CLIFTON PUBLIC SCHOOLS
PUBLIC SCHOOL #13

782 VAN HOUTEN AVENUE
CLIFTON, NEW JERSEY 07013

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 and Gas
Electric Utility Rate Structure:	General Lighting and Power (GLP)
Third Party Supplier:	Champion Energy Services LLC

Natural Gas Utility Provider:	Public Service Electric and Gas
Utility Rate Structure:	Large Volume Gas (LVG)
Third Party Supplier:	Hess

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

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

Table 1
Electricity Billing Data

ELECTRIC USAGE SUMMARY

Utility Provider: PSE&G
Rate: GLP
Meter No: 678000767
Account No: 65 001 043 07
Third Party Utility Provider: Champion Energy Services LLC
TPS Meter / Acct No: -

MONTH OF USE	CONSUMPTION KWH	DEMAND KW	TOTAL BILL
Mar-12	13,590	60.9	$2,138
Apr-12	12,375	61.5	$2,075
May-12	12,180	59.4	$2,501
Jun-12	8,985	56.6	$2,105
Jul-12	5,460	25.8	$1,650
Aug-12	7,710	58.2	$1,650
Sep-12	12,690	61.2	$1,998
Oct-12	13,950	60.9	$2,129
Nov-12	16,095	70.1	$2,368
Dec-12	16,035	67.1	$2,357
Jan-13	17,310	70.8	$2,526
Feb-13	15,885	67.4	$2,377
Totals	**152,265**	**70.8 Max**	**$25,872**

AVERAGE DEMAND **60.0 KW average**
AVERAGE RATE **$0.170** **$/kWh**

Figure 1
Electricity Usage Profile

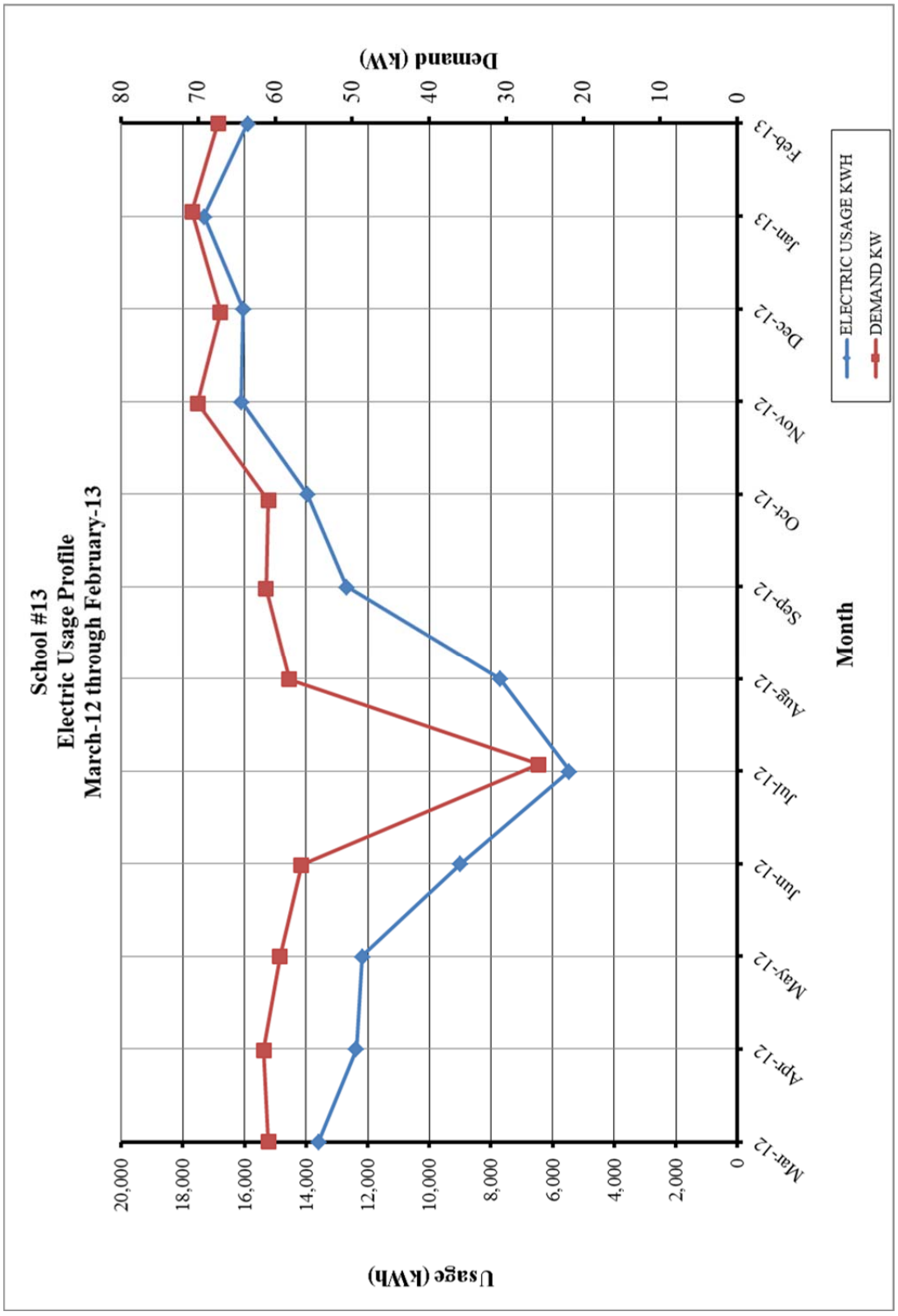
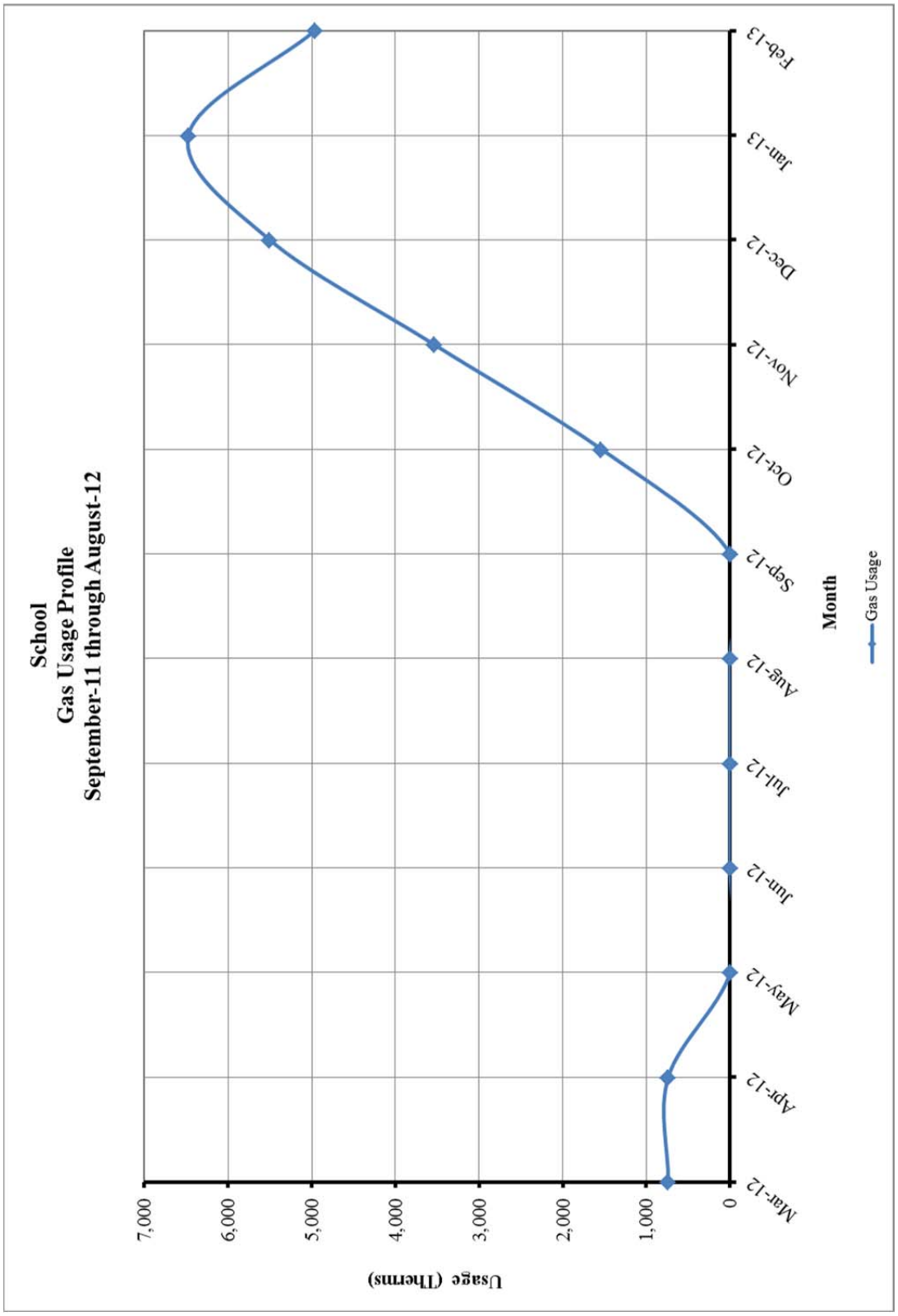


Table 4
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider: PSE&G		
Rate: LVG		
Meter No: 2415326		
Account No: 65 001 043 07		
Third Party Utility Provider: Hess		
TPS Meter No: 446575/446931		
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Mar-12	739.07	$534.01
Apr-12	739.10	$469.91
May-12	0.00	$99.50
Jun-12	0.00	$99.50
Jul-12	0.00	$99.50
Aug-12	0.00	$99.50
Sep-12	0.00	$99.50
Oct-12	1,542.53	$1,633.64
Nov-12	3,541.70	$3,145.13
Dec-12	5,505.57	$4,849.53
Jan-13	6,473.60	$5,535.59
Feb-13	4,956.17	$4,461.85
TOTALS	**23,497.74**	**$21,127.16**
AVERAGE RATE:	**$0.90**	**$/THERM**

Figure 2
Natural Gas Usage Profile



II. FACILITY DESCRIPTION

The public school #13 is located at 782 Van Houten Avenue in Clifton, New Jersey. The 46,465 SF Elementary School was built in 1928 with a 5,995 SF addition completed in 1969. The building is a two story facility comprised of classrooms, offices, cafeteria, gym, media center and mechanical spaces.

Occupancy Profile

The typical hours of operation for the Middle School are Monday through Friday between 7:00 am and 4:00 pm. Maintenance staff is present in the building as early as 6:00 am. The school's enrollment is approximately 463 students, grades K through 5th, and has 32 teachers, support staff, and administrative personnel.

Building Envelope

Exterior walls for the original building are concrete block, with a concrete external finish. For the addition, the exterior walls are brick faced with a concrete block construction. The amount of insulation within the walls is unknown. Typical windows throughout the school are single pane, operable, ¼" clear glass with wood frames. The roof is a flat, EPDM rubber roof on steel decking. The amount of insulation below the roof is unknown.

HVAC Systems

The elementary school HVAC system consists of two steam boilers, unit ventilators and steam radiators in the classrooms, and some window mounted air conditioning units. Additionally the gym is ventilated by two heating and ventilation units.

The boilers are gas-fired steam boilers manufactured by AL Eastmond and Sons Inc. These boilers have an input rating of 6300 MBH and an efficiency of 79%. They serve the heating load throughout the building via the steam radiators and the steam heating coils in the unit ventilators and the heating and ventilation units for the gym.

Fresh air is supplied to the building by the unit ventilators in the classrooms. These units are heating and ventilation only and have a steam coil to serve the heating load. Most of these units have an outside air inlet and supply air directly to the space in which it is located. Outside air is brought into the gym by a larger heating and ventilation unit.

Exhaust System

Air is exhausted from the toilet rooms through switch operated exhaust fans. There are also two exhaust fans that exhaust air from the gym through the roof. The gym exhaust fans are controlled by a timer.

HVAC System Controls

The HVAC System is controlled by a pneumatic system. There is one master thermostat that commands the boilers on or off. From there, the school is split into three zones, each with a thermostat that controls the amount of steam supplied to the radiators and unit ventilators in each area of the building.

Domestic Hot Water

Domestic hot water for the restrooms is provided by a Rheem 82V30-2 electric water heater located in the gym fan room. It has a tank volume of 30 gallons, and an input capacity of 9,000 watts.

Lighting

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

Miscellaneous

The kitchen is equipped with two TurboAire Energy Star rated refrigerators, two Powers Chest coolers, and one EPCO rack heater.

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	$47,625	$4,353	10.9	37.1%
ECM #2	Lighting Upgrade - Gym	$7,028	$345	20.4	-26.4%
ECM #3	Lighting Upgrade - Exterior	$360	$101	3.6	320.8%
ECM #4	Lighting Controls Upgrade	$12,550	$1,080	11.6	29.1%
ECM #5	DDC Controls Upgrade	$251,080	$2,149	116.8	-87.2%
ECM #6	New Boiler Burner and Contols	$51,000	$1,057	48.2	-56.5%
ECM #7	Steam Trap Replacement	$55,640	$1,739	32.0	-68.7%
ECM #8	CRT Monitor Replacement	$17,661	$1,316	13.4	11.8%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	84.37 KW PV System	$519,521	$35,204	14.8	1.6%

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	17.5	25,605	-
ECM #2	Lighting Upgrade - Gym	1.3	2,032	-
ECM #3	Lighting Upgrade - Exterior	0.2	592	-
ECM #4	Lighting Controls Upgrade	-	6,355	-
ECM #5	DDC Controls Upgrade	-	2,147	1,982
ECM #6	New Boiler Burner and Contols	-	-	1,175
ECM #7	Steam Trap Replacement	-	-	1,717
ECM #8	CRT Monitor Replacement	4.2	7,739	-
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	**DESCRIPTION**	**ANNUAL UTILITY REDUCTION**		
		ELECTRIC DEMAND (KW)	**ELECTRIC CONSUMPTION (KWH)**	**NATURAL GAS (THERMS)**
REM #1	84.37 KW PV System	84.4	97,494	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	$4,353	$52,245	$4,620	$47,625	10.9
Lighting Upgrade - Gym	$345	$8,028	$1,000	$7,028	20.4
Lighting Upgrade - Exterior	$101	$560	$200	$360	3.6
Lighting Controls Upgrade	$1,080	$13,700	$1,150	$12,550	11.6
~~DDC Controls Upgrade~~	~~$2,149~~	~~$251,080~~	~~$0~~	~~$251,080~~	~~116.8~~
~~New Boiler Burner and Contols~~	~~$1,057~~	~~$51,000~~	~~$0~~	~~$51,000~~	~~48.2~~
Steam Trap Replacement	$1,739	$55,640	$0	$55,640	32.0
CRT Monitor Replacement	$1,316	$17,661	$0	$17,661	13.4
Design / Construction Extras (15%)		$22,175		*$22,175*	
Total Project	**$8,934**	**$170,009**	**$6,970**	**$163,039**	**18.2**

Note: ECM's with the strike-through font are not included in the ESIP.

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 Clifton Elementary School #13 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 most of 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. For other areas that are over lit, Concord Engineering recommends that the fixture be retrofitted with new Super T-8 lamps/reflector, de-lamped to the appropriate light levels, and a new high-efficiency electronic ballast be installed.

This 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. 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. 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. 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.

The ECM also includes replacement of some incandescent lamps with LED lamps. The retrofit of existing incandescent fixtures with 20 watt PAR38 LED lamps will assist in reducing the facility's electric expenses.

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 ($):	$52,245
NJ Smart Start Equipment Incentive ($):	$4,620
Net Installation Cost ($):	$47,625
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$4,353
Total Yearly Savings ($/Yr):	$4,353
Estimated ECM Lifetime (Yr):	15
Simple Payback	10.9
Simple Lifetime ROI	37.1%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$65,295
Internal Rate of Return (IRR)	4%
Net Present Value (NPV)	$4,340.83

ECM #2: Lighting Upgrade – Gym

Description:

The Gym at Clifton Elementary School #13 is currently lit via 400 watt Metal Halide HID 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 system that includes new six lamp, 54 watt high output fixtures.

This measure replaces all the HID, 250 watt HID MH fixtures with a well-designed T5 high output (HO) system. T5 High output fixtures with reflectors and wire guards will be required in order to meet the mandated 50 foot-candle average within the spaces.

Additionally there are 100 watt incandescent down-lights that can be replaced with 20 watt PAR38 LED lamps.

Energy Savings Calculations:

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

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$8,028
NJ Smart Start Equipment Incentive ($):	$1,000
Net Installation Cost ($):	$7,028
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$345
Total Yearly Savings ($/Yr):	$345
Estimated ECM Lifetime (Yr):	15
Simple Payback	20.4
Simple Lifetime ROI	-26.4%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$5,175
Internal Rate of Return (IRR)	-4%
Net Present Value (NPV)	($2,909.41)

ECM #3: Lighting Upgrade – Exterior Lighting

Description:

The exterior lighting at Clifton Elementary School #13 is currently lit via 70 watt high pressure sodium (HPS) wall packs. The exterior would be better served with more efficient LED lighting system. Concord Engineering recommends upgrading the lighting to an energy-efficient LED lighting system that includes LED lamps for the existing 70 watt HPS wall packs on the exterior with 20 watt Lumarck LED Wall packs.

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 ($):	$560
NJ Smart Start Equipment Incentive ($):	$200
Net Installation Cost ($):	$360
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$101
Total Yearly Savings ($/Yr):	$101
Estimated ECM Lifetime (Yr):	15
Simple Payback	3.6
Simple Lifetime ROI	320.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$1,515
Internal Rate of Return (IRR)	27%
Net Present Value (NPV)	$845.73

ECM #4: Lighting Controls Upgrade – Occupancy Sensors

Description:

Some of the lights in the Clifton Elementary School #13 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 #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$13,700
NJ Smart Start Equipment Incentive ($):	$1,150
Net Installation Cost ($):	$12,550
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,080
Total Yearly Savings ($/Yr):	$1,080
Estimated ECM Lifetime (Yr):	15
Simple Payback	11.6
Simple Lifetime ROI	29.1%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$16,200
Internal Rate of Return (IRR)	3%
Net Present Value (NPV)	$342.97

ECM #5: Digital Energy Management System (DDC EMS)

Description:

Currently, Clifton Public School #13 uses a pneumatic control system. This system is very old and offers limited control options for the HVAC systems.

Concord Engineering recommends installing a DDC system throughout the school to control all of the HVAC systems including the boilers, indoor air handling units, and roof exhaust fans.

The system will include new temperature sensors and new local thermostats with limited over-ride capability, a front end computer and main controller. The system will also include central controls for lighting. With the communication between the control devices and the front end computer interface, the facility manager will be able to take advantage of scheduling for occupied and unoccupied periods based on the actual occupancy of each space in the facility. Due to the fact that the building may have diverse hours of occupancy, including evening and weekend activities, having supervisory control over all of the equipment makes sense. The DDC system will also aid in the response time to service / maintenance issues when the facility is not under normal maintenance supervision, i.e. after-hours.

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

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

Savings resulting from the implementation of this ECM for energy management controls are estimated to be 10% of the electricity and 10% for natural gas used for HVAC in this building.

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

Energy Savings Calculations:

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

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

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

DDC ENERGY MANAGEMENT SYSYEM CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Controls w/ Local Thermostats	DDC Controls	
Existing Nat Gas Usage (Therms)	19,825	-	
Existing Electricity Usage (kWh)	42,938	-	
Energy Savings, Nat Gas	-	10%	
Energy Savings, Electricity	-	5%	
Gas Cost ($/Therm)	*$0.90*	$0.90	
Electricity Cost ($/kWh)	*$0.170*	$0.170	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Nat Gas Usage (Therms)	19,825	17,842	1,982
Electricity Usage (kWh)	42,938	40,791	2,147
Nat Gas Cost ($)	$17,842	$16,058	$1,784
Electricity Cost ($)	$7,299	$6,934	$365
Energy Cost ($)	$25,142	$22,993	$2,149
COMMENTS:			

Demand savings due to implementation of this ECM is minimal.

The cost of a full DDC system with new field devices, controllers, computer, software, programming, etc. is approximately $4.79 per SF in accordance with recent Contractor pricing for systems of this magnitude. Savings from the implementation of this ECM will be from the reduced energy consumption currently used by the HVAC system by proper control of schedule and temperatures via the DDC system.

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$251,080
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$251,080
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,149
Total Yearly Savings ($/Yr):	$2,149
Estimated ECM Lifetime (Yr):	15
Simple Payback	116.8
Simple Lifetime ROI	-87.2%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$32,235
Internal Rate of Return (IRR)	-19%
Net Present Value (NPV)	($225,425.38)

ECM #6: Steam Boiler Burner & Controls Upgrade

Description:

The majority of the heating is provided to the Clifton Public School #13 by two gas fired AL Eastmond and Sons Inc. steam boilers. These boilers are very old and have very limited control of the burners. Based on the age and condition of the boilers, it is estimated that they could receive a 5%-10% increase in efficiency

This ECM will install new Cleaver Brooks Profire burner with Honeywell controls on each of these boilers with separate motors that will control fuel flow, excess air oxygen trim and variable speed on the blower. Installation of this system will result in improved operating efficiency of the boilers and less cycling of boilers since the boilers can operate closer to the demanded load requirement. These burners can also be equipped with parallel positioning for further control.

Energy Savings Using Hand Calculations:

Annual Heating Energy Savings = Existing Fuel Consumption **x** 5% Efficiency Increase

Heating Cost Savings = Annual Heating Energy **x** Fuel Cost $/Unit

Savings were calculated with a spreadsheet and are tabulated below:

Month	Days	HDD	Fuel Usage , kBtu	Fuel Usage, Therms	Avg Boiler Input Load, Btu/h	Fuel Usage Reduction, kBtu	Fuel Usage Reduction, Therms	Fuel Cost Savings
January	31	914	647,360.0	6,473.6	870,107.5	32,368.0	323.7	$291
February	28	708	495,616.9	4,956.2	737,525.1	24,780.8	247.8	$223
March	31	461	73,907.3	739.1	99,337.7	3,695.4	37.0	$33
April	30	311	73,910.0	739.1	102,652.8	3,695.5	37.0	$33
May	31	90	0.0	0.0	0.0	0.0	0.0	$0
June	30	25	0.0	0.0	0.0	0.0	0.0	$0
July	31	0	0.0	0.0	0.0	0.0	0.0	$0
August	31	1	0.0	0.0	0.0	0.0	0.0	$0
September	30	40	0.0	0.0	0.0	0.0	0.0	$0
October	31	219	154,253.1	1,542.5	207,329.4	7,712.7	77.1	$69
November	30	656	354,170.1	3,541.7	491,902.9	17,708.5	177.1	$159
December	31	732	550,557.1	5,505.6	739,996.1	27,527.9	275.3	$248
Total	**365**	**4,157**	**2,349,774.5**	**23,497.7**		**117,489**	**1,175**	**$1,057**

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$51,000
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$51,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,057
Total Yearly Savings ($/Yr):	$1,057
Estimated ECM Lifetime (Yr):	21
Simple Payback	48.2
Simple Lifetime ROI	-56.5%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	$22,197
Internal Rate of Return (IRR)	-7%
Net Present Value (NPV)	($34,706.32)

ECM #7: Steam Trap Replacement Program

Description:

Steam traps are required for the proper operation of steam distribution systems. Traps are mechanical devices installed on steam pipes to remove condensate from steam flow. When working properly, traps allow condensate to pass, while keeping the steam in the system to deliver heat where it is needed. Unfortunately steam traps have a tendency to leak. On average, steam traps have a useful life of 5 years, and with the large quantity of traps typically used within a facility, maintenance personnel have a hard time keeping up with the replacements. As a result, steam is lost and energy is wasted.

This ECM would replace approximately sixteen (16) steam traps throughout the building. All non-thermostatic traps will be replaced with either bucket or float & thermostatic traps. Thermostatic traps will be repaired with cage units and new covers. Where repairing is not feasible, the thermostatic traps will be replaced. Schedule 80 piping and extra heavy fittings will be used, and all piping and fittings between the unions will be replaced along with the steam traps. In addition, a complete steam trap survey will be performed along with tagging and implementing a 3-year, revolving, steam trap maintenance program.

Energy Savings Calculations:

See **Appendix G** for a detailed analysis.

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$55,640
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$55,640
Maintenance Savings ($/Yr):	($3,577)
Energy Savings ($/Yr):	$5,316
Total Yearly Savings ($/Yr):	$1,739
Estimated ECM Lifetime (Yr):	10
Simple Payback	32.0
Simple Lifetime ROI	-68.7%
Simple Lifetime Maintenance Savings	($35,770)
Simple Lifetime Savings	$17,390
Internal Rate of Return (IRR)	-17%
Net Present Value (NPV)	($40,805.98)

ECM #8: CRT Monitor Replacement

Description:

Clifton School #13 still utilizes CRT Monitors for use by its staff and students. These monitors not only utilize more energy in operating mode, but also while in idle mode. Typical monitors throughout the buildings consisted of 15 inch size monitors.

This ECM will replace all remaining eighty-seven (87) existing CRT monitors throughout the school with new 19" Widescreen Dell LCD Model P1911 with AX510 sounds bars. It is assumed the IT department will distribute and install the monitors throughout the district.

Energy Savings Calculations / Results:

Savings calculations were based on operating occupied hours per week of operating staff and students, and estimated idle time of monitors per week outside occupied hours. Power consumption data is based on actual monitor characteristics for a Dell CRT Model E773c, and Dell LCD Model P1911.

$$Energy\ Savings = Qty \times Op\ Hrs \times P_O + Qty \times IdleHrs \times P_I$$

Qty = Quantity
Op Hrs = Operating Hours per Year
Idle Hrs = Idle Hours per Year
P_O = Operating Power Consumption Watts
P_I = Idle Power Consumption Watts

CRT MONITOR REPLACEMENT CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	15" CRT	19" LCD	
# of Monitors	87	87	
Power Cons. (W)	71	23	48
Idle Power Cons. (W)	5	0.5	4.5
Operating Hrs per Week	33	33	
Operating Weeks per Yr	41	41	
Idle Hrs per Week	136	136	
Idle Weeks per Yr	41	41	
Elec Cost ($/kWh)	0.170	0.170	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Electric Demand (kW)	6.177	2.001	4.176
Electric Usage (kWh)	10,647	2,908	7,739
Energy Cost ($)	$1,810	$494	$1,316
COMMENTS:	Savings Based on Dell 15" CRT Monitor Compared with Dell 19 " LCD Model P1911 w/ AX510 Soundbar		

Energy Savings Summary:

ECM #8 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$17,661
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$17,661
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,316
Total Yearly Savings ($/Yr):	$1,316
Estimated ECM Lifetime (Yr):	15
Simple Payback	13.4
Simple Lifetime ROI	11.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$19,740
Internal Rate of Return (IRR)	1%
Net Present Value (NPV)	($1,950.68)

REM #1: 84.37 kW Solar System

Description:

The Clifton Elementary School #13 has available roof space that could accommodate a significant amount of solar generation, assuming the roof can accommodate the additional panel weight. Based on the available areas a 84.37 kilowatt solar array could be installed. The array will produce approximately 97,494 kilowatt-hours annually that will reduce the overall electric usage of the facility by 64.03%.

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}):	84.37
Electric Generation (KWH/Yr):	97,494
Installation Cost ($):	$519,521
SREC Revenue ($/Yr):	$18,630
Energy Savings ($/Yr):	$16,574
Total Yearly Savings ($/Yr):	$35,204
ECM Analysis Period (Yr):	15
Simple Payback (Yrs):	14.8
Analysis Period Electric Savings ($):	$308,258
Analysis Period SREC Revenue ($):	$269,872
Net Present Value (NPV)	($162,194.48)

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. While the District is already performing many of these functions through routine maintenance it is important to continue to address these items as they provide an energy savings benefit.

A. Maintain all weather stripping on windows and doors.

B. Clean all light fixtures to maximize light output.

C. Provide more frequent air filter changes to decrease overall system power usage and maintain better IAQ.

D. Turn off computers when not in use. Ensure computers are not running in screen saver mode.

E. Replace older style CRT monitors with newer energy efficient LCD/LED monitors.

F. Ensure outside air dampers are functioning properly and only open during occupied mode.

APPENDIX A

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Clifton Public Schools – School #13

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)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^{n_i}}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^{n_i}}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
ECM #1	Lighting Upgrade - General	$24,635	$27,610	$4,620	$47,625	$4,353	$0	$4,353	15	$65,295	$0	37.1%	10.9	4.23%	$4,340.83
ECM #2	Lighting Upgrade - Gym	$3,188	$4,840	$1,000	$7,028	$345	$0	$345	15	$5,175	$0	-26.4%	20.4	-3.60%	($2,909.41)
ECM #3	Lighting Upgrade - Exterior	$400	$160	$200	$360	$101	$0	$101	15	$1,515	$0	320.8%	3.6	27.31%	$845.73
ECM #4	Lighting Controls Upgrade	$8,750	$4,950	$1,150	$12,550	$1,080	$0	$1,080	15	$16,200	$0	29.1%	11.6	3.38%	$342.97
ECM #5	DDC Controls Upgrade	$251,080	$0	$0	$251,080	$2,149	$0	$2,149	15	$32,235	$0	-87.2%	116.8	-18.88%	($225,425.38)
ECM #6	New Boiler Burner and Contols	$26,000	$25,000	$0	$51,000	$1,057	$0	$1,057	21	$22,197	$0	-56.5%	48.2	-6.58%	($34,706.32)
ECM #7	Steam Trap Replacement	$15,440	$40,200	$0	$55,640	$5,316	($3,577)	$1,739	10	$17,390	-$35,770	-68.7%	32.0	-16.99%	($40,805.98)
ECM #8	CRT Monitor Replacement	$17,661	$0	$0	$17,661	$1,316	$0	$1,316	15	$19,740	$0	11.8%	13.4	1.42%	($1,950.68)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	84.37 KW PV System	$519,521	$0	$0	$519,521	$16,574	$18,630	$35,204	15	$528,054	$279,444	1.6%	14.8	0.20%	($99,263.31)

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
10-Clifton BOE - PS 13

Building ID: 3477581
For 12-month Period Ending: February 28, 2013[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: April 11, 2013

Facility
10-Clifton BOE - PS 13
782 Van Houten Avenue
Clifton, NJ 07013

Facility Owner
Clifton BOE
745 Clifton Avenue
Clifton, NJ 07013

Primary Contact for this Facility
Karen Perkins
745 Clifton Avenue
Clifton, NJ 07013

Year Built: 1928
Gross Floor Area (ft²): 52,460

Energy Performance Rating[2] (1-100) 60

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	512,069
Natural Gas (kBtu)[4]	2,185,805
Total Energy (kBtu)	2,697,874

Energy Intensity[4]

Site (kBtu/ft²/yr)	51
Source (kBtu/ft²/yr)	76

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	189

Electric Distribution Utility
Public Service Electric & Gas Co

National Median Comparison

National Median Site EUI	57
National Median Source EUI	84
% Difference from National Median Source EUI	-9%
Building Type	K-12 School

Stamp of Certifying Professional

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

Meets Industry Standards[5] **for Indoor Environmental Conditions:**

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

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

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

ENERGY STAR® Data Checklist for Commercial Buildings

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

Please complete and sign this checklist and include it with the stamped, signed Statement of Energy Performance.
NOTE: You must check each box to indicate that each value is correct, OR include a note.

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Building Name	10-Clifton BOE - PS 13	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	782 Van Houten Avenue, Clifton, NJ 07013	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.		☐
Elementary School 13 (K-12 School)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	52,460 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	92 (Default)	Is this the number of personal computers in the K12 School?		☐
Number of walk-in refrigeration/freezer units	0	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	No	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	0 %	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 (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
01/15/2013	02/14/2013	17,310.00
12/15/2012	01/14/2013	16,035.00
11/15/2012	12/14/2012	16,095.00
10/15/2012	11/14/2012	13,950.00
09/15/2012	10/14/2012	12,690.00
08/15/2012	09/14/2012	7,710.00
07/15/2012	08/14/2012	5,460.00
06/15/2012	07/14/2012	8,985.00
05/15/2012	06/14/2012	12,180.00
04/15/2012	05/14/2012	12,375.00
03/15/2012	04/14/2012	13,590.00

Electric Consumption (kWh (thousand Watt-hours))	**136,380.00**
Electric Consumption (kBtu (thousand Btu))	**465,328.56**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))	**465,328.56**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?	☐

Fuel Type: Natural Gas

Meter: gas (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
01/15/2013	02/14/2013	6,473.60
12/15/2012	01/14/2013	5,505.57
11/15/2012	12/14/2012	3,541.70
10/15/2012	11/14/2012	1,542.53
09/15/2012	10/14/2012	0.00
08/15/2012	09/14/2012	0.00
07/15/2012	08/14/2012	0.00
06/15/2012	07/14/2012	0.00
05/15/2012	06/14/2012	0.00
04/15/2012	05/14/2012	739.10
03/15/2012	04/14/2012	739.07

gas Consumption (therms)	**18,541.57**
gas Consumption (kBtu (thousand Btu))	**1,854,157.00**
Total Natural Gas Consumption (kBtu (thousand Btu))	**1,854,157.00**
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
10-Clifton BOE - PS 13
782 Van Houten Avenue
Clifton, NJ 07013

Facility Owner
Clifton BOE
745 Clifton Avenue
Clifton, NJ 07013

Primary Contact for this Facility
Karen Perkins
745 Clifton Avenue
Clifton, NJ 07013

General Information

10-Clifton BOE - PS 13	
Gross Floor Area Excluding Parking: (ft^2)	52,460
Year Built	1928
For 12-month Evaluation Period Ending Date:	February 28, 2013

Facility Space Use Summary

Elementary School 13	
Space Type	K-12 School
Gross Floor Area (ft^2)	52,460
Open Weekends?	No
Number of PCs [d]	92
Number of walk-in refrigeration/freezer units	0
Presence of cooking facilities	No
Percent Cooled	0
Percent Heated	100
Months [o]	10
High School?	No
School District [o]	clifton

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 02/28/2013)	**Baseline** (Ending Date 02/28/2013)	**Rating of 75**	**Target**	**National Median**
Energy Performance Rating	60	60	75	N/A	50
Energy Intensity					
Site ($kBtu/ft^2$)	51	51	44	N/A	57
Source ($kBtu/ft^2$)	76	76	66	N/A	84
Energy Cost					
$/year	N/A	N/A	N/A	N/A	N/A
$/$ft^2$/year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
$MtCO_2e$/year	189	189	163	N/A	208
$kgCO_2e/ft^2$/year	4	4	3	N/A	4

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.

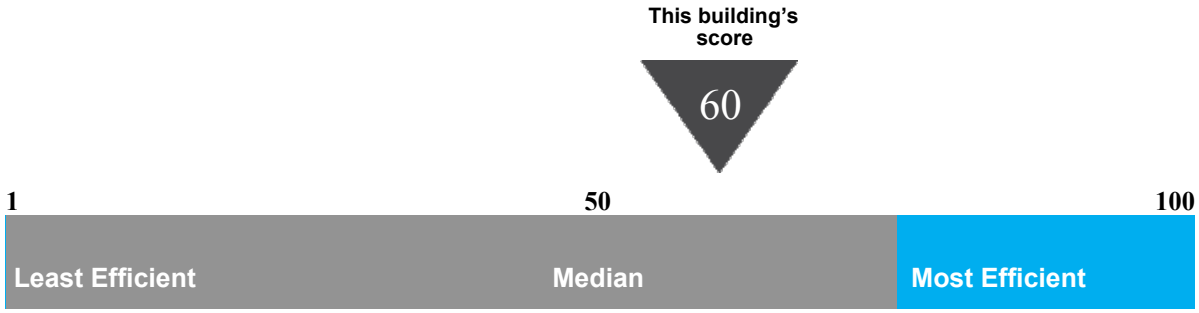
Statement of Energy Performance

2013

10-Clifton BOE - PS 13
782 Van Houten Avenue
Clifton, NJ 07013

Portfolio Manager Building ID: 3477581

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 76 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending February 2013

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: 04/11/2013

APPENDIX D

MAJOR EQUIPMENT LIST

Concord Engineering Group

AC Units

Tag	UV		
Unit Type	Unit Ventilator		
Qty	29		
Location	Classrooms		
Area Served	Classrooms		
Manufacturer	Nesbitt		
Model #	-		
Serial #	-		
Cooling Type	N/A		
Cooling Capacity (Tons)	N/A		
Cooling Efficiency (SEER/EER)	N/A		
Heating Type	Steam		
Heating Input (MBH)	-		
Efficiency	-		
Fuel	-		
Approx Age	-		
ASHRAE Service Life	25		
Remaining Life	-		
Comments			

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

AHUs

Tag	HV-1		
Unit Type	Heating and Ventilation		
Qty	2		
Location	Gym Fan Room		
Area Served	Gym		
Manufacturer	Nesbitt		
Model #	-		
Serial #	-		
Cooling Type	N/A		
Cooling Capacity (Tons)	N/A		
Heating Type	Steam		
Heating Input (MBH)	-		
Supply Fan (HP)	-		
Return Fan (HP)	-		
Electrical (V/H/P)	-		
Approx Age	-		
ASHRAE Service Life	25		
Remaining Life	-		
Comments			

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

0

Boilers

Tag	**B-1 & B-2**		
Unit Type	Steam Boiler		
Qty	2		
Location	Boiler Room		
Area Served	Building Heat		
Manufacturer	AL Eastmond & Sons Inc		
Model #	FST-159		
Serial #	7293 & 7294		
Input Capacity (Btu/Hr)	6,300,000		
Rated Output Capacity (Btu/Hr)	5,021,000		
Approx. Efficiency %	79.7%		
Fuel	Natural Gas		
Approx Age	20		
ASHRAE Service Life	25		
Remaining Life	5		
Comments			

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

0

Domestic Water Heaters

Tag	**DHW-1**		
Unit Type	Domestic HWH		
Qty	1		
Location	Gym Fan Room		
Area Served	Buildin DHW		
Manufacturer	Rheem		
Model #	82V30-2		
Serial #	RH Q361228181		
Size (Gallons)	30		
Input Capacity (MBH/KW)	9 kW		
Recovery (Gal/Hr)	-		
Efficiency %	100%		
Fuel	Electricity		
Approx Age	1		
ASHRAE Service Life	10		
Remaining Life	9		
Comments			

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

0

Pumps

Tag	**CRP-1**		
Unit Type	Condensate Return Pump		
Qty	1		
Location	Boiler Room		
Area Served	Boiler 1 &2		
Manufacturer	-		
Model #	-		
Serial #	-		
Horse Power	2		
Flow	-		
Motor Info	Baldor		
Electrical Power	208-230/460 V 3 Ph		
RPM	3450		
Motor Efficiency %	80.0%		
Approx Age	-		
ASHRAE Service Life	15		
Remaining Life	-		
Comments			

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

Exhaust Fans

Tag	EF-1 & EF-2		
Unit Type	Exhaust Fan		
Qty	2		
Location	Gym Fan Room		
Area Served	Gym		
Manufacturer	-		
Model #	ED8HC		
Serial #	-		
Motor (HP)	1 1/2		
Electrical (V/H/P)	208/60/3		
Approx Age	-		
ASHRAE Service Life	15		
Remaining Life	-		
Comments	5460 CFM		

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

APPENDIX E

CEG Project #: 9C12066
Facility Name: School #13
Address: 782 Van Houten Avenue
City, State, Zip Clifton, NJ

			EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT							RETROFIT ENERGY SAVINGS			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, $	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $
2	1 - Special Education #1	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	9	0.98	1,373	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	9	0.65	907	0.33	466	$79	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	181	$31
2	1 - Special Education #2	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	9	0.98	1,373	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	9	0.65	907	0.33	466	$79	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	181	$31
2	1 - Special Education #3	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	9	0.98	1,373	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	9	0.65	907	0.33	466	$79	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	181	$31
2	1 - Special Education #4	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	9	0.98	1,373	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	9	0.65	907	0.33	466	$79	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	181	$31
2	1 - Classroom #5	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	9	0.98	1,373	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	9	0.65	907	0.33	466	$79	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	181	$31
2	1 - Classroom #6	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	9	0.98	1,373	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	9	0.65	907	0.33	466	$79	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	181	$31
5	1- Storage Room #7	800	1x4 3-Lamp T12 34 W Magnetic Pendant Mount	3	130	1	0.13	104	Re-ballast & Re-lamp	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	1	0.07	58	0.06	46	$8	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	12	$2
2	1 - Cafeteria #8	1600	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	8	0.87	1,395	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	8	0.58	922	0.30	474	$81	5	Dual Technology Occupancy Sensor - Remote Mnt.	2	20.0%	184	$31
2	1 - Nurse #9	1600	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	4	0.44	698	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	4	0.29	461	0.15	237	$40	0	No New Controls	0	0.0%	0	$0
12	1 - Nurse #9 Toilet	800	60 W A-Lamp Incandescent	1	60	1	0.06	48	Re-Lamp	13w CFL Screw Base	1	13	1	0.01	10	0.05	38	$6	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	2	$0
9	1 - Mutipurpose Room #10	1600	2x4 3-Lamp T8 32 W Surface Wrap	3	87	4	0.35	557	Existing to Remain	Existing to Remain	3	87	0	0.35	557	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
10	1 - Mutipurpose Room #10	1600	2x8 4-Lamp T12 F96 Surface Wrap	4	450	3	1.35	2,160	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	6	147	3	0.44	706	0.91	1,454	$247	0	No New Controls	0	0.0%	0	$0
13	1 - Stage #11	1600	75 W Flood Lamps	1	75	15	1.13	1,800	Re-Lamp	20w LED PAR 38	1	20	15	0.30	480	0.83	1,320	$224	0	No New Controls	0	0.0%	0	$0
2	1 - Office #12	1600	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	8	0.87	1,395	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	8	0.58	922	0.30	474	$81	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	184	$31
1	1 - Kitchen #13	1600	1x4 2-Lamp T8 32 W Surface Wrap	2	58	4	0.23	371	Existing to Remain	Existing to Remain	2	58	0	0.23	371	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	74	$13
2	1 - Special Education #16	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	9	0.98	1,373	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	9	0.65	907	0.33	466	$79	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	181	$31
1	1 - Cafeteria #15	1600	1x4 2-Lamp T8 32 W Surface Wrap	2	58	4	0.23	371	Existing to Remain	Existing to Remain	2	58	0	0.23	371	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	2	20.0%	74	$13
1.1	1 - Cafeteria #15	1600	1x4 2-Lamp T8 32 W Surface Wrap Magnetic Ballast	2	76	24	1.82	2,918	Re-ballast	Sylvania Ballast QHE2X32T8/UNV ISL-SC	2	48	24	1.15	1,843	0.67	1,075	$183	5	Dual Technology Occupancy Sensor - Remote Mnt.	2	20.0%	369	$63
2	1 - Special Education #16	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	9	0.98	1,373	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	9	0.65	907	0.33	466	$79	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	181	$31
11	1 - Gymnasium #17	1600	400 W HID Highbay Metal Halide	1	455	10	4.55	7,280	Remove & Replace New Fixture	2x4, 6 Lamp, 54w T5, (3) 2/54 Elect. Ballast, Singlepoint Mnt., High Bay, Wire Guard, Lens	4	360	10	3.60	5,760	0.95	1,520	$258	0	No New Controls	0	0.0%	0	$0

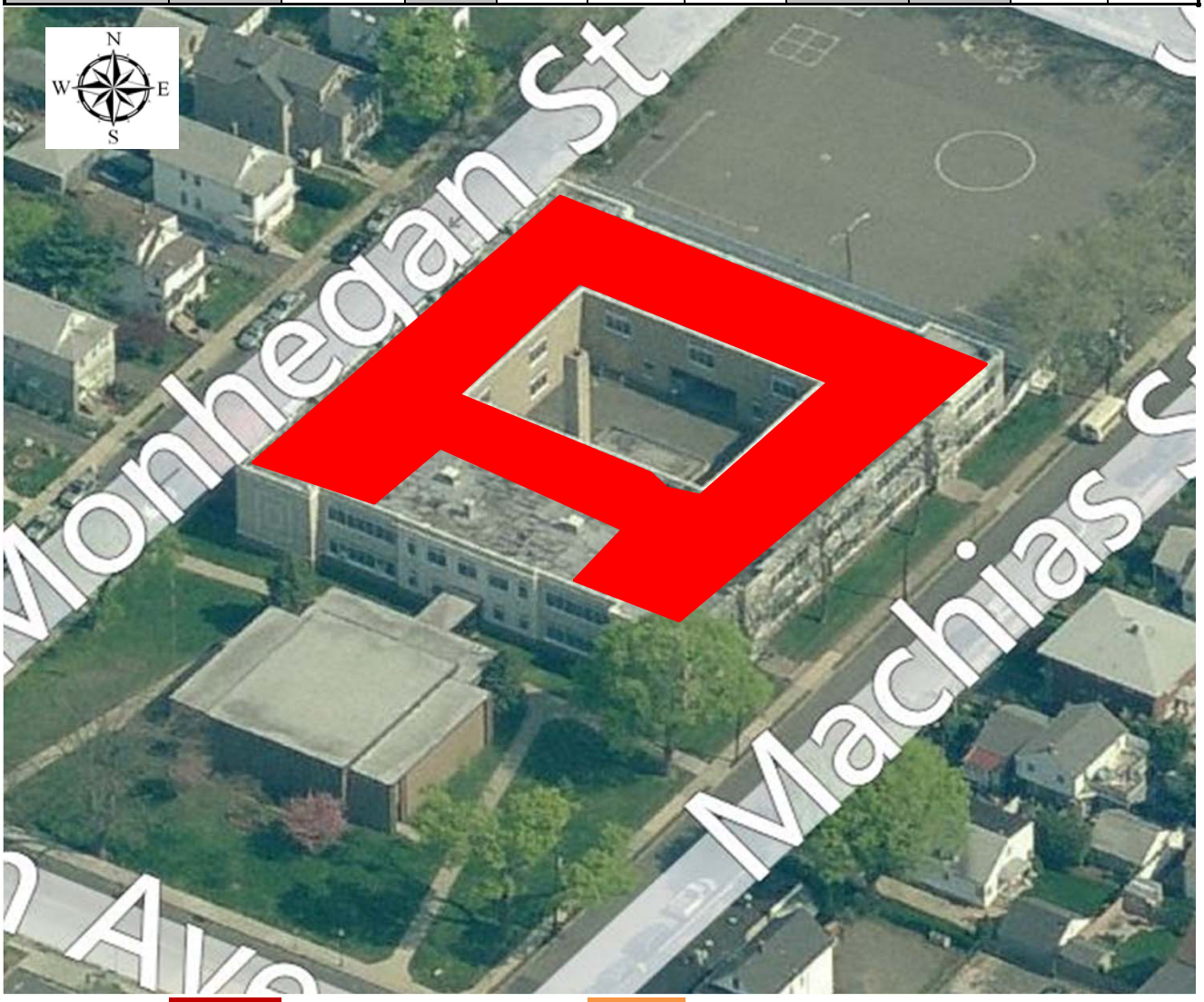
			EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT						RETROFIT ENERGY SAVINGS			PROPOSED LIGHTING CONTROLS					
Fixture Reference #	Location	Average Burn Hours	Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, $	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $
14	1 - Gymnasium #17	1600	R30 100W Down light	1	100	4	0.40	640	Re-Lamp	20w LED PAR 38	1	20	4	0.08	128	0.32	512	$87	0	No New Controls	0	0.0%	0	$0
3	1 - Gym Office	1600	1x4 2-Lamp T12 34 W Magnetic Surface Wrap	2	76	2	0.15	243	Re-ballast & Re-lamp	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	2	48	2	0.10	154	0.06	90	$15	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	31	$5
15	1 - Gym Storage	800	100 W Incandescent Medium Base A-Lamp	1	100	4	0.40	320	Re-Lamp	23w CFL Screw Base	1	23	4	0.09	74	0.31	246	$42	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	15	$3
15	1 - Gym Mech Mezz	1000	100 W Incandescent Medium Base A-Lamp	1	100	2	0.20	200	Re-Lamp	23w CFL Screw Base	1	23	2	0.05	46	0.15	154	$26	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	9	$2
1	1 - Gym Boy's Restroom	2000	1x4 2-Lamp T8 32 W Surface Wrap	2	58	2	0.12	232	Existing to Remain	Existing to Remain	2	58	0	0.12	232	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	46	$8
1	1 - Gym Girl's Restroom	2000	1x4 2-Lamp T8 32 W Surface Wrap	2	58	2	0.12	232	Existing to Remain	Existing to Remain	2	58	0	0.12	232	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	46	$8
15	1 - Restroom Janitor Closet	800	100 W Incandescent Medium Base A-Lamp	1	100	1	0.10	80	Re-Lamp	23w CFL Screw Base	1	23	1	0.02	18	0.08	62	$10	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	4	$1
3	1 - Custodial Room	1000	1x4 2-Lamp T12 34 W Magnetic Surface Wrap	2	76	3	0.23	228	Re-ballast & Re-lamp	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	2	48	3	0.14	144	0.08	84	$14	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	29	$5
2	1 - Storage Across from Custodial	800	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	4	0.44	349	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	4	0.29	230	0.15	118	$20	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	46	$8
4	1 - Storage by Office #12	800	2x4 4-Lamp T8 32 W Surface Wrap	4	109	1	0.11	87	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	1	0.07	58	0.04	30	$5	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	12	$2
2	1 - Storage by Office #12	800	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	1	0.11	87	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	1	0.07	58	0.04	30	$5	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	12	$2
6	1 - Toilet Room by Offfice #12	2000	2x4 4-Lamp T12 34 W Magnetic Surface Wrap	4	160	2	0.32	640	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	2	0.14	288	0.18	352	$60	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	58	$10
6	1 - Restroom by Room #16	2000	2x4 4-Lamp T12 34 W Magnetic Surface Wrap	4	160	2	0.32	640	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	2	0.14	288	0.18	352	$60	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	58	$10
16	1 - Restroom Closet by Room #16	800	150 W Incandescent Medium Base A-Lamp	1	150	1	0.15	120	Re-Lamp	42w CFL Screw Base	1	42	1	0.04	34	0.11	86	$15	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	7	$1
16	1 - Storage by Room #1	800	150 W Incandescent Medium Base A-Lamp	1	150	2	0.30	240	Re-Lamp	42w CFL Screw Base	1	42	2	0.08	67	0.22	173	$29	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	13	$2
2	1 - Storage by Room #2	800	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	2	0.22	174	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	2	0.14	115	0.07	59	$10	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	23	$4
6	1 - Restroom by Room #3	2000	2x4 4-Lamp T12 34 W Magnetic Surface Wrap	4	160	2	0.32	640	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	2	0.14	288	0.18	352	$60	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	58	$10
16	1 - Restroom Closet by Room #3	800	150 W Incandescent Medium Base A-Lamp	1	150	1	0.15	120	Re-Lamp	42w CFL Screw Base	1	42	1	0.04	34	0.11	86	$15	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	7	$1
16	1 - Mechanical Room	1000	150 W Incandescent Medium Base A-Lamp	1	150	8	1.20	1,200	Re-Lamp	42w CFL Screw Base	1	42	8	0.34	336	0.86	864	$147	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	67	$11
2	1 - Gym Connecting Corridor	2000	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	4	0.44	872	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	4	0.29	576	0.15	296	$50	0	No New Controls	0	0.0%	0	$0
2	1 - Monhegan St. Side Corridor	2000	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	14	1.53	3,052	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	14	1.01	2,016	0.52	1,036	$176	0	No New Controls	0	0.0%	0	$0
2	1 - Machias St. Side Corridor	2000	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	9	0.98	1,962	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	9	0.65	1,296	0.33	666	$113	0	No New Controls	0	0.0%	0	$0

			EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT							RETROFIT ENERGY SAVINGS			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, $	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $
3	1 - Monhegan St. Stair North	2000	1x4 2-Lamp T12 34 W Magnetic Surface Wrap	2	76	1	0.08	152	Re-ballast & Re-lamp	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	2	48	1	0.05	96	0.03	56	$10	0	No New Controls	0	0.0%	0	$0
7	1 - Monhegan St. Stair North	2000	1x4 2-Lamp T8 32 W Pendant Wrap	2	58	3	0.17	348	Existing to Remain	Existing to Remain	2	58	0	0.17	348	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
1	1 - Monhegan St. Stair South	2000	1x4 2-Lamp T8 32 W Surface Wrap	2	58	1	0.06	116	Existing to Remain	Existing to Remain	2	58	0	0.06	116	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
7	1 - Monhegan St. Stair South	2000	1x4 2-Lamp T8 32 W Pendant Wrap	2	58	3	0.17	348	Existing to Remain	Existing to Remain	2	58	0	0.17	348	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
1	1 - Machias St. Stair North	2000	1x4 2-Lamp T8 32 W Surface Wrap	2	58	1	0.06	116	Existing to Remain	Existing to Remain	2	58	0	0.06	116	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
7	1 - Machias St. Stair North	2000	1x4 2-Lamp T8 32 W Pendant Wrap	2	58	3	0.17	348	Existing to Remain	Existing to Remain	2	58	0	0.17	348	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
1	1 - Machias St. Stair South	2000	1x4 2-Lamp T8 32 W Surface Wrap	2	58	1	0.06	116	Existing to Remain	Existing to Remain	2	58	0	0.06	116	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
7	1 - Machias St. Stair South	2000	1x4 2-Lamp T8 32 W Pendant Wrap	2	58	3	0.17	348	Existing to Remain	Existing to Remain	2	58	0	0.17	348	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
2	2 - Classroom #1	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	9	0.98	1,373	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	9	0.65	907	0.33	466	$79	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	181	$31
2	2 - Classroom #2	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	1	0.11	153	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	1	0.07	101	0.04	52	$9	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	20	$3
2.1	2 - Classroom #2	1400	2x4 4-Lamp T8 32 W Recessed Prismatic Magnetic Ballast	4	152	11	1.67	2,341	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	11	0.79	1,109	0.88	1,232	$209	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	222	$38
2	2 - Classroom #3	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	9	0.98	1,373	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	9	0.65	907	0.33	466	$79	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	181	$31
2	2 - Teachers' Room #4	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	2	0.22	305	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	2	0.14	202	0.07	104	$18	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	40	$7
12	2 - Teachers' Room Toilet	800	60 W A-Lamp Incandescent	1	60	1	0.06	48	Re-Lamp	13w CFL Screw Base	1	13	1	0.01	10	0.05	38	$6	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	2	$0
2	2 - Classroom #5	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	9	0.98	1,373	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	9	0.65	907	0.33	466	$79	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	181	$31
2	2 - Classroom #6	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	9	0.98	1,373	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	9	0.65	907	0.33	466	$79	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	181	$31
2	2 - Classroom #7	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	9	0.98	1,373	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	9	0.65	907	0.33	466	$79	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	181	$31
2	2 - Classroom #8	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	9	0.98	1,373	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	9	0.65	907	0.33	466	$79	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	181	$31
2	2 - Classroom #10	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	9	0.98	1,373	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	9	0.65	907	0.33	466	$79	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	181	$31
2	2 - Kindergarten #11	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	9	0.98	1,373	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	9	0.65	907	0.33	466	$79	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	181	$31
2	2 - General Office #12	1600	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	2	0.22	349	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	2	0.14	230	0.07	118	$20	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	46	$8
2	2 - Principal's Office	1600	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	1	0.11	174	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	1	0.07	115	0.04	59	$10	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	23	$4

			EXISTING FIXTURES						PROPOSED FIXTURE RETROFIT						RETROFIT ENERGY SAVINGS			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, $	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $
2	2 - Classroom #14	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	9	0.98	1,373	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	9	0.65	907	0.33	466	$79	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	181	$31
2	2 - Classroom #15	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	9	0.98	1,373	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	9	0.65	907	0.33	466	$79	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	181	$31
2	2 - Classroom #16	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	9	0.98	1,373	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	9	0.65	907	0.33	466	$79	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	181	$31
2	2 - Classroom #17	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	9	0.98	1,373	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	9	0.65	907	0.33	466	$79	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	181	$31
2	2 - Classroom #18	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	9	0.98	1,373	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	9	0.65	907	0.33	466	$79	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	181	$31
2	2 - Classroom #19	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	9	0.98	1,373	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	9	0.65	907	0.33	466	$79	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	181	$31
2	2 - Small Group 20, 21	1400	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	4	0.44	610	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	4	0.29	403	0.15	207	$35	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	81	$14
1.1	2 - Media Center 22, 23	1400	1x4 2-Lamp T8 32 W Surface Wrap Magnetic Ballast	2	76	16	1.22	1,702	Re-ballast	Sylvania Ballast QHE2X32T8/UNV ISL-SC	2	48	16	0.77	1,075	0.45	627	$107	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	215	$37
1	2 - Media Center 22, 23	1400	1x4 2-Lamp T8 32 W Surface Wrap	2	58	16	0.93	1,299	Existing to Remain	Existing to Remain	2	58	0	0.93	1,299	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	260	$44
8	2 - Toilet Room Classroom #11	800	2x2 4-Lamp T8 17 W Surface Prismatic	4	56	1	0.06	45	Existing to Remain	Existing to Remain	4	56	0	0.06	45	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	9	$2
16	2 - Closet Classroom #11	800	150 W Incandescent Medium Base A-Lamp	1	150	1	0.15	120	Re-Lamp	42w CFL Screw Base	1	42	1	0.04	34	0.11	86	$15	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	7	$1
2	2 - Monhegan St. Side Corridor	2000	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	8	0.87	1,744	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	8	0.58	1,152	0.30	592	$101	0	No New Controls	0	0.0%	0	$0
2	2 - Machias St. Side Corridor	2000	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	8	0.87	1,744	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	8	0.58	1,152	0.30	592	$101	0	No New Controls	0	0.0%	0	$0
2	2 - North Corridor	2000	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	8	0.87	1,744	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	8	0.58	1,152	0.30	592	$101	0	No New Controls	0	0.0%	0	$0
17	Exterior	4000	70W HPS Wall Pack	1	94	2	0.19	752	Replace	Lumark 20W LED Wall Pack XTOR2A-PC2	1	20	2	0.04	160	0.15	592	$101	0	No New Controls	0	0.0%	0	$0
2	2 - South Corridor	2000	2x4 4-Lamp T8 32 W Recessed Prismatic	4	109	10	1.09	2,180	De-lamp / Re-Lamp / Re-Ballast / Reflector	Sylvania Lamp FO28/841/XP/XL/SS/ECO3 Sylvania Ballast QHE2X32T8/UNV ISL-SC	3	72	10	0.72	1,440	0.37	740	$126	0	No New Controls	0	0.0%	0	$0
	TOTAL					**465**	**52**	**78,874**					**417**	**33**	**50,644**	**19**	**28,229**	**$4,799**			**61**	**12**	**6,355**	**$1,080**

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
School #13	8800	SHARP NU-U235F2	359	17.5	6,297	84.37	97,494	68.3	15,042	13.40



= Proposed Roof 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 - School #13**
Location: **Clifton, NJ**
Description: **Photovoltaic System 100% Financing - 15 year**

Simple Payback Analysis

	Photovoltaic System 100% Financing - 15 year
Total Construction Cost	$519,521
Annual kWh Production	97,494
Annual Energy Cost Reduction	$16,574
Average Annual SREC Revenue	$18,630

Simple Payback: **14.76** Years

Life Cycle Cost Analysis

Analysis Period (years): 15
Discount Rate: 3%
Average Energy Cost ($/kWh) **$0.170**
Financing Rate: 6.00%
Financing %: 100%
Maintenance Escalation Rate: 3.0%
Energy Cost Escalation Rate: 3.0%
Average SREC Value ($/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	97,494	$16,574	$0	$24,374	$30,572	$22,036	($11,661)	($11,661)
2	$0	97,007	$17,071	$0	$24,252	$29,213	$23,396	($11,285)	($22,946)
3	$0	96,521	$17,583	$0	$24,130	$27,770	$24,839	($10,894)	($33,841)
4	$0	96,039	$18,111	$0	$24,010	$26,238	$26,370	($10,488)	($44,328)
5	$0	95,559	$18,654	$984	$23,890	$24,611	$27,997	($11,049)	($55,377)
6	$0	95,081	$19,214	$979	$19,016	$22,884	$29,724	($15,358)	($70,734)
7	$0	94,605	$19,790	$974	$18,921	$21,051	$31,557	($14,871)	($85,606)
8	$0	94,132	$20,384	$970	$18,826	$19,105	$33,503	($14,367)	($99,973)
9	$0	93,662	$20,995	$965	$18,732	$17,038	$35,570	($13,845)	($113,818)
10	$0	93,193	$21,625	$960	$13,979	$14,844	$37,764	($17,964)	($131,782)
11	$0	92,728	$22,274	$955	$13,909	$12,515	$40,093	($17,380)	($149,162)
12	$0	92,264	$22,942	$950	$13,840	$10,042	$42,566	($16,777)	($165,939)
13	$0	91,803	$23,631	$946	$13,770	$7,417	$45,191	($16,153)	($182,092)
14	$0	91,344	$24,339	$941	$9,134	$4,630	$47,978	($20,075)	($202,167)
15	$0	90,887	$25,070	$936	$9,089	$1,671	$50,938	($19,386)	($221,553)
	Totals:	1,412,318	$308,258	$10,560	$269,872	$269,602	$519,521	($221,553)	($1,590,978)

Net Present Value (NPV) **($162,194)**

APPENDIX G

STEAM TRAP REPLACEMENT ANALYSIS

Calculation Assumptions		
Description	**Value**	**Units**
Ann. Gas Usage	23,497	Therm
Less DHW Gas Usage	0	Therm
Less Other Gas Usage	0	Therm
Net Heating Gas Usage	23,497	Therm
Est. Steam Production	1,751,764	lbs
Boiler Efficiency	75%	
Makeup Water	50	°F
Condenstate Return	200	°F
30% Makeup		
Feedwater Enthalpy	155	btu/lb
Steam Enthalpy	1161	btu/lb
Steam Production Conversion	74.55	lb / Th
Hours per Day On	8	
Days per Week	5.5	
Htg Months per Year	6	
Ann. System Operation	1,144	hrs / yr
Gas Cost ($/Th)	$0.90	
Trap Failure Rate	15.00%	

Building Area	Estimated Quantity
Boiler Plant	2
Air Handlers	2
Condensate Pumps	1
Various Classrooms	68
TOTAL	73

STEAM TRAP LOSS CALCULATION

Steam Trap Sizes	Trap Orifice Diamter (in)	Steam Loss lb/hr (15 PSI)	Quantity of Traps	Estimated Quantity Failed	Annual Steam Loss lbs	Annual Steam Loss Therm	Cost Savings
1/2" Trap	1/8"	13.70	0	0	0	0	$0
3/4" Trap	3/16"	30.70	68	10	358,232	4,805	$4,325
1" Trap	1/4"	54.70	2	0	18,773	252	$227
1 -1/2" Trap	3/8"	123.00	3	0	63,320	849	$764
TOTAL			**73**	**11**	**440,326**	**5,906**	**$5,316**