NEW BRUNSWICK
BOARD OF EDUCATION

PAUL ROBESON ELEMENTARY SCHOOL

199 COMMERCIAL AVENUE
NEW BRUNSWICK, NJ 08901

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)
Third Party Supplier:	Direct Energy

Natural Gas Utility Provider:	Public Service Electric & Gas
Utility Rate Structure:	Large Volume Gas (LVG)
Third Party Supplier:	None

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
Meter No: 778009929
Account # 42-007-504-06
Third Party Utility Provider: Direct Energy
TPS Meter / Acct No: N/A

MONTH OF USE	CONSUMPTION KWH	DEMAND KW	TOTAL BILL
Nov-11	56,600	120.0	$7,610
Dec-11	54,000	122.0	$7,054
Jan-12	54,800	122.0	$7,171
Feb-12	52,400	120.0	$6,885
Mar-12	51,000	120.0	$6,723
Apr-12	56,000	150.0	$7,408
May-12	72,600	168.0	$10,791
Jun-12	64,200	164.0	$9,868
Jul-12	48,400	124.0	$7,539
Aug-12	42,600	148.0	$7,141
Sep-12	45,600	174.0	$6,356
Oct-12	29,000	156.0	$4,333
Totals	**627,200**	**174.0 Max**	**$88,879**

AVERAGE DEMAND **140.7 KW average**
AVERAGE RATE **$0.142 $/kWh**

Figure 1
Electricity Usage Profile

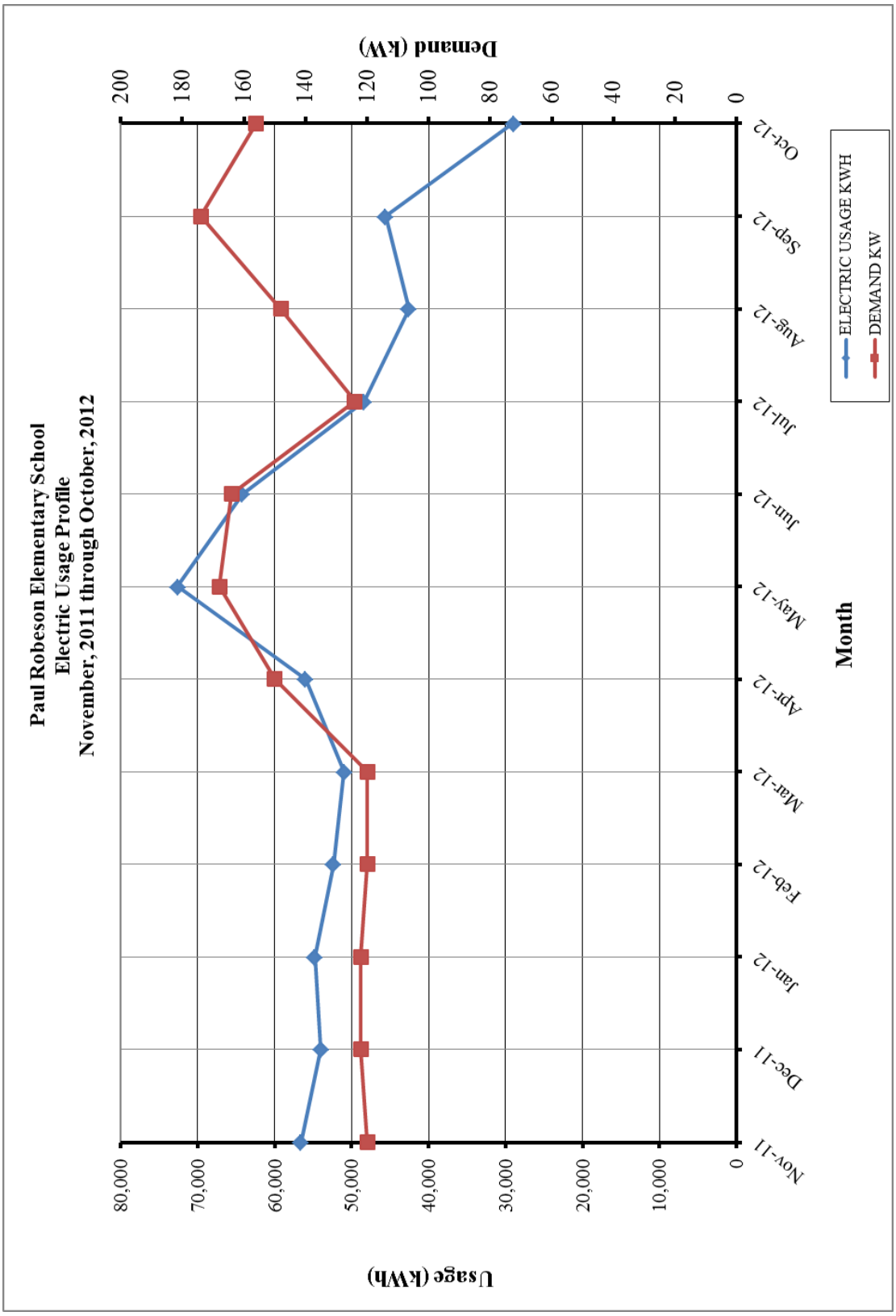
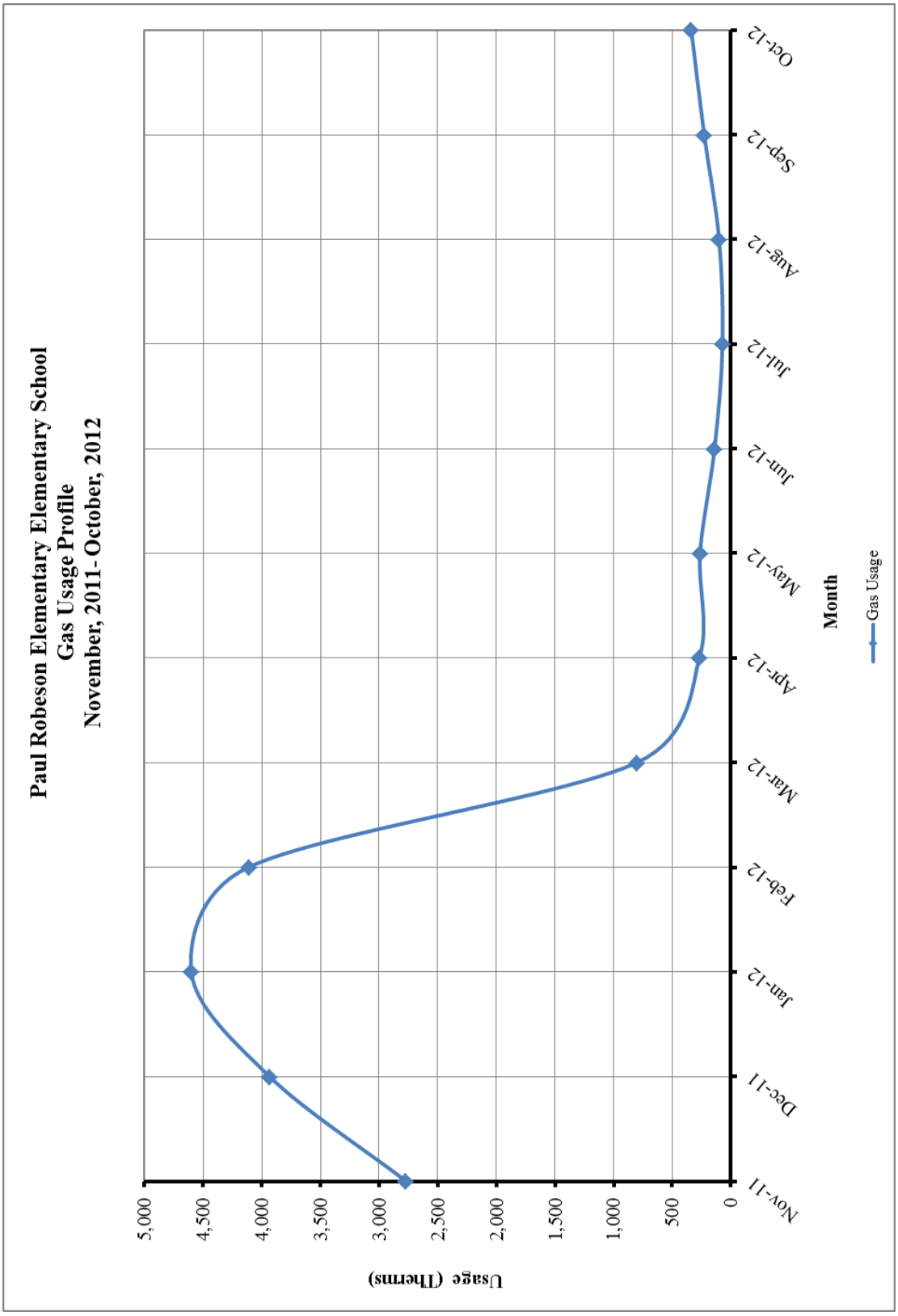


Table 4
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider: PSE&G		
Rate: LVG		
Meter No: 3637372		
Point of Delivery ID: PG000008653698443932		
Third Party Utility Provider: N/A		
TPS Meter No: N/A		
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Nov-11	2,772.00	$3,040.26
Dec-11	3,936.00	$3,946.56
Jan-12	4,601.00	$4,117.00
Feb-12	4,112.00	$3,537.88
Mar-12	799.00	$606.45
Apr-12	269.00	$263.78
May-12	264.00	$259.70
Jun-12	140.00	$190.65
Jul-12	72.00	$149.08
Aug-12	102.00	$170.24
Sep-12	229.00	$252.68
Oct-12	339.00	$876.72
TOTALS	**17,635.00**	**$17,411.00**
AVERAGE RATE:	**$0.99**	**$/THERM**

Figure 2
Natural Gas Usage Profile



II. FACILITY DESCRIPTION

The Paul Robeson Elementary School is located at 199 Commercial Avenue in New Brunswick, New Jersey. The 76,000 SF Paul Robeson Elementary School was built in 1982 with no current additions. The building is a two-story structure and consists of office space for administrative use, gymnasium, classrooms, kitchen, media center, cafeteria and mechanical rooms.

Occupancy Profile

The typical hours of operation for Paul Robeson Elementary School are Monday through Friday between 8:00 am and 3:30 pm, with custodial services running until 11:00 pm. The elementary school has a student population of 509 present for 10 months, and an administrative occupancy of 50.

Building Envelope

Exterior walls for the Paul Robeson Elementary School are brick faced with a concrete block construction. The windows in the building are single pane windows in average condition with privacy fog tinting. The roof is a flat, built up rubber roof with stone ballasts that appears to be in good condition.

Heating Plant

Heating is provided to the facility from the Mechanical Room which houses two natural gas fired, cast iron sectional hot water boilers made by Weil McLain. Both boilers have equivalent heating capacity characteristics having an input capacity of 2,396 MBH and output of 1,904 MBH for a combined output of 3,808 MBH. Both boilers appear to be maintained and in average condition. Combustion tests were not available for review but based on age the estimated fuel-to-thermal efficiency for the boilers is 75%, based on radiation losses and inefficiencies in operation inherent to the older technology. Both boilers are approximately 11 years old. The heating hot water is circulated throughout the building via two constant speed in-line pumps located in the Mechanical Room. The pumps are driven with standard efficiency motors that are recommended to be replaced with NEMA premium efficient motors. The hot water heating system provides heating hot water to the classroom VAV units with hot water coils, cabinet unit heaters and roof mounted air handling units with hot water coils.

HVAC Systems

Cooling for the majority of the facility is provided by two York air-cooled chillers located on the roof. These air cooled chillers provide 56 tons of cooling each to the chilled water system which supplies the rooftop air handling units. The chilled water is supplied to the system via two Amtrol 5 horsepower pumps rated at 260 GPM and 65 feet of head.

The Gymnasium is conditioned via two outdoor air-handling units with air cooled condensing units and hot water heat from the boiler plant. These units were installed in 2012.

Exhaust System

Air is exhausted from the toilet rooms and other areas of the facility through the roof exhaust fans.

HVAC System Controls

The HVAC systems within the Paul Robeson Elementary School are controlled by a Johnson Metasys Controls system. There is a modem installed in the control panel that provides supervisory control and monitoring to the Facilities Director.

Domestic Hot Water

The main source of domestic hot water for Paul Robeson Elementary School is a Laars 155 MBH gas fired water heater with a separate storage capacity of 100 gallons.

Lighting

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

III. MAJOR EQUIPMENT LIST

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

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

IV. ENERGY CONSERVATION MEASURES

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

Table 1
ECM Financial Summary

ENERGY CONSERVATION MEASURES (ECM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST[A]**	**ANNUAL SAVINGS[B]**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
ECM #1	Lighting Upgrade - General	$20,862	$2,020	10.3	45.2%
ECM #2	Lighting Controls Upgrade	$9,390	$1,688	5.6	169.7%
ECM #3	Lighting Upgrade - Gymnasium	$15,720	$1,329	11.8	26.8%
ECM #4	Exterior Lighting Upgrade	$16,560	$2,593	6.4	134.9%
ECM #5	NEMA Premium Motor Upgrades	$6,980	$648	10.8	67.1%
ECM #6	Computer Automatic Standby or Hibernate Modes	$1,984	$2,608	0.8	557.3%
ECM #7	Walk-in Controls	$2,500	$281	8.9	68.6%
ECM #8	Window Replacement	$73,000	$1,838	39.7	-62.2%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	120.32 KW PV System	$733,214	$46,311	15.8	-5.3%
Notes:	A. Cost takes into consideration applicable NJ Smart StartTM incentives.				
	B. Savings takes into consideration applicable maintenance savings.				

Table 2
ECM Energy Summary

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	**DESCRIPTION**	**ANNUAL UTILITY REDUCTION**		
		ELECTRIC DEMAND (KW)	**ELECTRIC CONSUMPTION (KWH)**	**NATURAL GAS (THERMS)**
ECM #1	Lighting Upgrade - General	5.2	14,226	-
ECM #2	Lighting Controls Upgrade	-	11,888	-
ECM #3	Lighting Upgrade - Gymnasium	3.6	9,360	-
ECM #4	Exterior Lighting Upgrade	4.6	18,264	-
ECM #5	NEMA Premium Motor Upgrades	1.4	4,561	-
ECM #6	Computer Automatic Standby or Hibernate Modes	-	18,368	-
ECM #7	Walk-in Controls	-	1,939	-
ECM #8	Window Replacement	-	1,343	1,664
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	**DESCRIPTION**	**ANNUAL UTILITY REDUCTION**		
		ELECTRIC DEMAND (KW)	**ELECTRIC CONSUMPTION (KWH)**	**NATURAL GAS (THERMS)**
REM #1	120.32 KW PV System	190.4	223,072	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**
Lighting Upgrade - General	$2,020	$20,862	$0	$20,862	10.3
Lighting Controls Upgrade	$1,688	$10,800	$1,410	$9,390	5.6
Lighting Upgrade - Gymnasium	$1,329	$18,120	$2,400	$15,720	11.8
Exterior Lighting Upgrade	$2,593	$16,560	$0	$16,560	6.4
NEMA Premium Motor Upgrades	$648	$6,980	$0	$6,980	10.8
Computer Automatic Standby or Hibernate	$2,608	$1,984	$0	$1,984	0.8
Walk-in Controls	$281	$2,500	$0	$2,500	8.9
Window Replacement	$1,838	$73,000	$0	$73,000	39.7
Design / Construction Extras (15%)	*$0*	*$22,621*	*$0*	*$22,621*	
Total Project	**$13,006**	**$173,427**	**$3,810**	**$169,617**	**13**

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 Paul Robeson 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. Concord Engineering recommends that these fixtures remain unmodified due to the extensive costs which will be incurred if these fixtures are to be re-lamped and re-ballasted, which results in a long payback period unless said fixtures reside in an area which is over-lit, in which case the fixtures will be de-lamped and given a new reflector. 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 fixtures in these areas with higher efficiency fluorescent T8 fixtures with electronic ballasts.

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

Additionally, there is a corridor area which contains an incandescent recessed down-light fixture which is to be replaced with a 60 watt LED.

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 ($):	$20,862
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$20,862
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,020
Total Yearly Savings ($/Yr):	$2,020
Estimated ECM Lifetime (Yr):	15
Simple Payback	10.3
Simple Lifetime ROI	45.2%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$30,300
Internal Rate of Return (IRR)	5%
Net Present Value (NPV)	$3,252.63

ECM #2: Lighting Controls Upgrade – Occupancy Sensors

Description:

Some of the lights in the Paul Robeson 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:

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

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

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
= (# Wall mount sensors × $20 per sensor)
+ (# Ceiling mount sensors × $35 per sensor)

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$10,800
NJ Smart Start Equipment Incentive ($):	$1,410
Net Installation Cost ($):	$9,390
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,688
Total Yearly Savings ($/Yr):	$1,688
Estimated ECM Lifetime (Yr):	15
Simple Payback	5.6
Simple Lifetime ROI	169.7%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$25,322
Internal Rate of Return (IRR)	16%
Net Present Value (NPV)	$10,762.79

ECM #3: Lighting Upgrade – Gymnasium

Description:

The gymnasium at Paul Robeson School is currently lit via Twenty-eight 400W Metal Halide fixtures. The space would be better served with a more efficient, fluorescent lighting system. Concord Engineering recommends upgrading the lighting to an energy-efficient T5 High Output lighting system.

This measure replaces all the HID, 400 W HID MH fixtures with a well-designed T5HO lighting system. Ten, 54 watt, 6-Lamp T5HO fixtures 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 #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$18,120
NJ Smart Start Equipment Incentive ($):	$2,400
Net Installation Cost ($):	$15,720
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,329
Total Yearly Savings ($/Yr):	$1,329
Estimated ECM Lifetime (Yr):	15
Simple Payback	11.8
Simple Lifetime ROI	26.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$19,937
Internal Rate of Return (IRR)	3%
Net Present Value (NPV)	$146.95

ECM #4: Lighting Upgrade – Exterior Lighting

Description:

The exterior lighting at Paul Robeson School is currently lit via metal halide fixtures. The exterior would be better served with more efficient LED lighting system. CE recommends upgrading the lighting to an energy-efficient LED lighting system that includes retrofit kits for the existing 400 watt metal halide shoebox lights and new LED wall pack and walkway area lights for the 175 watt metal halide fixtures on the exterior.

This measure replaces all the 400 watt metal halide shoebox fixtures with 73 Watt LED retrofit kits and all 175 watt metal halide wall packs and area lights with 90 watt LED fixtures.

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 #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$16,560
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$16,560
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,593
Total Yearly Savings ($/Yr):	$2,593
Estimated ECM Lifetime (Yr):	15
Simple Payback	6.4
Simple Lifetime ROI	134.9%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$38,895
Internal Rate of Return (IRR)	13%
Net Present Value (NPV)	$14,395.07

ECM #5: 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 and cold water 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**
P1	Hot Water Pump	7.5	3,391	84.0%	91.7%
P2	Hot Water Pump	7.5	3,391	84.0%	91.7%
P3	Chiller Water Pump	5	2,745	85.5%	90.2%
P4	Chiller Water Pump	5	2,745	85.5%	90.2%

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

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
P1	7.5	90%	84.0%	91.7%	0.50	1,716	$244
P2	7.5	90%	84.0%	91.7%	0.50	1,716	$244
P3	5	90%	85.5%	90.2%	0.20	565	$80
P4	5	90%	85.5%	90.2%	0.20	565	$80
TOTAL					**1.4**	**4,561**	**$648**

Equipment Cost and Incentives

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

INCENTIVES	
HORSE POWER	NJ SMART START INCENTIVE
1	$50
1.5	$50
2	$60
3	$60
5	$60
7.5	$90
10	$100

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

MOTOR REPLACEMENT SUMMARY					
EQMT ID	MOTOR POWER HP	INSTALLED COST	NET COST	TOTAL SAVINGS	SIMPLE PAYBACK
P1	7.5	$1,971	$1,971	$244	8.1
P2	7.5	$1,971	$1,971	$244	8.1
P3	5	$1,519	$1,519	$80	18.9
P4	5	$1,519	$1,519	$80	18.9
TOTAL	**Totals:**	**$6,980**	**$6,980**	**$648**	**10.8**

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$6,980
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$6,980
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$648
Total Yearly Savings ($/Yr):	$648
Estimated ECM Lifetime (Yr):	18
Simple Payback	10.8
Simple Lifetime ROI	67.1%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$11,664
Internal Rate of Return (IRR)	6%
Net Present Value (NPV)	$1,932.28

ECM #6: Set Computers to Automatic Stand-by or Hibernate Modes

Description:

During the survey, it was noticed that the majority of the computers were left at ON position with the monitors at Screen Saver or OFF positions.

Many personal computers (PC) came equipped with automatic Sleep Mode or Hibernate (power down) mode features. Normally computers boot up from Sleep Mode or Hibernate mode much faster than powering up from Shut Down position.

Based on an independent study by the U.S. Department of Energy, Energy star® rated computers use approximately 70% less power during Sleep Mode. It is recommended to set up the PCs at this facility to switch into Sleep Mode after a short period of inactivity and Hibernate mode after a long period of inactivity.

This ECM includes configuring the computers in the classrooms and the offices such that they automatically switch into:

- Sleep Mode after 15 minutes of inactivity
- Hibernate after 60 minutes of inactivity

The inactivity times above can be adjusted based on experience or preference. Even though this ECM can be implemented easily in house, the calculations assume an independent computer technician performing the task at a typical market rate.

Energy Savings Calculations:

No. of Computers:	119
Operating Weeks per Yr:	42
Estimated percentage of computers left ON over night:	75%

$$\text{Electric Usage} = \frac{\#\text{of Computers} \times \text{Computer Power (W)} \times \text{Operation (Hrs)}}{1000\left(\frac{\text{W}}{\text{KW}}\right)}$$

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

The cost of configuring the computers to automatically sleep or hibernate is based on 10 minutes per computer per technician at an hourly rate indicated below.

Implementation Costs: = # Computers X Configuration Time X Cost per Hour
= 119 Computers X 10 Minutes/Computer X $100 per Hour

= $1,984

AUTOMATIC SLEEP OR HIBERNATE MODES FOR COMPUTERS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Manual Operation	Auto Power Save	-
# of Computers	119	119	-
% Computers left ON	75%	75%	-
Power when left ON (Watt)	50	50	-
Power at Stand-by (Watt)	5	5	-
Power at Hibernate (Watt)	4	4	-
Power when OFF (Watt)	0	0	-
Operating Weeks per Yr	42	42	-
Operating Hours per Week	168	168	-
Hours/Wk Computers ON	120	20	-
Hours/Wk at Sleep Mode	0	20	-
Hours/Wk at Hibernate Mode	0	80	-
Hours/Wk at Power Down	48	48	-
Elec Cost ($/kWh)	0.142	0.142	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Electric Usage (kWh)	22,491	4,123	18,368
Energy Cost ($)	$3,194	$586	$2,608
COMMENTS:	Calculation assumes computers currently run throughout work week and get shut down over the weekend.		

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,984
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$1,984
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,608
Total Yearly Savings ($/Yr):	$2,608
Estimated ECM Lifetime (Yr):	5
Simple Payback	0.8
Simple Lifetime ROI	557.3%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	$13,041
Internal Rate of Return (IRR)	129%
Net Present Value (NPV)	$9,960.82

ECM #7: Walk-In Evaporator Controls

Description:

The two refrigerated walk-in cooler/freezers have a bank of evaporator fans that circulate the cold air over and under the food. These banks of evaporator fans (~1/20 HP motors) run continuously and give off heat that must be removed by the refrigeration.

This measure would install an evaporator fan controller that features two-speed operation of the evaporator fans – high speed during cooling, and low speed or off when not cooling manufactured by Frigitek or equivalent.

Energy Savings Calculations:

Energy savings calculations are based on New Jersey Board of Public Utilities Protocols to Measure Resource Savings. The energy savings are calculated with using existing equipment characteristics.

$$\text{kWh Savings Evap Fans} = \frac{\left(\text{Amps} \times \text{Volts} \times \text{Phase}^{\frac{1}{2}}\right)}{1000} \times 0.55 \times 8760 \times 35.52\%$$

$$\text{kWh Savings Evap Reduced Heat} = \text{kWh Savings Evap Fans} \times 0.28 \times 1.6$$

$$\text{kWh Savings Controls} = \frac{\text{Amps}_{\text{CP}} \times \text{Volts}_{\text{CP}} \times \text{Phase}_{\text{CP}}^{\frac{1}{2}}}{1000} \times 0.85 \times (35\% \times 2{,}195\ \text{Hrs} + 55\% \times 6{,}565\ \text{Hrs}) + \frac{\text{Amps}_{\text{EF}} \times \text{Volts}_{\text{EF}} \times \text{Phase}_{\text{EF}}^{\frac{1}{2}}}{1000} \times 0.55 \times 8760 \times 35.52\% \times 5\%$$

WALK-IN COOLER/FREEZER EVAPORATOR FAN CONTROL			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	No Controller	Frigitek Controller	
Qty of Evaporator Fans	2	2	
Nameplate Amps of Evap Fan	1.0	1.0	
Nameplate Volts of Evap Fan	230	230	
Phase of Evap Fan	1	1	
Evap Fan Motor Power Factor	0.55	0.55	
Conversion from kW to tons (Refrigeration)	0.28	0.28	
Efficiency of Typical Refrigeration System (kW/ton)	1.6	1.6	
Nameplate Amps of Compressor	6.6	6.6	
Nameplate Volts of Compressor	230	230	
Phase of Compressor	3	3	
Compressor Power Factor	0.85	0.85	
Winter Compressor Duty Cycle	0.35	0.35	
Winter Compressor Op. Hours	2,195	2,195	
Non-Winter Compressor Duty Cycle	0.55	0.55	
Non-Winter Compressor Op. Hours	6,565	6,565	
Elec Cost ($/kWh)	$0.142	$0.142	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Evaporator Fan Usage (KWH)	2,216	1,429	787
Evap Fan Heat Usage (KWH)	496	320	176
Compressor Usage (KWH)	9,786	9,297	489
Total Electric Usage (KWH)	12,499	11,046	1,453
Electric Cost ($)	$1,775	$1,569	$206
COMMENTS:			

WALK-IN COOLER/FREEZER EVAPORATOR FAN CONTROL			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	No Controller	Frigitek Controller	
Qty of Evaporator Fans	2	2	
Nameplate Amps of Evap Fan	0.50	0.50	
Nameplate Volts of Evap Fan	115	115	
Phase of Evap Fan	1	1	
Evap Fan Motor Power Factor	0.55	0.55	
Conversion from kW to tons (Refrigeration)	0.28	0.28	
Efficiency of Typical Refrigeration System (kW/ton)	1.6	1.6	
Nameplate Amps of Compressor	3.3	3.3	
Nameplate Volts of Compressor	230	230	
Phase of Compressor	3	3	
Compressor Power Factor	0.85	0.85	
Winter Compressor Duty Cycle	0.35	0.35	
Winter Compressor Op. Hours	2,195	2,195	
Non-Winter Compressor Duty Cycle	0.55	0.55	
Non-Winter Compressor Op. Hours	6,565	6,565	
Elec Cost ($/kWh)	$0.155	$0.155	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Evaporator Fan Usage (KWH)	554	357	197
Evap Fan Heat Usage (KWH)	124	80	44
Compressor Usage (KWH)	4,893	4,649	245
Total Electric Usage (KWH)	5,571	5,086	486
Electric Cost ($)	$864	$788	$75
COMMENTS:			

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$2,500
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$2,500
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$281
Total Yearly Savings ($/Yr):	$281
Estimated ECM Lifetime (Yr):	15
Simple Payback	8.9
Simple Lifetime ROI	68.6%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$4,215
Internal Rate of Return (IRR)	7%
Net Present Value (NPV)	$854.56

ECM #8: Window Replacement

Description:

The Paul Robeson Elementary School's envelope consists of single pane windows with aluminum frames.

The windows account for significant energy use through leakage heat loss and conductive heat loss. The age and condition of the windows contribute to the leakage rate of the building. The single pane construction allows higher thermal (conductive) energy loss. These factors lead to increased energy use in the heating season. The heating loss due to single pane glass is combined with heat loss due to poor seals at each operable window. New double pane windows with low E glazing offer a substantial improvement in thermal performance in the summer months.

This ECM includes the replacement of all remaining older windows single pane glass in the facility with double pane windows with low emissivity glass. The proposed windows include reduced outside air leakage. In addition the double pane structure will significantly increase the insulation value compared to the existing single pane window structure.

The basis for this ECM is Serious Windows at $40 per SF of window installed.

Energy Savings Calculations:

$$\text{Infiltration}\left(\frac{\text{Ft}^3}{\text{Min.}}\right) = \text{Window Area}\left(\text{Ft}^2\right) \times \text{Estimated Infiltration per SF of Window}\left(\frac{\text{CFM}}{\text{Ft}^2}\right)$$

$$\text{Heat Load}\left(\frac{\text{Btu}}{\text{Hr.}}\right) = 1.1 \times \text{Infiltration}\left(\frac{\text{Ft}^3}{\text{Min}}\right) \times \text{Design Temperature Difference}\left(^\circ\text{F}\right)$$

$$\text{Cooling Load}\left(\text{Ton}\right) = \text{Infiltration}\left(\frac{\text{Ft}^3}{\text{Min}}\right) \times \frac{1\,\text{Ton Cooling}}{400\left(\frac{\text{Ft}^3}{\text{Min}}\right)}$$

$$\text{Heating Leakage Energy}\left(\text{Therms}\right) = \frac{\text{Heat Load}\left(\frac{\text{Btu}}{\text{Hr.}}\right) \times \text{HDD}\left(\text{Day}\,^\circ\text{F}\right) \times 24\left(\frac{\text{Hr.}}{\text{Day}}\right) \times \left(0.60\right)}{65\left(^\circ\text{F}\right) \times \text{Fuel Heat Value}\left(\frac{\text{Btu}}{\text{Therms}}\right) \times \text{Heating Efficiency}\left(\%\right)}$$

$$\text{Cooling Leakage Energy}\left(\text{kWh}\right)=\frac{\text{Cooling Load}\left(\text{Ton}\right)\ \times\left(\frac{12{,}000\ \text{Btu}}{\text{Ton Hr.}}\right)\ \times\ \text{Full Load Cooling Hours}}{\frac{1000\ \text{W.h}}{\text{kWh}}\times\text{Cooling Efficiency}\left(\text{EER}\right)}$$

$$\text{Conductive Energy}\left(\text{Therms}\right)=\frac{\text{U}-\text{Value}\times\text{Area}\left(\text{Ft}^2\right)\times\text{HDD}\left(\text{Day }^\circ\text{F}\right)\times 24\left(\frac{\text{Hr.}}{\text{Day}}\right)\times\left(0.60\right)}{65\left(^\circ\text{F}\right)\times\text{Fuel Heat Value}\left(\frac{\text{Btu}}{\text{Therms}}\right)\times\text{Heating Efficiency}\left(\%\right)}$$

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

$$\text{Cooling Energy Cost} = \text{Total Cooling Energy}\left(\text{kWh}\right)\times\text{Ave Fuel Cost}\left(\frac{\$}{\text{kWh}}\right)$$

WINDOW REPLACEMENT CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Description:	Existing Single Pane Windows	Double Pane Low-E Windows	
Window (SF)	1,650	1,650	
U-Value (BTU/HR/SF*°F)	1.0	0.45	0.55
Infiltration Rate (CFM/SF)	0.6	0.3	0.30
Indoor Temperature Cooling (°F)	72	72	
Indoor Temperature Heating (°F)	70	70	
Average Thermal Loss Rate Heating (BTU/HR)	41,486	18,669	22,817
Average Thermal Loss Rate Cooling (BTU/HR)	6,270	2,822	3,449
Heating Degree Days (65°F)	4157	4157	
Cooling Degree Days (65°F)	1488	1488	
Thermal Losses Heating (kBtu)	211,820	95,319	116,501
Thermal Losses Cooling (kBtu)	23,206	10,443	12,763
Heating System Efficiency (%)	70.0%	70.0%	
Cooling System Efficiency (EER)	9.5	9.5	
Natural Gas Cost ($/Therm)	$0.99	$0.99	-
Electric Cost ($/kWh)	$0.142	$0.142	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Electric Usage (kWh)	2,443	1,099	1,343
Natural Gas Usage (Therm)	3,026	1,362	1,664
Energy Cost Savings ($)	$3,343	$1,504	$1,838
Comments:	1. Proposed window U-value Based on ASHRAE 90.1 - 2007 2. Savings Based on Avg. Monthly Temperature for Sep-11 to Aug-12		

Energy Savings Summary:

ECM #8 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$73,000
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$73,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,838
Total Yearly Savings ($/Yr):	$1,838
Estimated ECM Lifetime (Yr):	15
Simple Payback	39.7
Simple Lifetime ROI	-62.2%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$27,577
Internal Rate of Return (IRR)	-10%
Net Present Value (NPV)	($51,052.89)

REM #1: 120.32 kW Solar System

Description:

The Paul Robeson Elementary School has available roof space that could accommodate a significant amount of solar generation. Based on the available areas a 120.32 kilowatt solar array could be installed, assuming the existing roof structure is capable of supporting an array. The array will produce approximately 139,036 kilowatt-hours annually that will reduce the overall electric usage of the facility by 22.17%.

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}):	120.32
Electric Generation (KWH/Yr):	139,036
Installation Cost ($):	$733,214
SREC Revenue ($/Yr):	$26,568
Energy Savings ($/Yr):	$19,743
Total Yearly Savings ($/Yr):	$46,311
ECM Analysis Period (Yr):	15
Simple Payback (Yrs):	15.8
Analysis Period Electric Savings ($):	$367,200
Analysis Period SREC Revenue ($):	$384,864
Net Present Value (NPV)	($276,006.47)

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

New Brunswick Board of Education - Paul Robeson 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 (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Svaing * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM #1	Lighting Upgrade - General	$11,052	$9,810	$0	$20,862	$2,020	$0	$2,020	15	$30,300	$0	45.2%	10.3	5.07%	$3,252.63
ECM #2	Lighting Controls Upgrade	$9,150	$1,650	$1,410	$9,390	$1,688	$0	$1,688	15	$25,322	$0	169.7%	5.6	16.05%	$10,762.79
ECM #3	Lighting Upgrade - Gymnasium	$6,000	$12,120	$2,400	$15,720	$1,329	$0	$1,329	15	$19,937	$0	26.8%	11.8	3.13%	$146.95
ECM #4	Exterior Lighting Upgrade	$11,820	$4,740	$0	$16,560	$2,593	$0	$2,593	15	$38,895	$0	134.9%	6.4	13.23%	$14,395.07
ECM #5	NEMA Premium Motor Upgrades	$4,130	$2,850	$0	$6,980	$648	$0	$648	18	$11,664	$0	67.1%	10.8	6.07%	$1,932.28
ECM #6	Computer Automatic Standby or Hibernate Modes	$0	$1,984	$0	$1,984	$2,608	$0	$2,608	5	$13,041	$0	557.3%	0.8	129.39%	$9,960.82
ECM #7	Walk-in Controls	$1,500	$1,000	$0	$2,500	$281	$0	$281	15	$4,215	$0	68.6%	8.9	7.37%	$854.56
ECM #8	Window Replacement	$66,000	$7,000	$0	$73,000	$1,838	$0	$1,838	15	$27,577	$0	-62.2%	39.7	-10.26%	($51,052.89)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	120.32 KW PV System	$733,214	$0	$0	$733,214	$19,743	$26,568	$46,311	15	$694,661	$398,514	-5.3%	15.8	-0.67%	($180,359.29)

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 11, 2013:

Electric Chillers

Water-Cooled Chillers	$16 - $170 per ton
Air-Cooled Chillers	$8 - $52 per ton

Energy Efficiency must comply with ASHRAE 90.1-2007

Gas Cooling

Gas Absorption Chillers	$185 - $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
A/C Economizing Controls	≤ 5 tons $85/unit; >5 tons $170/unit

Energy Efficiency must comply with ASHRAE 90.1-2007

Gas Heating

Gas Fired Boilers < 300 MBH	$2.00 per MBH, but not less than $300 per unit
Gas Fired Boilers ≥ 300 - 1500 MBH	$1.75 per MBH
Gas Fired Boilers ≥1500 - ≤ 4000 MBH	$1.00 per MBH
Gas Fired Boilers > 4000 MBH	(Calculated through Custom Measure Path)
Gas Furnaces	$400 per unit, AFUE ≥ 95%
Boiler Economizing Controls	$1,200 - $2,700
Low Intensity Infrared Heating	$300 - $500 per unit

Ground Source Heat Pumps

Closed Loop	$450 per ton, EER ≥ 16 $600 per ton, EER ≥ 18 $750 per ton, EER ≥ 20

Energy Efficiency must comply with ASHRAE 90.1-2007

Variable Frequency Drives

Variable Air Volume	$65 - $155 per hp
Chilled-Water Pumps	$60 per VFD rated hp
Compressors	$5,250 to $12,500 per drive
Cooling Towers ≥ 10 hp	$60 per VFD rated hp
Boiler Fans ≥ 5 HP	$65 to $155 per hp
Boiler Feed Water Pumps ≥ 5 HP	$60 to $155 per hp
Commercial Kitchen Hood up to 50 HP	Retrofit $55 – $300 per hp New Hood $55 - $250 per hp

Natural Gas Water Heating

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

Prescriptive Lighting

Retro fit of T12 to T-5 or T-8 Lamps w/Electronic Ballast in Existing Facilities (Expires 3/1/2013)	$10 per fixture (1-4 lamps)
Replacement of T12 with new T-5 or T-8 Lamps w/Electronic Ballast in Existing Facilities (Expires 3/1/2013)	$25 per fixture (1-4 lamps)
T-8 reduced Wattage (28w/25w 4', 1-4 lamps) Lamp & ballast replacement	$10 per fixture
For retrofit of T-8 fixtures by permanent de-lamping & new reflectors (Electronic ballast replacement required)	$15 per fixture
T-5 and T-8 High Bay Fixtures	$16 - $200 per fixture
Metal Halide w/Pulse Start Including Parking Lot	$25 per fixture
HID ≥ 100w Retrofit with induction lamp, power coupler and generator (must be 30% less watts/fixture than HID system)	$50 per fixture
HID ≥ 100w Replacement with new HID ≥ 100w	$70 per fixture

Prescriptive Lighting - LED

LED Display Case Lighting	$30 per display case
LED Shelf-Mtd. Display & Task Lights	$15 per linear foot
LED Portable Desk Lamp	$20 per fixture
LED Wall-wash Lights	$30 per fixture
LED Recessed Down Lights	$35 per fixture
LED Outdoor Pole/Arm-Mounted Area and Roadway Luminaries	$175 per fixture
LED Outdoor Pole/Arm-Mounted Decorative Luminaries	$175 per fixture
LED Outdoor Wall-Mounted Area Luminaries	$100 per fixture
LED Parking Garage Luminaries	$100 per fixture
LED Track or Mono-Point Directional Lighting Fixtures	$50 per fixture
LED High-Bay and Low-Bay Fixtures for Commercial & Industrial Bldgs.	$150 per fixture
LED High-Bay-Aisle Lighting	$150 per fixture
LED Bollard Fixtures	$50 per fixture
LED Linear Panels (1x4, 2x2, 2x4 Troffers only)	$100 per fixture
LED Fuel Pump Canopy	$100 per fixture
LED Screw-based & Pin-based (PAR, MR, BR, R) Standards (A-Style) and Decorative Lamps	$20 per lamp
LED Refrigerator/Freezer case lighting replacement of fluorescent in medium and low temperature display case	$30 per 4 foot $42 per 5 foot $65 per 6 foot
LED Retrofit Kits	To be evaluated through the customer measure path

Lighting Controls – Occupancy Sensors

Wall Mounted	$20 per control
Remote Mounted	$35 per control
Daylight Dimmers	$25-$50 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

Premium Motors

Three-Phase Motors (Expires 3/1/2013)	$45 - $700 per motor
Fractional HP Motors Electronic Commutated Motors (replacing shaded pole motors in refrigerator/freezer cases)	$40 per electronic commutated motor

Refrigeration Doors/Covers

Energy-Efficient Doors/Covers for Installation on Open Refrigerated Cases	$100 per door
Aluminum Night Curtains for Installation on Open Refrigerated Cases	$3.50 per linear foot

Refrigeration Controls

Door Heater Controls	$50 per control
Electric Defrost Controls	$50 per control
Evaporator Fan Controls	$75 per control
Novelty Cooler Shutoff	$50 per control

Other Equipment Incentives

Performance Lighting	$1.00 per watt per SF below program incentive threshold, currently 5% more energy efficient than ASHRAE 90.1-2007 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive
Custom Measures	$0.16 KWh and $1.60/Therm of 1st year savings, or a buy down to a 1 year payback on estimated savings. Minimum required savings of 75,000 KWh or 1,500 Therms and an IRR of at least 10%.

APPENDIX C

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
7-New Brunswick BOE - Paul Robeson Elementary School

Building ID: 3415942
For 12-month Period Ending: October 31, 2012[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: February 04, 2013

Facility
7-New Brunswick BOE - Paul Robeson Elementary School
199 Commercial Avenue
New Brunswick, NJ 08901

Facility Owner
New Brunswick Board of Education
268 Baldwin Street 3rd Floor
New Brunswick, NJ 08901

Primary Contact for this Facility
Jack Humma
268 Baldwin Street 3rd Floor
New Brunswick, NJ 08901

Year Built: 1982
Gross Floor Area (ft²): 76,000

Energy Performance Rating[2] (1-100) 78

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	2,139,484
Natural Gas (kBtu)[4]	1,766,152
Total Energy (kBtu)	3,905,636

Energy Intensity[4]	
Site (kBtu/ft²/yr)	51
Source (kBtu/ft²/yr)	118

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	397

Electric Distribution Utility
Public Service Electric & Gas Co

National Median Comparison	
National Median Site EUI	68
National Median Source EUI	157
% Difference from National Median Source EUI	-25%
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.

Certifying Professional
Michael Fischette
520 South Burnt Mill Road
Voorhees, NJ 08043

Meets Industry Standards[5] **for Indoor Environmental Conditions:**	
Ventilation for Acceptable Indoor Air Quality	**N/A**
Acceptable Thermal Environmental Conditions	**N/A**
Adequate Illumination	**N/A**

Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. 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	7-New Brunswick BOE - Paul Robeson 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	199 Commercial Avenue, New Brunswick, NJ 08901	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.		☐
Paul Robeson ES (K-12 School)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	76,000 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	119	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	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐
Months	10(Optional)	Is this school in operation for at least 8 months of the year?		☐

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

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 Meter # 778009929 (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
09/03/2012	10/02/2012	45,600.00
08/03/2012	09/02/2012	42,600.00
07/03/2012	08/02/2012	48,400.00
06/03/2012	07/02/2012	64,200.00
05/03/2012	06/02/2012	72,600.00
04/03/2012	05/02/2012	56,000.00
03/03/2012	04/02/2012	51,000.00
02/03/2012	03/02/2012	52,400.00
01/03/2012	02/02/2012	54,800.00
12/03/2011	01/02/2012	54,000.00
11/03/2011	12/02/2011	56,600.00
Electric Meter # 778009929 Consumption (kWh (thousand Watt-hours))		**598,200.00**
Electric Meter # 778009929 Consumption (kBtu (thousand Btu))		**2,041,058.40**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**2,041,058.40**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

Meter: Gas Meter # 3637372 (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
09/03/2012	10/02/2012	229.00
08/03/2012	09/02/2012	102.00
07/03/2012	08/02/2012	72.00
06/03/2012	07/02/2012	140.00
05/03/2012	06/02/2012	264.00
04/03/2012	05/02/2012	269.00
03/03/2012	04/02/2012	799.00
02/03/2012	03/02/2012	4,112.00
01/03/2012	02/02/2012	4,601.00
12/03/2011	01/02/2012	3,936.00
11/03/2011	12/02/2011	2,772.00

Gas Meter # 3637372 Consumption (therms)	**17,296.00**
Gas Meter # 3637372 Consumption (kBtu (thousand Btu))	**1,729,600.00**
Total Natural Gas Consumption (kBtu (thousand Btu))	**1,729,600.00**
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
7-New Brunswick BOE - Paul Robeson Elementary School
199 Commercial Avenue
New Brunswick, NJ 08901

Facility Owner
New Brunswick Board of Education
268 Baldwin Street 3rd Floor
New Brunswick, NJ 08901

Primary Contact for this Facility
Jack Humma
268 Baldwin Street 3rd Floor
New Brunswick, NJ 08901

General Information

7-New Brunswick BOE - Paul Robeson Elementary School	
Gross Floor Area Excluding Parking: (ft^2)	76,000
Year Built	1982
For 12-month Evaluation Period Ending Date:	October 31, 2012

Facility Space Use Summary

Paul Robeson ES	
Space Type	K-12 School
Gross Floor Area (ft^2)	76,000
Open Weekends?	No
Number of PCs	119
Number of walk-in refrigeration/freezer units	2
Presence of cooking facilities	Yes
Percent Cooled	100
Percent Heated	100
Months °	10
High School?	No
School District °	new brunswick

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 10/31/2012)	**Baseline** (Ending Date 10/31/2012)	**Rating of 75**	**Target**	**National Median**
Energy Performance Rating	78	78	75	N/A	50
Energy Intensity					
Site (kBtu/ft^2)	51	51	53	N/A	68
Source (kBtu/ft^2)	118	118	123	N/A	157
Energy Cost					
$/year	$ 105,954.02	$ 105,954.02	$ 110,077.55	N/A	$ 140,777.20
$/$ft^2$/year	$ 1.39	$ 1.39	$ 1.44	N/A	$ 1.85
Greenhouse Gas Emissions					
$MtCO_2e$/year	397	397	412	N/A	527
$kgCO_2e/ft^2$/year	5	5	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.

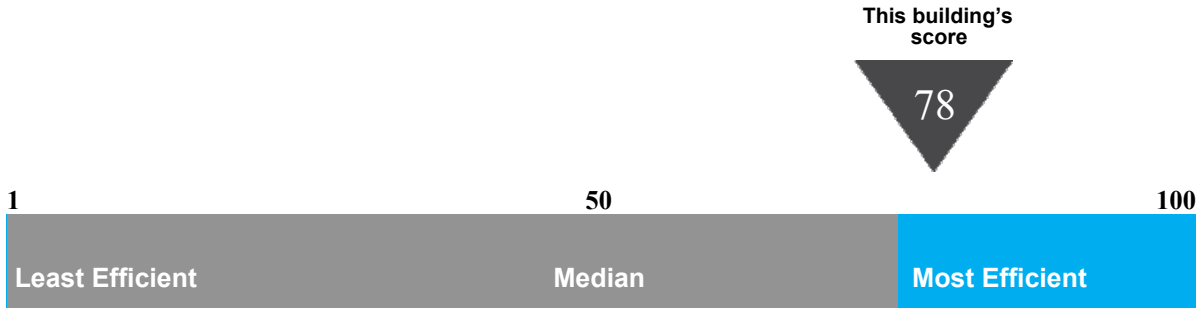
Statement of Energy Performance

2012

7-New Brunswick BOE - Paul Robeson Elementary School
199 Commercial Avenue
New Brunswick, NJ 08901

Portfolio Manager Building ID: 3415942

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 118 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending October 2012

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

EPA United States Environmental Protection Agency

Date Generated: 02/04/2013

APPENDIX D

MAJOR EQUIPMENT LIST

Concord Engineering Group

Paul Robeson Elementary School

AC Units

Tag	AHU-7	CU	CU
Unit Type	Packaged Rooftop Unit	Refrigeration Condenser	Refrigeration Condenser
Qty	1	1	1
Location	Roof	Roof	Roof
Area Served		Kitchen Walk-ins	Kitchen Walk-ins
Manufacturer	Trane	Bally	Bally
Model #	THC047E4R0A04H0C 0A1A60104	PL-200A-1	PN-100A-1
Serial #	123012854L	27840-N2	26695-N2
Cooling Type	DX, R-410A	DX,R-502	DX,R-12
Cooling Capacity (Tons)	4 Ton	-	-
Cooling Efficiency (SEER/EER)	17 SEER	-	-
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	1	10	10
ASHRAE Service Life	15	15	15
Remaining Life	14	5	5
Comments			

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

AC Units

Tag	AHU-4,5	CU-4,5	AHU-8,9
Unit Type	Outdoor Air Handler	Rooftop Condensing Unit	Packaged Rooftop Unit
Qty	2	2	2
Location	Roof	Roof	Roof
Area Served			
Manufacturer	McQuay	McQuay	Trane
Model #	OAH025GDAM	RSC035DYY	THC072E4R0A0DH0C0A1B60104
Serial #	FB0U120701671	FB0U120800017	123012779L
Cooling Type	See CU-4,5	DX, R-410A	DX, R-410A
Cooling Capacity (Tons)	See CU-4,5	35 Tons	6 Tons
Cooling Efficiency (SEER/EER)	See CU-4,5	11.3 EER	15 SEER
Heating Type	Hot Water	N/A	N/A
Heating Input (MBH)	-	N/A	N/A
Efficiency	See Boilers	N/A	N/A
Fuel	See Boilers	N/A	N/A
Approx Age	1	1	1
ASHRAE Service Life	15	15	15
Remaining Life	14	14	14
Comments			

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

AC Units

Tag	AHU-3	AHU-2	AHU-6
Unit Type	Outdoor Air Handler	Outdoor Air Handler	Packaged Rooftop Unit
Qty	1	1	1
Location	High Roof	High Roof	High Roof
Area Served			
Manufacturer	McQuay	McQuay	Trane
Model #	OAH018GDAM	OAH033GDAM	THC067E4R0A04H0C 0A1A60104
Serial #	FB0U120701738	FB0U120701687	123012838L
Cooling Type	Chilled Water	Chilled Water	DX, R-410A
Cooling Capacity (Tons)	-	-	5 Ton
Cooling Efficiency (SEER/EER)	-	-	17 SEER
Heating Type	Hot Water	Hot Water	N/A
Heating Input (MBH)	-	-	N/A
Efficiency	See Boilers	See Boilers	N/A
Fuel	See Boilers	See Boilers	N/A
Approx Age	1	1	1
ASHRAE Service Life	15	15	15
Remaining Life	14	14	14
Comments			

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

Francis DeMasi School

Cooling Tower

Tag	**CH-1,2**		
Unit Type	Scroll Air Cooled Water Chiller		
Qty	2		
Location	Roof		
Area Served	Chilled Water Loop		
Manufacturer	York		
Model #	YCAL0056EE46XEBS XTXH		
Serial #	2GYM017146		
Refrigerant	R-410A		
Cooling Capacity (Tons)	56 Tons		
Cooling Efficiency (KW/Ton)	11.3 EER		
Volts / Phase / Hz	460/3/60		
Fuel	Electric		
Chilled Water GPM / ΔT	~260 GPM / 10°ΔT		
Condenser Water GPM / ΔT	N/A		
Approx Age	1		
ASHRAE Service Life	20		
Remaining Life	19		
Comments			

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

Paul Robeson Elementary School

Boilers

Tag			
Unit Type	Cast Iron Sectional		
Qty	2		
Location	Boiler Room		
Area Served	Hot Water Loop		
Manufacturer	Weil McLain		
Model #	888		
Serial #	-		
Input Capacity (Btu/Hr)	2,396		
Rated Output Capacity (Btu/Hr)	1,904		
Approx. Efficiency %	75.0%		
Fuel	Natural Gas		
Approx Age	11		
ASHRAE Service Life	35		
Remaining Life	24		
Comments	Power Flame Burner MN: CR2-G-20A SN: 090101034		

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

Paul Robeson Elementary School

Domestic Water Heaters

Tag			
Unit Type	Gas Fired Hot Water Heater		
Qty	1		
Location	Boiler room		
Area Served	Domestic Hot Water loop		
Manufacturer	Laars		
Model #	-		
Serial #			
Size (Gallons)	Separate Storage~100 Gallons		
Input Capacity (MBH/KW)	155 MBH		
Recovery (Gal/Hr)	-		
Efficiency %	80%		
Fuel	Natural Gas		
Approx Age	12		
ASHRAE Service Life	24		
Remaining Life	12		
Comments			

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

Paul Robeson Elementary School

Pumps

Tag	P-1,2	P-3,4	
Unit Type	In-Line Pumps	In-Line Pumps	
Qty	2	2	
Location	Boiler Room	Boiler Room	
Area Served	Hot Water Loop	Chilled Water Loop	
Manufacturer	Thrush Co. Inc.	Amtrol	
Model #	3-3-9 TV2G	3x3x9TV20	
Serial #	700	36850-2P	
Horse Power	7.5 HP	5 HP	
Flow	-	260 GPM @ 65 FTHD	
Motor Info	Marathon Electric	Marathon Electric	
Electrical Power	208-230/460	208-230/460	
RPM	1745 RPM	1750 RPM	
Motor Efficiency %	84.0%	85.5%	
Approx Age	11	11	
ASHRAE Service Life	18	18	
Remaining Life	7	7	
Comments			

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

APPENDIX E

CEG Project #: 9C12064
Facility Name: Paul Robeson Elementary
Address: 199 Commercial Avenue
City, State, Zip New Brunswick, NJ 08901

			Existing Fixtures						Proposed Fixtures Retrofit							Retrofit Energy Savings			Lighting Retrofit Costs					Proposed Lighting Controls					
Fixture Reference #	Location	Average Burn Hours	Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, $	Material	Total Labor	Total All	Rebate Estimate	Simple Payback	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $
737	2nd Floor Corridor	3000	Recessed Downlight, (1) 100w Mercury vapor	1	125	7	0.88	2,625	Relamp	Neu-Tech NT-4293-TR-HO, 60w LED Retrofit	1	60	7	0.42	1,260	0.46	1,365	$194	$3,150.00	$1,400.00	$4,550.00	$0.00	23.47	0	No New Controls	0	0.0%	0	$0
613	2nd Floor Corridor	3000	Recessed Down Light, 150w Lamp	1	150	1	0.15	450	Relamp	(1) 42w CFL Lamp	1	42	1	0.04	126	0.11	324	$46	$22.00	$10.00	$32.00	$0.00	0.70	0	No New Controls	0	0.0%	0	$0
127.22	2nd Floor Corridor	3000	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	13	1.01	3,042	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	13	0.64	1,911	0.38	1,131	$161	$520.00	$650.00	$1,170.00	$0.00	7.29	0	No New Controls	0	0.0%	0	$0
221.42	2nd Floor Corridor	3000	1x4, 2 Lamp, 32w T8, Elect, Ballast, Wall Mount, Parabolic Lens	2	62	1	0.06	186	Existing to Remain	Existing to Remain	2	62	0	0.06	186	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
232.22	217 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect, Ballast, Recessed Mnt., Parabolic Lens	3	86	9	0.77	2,012	Existing to Remain	Existing to Remain	3	86	0	0.77	2,012	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	402	$57
221.42	217 Classroom	2600	1x4, 2 Lamp, 32w T8, Elect, Ballast, Wall Mount, Parabolic Lens	2	62	4	0.25	645	Existing to Remain	Existing to Remain	2	62	0	0.25	645	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	129	$18
232.22	216 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect, Ballast, Recessed Mnt., Parabolic Lens	3	86	9	0.77	2,012	Existing to Remain	Existing to Remain	3	86	0	0.77	2,012	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	402	$57
221.42	216 Classroom	2600	1x4, 2 Lamp, 32w T8, Elect, Ballast, Wall Mount, Parabolic Lens	2	62	4	0.25	645	Existing to Remain	Existing to Remain	2	62	0	0.25	645	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	129	$18
232.22	220 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect, Ballast, Recessed Mnt., Parabolic Lens	3	86	9	0.77	2,012	Existing to Remain	Existing to Remain	3	86	0	0.77	2,012	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	402	$57
221.42	220 Classroom	2600	1x4, 2 Lamp, 32w T8, Elect, Ballast, Wall Mount, Parabolic Lens	2	62	4	0.25	645	Existing to Remain	Existing to Remain	2	62	0	0.25	645	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	129	$18
232.22	219 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect, Ballast, Recessed Mnt., Parabolic Lens	3	86	9	0.77	2,012	Existing to Remain	Existing to Remain	3	86	0	0.77	2,012	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	402	$57
221.42	219 Classroom	2600	1x4, 2 Lamp, 32w T8, Elect, Ballast, Wall Mount, Parabolic Lens	2	62	4	0.25	645	Existing to Remain	Existing to Remain	2	62	0	0.25	645	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	129	$18
232.22	218 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect, Ballast, Recessed Mnt., Parabolic Lens	3	86	9	0.77	2,012	Existing to Remain	Existing to Remain	3	86	0	0.77	2,012	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	402	$57
221.42	218 Classroom	2600	1x4, 2 Lamp, 32w T8, Elect, Ballast, Wall Mount, Parabolic Lens	2	62	3	0.19	484	Existing to Remain	Existing to Remain	2	62	0	0.19	484	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	97	$14
222.22	207 Classroom	2600	2x4, 2 Lamp, 32w T8, Elect, Ballast, Recessed Mnt., Parabolic Lens	2	62	9	0.56	1,451	Existing to Remain	Existing to Remain	2	62	0	0.56	1,451	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	290	$41
221.42	207 Classroom	2600	1x4, 2 Lamp, 32w T8, Elect, Ballast, Wall Mount, Parabolic Lens	2	62	2	0.12	322	Existing to Remain	Existing to Remain	2	62	0	0.12	322	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	64	$9
222.22	206 Classroom	2600	2x4, 2 Lamp, 32w T8, Elect, Ballast, Recessed Mnt., Parabolic Lens	2	62	12	0.74	1,934	Existing to Remain	Existing to Remain	2	62	0	0.74	1,934	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	387	$55
221.42	206 Classroom	2600	1x4, 2 Lamp, 32w T8, Elect, Ballast, Wall Mount, Parabolic Lens	2	62	0	0.00	0	Existing to Remain	Existing to Remain	2	62	0	0.00	0	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	0	$0
127.22	Girls Restroom	2600	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	4	0.31	811	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	4	0.20	510	0.12	302	$43	$160.00	$200.00	$360.00	$0.00	8.41	0	No New Controls	0	0.0%	0	$0
127.22	Faculty Restroom	1200	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	1	0.08	94	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	1	0.05	59	0.03	35	$5	$40.00	$50.00	$90.00	$0.00	18.21	0	No New Controls	0	0.0%	0	$0
127.22	Boys Restroom	2600	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	3	0.23	608	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	3	0.15	382	0.09	226	$32	$120.00	$150.00	$270.00	$0.00	8.41	0	No New Controls	0	0.0%	0	$0
221.31	Electrical Room	1200	1x4, 2 Lamp, 32w T8, Elect, Ballast, Pendant Mnt., Prismatic Lens	2	62	1	0.06	74	Existing to Remain	Existing to Remain	2	62	0	0.06	74	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
232.22	211 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect, Ballast, Recessed Mnt., Parabolic Lens	3	86	9	0.77	2,012	Existing to Remain	Existing to Remain	3	86	0	0.77	2,012	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	402	$57
232.22	210 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect, Ballast, Recessed Mnt., Parabolic Lens	3	86	9	0.77	2,012	Existing to Remain	Existing to Remain	3	86	0	0.77	2,012	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	402	$57

			Existing Fixtures						Proposed Fixtures Retrofit							Retrofit Energy Savings			Lighting Retrofit Costs					Proposed Lighting Controls					
Fixture Reference #	Location	Average Burn Hours	Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, $	Material	Total Labor	Total All	Rebate Estimate	Simple Payback	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $
222.22	205 Classroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	2	62	12	0.74	1,934	Existing to Remain	Existing to Remain	2	62	0	0.74	1,934	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	387	$55
222.22	204 Classroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	2	62	12	0.74	1,934	Existing to Remain	Existing to Remain	2	62	0	0.74	1,934	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	387	$55
232.22	209 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	9	0.77	2,012	Existing to Remain	Existing to Remain	3	86	0	0.77	2,012	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	402	$57
232.22	208 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	9	0.77	2,012	Existing to Remain	Existing to Remain	3	86	0	0.77	2,012	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	402	$57
221.42	208 Classroom	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mount, Parabolic Lens	2	62	3	0.19	484	Existing to Remain	Existing to Remain	2	62	0	0.19	484	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	97	$14
232.22	203 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	9	0.77	2,012	Existing to Remain	Existing to Remain	3	86	0	0.77	2,012	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	402	$57
221.42	203 Classroom	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mount, Parabolic Lens	2	62	3	0.19	484	Existing to Remain	Existing to Remain	2	62	0	0.19	484	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	97	$14
232.22	Stairwell	3000	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	2	0.17	516	Existing to Remain	Existing to Remain	3	86	0	0.17	516	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
227.22	Stairwell	3000	2x2, 2 Lamp U-Tube, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	2	65	1	0.07	195	Existing to Remain	Existing to Remain	2	65	0	0.07	195	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
221.41	Stairwell	3000	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mount, Prismatic Lens	2	62	1	0.06	186	Existing to Remain	Existing to Remain	2	62	0	0.06	186	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
232.22	103 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	9	0.77	2,012	Existing to Remain	Existing to Remain	3	86	0	0.77	2,012	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	402	$57
221.41	103 Classroom	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mount, Prismatic Lens	2	62	3	0.19	484	Existing to Remain	Existing to Remain	2	62	0	0.19	484	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	97	$14
232.22	109 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	9	0.77	2,012	Existing to Remain	Existing to Remain	3	86	0	0.77	2,012	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	402	$57
127.22	109 Classroom	2600	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	3	0.23	608	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	3	0.15	382	0.09	226	$32	$120.00	$150.00	$270.00	$0.00	8.41	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	76	$11
222.22	109 Closet	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	2	62	1	0.06	74	Existing to Remain	Existing to Remain	2	62	0	0.06	74	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
127.22	109 Restroom	1200	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	1	0.08	94	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	1	0.05	59	0.03	35	$5	$40.00	$50.00	$90.00	$0.00	18.21	0	No New Controls	0	0.0%	0	$0
232.22	110 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	9	0.77	2,012	Existing to Remain	Existing to Remain	3	86	0	0.77	2,012	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	402	$57
127.22	110 Classroom	2600	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	3	0.23	608	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	3	0.15	382	0.09	226	$32	$120.00	$150.00	$270.00	$0.00	8.41	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	76	$11
222.22	110 Closet	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	2	62	1	0.06	74	Existing to Remain	Existing to Remain	2	62	0	0.06	74	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
127.22	110 Restroom	1200	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	1	0.08	94	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	1	0.05	59	0.03	35	$5	$40.00	$50.00	$90.00	$0.00	18.21	0	No New Controls	0	0.0%	0	$0
232.22	104 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	9	0.77	2,012	Existing to Remain	Existing to Remain	3	86	0	0.77	2,012	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	402	$57
222.22	104 Prep	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	2	62	2	0.12	322	Existing to Remain	Existing to Remain	2	62	0	0.12	322	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	64	$9
227.22	104 Restroom	1200	2x2, 2 Lamp U-Tube, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	2	65	1	0.07	78	Existing to Remain	Existing to Remain	2	65	0	0.07	78	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
232.22	111 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	9	0.77	2,012	Existing to Remain	Existing to Remain	3	86	0	0.77	2,012	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	402	$57
127.22	111 Classroom	2600	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	3	0.23	608	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	3	0.15	382	0.09	226	$32	$120.00	$150.00	$270.00	$0.00	8.41	4	Dual Technology Occupancy Sensor - Remote Mnt.	0.5	20.0%	76	$11
222.22	111 Closet	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	2	62	1	0.06	74	Existing to Remain	Existing to Remain	2	62	0	0.06	74	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0

			Existing Fixtures						Proposed Fixtures Retrofit							Retrofit Energy Savings			Lighting Retrofit Costs					Proposed Lighting Controls					
Fixture Reference #	Location	Average Burn Hours	Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, $	Material	Total Labor	Total All	Rebate Estimate	Simple Payback	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $
127.22	111 Restroom	1200	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	1	0.08	94	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	1	0.05	59	0.03	35	$5	$40.00	$50.00	$90.00	$0.00	18.21	0	No New Controls	0	0.0%	0	$0
232.22	105 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	9	0.77	2,012	Existing to Remain	Existing to Remain	3	86	0	0.77	2,012	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	402	$57
232.22	107 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	9	0.77	2,012	Existing to Remain	Existing to Remain	3	86	0	0.77	2,012	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	402	$57
242.21	106 Classroom	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	4	107	3	0.32	835	Existing to Remain	Existing to Remain	4	107	0	0.32	835	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	167	$24
222.22	108 Classroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	2	62	8	0.50	1,290	Existing to Remain	Existing to Remain	2	62	0	0.50	1,290	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	258	$37
222.22	118 Classroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	2	62	10	0.62	1,612	Existing to Remain	Existing to Remain	2	62	0	0.62	1,612	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	322	$46
127.22	Girls Restroom	2600	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	4	0.31	811	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	4	0.20	510	0.12	302	$43	$160.00	$200.00	$360.00	$0.00	8.41	0	No New Controls	0	0.0%	0	$0
221.31	Electrical Room	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	2	62	1	0.06	74	Existing to Remain	Existing to Remain	2	62	0	0.06	74	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
127.22	Boys Restroom	2600	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	3	0.23	608	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	3	0.15	382	0.09	226	$32	$120.00	$150.00	$270.00	$0.00	8.41	0	No New Controls	0	0.0%	0	$0
222.22	120 Office	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	2	62	4	0.25	645	Existing to Remain	Existing to Remain	2	62	0	0.25	645	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	129	$18
222.22	Nurse	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	2	62	6	0.37	967	Existing to Remain	Existing to Remain	2	62	0	0.37	967	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	5	Dual Technology Occupancy Sensor - Switch Mnt.	0.5	20.0%	193	$27
127.22	Nurse	2600	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	2	0.16	406	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	2	0.10	255	0.06	151	$21	$80.00	$100.00	$180.00	$0.00	8.41	5	Dual Technology Occupancy Sensor - Switch Mnt.	0.5	20.0%	51	$7
127.22	Media Center	2600	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	13	1.01	2,636	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	13	0.64	1,656	0.38	980	$139	$520.00	$650.00	$1,170.00	$0.00	8.41	0	No New Controls	0	0.0%	0	$0
222.22	Media Center	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	2	62	20	1.24	3,224	Existing to Remain	Existing to Remain	2	62	0	1.24	3,224	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
127.22	Teacher Lounge	2600	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	12	0.94	2,434	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	12	0.59	1,529	0.35	905	$128	$480.00	$600.00	$1,080.00	$0.00	8.41	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	306	$43
127.22	Teacher Lounge Restroom	1200	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	1	0.08	94	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	1	0.05	59	0.03	35	$5	$40.00	$50.00	$90.00	$0.00	18.21	0	No New Controls	0	0.0%	0	$0
127.22	Teacher Lounge Restroom	1200	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	1	0.08	94	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	1	0.05	59	0.03	35	$5	$40.00	$50.00	$90.00	$0.00	18.21	0	No New Controls	0	0.0%	0	$0
127.22	Main Office	2600	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	7	0.55	1,420	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	7	0.34	892	0.20	528	$75	$280.00	$350.00	$630.00	$0.00	8.41	0	No New Controls	0	0.0%	0	$0
222.22	Principal Office	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	2	62	3	0.19	484	Existing to Remain	Existing to Remain	2	62	0	0.19	484	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	97	$14
737	Vestibules	3000	Recessed Downlight, (1) 100w Mercury vapor	1	125	4	0.50	1,500	Relamp	Neu-Tech NT-4293-TR-HO, 60w LED Retrofit	1	60	4	0.24	720	0.26	780	$111	$1,800.00	$800.00	$2,600.00	$0.00	23.47	0	No New Controls	0	0.0%	0	$0
127.22	Stairwell	3000	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	2	0.16	468	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	2	0.10	294	0.06	174	$25	$80.00	$100.00	$180.00	$0.00	7.29	0	No New Controls	0	0.0%	0	$0
232.22	Stairwell	3000	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	2	0.17	516	Existing to Remain	Existing to Remain	3	86	0	0.17	516	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
221.31	Maintenance/Electric Room	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	2	62	6	0.37	446	Existing to Remain	Existing to Remain	2	62	0	0.37	446	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
221.31	Boiler Room	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	2	62	7	0.43	521	Existing to Remain	Existing to Remain	2	62	0	0.43	521	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
127.22	Boys Restroom	2600	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	3	0.23	608	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	3	0.15	382	0.09	226	$32	$120.00	$150.00	$270.00	$0.00	8.41	0	No New Controls	0	0.0%	0	$0
221.31	134 Custodial Office	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	2	62	3	0.19	223	Existing to Remain	Existing to Remain	2	62	0	0.19	223	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0

			Existing Fixtures						Proposed Fixtures Retrofit							Retrofit Energy Savings			Lighting Retrofit Costs					Proposed Lighting Controls					
Fixture Reference #	Location	Average Burn Hours	Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, $	Material	Total Labor	Total All	Rebate Estimate	Simple Payback	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $
127.22	1st Floor Corridor	3000	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	28	2.18	6,552	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	28	1.37	4,116	0.81	2,436	$346	$1,120.00	$1,400.00	$2,520.00	$0.00	7.29	0	No New Controls	0	0.0%	0	$0
127.22	1st Floor Corridor	3000	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	28	2.18	6,552	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	28	1.37	4,116	0.81	2,436	$346	$1,120.00	$1,400.00	$2,520.00	$0.00	7.29	0	No New Controls	0	0.0%	0	$0
769	Gym	2600	400w MH, Hi-Bay	1	465	24	11.16	29,016	Remove and Return	1x4, 6 Lamp, 54w T5HO, Elect. Dimming Ballast, Lo Bay	6	315	24	7.56	19,656	3.60	9,360	$1,329	$6,000.00	$12,120.00	$18,120.00	$2,400.00	11.83	0	No New Controls	0	0.0%	0	$0
127.22	Storage (Old Locker Room)	1200	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	7	0.55	655	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	7	0.34	412	0.20	244	$35	$280.00	$350.00	$630.00	$0.00	18.21	0	No New Controls	0	0.0%	0	$0
127.22	Gym Office	2600	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	4	0.31	811	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	4	0.20	510	0.12	302	$43	$160.00	$200.00	$360.00	$0.00	8.41	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	102	$14
242.21	Kitchen	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	4	107	14	1.50	3,895	Existing to Remain	Existing to Remain	4	107	0	1.50	3,895	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
127.22	Girls Restroom	2600	2x2, 2 Lamp U-Tube, 34w T12, Magnetic Ballast, Recessed Mnt., Parabolic Lens	2	78	4	0.31	811	Reballast & Relamp	Reballast & Relamp; 25w T8 U-bent Energy Advantage Lamps, Elec Ballast	2	49	4	0.20	510	0.12	302	$43	$160.00	$200.00	$360.00	$0.00	8.41	0	No New Controls	0	0.0%	0	$0
624	Auditorium	2600	Recessed Auditorium Light, 300w A Lamp Incandescent	1	300	42	12.60	32,760	Existing to Remain	Existing to Remain	1	300	0	12.60	32,760	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
222.22	131 Classroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	2	62	11	0.68	1,773	Existing to Remain	Existing to Remain	2	62	0	0.68	1,773	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	355	$50
222.22	130 Classroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	2	62	11	0.68	1,773	Existing to Remain	Existing to Remain	2	62	0	0.68	1,773	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	355	$50
810	Exterior	4000	1 Lamp, 175w Metal Halide, Mag. Ballast, Area Light Walkway Exterior	1	213	12	2.56	10,224	Replace Fixture	90w LED Walkway Area Light	1	90	12	1.08	4,320	1.48	5,904	$838	$5,220.00	$2,040.00	$7,260.00	$0.00	8.66	0	No New Controls	0	0.0%	0	$0
800	Exterior	4000	1 Lamp, 175w Metal Halide, Mag. Ballast, Wall Pack, Exterior	1	213	10	2.13	8,520	Replace Fixture	90w LED Wall Pack	1	90	10	0.90	3,600	1.23	4,920	$699	$4,350.00	$1,700.00	$6,050.00	$0.00	8.66	0	No New Controls	0	0.0%	0	$0
820	Exterior	4000	1 Lamp, 150w HPS, Mag. Ballast, Wall Pack, Exterior	1	188	2	0.38	1,504	Existing to Remain	Existing to Remain	1	188	0	0.38	1,504	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
830	Exterior	4000	400w MH, Shoebox, Parking Exterior	1	465	5	2.33	9,300	Relamp	Neu-Tech NT-4293-TR-HO, 93w LED Retrofit	1	93	5	0.47	1,860	1.86	7,440	$1,056	$2,250.00	$1,000.00	$3,250.00	$0.00	3.08	0	No New Controls	0	0.0%	0	$0
	TOTAL					**608**	**71**	**193,880**					**215**	**57**	**152,030**	**13**	**41,850**	**5,943**	**28,872**	**26,670**	**55,542**	**2,400**	**9.35**			**33**		**11,888**	**1,688**

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
Paul Robeson ES	12550	SHARP NU-U235F2	512	17.5	8,981	120.32	139,036	97.5	21,453	13.40

.= Proposed PV Layout = Proposed Parking PV Layout

Notes:

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

Project Name: **LGEA Solar PV Project - Paul Robeson ES**
Location: **New Brunswick, NJ**
Description: **Photovoltaic System 100% Financing - 15 year**

Simple Payback Analysis

	Photovoltaic System 100% Financing - 15 year
Total Construction Cost	$733,214
Annual kWh Production	139,036
Annual Energy Cost Reduction	$19,743
Average Annual SREC Revenue	$26,568

Simple Payback: **15.83** Years

Life Cycle Cost Analysis

Analysis Period (years): 15
Discount Rate: 3%
Average Energy Cost ($/kWh) **$0.142**
Financing Rate: 6.00%
Financing %: 100%
Maintenance Escalation Rate: 3.0%
Energy Cost Escalation Rate: 3.0%
Average SREC Value ($/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	139,036	$19,743	$0	$34,759	$43,147	$31,100	($19,745)	($19,745)
2	$0	138,341	$20,335	$0	$34,585	$41,229	$33,019	($19,327)	($39,072)
3	$0	137,649	$20,945	$0	$34,412	$39,192	$35,055	($18,890)	($57,961)
4	$0	136,961	$21,574	$0	$34,240	$37,030	$37,217	($18,433)	($76,395)
5	$0	136,276	$22,221	$1,404	$34,069	$34,734	$39,513	($19,361)	($95,756)
6	$0	135,595	$22,888	$1,397	$27,119	$32,297	$41,950	($25,637)	($121,393)
7	$0	134,917	$23,574	$1,390	$26,983	$29,710	$44,537	($25,079)	($146,472)
8	$0	134,242	$24,282	$1,383	$26,848	$26,963	$47,284	($24,500)	($170,972)
9	$0	133,571	$25,010	$1,376	$26,714	$24,047	$50,201	($23,899)	($194,871)
10	$0	132,903	$25,760	$1,369	$19,935	$20,950	$53,297	($29,920)	($224,792)
11	$0	132,239	$26,533	$1,362	$19,836	$17,663	$56,584	($29,240)	($254,032)
12	$0	131,577	$27,329	$1,355	$19,737	$14,173	$60,074	($28,537)	($282,569)
13	$0	130,919	$28,149	$1,348	$19,638	$10,468	$63,779	($27,809)	($310,378)
14	$0	130,265	$28,993	$1,342	$13,026	$6,534	$67,713	($33,569)	($343,947)
15	$0	129,614	$29,863	$1,335	$12,961	$2,358	$71,890	($32,758)	($376,705)
	Totals:	2,014,104	$367,200	$15,060	$384,864	$380,496	$733,214	($376,705)	($2,715,061)

Net Present Value (NPV) **($276,006)**