hot Water Heater	Domestic Hot Water Heater	Domestic Hot Water Heater
Qty	1	1	1
Location	Boiler Room	Boiler Room	Janitor Closet
Area Served	Building Domestic	Building Domestic	1993 Addition
Manufacturer	A.O. Smith	A.O. Smith	Rheem
Model #	6E738B	B0200770	81VP208
Serial #	VGNG0299G05942	770P18230432	0594307385
Size (Gallons)	65 Gallons	30 Gallons	17 Gallons
Input Capacity (MBH/KW)	360 MBH	199 MBH	2 KW
Recovery (Gal/Hr)	327.3 GPH	167.2 GPH	-
Efficiency %	80%	80%	98%
Fuel	Natural Gas	Natural Gas	Electric
Approx Age	13	30	19
ASHRAE Service Life	12	12	12
Remaining Life	(1)	(18)	(7)
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering Group

Blackwood Elementary School

Pumps

Tag	HWP-1,2	P-1,2	P-3,4
Unit Type	Base Mounted End Suction	Base Mounted End Suction	In-Line
Qty	2	2	2
Location	Boiler Room	Secondary Boiler Room	Secondary Boiler Room
Area Served	Original Building Hot Water Loop	1993 Addition/ Gym	1993 Addition Freeze Protection
Manufacturer	Thrush	Aurora	Aurora
Model #	2 x 2 1/2 x 9 PFG	Series 342 A	Series 380
Serial #	26361B A	-	-
Horse Power	10 HP	10 HP	1 HP
Flow	225 GPM @ 75 FTHD	200 GPM @ 70 FTHD	72 GPM @ 20 FTHD
Motor Info	Marathon	US Motor	US Motor
Electrical Power	460/3/60	208/3/60	208/3/60
RPM	1745 RPM	1750 RPM	1740 RPM
Motor Efficiency %	83.0%	83.0%	85.50%
Approx Age	31	19	19
ASHRAE Service Life	20	20	20
Remaining Life	(11)	1	1
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

Pumps

Tag	P-5,6		
Unit Type	Base Mounted End Suction		
Qty	2		
Location	Secondary Boiler Room		
Area Served	Heat Reclaim System		
Manufacturer	Aurora		
Model #	Series 342A		
Serial #	-		
Horse Power	10 HP		
Flow	150 GPM @ 100 FTHD		
Motor Info	US Motor		
Electrical Power	208/3/60		
RPM	1740 RPM		
Motor Efficiency %	87.0%		
Approx Age	19		
ASHRAE Service Life	20		
Remaining Life	1		
Comments			

Note:

"N/A" = Not Applicable.

"- " = Info Not Available

APPENDIX E

CEG Project #: 9C12010
Facility Name: Blackwood Elementary School
Address: 260 Blenheim/Erial Road
City, State, Zip: Blackwood, NJ 08012

Fixture Reference #	Location	Average Burn Hours	Existing Fixtures						Proposed Fixtures Retrofit						Retrofit Energy Savings			Control Ref #	Proposed Lighting Controls					
			Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh		Energy Savings, \$	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, \$
44	Front Lobby	3000	2-Lamp T8 FO32 4100K 2x4 Recessed Prismatic Lens	2	55	4	0.22	660	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	4	0.17	504	0.05	156	\$24	0	No New Controls	0	0.0%	0	\$0
36	Front Lobby	3000	1-Lamp T8 FO32 4100k Surface Mount No Lens	1	30	2	0.06	180	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	1	25	2	0.05	150	0.01	30	\$5	0	No New Controls	0	0.0%	0	\$0
3	Small Work Room	2600	4-Lamp T8 FO32 4100K 2x4 Recessed Prismatic Lens	4	108	2	0.22	562	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	2	0.17	437	0.05	125	\$19	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	87	\$13
3	Medical Office	2600	4-Lamp T8 FO32 4100K 2x4 Recessed Prismatic Lens	4	108	7	0.76	1,966	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	7	0.59	1,529	0.17	437	\$67	0	No New Controls	0	0.0%	0	\$0
19	Medical Office Restroom	1200	25W Incandescent Screw-in Medium Base Lamp	1	25	1	0.03	30	Re-Lamp	Sylvania Product #29708 Supermini Twist 11 Watt CFL Medium Base	1	11	1	0.01	13	0.01	17	\$3	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	3	\$0
44	Classroom 1-A	2600	2-Lamp T8 FO32 4100K 2x4 Recessed Prismatic Lens	2	55	8	0.44	1,144	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	8	0.34	874	0.10	270	\$42	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	175	\$27
19	Classroom 1-A	2600	25W Incandescent Screw-in Medium Base Lamp	1	25	1	0.03	65	Re-Lamp	Sylvania Product #29708 Supermini Twist 11 Watt CFL Medium Base	1	11	1	0.01	29	0.01	36	\$6	0	No New Controls	0	0.0%	0	\$0
3	Classroom 1-B	2600	4-Lamp T8 FO32 4100K 2x4 Recessed Prismatic Lens	4	108	7	0.76	1,966	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	7	0.59	1,529	0.17	437	\$67	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	306	\$47
31	Classroom 2	2600	2-Lamp T8 FO32 4100k 1x4 Pendant Mount Prismatic Lens	2	55	18	0.99	2,574	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	18	0.76	1,966	0.23	608	\$94	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	393	\$61
31	Classroom 3	2600	2-Lamp T8 FO32 4100k 1x4 Pendant Mount Prismatic Lens	2	55	22	1.21	3,146	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	22	0.92	2,402	0.29	744	\$115	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	480	\$74
45	Classroom 3 Restroom	1200	2-Lamp T8 F17 4100K 2 Foot Side Wall Mount Prismatic Lens Vanity Fixture	2	55	2	0.11	132	Existing to Remain	0	2	55	0	0.11	132	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
19	Classroom 3	2600	25W Incandescent Screw-in Medium Base Lamp	1	25	1	0.03	65	Re-Lamp	Sylvania Product #29708 Supermini Twist 11 Watt CFL Medium Base	1	11	1	0.01	29	0.01	36	\$6	0	No New Controls	0	0.0%	0	\$0
31	Classroom 4	2600	2-Lamp T8 FO32 4100k 1x4 Pendant Mount Prismatic Lens	2	55	22	1.21	3,146	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	22	0.92	2,402	0.29	744	\$115	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	480	\$74
45	Classroom 4 Restroom	1200	2-Lamp T8 F17 4100K 2 Foot Side Wall Mount Prismatic Lens Vanity Fixture	2	55	2	0.11	132	Existing to Remain	0	2	55	0	0.11	132	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
19	Classroom 4	2600	25W Incandescent Screw-in Medium Base Lamp	1	25	1	0.03	65	Re-Lamp	Sylvania Product #29708 Supermini Twist 11 Watt CFL Medium Base	1	11	1	0.01	29	0.01	36	\$6	0	No New Controls	0	0.0%	0	\$0
31	Classroom 5	2600	2-Lamp T8 FO32 4100k 1x4 Pendant Mount Prismatic Lens	2	55	14	0.77	2,002	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	14	0.59	1,529	0.18	473	\$73	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	306	\$47
31	Guidance	2600	2-Lamp T8 FO32 4100k 1x4 Pendant Mount Prismatic Lens	2	55	6	0.33	858	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	6	0.25	655	0.08	203	\$31	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	131	\$20
45	Guidance	2600	2-Lamp T8 F17 4100K 2 Foot Side Wall Mount Prismatic Lens Vanity Fixture	2	55	1	0.06	143	Existing to Remain	0	2	55	0	0.06	143	0.00	0	\$0	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	29	\$4
45	Guidance Storage	600	2-Lamp T8 F17 4100K 2 Foot Side Wall Mount Prismatic Lens Vanity Fixture	2	55	1	0.06	33	Existing to Remain	0	2	55	0	0.06	33	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
19	Guidance Bathroom	1200	25W Incandescent Screw-in Medium Base Lamp	1	25	1	0.03	30	Re-Lamp	Sylvania Product #29708 Supermini Twist 11 Watt CFL Medium Base	1	11	1	0.01	13	0.01	17	\$3	0	No New Controls	0	0.0%	0	\$0

Fixture Reference #	Location	Average Burn Hours	Existing Fixtures						Proposed Fixtures Retrofit						Retrofit Energy Savings			Proposed Lighting Controls						
			Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, \$	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, \$
10	Girls Restroom	1200	2-Lamp T8 FO32 4100K 1x4 Surface Mount Prismatic Wrap	2	55	2	0.11	132	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	2	0.08	101	0.03	31	\$5	0	No New Controls	0	0.0%	0	\$0
45	Girls Restroom	1200	2-Lamp T8 F17 4100K 2 Foot Side Wall Mount Prismatic Lens Vanity Fixture	2	55	1	0.06	66	Existing to Remain	0	2	55	0	0.06	66	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
10	Boys Restroom	1200	2-Lamp T8 FO32 4100K 1x4 Surface Mount Prismatic Wrap	2	55	2	0.11	132	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	2	0.08	101	0.03	31	\$5	0	No New Controls	0	0.0%	0	\$0
45	Boys Restroom	1200	2-Lamp T8 F17 4100K 2 Foot Side Wall Mount Prismatic Lens Vanity Fixture	2	55	1	0.06	66	Existing to Remain	0	2	55	0	0.06	66	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
45	Janitor Closet	600	2-Lamp T8 F17 4100K 2 Foot Side Wall Mount Prismatic Lens Vanity Fixture	2	55	1	0.06	33	Existing to Remain	0	2	55	0	0.06	33	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
3	Main Office	2600	4-Lamp T8 FO32 4100K 2x4 Recessed Prismatic Lens	4	108	6	0.65	1,685	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	6	0.50	1,310	0.14	374	\$58	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	262	\$40
6	Office Corridor	2600	2-Lamp T12 4100K U Tube 2x2 Recessed Prismatic	2	82	2	0.16	426	Re-ballast & re-lamp	Sylvania Ballast QHE2x32T8/UNV-ISL-SC Sylvania Lamp FBO30/841XP/6/SS/ECO	2	49	2	0.10	255	0.07	172	\$26	0	No New Controls	0	0.0%	0	\$0
3	Principal	2600	4-Lamp T8 FO32 4100K 2x4 Recessed Prismatic Lens	4	108	2	0.22	562	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	2	0.17	437	0.05	125	\$19	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	87	\$13
3	Vice Principal	2600	4-Lamp T8 FO32 4100K 2x4 Recessed Prismatic Lens	4	108	2	0.22	562	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	2	0.17	437	0.05	125	\$19	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	87	\$13
3	Conference Room	2600	4-Lamp T8 FO32 4100K 2x4 Recessed Prismatic Lens	4	108	3	0.32	842	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	3	0.25	655	0.07	187	\$29	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	131	\$20
3	Work Room	2600	4-Lamp T8 FO32 4100K 2x4 Recessed Prismatic Lens	4	108	4	0.43	1,123	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	4	0.34	874	0.10	250	\$38	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	175	\$27
19	Restroom	1200	25W Incandescent Screw-in Medium Base Lamp	1	25	1	0.03	30	Re-Lamp	Sylvania Product #29708 Supermini Twist 11 Watt CFL Medium Base	1	11	1	0.01	13	0.01	17	\$3	0	No New Controls	0	0.0%	0	\$0
19	Restroom	1200	25W Incandescent Screw-in Medium Base Lamp	1	25	1	0.03	30	Re-Lamp	Sylvania Product #29708 Supermini Twist 11 Watt CFL Medium Base	1	11	1	0.01	13	0.01	17	\$3	0	No New Controls	0	0.0%	0	\$0
3	Classroom A	2600	4-Lamp T8 FO32 4100K 2x4 Recessed Prismatic Lens	4	108	4	0.43	1,123	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	4	0.34	874	0.10	250	\$38	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	175	\$27
3	Classroom B	2600	4-Lamp T8 FO32 4100K 2x4 Recessed Prismatic Lens	4	108	4	0.43	1,123	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	4	0.34	874	0.10	250	\$38	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	175	\$27
6	Classroom B	2600	2-Lamp T12 4100K U Tube 2x2 Recessed Prismatic	2	82	1	0.08	213	Re-ballast & re-lamp	Sylvania Ballast QHE2x32T8/UNV-ISL-SC Sylvania Lamp FBO30/841XP/6/SS/ECO	2	49	1	0.05	127	0.03	86	\$13	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	25	\$4
3	Classroom C	2600	4-Lamp T8 FO32 4100K 2x4 Recessed Prismatic Lens	4	108	4	0.43	1,123	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	4	0.34	874	0.10	250	\$38	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	175	\$27
3	Classroom D	2600	4-Lamp T8 FO32 4100K 2x4 Recessed Prismatic Lens	4	108	4	0.43	1,123	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	4	0.34	874	0.10	250	\$38	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	175	\$27
6	Classroom D	2600	2-Lamp T12 4100K U Tube 2x2 Recessed Prismatic	2	82	1	0.08	213	Re-ballast & re-lamp	Sylvania Ballast QHE2x32T8/UNV-ISL-SC Sylvania Lamp FBO30/841XP/6/SS/ECO	2	49	1	0.05	127	0.03	86	\$13	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	25	\$4
27	Boiler Room	600	2-Lamp T8 FO32 4100K 1x4 Surface Mount No Lens	2	55	7	0.39	231	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	7	0.29	176	0.09	55	\$8	0	No New Controls	0	0.0%	0	\$0
31	Classroom 6	2600	2-Lamp T8 FO32 4100K 1x4 Pendant Mount Prismatic Lens	2	55	12	0.66	1,716	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	12	0.50	1,310	0.16	406	\$62	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	262	\$40

Fixture Reference #	Location	Average Burn Hours	Existing Fixtures						Proposed Fixtures Retrofit						Retrofit Energy Savings			Central Ref #	Proposed Lighting Controls					
			Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh		Energy Savings, \$	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, \$
31	Classroom 7	2600	2-Lamp T8 F032 4100K 1x4 Pendant Mount Prismatic Lens	2	55	12	0.66	1,716	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	12	0.50	1,310	0.16	406	\$62	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	262	\$40
10	Classroom 8	2600	2-Lamp T8 F032 4100K 1x4 Surface Mount Prismatic Wrap	2	55	6	0.33	858	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	6	0.25	655	0.08	203	\$31	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	131	\$20
14	Classroom 9	2600	3-Lamp T12 F40 2x4 Recessed Prismatic Lens	3	132	9	1.19	3,089	Relamp, Re-ballast, & De-lamp	Sylvania Ballast QHE2x32T8/UNV-ISL-SC Sylvania Lamp FO28/841/SS/ECO	2	42	9	0.38	983	0.81	2,106	\$324	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	197	\$30
44	Front Hallway	3000	2-Lamp T8 F032 4100K 2x4 Recessed Prismatic Lens	2	55	19	1.05	3,135	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	19	0.80	2,394	0.25	741	\$114	0	No New Controls	0	0.0%	0	\$0
44	New Wing Hallway	3000	2-Lamp T8 F032 4100K 2x4 Recessed Prismatic Lens	2	55	20	1.10	3,300	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	20	0.84	2,520	0.26	780	\$120	0	No New Controls	0	0.0%	0	\$0
10	East Hallways	3000	2-Lamp T8 F032 4100K 1x4 Surface Mount Prismatic Wrap	2	55	24	1.32	3,960	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	24	1.01	3,024	0.31	936	\$144	0	No New Controls	0	0.0%	0	\$0
44	West Hallway back to front	3000	2-Lamp T8 F032 4100K 2x4 Recessed Prismatic Lens	2	55	9	0.50	1,485	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	9	0.38	1,134	0.12	351	\$54	0	No New Controls	0	0.0%	0	\$0
45	West Hallway back to front	3000	2-Lamp T8 F17 4100K 2 Foot Side Wall Mount Prismatic Lens Vanity Fixture	2	55	5	0.28	825	Existing to Remain	0	2	55	0	0.28	825	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
10	Classroom 10	2600	2-Lamp T8 F032 4100K 1x4 Surface Mount Prismatic Wrap	2	55	12	0.66	1,716	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	12	0.50	1,310	0.16	406	\$62	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	262	\$40
31	Classroom 11	2600	2-Lamp T8 F032 4100K 1x4 Pendant Mount Prismatic Lens	2	55	12	0.66	1,716	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	12	0.50	1,310	0.16	406	\$62	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	262	\$40
31	Classroom 12	2600	2-Lamp T8 F032 4100K 1x4 Pendant Mount Prismatic Lens	2	55	12	0.66	1,716	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	12	0.50	1,310	0.16	406	\$62	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	262	\$40
31	Classroom 13	2600	2-Lamp T8 F032 4100K 1x4 Pendant Mount Prismatic Lens	2	55	12	0.66	1,716	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	12	0.50	1,310	0.16	406	\$62	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	262	\$40
39	Library Storage	600	4-Lamp T8 F032 4100K 2x4 Surface Mount Prismatic Lens	4	108	1	0.11	65	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	1	0.08	50	0.02	14	\$2	0	No New Controls	0	0.0%	0	\$0
39	Library Storage	600	4-Lamp T8 F032 4100K 2x4 Surface Mount Prismatic Lens	4	108	1	0.11	65	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	1	0.08	50	0.02	14	\$2	0	No New Controls	0	0.0%	0	\$0
39	Library Office	2600	4-Lamp T8 F032 4100K 2x4 Surface Mount Prismatic Lens	4	108	1	0.11	281	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	1	0.08	218	0.02	62	\$10	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	44	\$7
39	Library Office	2600	4-Lamp T8 F032 4100K 2x4 Surface Mount Prismatic Lens	4	108	2	0.22	562	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	2	0.17	437	0.05	125	\$19	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	87	\$13
39	Library	2600	4-Lamp T8 F032 4100K 2x4 Surface Mount Prismatic Lens	4	108	13	1.40	3,650	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	13	1.09	2,839	0.31	811	\$125	0	No New Controls	0	0.0%	0	\$0
6	Library Classroom	2600	2-Lamp T12 4100K U Tube 2x2 Recessed Prismatic	2	82	8	0.66	1,706	Re-ballast & re-lamp	Sylvania Ballast QHE2x32T8/UNV-ISL-SC Sylvania Lamp FBO30/841XP/6/SS/ECO	2	49	8	0.39	1,019	0.26	686	\$106	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	204	\$31
39	Stage	2600	4-Lamp T8 F032 4100K 2x4 Surface Mount Prismatic Lens	4	108	39	4.21	10,951	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	39	3.28	8,518	0.94	2,434	\$375	0	No New Controls	0	0.0%	0	\$0
39	Kitchen	2600	4-Lamp T8 F032 4100K 2x4 Surface Mount Prismatic Lens	4	108	11	1.19	3,089	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	11	0.92	2,402	0.26	686	\$106	0	No New Controls	0	0.0%	0	\$0
10	Kitchen	2600	2-Lamp T8 F032 4100K 1x4 Surface Mount Prismatic Wrap	2	55	3	0.17	429	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	3	0.13	328	0.04	101	\$16	0	No New Controls	0	0.0%	0	\$0

Fixture Reference #	Location	Average Burn Hours	Existing Fixtures						Proposed Fixtures Retrofit						Retrofit Energy Savings			Control Ref #	Proposed Lighting Controls					
			Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh		Energy Savings, \$	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, \$
45	Kitchen	2600	2-Lamp T8 F17 4100K 2 Foot Side Wall Mount Prismatic Lens Vanity Fixture	2	55	2	0.11	286	Existing to Remain	0	2	55	0	0.11	286	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
39	Staff Lounge	2600	4-Lamp T8 FO32 4100K 2x4 Surface Mount Prismatic Lens	4	108	9	0.97	2,527	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	9	0.76	1,966	0.22	562	\$86	4	Dual Technology Occupancy Sensor - Remote Mat.	0.3333	20.0%	393	\$61
10	Staff Lounge	2600	2-Lamp T8 FO32 4100K 1x4 Surface Mount Prismatic Wrap	2	55	1	0.06	143	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	1	0.04	109	0.01	34	\$5	4	Dual Technology Occupancy Sensor - Remote Mat.	0.3333	20.0%	22	\$3
45	Staff Lounge	2600	2-Lamp T8 F17 4100K 2 Foot Side Wall Mount Prismatic Lens Vanity Fixture	2	55	3	0.17	429	Existing to Remain	0	2	55	0	0.17	429	0.00	0	\$0	4	Dual Technology Occupancy Sensor - Remote Mat.	0.3333	20.0%	86	\$13
10	Classroom 14	2600	2-Lamp T8 FO32 4100K 1x4 Surface Mount Prismatic Wrap	2	55	12	0.66	1,716	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	12	0.50	1,310	0.16	406	\$62	4	Dual Technology Occupancy Sensor - Remote Mat.	1	20.0%	262	\$40
10	Classroom 15	2600	2-Lamp T8 FO32 4100K 1x4 Surface Mount Prismatic Wrap	2	55	12	0.66	1,716	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	12	0.50	1,310	0.16	406	\$62	4	Dual Technology Occupancy Sensor - Remote Mat.	1	20.0%	262	\$40
10	Classroom 16	2600	2-Lamp T8 FO32 4100K 1x4 Surface Mount Prismatic Wrap	2	55	12	0.66	1,716	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	12	0.50	1,310	0.16	406	\$62	4	Dual Technology Occupancy Sensor - Remote Mat.	1	20.0%	262	\$40
10	Classroom 17	2600	2-Lamp T8 FO32 4100K 1x4 Surface Mount Prismatic Wrap	2	55	12	0.66	1,716	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	12	0.50	1,310	0.16	406	\$62	4	Dual Technology Occupancy Sensor - Remote Mat.	1	20.0%	262	\$40
10	Classroom 18	2600	2-Lamp T8 FO32 4100K 1x4 Surface Mount Prismatic Wrap	2	55	12	0.66	1,716	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	12	0.50	1,310	0.16	406	\$62	4	Dual Technology Occupancy Sensor - Remote Mat.	1	20.0%	262	\$40
10	Classroom 19	2600	2-Lamp T8 FO32 4100K 1x4 Surface Mount Prismatic Wrap	2	55	12	0.66	1,716	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	12	0.50	1,310	0.16	406	\$62	4	Dual Technology Occupancy Sensor - Remote Mat.	1	20.0%	262	\$40
10	Classroom 20	2600	2-Lamp T8 FO32 4100K 1x4 Surface Mount Prismatic Wrap	2	55	12	0.66	1,716	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	12	0.50	1,310	0.16	406	\$62	4	Dual Technology Occupancy Sensor - Remote Mat.	1	20.0%	262	\$40
10	Classroom 21	2600	2-Lamp T8 FO32 4100K 1x4 Surface Mount Prismatic Wrap	2	55	12	0.66	1,716	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	12	0.50	1,310	0.16	406	\$62	4	Dual Technology Occupancy Sensor - Remote Mat.	1	20.0%	262	\$40
45	Boys Restroom	1200	2-Lamp T8 F17 4100K 2 Foot Side Wall Mount Prismatic Lens Vanity Fixture	2	55	2	0.11	132	Existing to Remain	0	2	55	0	0.11	132	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Switch Mnt.	0.5	20.0%	26	\$4
10	Boys Restroom	1200	2-Lamp T8 FO32 4100K 1x4 Surface Mount Prismatic Wrap	2	55	1	0.06	66	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	1	0.04	50	0.01	16	\$2	5	Dual Technology Occupancy Sensor - Switch Mnt.	0.5	20.0%	10	\$2
45	Girls Restroom	1200	2-Lamp T8 F17 4100K 2 Foot Side Wall Mount Prismatic Lens Vanity Fixture	2	55	2	0.11	132	Existing to Remain	0	2	55	0	0.11	132	0.00	0	\$0	5	Dual Technology Occupancy Sensor - Switch Mnt.	0.5	20.0%	26	\$4
10	Girls Restroom	1200	2-Lamp T8 FO32 4100K 1x4 Surface Mount Prismatic Wrap	2	55	1	0.06	66	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	1	0.04	50	0.01	16	\$2	5	Dual Technology Occupancy Sensor - Switch Mnt.	0.5	20.0%	10	\$2
45	Janitor Closet	600	2-Lamp T8 F17 4100K 2 Foot Side Wall Mount Prismatic Lens Vanity Fixture	2	55	1	0.06	33	Existing to Remain	0	2	55	0	0.06	33	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
39	Classroom 22	2600	4-Lamp T8 FO32 4100K 2x4 Surface Mount Prismatic Lens	4	108	6	0.65	1,685	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	6	0.50	1,310	0.14	374	\$58	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	262	\$40
14	New Wing Classroom 36	2600	3-Lamp T12 F40 2x4 Recessed Prismatic Lens	3	132	12	1.58	4,118	Relamp, Re-ballast, & De-lamp	Sylvania Ballast QHE2x32T8/UNV-ISL-SC Sylvania Lamp FO28/841/SS/ECO	2	42	12	0.50	1,310	1.08	2,808	\$432	4	Dual Technology Occupancy Sensor - Remote Mat.	0.5	20.0%	262	\$40
31	New Wing Classroom 36	2600	2-Lamp T8 FO32 4100K 1x4 Pendant Mount Prismatic Lens	2	55	2	0.11	286	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	2	0.08	218	0.03	68	\$10	4	Dual Technology Occupancy Sensor - Remote Mat.	0.5	20.0%	44	\$7
14	New Wing Classroom 37	2600	3-Lamp T12 F40 2x4 Recessed Prismatic Lens	3	132	12	1.58	4,118	Relamp, Re-ballast, & De-lamp	Sylvania Ballast QHE2x32T8/UNV-ISL-SC Sylvania Lamp FO28/841/SS/ECO	2	42	12	0.50	1,310	1.08	2,808	\$432	4	Dual Technology Occupancy Sensor - Remote Mat.	1	20.0%	262	\$40

Fixture Reference #	Location	Average Burn Hours	Existing Fixtures						Proposed Fixtures Retrofit						Retrofit Energy Savings			Proposed Lighting Controls						
			Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, \$	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, \$
14	New Wing Classroom 38	2600	3-Lamp T12 F40 2x4 Recessed Prismatic Lens	3	132	12	1.58	4,118	Relamp, Re-ballast, & De-lamp	Sylvania Ballast QHE2x32T8/UNV-ISL-SC Sylvania Lamp FO28/841/SS/ECO	2	42	12	0.50	1,310	1.08	2,808	\$432	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	262	\$40
14	New Wing Classroom 39	2600	3-Lamp T12 F40 2x4 Recessed Prismatic Lens	3	132	12	1.58	4,118	Relamp, Re-ballast, & De-lamp	Sylvania Ballast QHE2x32T8/UNV-ISL-SC Sylvania Lamp FO28/841/SS/ECO	2	42	12	0.50	1,310	1.08	2,808	\$432	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	262	\$40
44	New Wing Gym Office	2600	2-Lamp T8 FO32 4100K 2x4 Recessed Prismatic Lens	2	55	2	0.11	286	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	2	0.08	218	0.03	68	\$10	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	44	\$7
31	New Wing Gym Storage	600	2-Lamp T8 FO32 4100k 1x4 Pendant Mount Prismatic Lens	2	55	4	0.22	132	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	4	0.17	101	0.05	31	\$5	0	No New Controls	0	0.0%	0	\$0
31	New Wing Boiler Room	600	2-Lamp T8 FO32 4100k 1x4 Pendant Mount Prismatic Lens	2	55	2	0.11	66	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	2	0.08	50	0.03	16	\$2	0	No New Controls	0	0.0%	0	\$0
44	New Wing Girls Room	1200	2-Lamp T8 FO32 4100K 2x4 Recessed Prismatic Lens	2	55	1	0.06	66	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	1	0.04	50	0.01	16	\$2	0	No New Controls	0	0.0%	0	\$0
6	New Wing Girls Room	1200	2-Lamp T12 4100K U Tube 2x2 Recessed Prismatic	2	82	1	0.08	98	Re-ballast & re-lamp	Sylvania Ballast QHE2x32T8/UNV-ISL-SC Sylvania Lamp FBO30/841XP/6/SS/ECO	2	49	1	0.05	59	0.03	40	\$6	0	No New Controls	0	0.0%	0	\$0
44	New Wing Boys Room	1200	2-Lamp T8 FO32 4100K 2x4 Recessed Prismatic Lens	2	55	1	0.06	66	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	1	0.04	50	0.01	16	\$2	0	No New Controls	0	0.0%	0	\$0
6	New Wing Boys Room	1200	2-Lamp T12 4100K U Tube 2x2 Recessed Prismatic	2	82	1	0.08	98	Re-ballast & re-lamp	Sylvania Ballast QHE2x32T8/UNV-ISL-SC Sylvania Lamp FBO30/841XP/6/SS/ECO	2	49	1	0.05	59	0.03	40	\$6	0	No New Controls	0	0.0%	0	\$0
31	New Wing Janitor Closet	600	2-Lamp T8 FO32 4100k 1x4 Pendant Mount Prismatic Lens	2	55	2	0.11	66	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	2	0.08	50	0.03	16	\$2	0	No New Controls	0	0.0%	0	\$0
10	East Wing Boys Room	1200	2-Lamp T8 FO32 4100K 1x4 Surface Mount Prismatic Wrap	2	55	2	0.11	132	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	2	0.08	101	0.03	31	\$5	0	No New Controls	0	0.0%	0	\$0
33	East Wing Boys Room	1200	2-Lamp T8 FO32 4100k 1x4 Side Wall Mount Prismatic Lens Vanity Fixture	2	55	2	0.11	132	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	2	0.08	101	0.03	31	\$5	0	No New Controls	0	0.0%	0	\$0
45	East Wing Boys Room	1200	2-Lamp T8 F17 4100K 2 Foot Side Wall Mount Prismatic Lens Vanity Fixture	2	55	1	0.06	66	Existing to Remain	0	2	55	0	0.06	66	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
10	East Wing Girls Room	1200	2-Lamp T8 FO32 4100K 1x4 Surface Mount Prismatic Wrap	2	55	2	0.11	132	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	2	0.08	101	0.03	31	\$5	0	No New Controls	0	0.0%	0	\$0
33	East Wing Girls Room	1200	2-Lamp T8 FO32 4100k 1x4 Side Wall Mount Prismatic Lens Vanity Fixture	2	55	2	0.11	132	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	2	42	2	0.08	101	0.03	31	\$5	0	No New Controls	0	0.0%	0	\$0
45	East Wing Girls Room	1200	2-Lamp T8 F17 4100K 2 Foot Side Wall Mount Prismatic Lens Vanity Fixture	2	55	1	0.06	66	Existing to Remain	0	2	55	0	0.06	66	0.00	0	\$0	0	No New Controls	0	0.0%	0	\$0
39	Classroom 26	2600	4-Lamp T8 FO32 4100K 2x4 Surface Mount Prismatic Lens	4	108	9	0.97	2,527	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	9	0.76	1,966	0.22	562	\$86	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	393	\$61
39	Classroom 27	2600	4-Lamp T8 FO32 4100K 2x4 Surface Mount Prismatic Lens	4	108	9	0.97	2,527	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	9	0.76	1,966	0.22	562	\$86	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	393	\$61
39	Classroom 28	2600	4-Lamp T8 FO32 4100K 2x4 Surface Mount Prismatic Lens	4	108	9	0.97	2,527	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	9	0.76	1,966	0.22	562	\$86	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	393	\$61
39	Classroom 29	2600	4-Lamp T8 FO32 4100K 2x4 Surface Mount Prismatic Lens	4	108	9	0.97	2,527	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	9	0.76	1,966	0.22	562	\$86	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	393	\$61
39	Classroom 30	2600	4-Lamp T8 FO32 4100K 2x4 Surface Mount Prismatic Lens	4	108	9	0.97	2,527	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	9	0.76	1,966	0.22	562	\$86	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	393	\$61

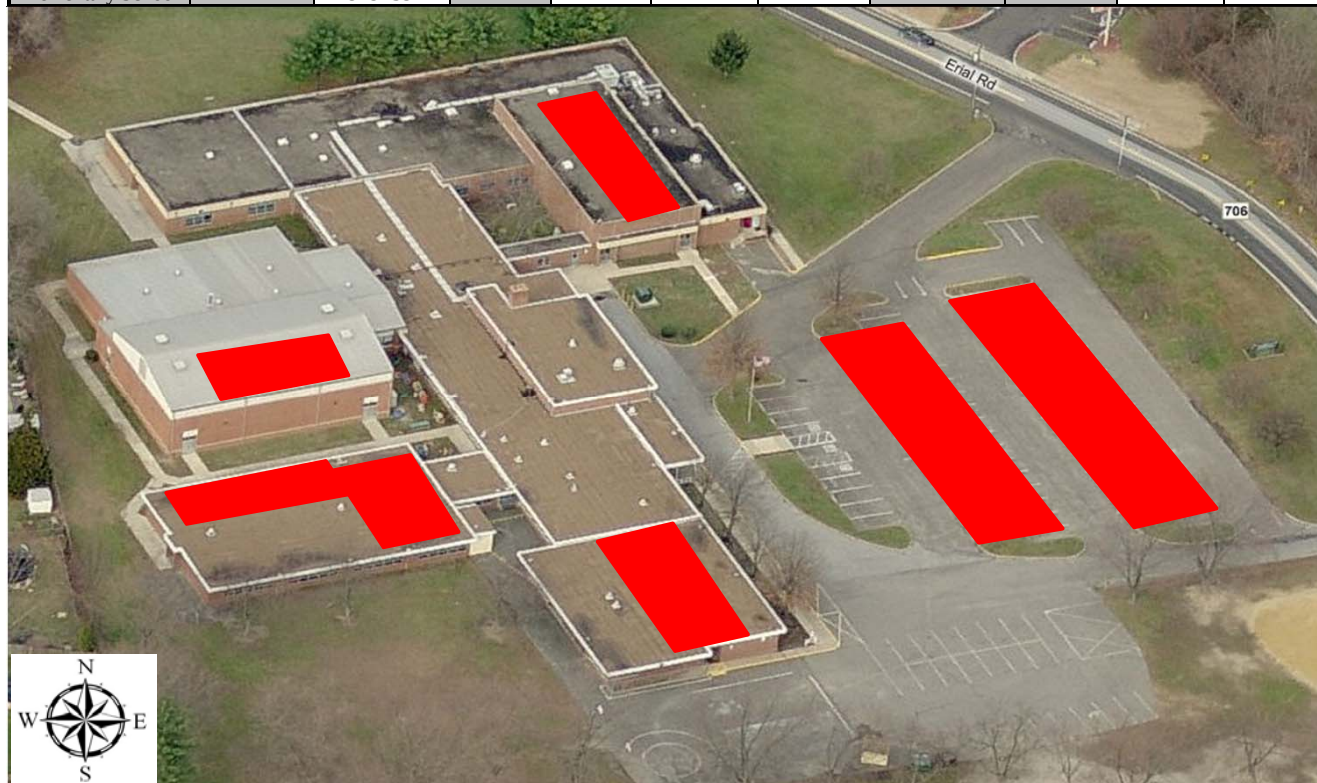
Fixture Reference #	Location	Average Burn Hours	Existing Fixtures						Proposed Fixtures Retrofit						Retrofit Energy Savings			Proposed Lighting Controls						
			Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, \$	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, \$
39	Classroom 31	2600	4-Lamp T8 FO32 4100K 2x4 Surface Mount Prismatic Lens	4	108	12	1.30	3,370	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	12	1.01	2,621	0.29	749	\$115	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	524	\$81
39	Classroom 32	2600	4-Lamp T8 FO32 4100K 2x4 Surface Mount Prismatic Lens	4	108	9	0.97	2,527	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	9	0.76	1,966	0.22	562	\$86	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	393	\$61
39	Classroom 33	2600	4-Lamp T8 FO32 4100K 2x4 Surface Mount Prismatic Lens	4	108	9	0.97	2,527	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	9	0.76	1,966	0.22	562	\$86	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	393	\$61
39	Classroom 34	2600	4-Lamp T8 FO32 4100K 2x4 Surface Mount Prismatic Lens	4	108	9	0.97	2,527	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	9	0.76	1,966	0.22	562	\$86	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	393	\$61
39	Classroom 35	2600	4-Lamp T8 FO32 4100K 2x4 Surface Mount Prismatic Lens	4	108	12	1.30	3,370	Re-lamp	Sylvania Lamp FO28/841/SS/ECO	4	84	12	1.01	2,621	0.29	749	\$115	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	524	\$81
	TOTAL					713	55.8	141,964					687	39.7	100,655	16.1	41,309	\$6,362			56		14,379	\$2,214

CEG Project #: 9C12010
Facility Name: Blackwood Elementary School
Address: 200 Blenheim/Erial Road
City, State, Zip: Blackwood, NJ 08012

Fixture Reference #	Location	Average Burn Hours	Existing Fixtures						Proposed Fixtures Retrofit						Retrofit Energy Savings			Proposed Lighting Controls						
			Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, \$	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, \$
28	Cafeteria	2600	400W MH Pendant Prismatic Lens	1	465	28	13.02	33,852	New Fixture	2x4 54w TSHO 6 Lamp w/Reflector & Wire Guard	6	354	28	9.91	25,771	3.11	8,081	\$1,244	0	No New Controls	0	0.0%	0	\$0
28	New Wing Gymnasium	2600	400W MH Pendant Prismatic Lens	1	465	24	11.16	29,016	New Fixture	2x4 54w TSHO 6 Lamp w/Reflector & Wire Guard	6	354	24	8.50	22,090	2.66	6,926	\$1,067	0	No New Controls	0	0.0%	0	\$0
TOTAL						52	24.2	62,868					52	18.4	47,861	5.8	15,007	\$2,311			0		0	\$0

APPENDIX F

Location Description	Area (Sq FT)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW _{DC}	Total Annual kWh	Total KW _{AC}	Panel Weight (41.9 lbs)	W/SQFT
Blackwood Elementary School	16800	SHARP NU-U235F2	876	17.5	15,366	205.86	248,888	166.7	36,704	13.40



[Red Rectangle] = Proposed PV Layout

Notes:

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

Project Name: LGEA Solar PV Project - Blackwood Elementary School										
Location: Blackwood, NJ										
Description: Photovoltaic System 100% Financing - 15 year										
Simple Payback Analysis										
		Photovoltaic System 100% Financing - 15 year								
Total Construction Cost		\$1,327,167								
Annual kWh Production		248,888								
Annual Energy Cost Reduction		\$38,329								
Average Annual SREC Revenue		\$47,559								
Simple Payback:		15.45						Years		
Life Cycle Cost Analysis										
Analysis Period (years):		15						Financing %:		100%
Discount Rate:		3%						Maintenance Escalation Rate:		3.0%
Average Energy Cost (\$/kWh)		\$0.154						Energy Cost Escalation Rate:		3.0%
Financing Rate:		6.00%						Average SREC Value (\$/kWh)		\$0.191
Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Interest Expense	Loan Principal	Net Cash Flow	Cumulative Cash Flow	
0	\$0	0	0	0	\$0	0	0	0	0	
1	\$0	248,888	\$38,329	\$0	\$62,222	\$78,099	\$56,294	(\$33,842)	(\$33,842)	
2	\$0	247,644	\$39,479	\$0	\$61,911	\$74,627	\$59,766	(\$33,003)	(\$66,845)	
3	\$0	246,405	\$40,663	\$0	\$61,601	\$70,940	\$63,452	(\$32,128)	(\$98,973)	
4	\$0	245,173	\$41,883	\$0	\$61,293	\$67,027	\$67,366	(\$31,216)	(\$130,190)	
5	\$0	243,947	\$43,139	\$2,513	\$60,987	\$62,872	\$71,521	(\$32,779)	(\$162,969)	
6	\$0	242,728	\$44,434	\$2,500	\$48,546	\$58,460	\$75,932	(\$43,914)	(\$206,883)	
7	\$0	241,514	\$45,767	\$2,488	\$48,303	\$53,777	\$80,615	(\$42,811)	(\$249,693)	
8	\$0	240,307	\$47,140	\$2,475	\$48,061	\$48,805	\$85,588	(\$41,667)	(\$291,360)	
9	\$0	239,105	\$48,554	\$2,463	\$47,821	\$43,526	\$90,867	(\$40,481)	(\$331,841)	
10	\$0	237,909	\$50,010	\$2,450	\$35,686	\$37,922	\$96,471	(\$51,146)	(\$382,987)	
11	\$0	236,720	\$51,511	\$2,438	\$35,508	\$31,972	\$102,421	(\$49,812)	(\$432,800)	
12	\$0	235,536	\$53,056	\$2,426	\$35,330	\$25,654	\$108,738	(\$48,432)	(\$481,232)	
13	\$0	234,359	\$54,648	\$2,414	\$35,154	\$18,948	\$115,445	(\$47,005)	(\$528,237)	
14	\$0	233,187	\$56,287	\$2,402	\$23,319	\$11,827	\$122,565	(\$57,189)	(\$585,426)	
15	\$0	232,021	\$57,976	\$2,390	\$23,202	\$4,268	\$130,125	(\$55,605)	(\$641,030)	
Totals:		3,605,443	\$712,873	\$26,959	\$688,944	\$688,723	\$1,327,167	(\$641,030)	(\$4,624,308)	
Net Present Value (NPV)								(\$469,776)		