CLIFTON PUBLIC SCHOOLS
PUBLIC SCHOOL #2

1270 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 & Gas
Electric Utility Rate Structure:	General Lighting & Power Service (GLP)
Third Party Supplier:	Champion Energy Services LLC

Natural Gas Utility Provider:	Public Service Electric & 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: 728003059
Account No: 65 328 656 05
Third Party Utility Provider: Champion Energy Services LLC
TPS Meter / Acct No: -

MONTH OF USE	CONSUMPTION KWH	DEMAND KW	TOTAL BILL
Mar-12	17,340	70.2	$858
Apr-12	15,480	70.8	$801
May-12	7,200	71.4	$1,663
Jun-12	10,980	68.4	$2,061
Jul-12	5,820	34.2	$1,070
Aug-12	6,900	74.4	$1,677
Sep-12	13,620	72.0	$1,746
Oct-12	15,420	64.8	$1,902
Nov-12	10,560	78.6	$801
Dec-12	15,120	66.0	$1,877
Jan-13	13,680	73.8	$1,837
Feb-13	14,220	64.2	$1,823
Totals	**146,340**	**78.6 Max**	**$18,113**

AVERAGE DEMAND **67.4 KW average**
AVERAGE RATE **$0.124** **$/kWh**

Figure 1
Electricity Usage Profile

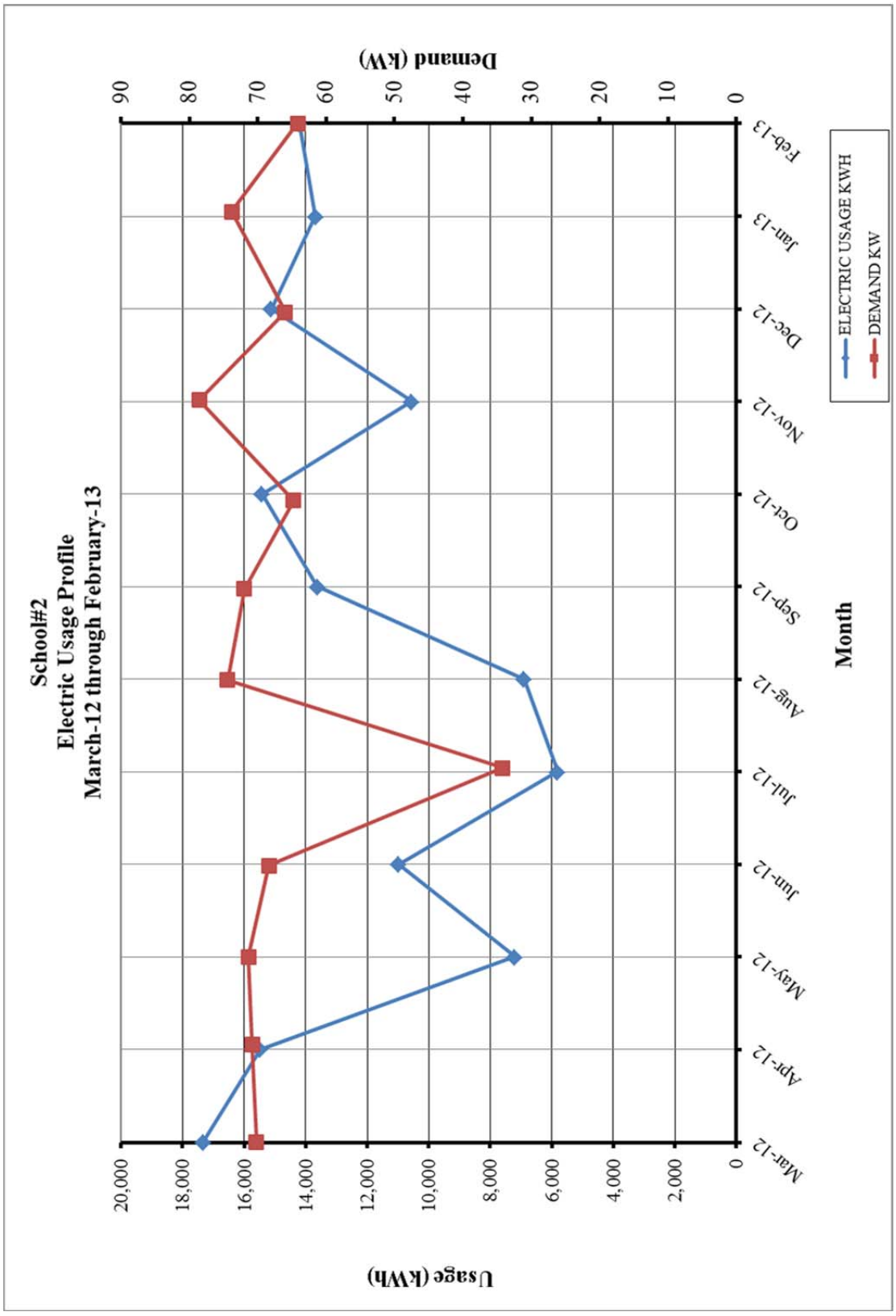
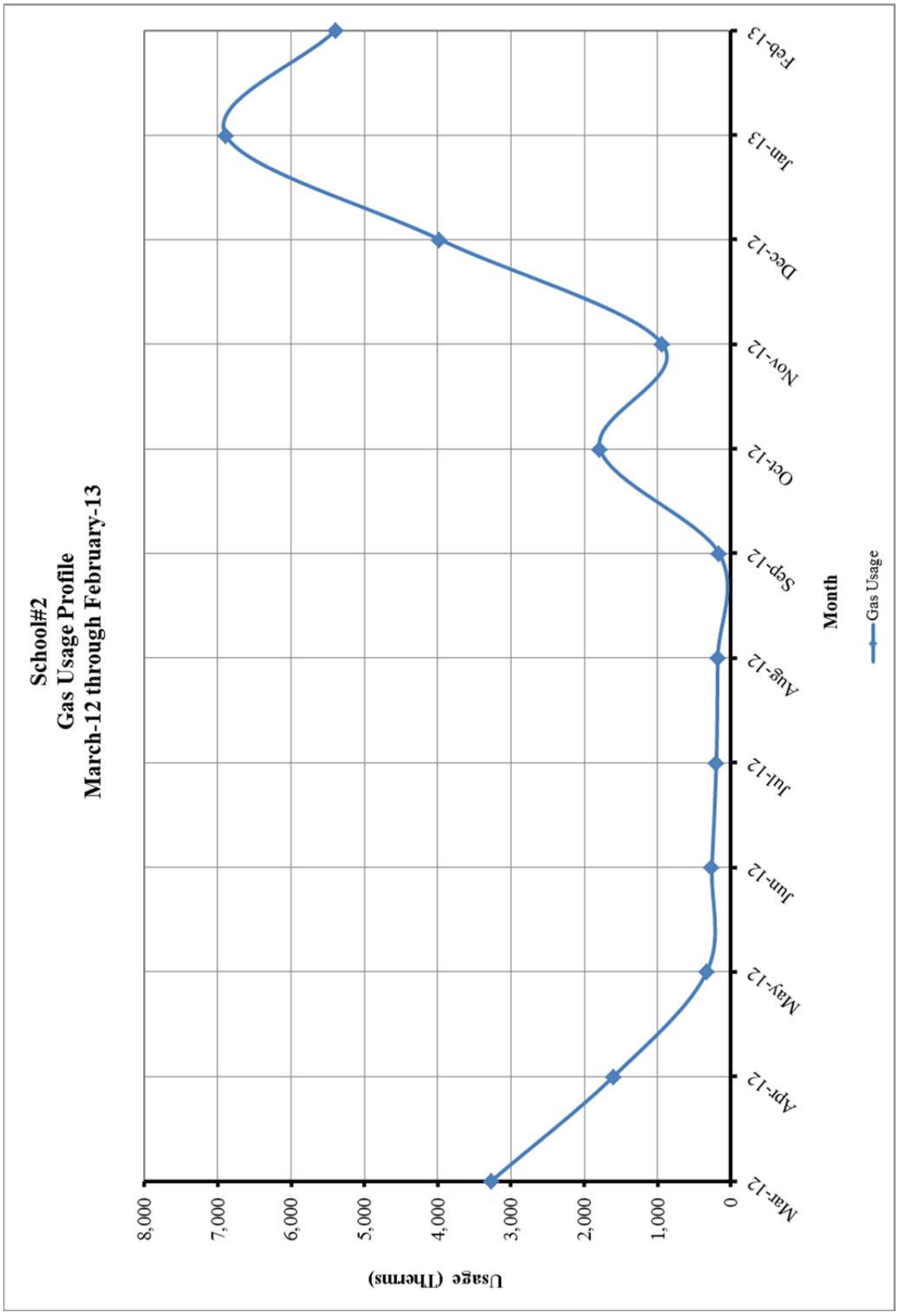


Table 2
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider: PSE&G		
Rate: GSG (HTG), LVG		
Meter No: 2663348, 3580022		
Account No: 65 328 656 05		
Third Party Utility Provider: Hess		
TPS Meter No: 446575/446941		
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Mar-12	3,269.93	$3,045.12
Apr-12	1,600.00	$453.66
May-12	330.35	$260.78
Jun-12	261.35	$276.00
Jul-12	199.59	$265.15
Aug-12	181.55	$270.42
Sep-12	162.82	$257.03
Oct-12	1,786.99	$1,156.88
Nov-12	937.29	$351.48
Dec-12	3,975.72	$5,572.52
Jan-13	6,895.40	$6,749.69
Feb-13	5,389.57	$5,614.14
TOTALS	**24,990.54**	**$24,272.87**
AVERAGE RATE:	**$0.97**	**$/THERM**

Figure 2
Natural Gas Usage Profile



II. FACILITY DESCRIPTION

School #2 is located at 1270 Van Houten Avenue in Clifton, New Jersey. This 60,660 SF school was built in1948 with additions in 1952 and 1958. The building is a two-story facility with a basement comprised of administration offices, general classrooms, music room, child study team room, nurse's office, kitchen serving area, all-purpose room/gym, locker rooms, stage, cafeteria, faculty work room, boiler rooms, storage rooms, library/media center and mechanical/electrical rooms.

Occupancy Profile

The typical hours of operation for School #2 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, and nighttime cleaning staff present until 10:00 pm. The school's enrollment is approximately 430 students and has 57 teachers, support staff, and administrative personnel.

Building Envelope

Exterior walls for this school are brick faced with a concrete block construction. The amount of insulation within the walls is unknown. The windows throughout the school are in good condition and appear to be well maintained. Typical windows throughout the school are double-section, double pane, operable, ¼" clear glass with aluminum frames. The building roof is pitched with shingles and the amount of roof insulation is unknown.

HVAC Systems

School #2 HVAC systems consists of two (2) steam boilers, one (1) fire-tube hot water boiler, a heating hot water pump, classroom heating and ventilating units, a split heat pump unit, and approximately a dozen window air conditioning unit.

Two of the boilers are gas-fired, cast iron sectional, steam boilers approximately 27 years old with an input of 4,718 MBH (Max) and an output of 3,350 lbs. /hr. at 212°F. Manufactured by H. B. Smith and having an existing efficiency of approximately 75%, these boilers feed steam radiators and steam coils throughout the facility. Steam condensate is returned to a pump and receiver unit that then pumps the hot water to the boilers. The third boiler is a hot water fire-tube boiler that is approximately 18 years old with an input of 2,100 MBH and an output of 1,659 MBH. Hot water is circulated via two (2) Bell & Gossett base-mounted pumps rated at 80 GPM with 2 HP motors. These pumps supply hot water to the 1958 Addition classroom unit ventilators, fin-tube radiators, cabinet/unit heaters, etc.

Fresh air is supplied to the classrooms via the unit ventilators, outside air intake louvers for the storage and mechanical rooms and operable windows.

Exhaust System

There are three (3) 1-HP exhaust fans in the attic space that exhaust the toilet rooms, offices, storage rooms, etc. There are also two (2) larger general exhaust fans (2-HP) in the attic space for the classrooms, corridors, cafeteria/general purpose room, lockers, etc.

HVAC System Controls

The various steam/hot water valves in the two boiler plants are controlled by 1950's vintage Powers pneumatic valve actuators and on/off switches. Some of the controls have proportional band logic but the sensors/controls are far out of calibration. The hot water supply temperature is reset via an outside air thermostat. Each unit ventilator in the classrooms is controlled by a Powers thermostat on the opposite wall with a temperature control dial that allows the occupant local temperature control. The cabinet/unit heaters are controlled by a remote thermostat.

Domestic Hot Water

Domestic hot water for the facility is supplied by a Patterson-Kelley Model N-700 modular, gas-fired hot water heater with an input of 700 MBH (gas) and an output of 595 MBH. The other unit is a RHEEM Model 22V40F1 gas-fired, hot water heater with a capacity of 40 gallons and an input of 38 MBH (gas). A 1/15 HP Bell & Gossett pump circulates the domestic hot water throughout the facility.

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 TurboAir Deluxe Energy Star freezer and refrigerator units along with two portable heated rack cabinets and two milk refrigerators owned by the vendor.

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	$407	$86	4.7	217.0%
ECM #2	Lighting Upgrade - MPR	$5,000	$213	23.5	-36.1%
ECM #3	Lighting Controls Upgrade	$8,105	$2,494	3.2	361.6%
ECM #4	Thermostatic Controls Valves	$37,500	$3,024	12.4	-19.4%
ECM #5	Valve Blanket Insulation	$14,400	$1,694	8.5	182.3%
ECM #6	Energy Star Refrigerator	$760	$52	14.6	2.6%
ECM #7	NEMA Premium Motors	$5,090	$122	41.7	-56.9%
ECM #8	Steam Trap Replacement	$28,720	$1,563	18.4	-45.6%
ECM #9	Replace Condensate Pump Receiver	$36,750	$252	145.8	-89.7%
ECM #10	Boiler Burner Controls	$51,000	$1,008	50.6	-58.5%
ECM #11	Water Conservation	$238	$434	0.5	2635.3%
ECM #12	Window AC Replacements	$1,750	$193	9.1	65.4%
ECM #13	DDC Controls Upgrade	$343,400	$2,021	169.9	-91.2%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	91.89 KW PV System	$564,406	$33,457	16.9	-11.1%
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	0.5	694	-
ECM #2	Lighting Upgrade - MPR	0.7	1,716	-
ECM #3	Lighting Controls Upgrade	-	20,109	-
ECM #4	Thermostatic Controls Valves	-	-	3,118
ECM #5	Valve Blanket Insulation	-	-	1,746
ECM #6	Energy Star Refrigerator	-	419	-
ECM #7	NEMA Premium Motors	0.2	980	-
ECM #8	Steam Trap Replacement	-	-	3,812
ECM #9	Replace Condensate Pump Receiver	-	69	251
ECM #10	Boiler Burner Controls	-	-	1,039
ECM #11	Water Conservation	-	-	225 (43,200 Gallons of Water)
ECM #12	Window AC Replacements	1.9	1,556	-
ECM #13	DDC Controls Upgrade	-	41	2,078
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	**DESCRIPTION**	**ANNUAL UTILITY REDUCTION**		
		ELECTRIC DEMAND (KW)	**ELECTRIC CONSUMPTION (KWH)**	**NATURAL GAS (THERMS)**
REM #1	91.89 KW PV System	91.9	106,183	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	$86	$407	$0	$407	4.7
Lighting Upgrade - MPR	$213	$5,600	$600	$5,000	23.5
Lighting Controls Upgrade	$2,494	$9,250	$1,145	$8,105	3.2
Thermostatic Controls Valves	$3,024	$37,500	$0	$37,500	12.4
Valve Blanket Insulation	$1,694	$14,400	$0	$14,400	8.5
Energy Star Refrigerator	$52	$760	$0	$760	14.6
~~NEMA Premium Motors~~	~~$122~~	~~$5,090~~	~~$0~~	~~$5,090~~	~~41.7~~
Steam Trap Replacement	$1,563	$28,720	$0	$28,720	18.4
~~Replace Condensate Pump Receiver~~	~~$252~~	~~$36,750~~	~~$0~~	~~$36,750~~	~~145.8~~
~~Boiler Burner Controls~~	~~$1,008~~	~~$51,000~~	~~$0~~	~~$51,000~~	~~50.6~~
Water Conservation	$434	$238	$0	$238	0.5
Window AC Replacements	$193	$1,750	$0	$1,750	9.1
~~DDC Controls Upgrade~~	~~$2,021~~	~~$343,400~~	~~$0~~	~~$343,400~~	~~169.9~~
Design / Construction Extras (15%)		$14,794		*$14,794*	
Total Project	**$9,753**	**$113,419**	**$1,745**	**$111,674**	**11.5**

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 #2 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. Finally, there are some fixtures that can be retrofitted to the Super T-8 lamp and Ballast system along with a reflector that would produce an economical payback period.

The ECM includes replacement of any incandescent lamps with LED lamps. The retrofit of existing incandescent fixtures with 12.5 watt Endura Philips 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 ($):	$407
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$407
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$86
Total Yearly Savings ($/Yr):	$86
Estimated ECM Lifetime (Yr):	15
Simple Payback	4.7
Simple Lifetime ROI	217.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$1,290
Internal Rate of Return (IRR)	20%
Net Present Value (NPV)	$619.66

ECM #2: Lighting Upgrade – Multi-Purpose Room

Description:

The Multi-Purpose Room at Clifton Elementary School #2 is currently lit via 250 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 four 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.

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 ($):	$5,600
NJ Smart Start Equipment Incentive ($):	$600
Net Installation Cost ($):	$5,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$213
Total Yearly Savings ($/Yr):	$213
Estimated ECM Lifetime (Yr):	15
Simple Payback	23.5
Simple Lifetime ROI	-36.1%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$3,195
Internal Rate of Return (IRR)	-5%
Net Present Value (NPV)	($2,457.22)

ECM #3: Lighting Controls Upgrade – Occupancy Sensors

Description:

Some of the lights in the Clifton Elementary School #2 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:

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

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

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 #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$9,250
NJ Smart Start Equipment Incentive ($):	$1,145
Net Installation Cost ($):	$8,105
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,494
Total Yearly Savings ($/Yr):	$2,494
Estimated ECM Lifetime (Yr):	15
Simple Payback	3.2
Simple Lifetime ROI	361.6%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$37,410
Internal Rate of Return (IRR)	30%
Net Present Value (NPV)	$21,668.21

ECM #4: New Thermostatic Valves/Controls

Description:

This facility has steam radiators and unit ventilators on the perimeter walls of the school. Due to the equipment age, the two-way valves and controls do not function properly so the rooms are often overheated and the occupants are forced to use the windows to control the heat further increasing energy costs. During our site survey, we counted a total of 25 existing valves that would be excellent candidates for replacement with these new high-efficiency, thermostatic two-way valves/controls.

This measure would install the newest generation of thermostatic valves on the steam pipe feeding each classroom unit or radiator which would improve control of the heating. Thermostatic controls are self-contained and are suitable for radiators, fin-tubes, baseboards or convector units. These new thermostatic valves have the capability of setting an upper limit to prevent overheating of the spaces. The valves include a remote sensor for accurately measuring the return air temperature for better heating control.

Energy Savings Calculations:

In our experience, we have seen a 15% to 20% reduction in heating steam use from installation of new thermostatic valves/controls. The energy cost to heat the spaces controlled by these valves is estimated to be approximately $20,161**.** Therefore, the annual energy cost savings for this ECM would be approximately 15% of $20,161 or $3,024.

The basis of design is the ISTEC 2000 Series Thermostatic Valve/Control or equal which has a total installation cost (including valve, sensor, calibration, piping changes, etc.) of $1,500 per unit. Replacement of 25 existing older control valves x $1,500/unit for the new thermostatic valves/controls = $37,500.

Final quantities and sizes will need to be confirmed during the engineering phase of the project.

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$37,500
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$37,500
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$3,024
Total Yearly Savings ($/Yr):	$3,024
Estimated ECM Lifetime (Yr):	10
Simple Payback	12.4
Simple Lifetime ROI	-19.4%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$30,240
Internal Rate of Return (IRR)	-4%
Net Present Value (NPV)	($11,704.67)

ECM #5: Valve Blanket Insulation

Description:

The boiler plant at Clifton Elementary School #2, supplies steam to the steam unit ventilators throughout the system. The piping remains heated at around 212°F continuously during this period (approximately 6 months). Un-insulated valves have significant heat losses due to the exposure of the steel and copper piping to the surrounding air. Insulated valves have a heat loss which is a small fraction of the heat loss from un-insulated valves. It was identified that insulation for the large steam valves in the boiler room were missing.

Based on the site survey following valves were identified for insulation:

Qty.	Size	Description	Surface Temp.	Area (Ea.) (Sq.ft.)	Bare Heat Loss (BTU/Hr/SF)	Bare Heat Loss (BTU/Hr)	Bare Heat Loss mmBtu	Insulated Heat Loss (BTU/Hr/SF)	Insulated Heat Loss (BTU/Hr)	Insulated Heat Loss mmBtu	Fuel Savings mmBtu/yr	Fuel Savings $/yr
		Mechical Room										
8	6"	Gate Valve	220	8.80	448.00	31,539.20	126.16	36.40	2,562.79	10.25	115.91	$1,124.28
1	3"	Return Plug Valve	220	2.40	448.00	1,075.20	4.30	36.40	87.37	0.35	3.95	$38.33
2	2"	Control Valve	220	3.40	448.00	3,046.40	12.19	36.40	247.54	0.99	11.20	$108.60
2	3"	Strainer	220	4.80	448.00	4,300.80	17.20	36.40	349.47	1.40	15.81	$153.31
2	4"	x 3" Reducer	220	0.59	448.00	528.64	2.11	36.40	42.96	0.17	1.94	$18.84
1	6"	Control Valve	220	6.10	448.00	2,732.80	10.93	36.40	222.06	0.89	10.04	$97.42
2	4"	Steam Trap	220	4.80	448.00	4,300.80	17.20	36.40	349.47	1.40	15.81	$153.31
18		**TOTAL**					**190.1**			**15.4**	**174.6**	**$1,694**

Valve blankets are designed to provide insulation value over large valves that must remain accessible. This ECM includes installation of valve blankets on all exposed boiler system valves.

Energy Savings Calculations:

Heat Loss for un-insulated steel piping is based on ASHRAE 2009 Fundamentals – "Insulation for Mechanical Systems".

$$\text{Heat Loss}\,\frac{\text{BTU}}{\text{HR}}\,\text{per Linear FT} = \frac{1}{\text{R} - \text{Value}} \times \text{Pipe Dia (FT)} \times 3.14 \times (\text{Pipe Temp (°F)} - \text{Ambient Temp(°F)})$$

$$\text{Heat Loss}\,\frac{\text{BTU}}{\text{HR}} = \text{Heat Loss}\,\frac{\text{BTU}}{\text{HR}}\,\text{per Linear FT} \times \text{Length of Uninsulated Pipe}$$

$$\text{Energy Use, Therms} = \frac{\text{Heat Loss}\,\frac{\text{BTU}}{\text{HR}} \times \text{Operating Hrs}}{\text{Heating System Eff. (\%)} \times \text{Fuel Heat Value}\,\frac{\text{BTU}}{\text{Therm}}}$$

$$\text{Heating Energy Cost Savings} = \text{Energy Use, Therms} \times \text{Cost of Nat Gas} \left(\frac{\$}{\text{Therm}} \right)$$

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$14,400
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$14,400
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,694
Total Yearly Savings ($/Yr):	$1,694
Estimated ECM Lifetime (Yr):	24
Simple Payback	8.5
Simple Lifetime ROI	182.3%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$40,656
Internal Rate of Return (IRR)	11%
Net Present Value (NPV)	$14,288.81

ECM #6: Refrigerator Replacement

Description:

The Clifton Elementary School #2 has residential style upright freezer in the kitchen. The Kitchen unit is an older upright model that could be replaced with a new Energy Star rated model.

The proposed replacement is a one-for-one with a unit of similar size and dimensions that has the most up-to-date Energy Star Rating. The model selected is a 2013 model manufactured by Frigidaire.

Energy Savings Calculations:

ENERGY STAR REFRIGERATOR CALCULATION			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Quantity	1	1	
Manufacturer	Gibson	Frigidaire	
Type	Upright Freezer	Upright Freezer	
Model	FV10M2WXFB	FFU13M3HW	
Size (Cu-Ft)	10.1	14	
Per Unit Electric Usage (kWh)	734	315	419
Electric Rate ($/kWh)	$0.124	$0.124	
ENERGY SAVINGS CALCULATIONS			
Electric Usage (kWh)	734	315	419
Energy Cost ($)	$91	$39	$52
COMMENTS:	Calculations based Energy Star Website http://www.energystar.gov/index.cfm?fuseaction=refrig.calculator		

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$760
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$760
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$52
Total Yearly Savings ($/Yr):	$52
Estimated ECM Lifetime (Yr):	15
Simple Payback	14.6
Simple Lifetime ROI	2.6%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	$780
Internal Rate of Return (IRR)	0%
Net Present Value (NPV)	($139.23)

ECM #7: 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 air handling units, hot water pumps and condensate return 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**
HW-1	HW Pump	2	2,745	84.0%	86.5%
AHU-1	Attic AHU	1	2,745	82.5%	85.5%
AHU-2	Attic AHU	1	2,745	82.5%	85.5%
AHU-3	Attic AHU	1	4,800	82.5%	85.5%
AHU-4	Attic AHU	3	4,800	86.5%	89.5%
AHU-5	Attic AHU	3	4,800	86.5%	89.5%

Energy Savings Calculations:

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

where, HP = Motor Nameplate Horsepower Rating

LF = Load Factor Motor Efficiency = Motor Nameplate Efficiency

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

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

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

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

PREMIUM EFFICIENCY MOTOR CALCULATIONS							
EQMT ID	**MOTOR HP**	**LOAD FACTOR**	**EXISTING EFFICIENCY**	**NEMA PREMIUM EFFICIENCY**	**POWER SAVINGS kW**	**ENERGY SAVINGS kWH**	**COST SAVINGS**
HW-1	2	75%	84.0%	86.5%	0.04	106	$13
AHU-1	1	75%	82.5%	85.5%	0.02	66	$8
AHU-2	1	75%	82.5%	85.5%	0.02	66	$8
AHU-3	1	75%	82.5%	85.5%	0.02	115	$14
AHU-4	3	75%	86.5%	89.5%	0.07	314	$39
AHU-5	3	75%	86.5%	89.5%	0.07	314	$39
TOTAL					**0.2**	**980**	**$122**

Equipment Cost

The following table outlines the summary of motor replacement costs:

MOTOR REPLACEMENT SUMMARY					
EQMT ID	**MOTOR POWER HP**	**INSTALLED COST**	**NET COST**	**TOTAL SAVINGS**	**SIMPLE PAYBACK**
HW-1	2	$868	$868	$13	65.9
AHU-1	1	$708	$708	$8	86.9
AHU-2	1	$708	$708	$8	86.9
AHU-3	1	$708	$708	$14	49.7
AHU-4	3	$1,049	$1,049	$39	27.0
AHU-5	3	$1,049	$1,049	$39	27.0
TOTAL	**Totals:**	**$5,090**	**$5,090**	**$122**	**41.7**

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$5,090
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$5,090
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$122
Total Yearly Savings ($/Yr):	$122
Estimated ECM Lifetime (Yr):	18
Simple Payback	41.7
Simple Lifetime ROI	-56.9%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$2,196
Internal Rate of Return (IRR)	-8%
Net Present Value (NPV)	($3,412.07)

ECM #8: STEAM TRAP REPLACEMENT PROGRAM

Description:

Steam traps are required for the proper operation of steam distributions systems. Traps are mechanical devices installed on steam pipes to remove condensate from steam flow. A typical school can have well over one hundred steam traps. Unfortunately steam traps have a tendency to leak. On average 15% of steam traps are leaking in existing installations. Steam traps only have an average life of five (5) years.

This ECM would replace approximately five (5) steam traps. 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 #8 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$28,720
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$28,720
Maintenance Savings ($/Yr):	($2,134)
Energy Savings ($/Yr):	$3,697
Total Yearly Savings ($/Yr):	$1,563
Estimated ECM Lifetime (Yr):	10
Simple Payback	18.4
Simple Lifetime ROI	-45.6%
Simple Lifetime Maintenance Savings	($21,342)
Simple Lifetime Savings	$15,631
Internal Rate of Return (IRR)	-10%
Net Present Value (NPV)	($15,386.33)

ECM #9: Condensate Pump and Receiver Replacement

Description:

The condensate pump and receiver set in the boiler room is in very poor condition and leaking condensate from the receiver and pump seals. The lost condensate is a loss of water which is costly and a loss of 200° F water that does not return to the receiver and steam boilers. The make-up water has to be heated from 55° F resulting in a loss of energy.

Energy Savings Calculations:

The losses of condensate were estimated and the energy required to heat the make-up water from 60°F to 200°F was calculated. The existing condensate pumps have older less efficient motors and the efficiency gained by installing premium efficiency motors was also calculated.

See **Appendix H** for detailed energy savings calculations.

Energy Savings Summary:

ECM #9 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$36,750
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$36,750
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$252
Total Yearly Savings ($/Yr):	$252
Estimated ECM Lifetime (Yr):	15
Simple Payback	145.8
Simple Lifetime ROI	-89.7%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$3,780
Internal Rate of Return (IRR)	-20%
Net Present Value (NPV)	($33,741.64)

ECM #10: Steam Boiler Burner & Controls Upgrade

Description:

The majority of the heating is provided to the Clifton Elementary School #2 facility by H.B. Smith 97 Boiler Horsepower (BHP) natural gas-fired boilers that produces steam for the heating season. The boilers are 1986 vintage and currently should be capable of achieving an efficiency rating of 70 to 75 percent while operating. Given the limitations of the current system burner and controls and the vast improvement in boiler controls today over what was available then, it is recommended that a burner and new controls upgrade be performed.

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

Energy Savings Summary:

ECM #10 - 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):	$1,008
Total Yearly Savings ($/Yr):	$1,008
Estimated ECM Lifetime (Yr):	21
Simple Payback	50.6
Simple Lifetime ROI	-58.5%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$21,168
Internal Rate of Return (IRR)	-7%
Net Present Value (NPV)	($35,461.66)

ECM #11: Water Conservation

Description:

The facility utilizes standard plumbing fixtures. The typical sink aerator consumption only meets the minimum federally required standard for water efficiency. New fixtures and aerators are available that use less water than today's requirements and can add up to significant water reduction over a long period.

This ECM includes the replacement of the existing sink aerators with low flow sink aerators in the restrooms.

Energy Savings Calculations:

Faucets:

$$\text{Water Consumption} = \text{Occupancy}\left(\frac{\text{Days}}{\text{Yr}}\right) \times \text{Use}\left(\frac{\text{min}}{\text{Day}}\right) \times \textit{FixtureQuantity} \times \text{Fixture}\left(\frac{\text{Gal}}{\text{Min}}\right)$$

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

$$\text{Water Heating Usage (therm)} = \frac{\text{Gallons}}{\text{year}} \times 8.33\frac{\text{Btu}}{\text{gal}} \times \Delta\text{T}\ (50°\text{F}) \times \frac{1}{\text{Heater Eff}\ (80\%)} \times \frac{\text{therm}}{100{,}000\ \text{Btu}}$$

LOW FLOW WATER SAVING DEVICES			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Quantity of Sinks	8	8	
Flow Rate (GPM)	2.2	1.0	1.2
Device Usage (min per day)	30	30	
Facility Operation (days / year)	150	150	
Natural Gas Rate ($/therm)	$0.970	$0.970	
Water Rate ($/1000gal)	$5.000	$5.000	
ENERGY SAVINGS CALCULATIONS			
Natural Gas Usage (Therm)	412	187	225
Water Usage (gallons)	79,200	36,000	43,200
Energy Cost ($)	$796	$362	$434
COMMENTS:			

Note water savings are shown as maintenance savings in summary tables.

Energy Savings Summary:

ECM #11 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$238
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$238
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$434
Total Yearly Savings ($/Yr):	$434
Estimated ECM Lifetime (Yr):	15
Simple Payback	0.5
Simple Lifetime ROI	2635.3%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$6,510
Internal Rate of Return (IRR)	182%
Net Present Value (NPV)	$4,943.06

ECM #12: Window AC Unit Replacement

Description:

Cooling is provided to several offices via window air conditioning units. These units vary in size, capacity and efficiency. The units have been fixed or replaced on an "as needed" basis throughout the building. These window AC units are old and inefficient.

It is recommended to utilize the energy star ratings as a minimum standard for replacing any window unit that is in need of replacement. Existing units that are old but still working should be considered for replacement if the efficiency is below 8.0 to 8.5 EER. Window AC units that are over 10 years old are very likely to fall in this efficiency range.

This ECM shows the savings and payback for replacing inefficient window air conditioners with new, Energy Star rated units. Qualifying product list can be found at Energy Star website at: www.energystar.gov/products. Although energy star rated products provide a valuable benchmark, it is recommended to consider even higher EER ratings for potential AC unit replacements where available.

Energy Savings Calculations:

Average Summer Electric Cost: $0.12/kWh (June through September)
Typical AC Unit Size: 12,000 BTU/HR

Estimated Full Load Hours of Unit: 800/Year

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

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

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

The following table depicts the replacement plan for the window air conditioning units:

ENERGY SAVINGS CALCULATIONS									
Capacity BTU/H	**Amount of Units**	**Full Load Hrs**	**Typical Eff. (10 Yrs & Older) EER**	**New Eff. EER**	**Energy Savings kWh**	**Demand Savings kW**	**Cooling Cost Savings**	**Net Installed Cost**	**Simple Payback**
12,000	5	800	8	10.8	1556	1.94	$193	$1,750	9.1

Energy Savings Summary:

ECM #12 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,750
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$1,750
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$193
Total Yearly Savings ($/Yr):	$193
Estimated ECM Lifetime (Yr):	15
Simple Payback	9.1
Simple Lifetime ROI	65.4%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$2,895
Internal Rate of Return (IRR)	7%
Net Present Value (NPV)	$554.02

ECM #13: Digital Energy Management System (DDC EMS)

Description:

Currently, Clifton Elementary School #2 uses a pneumatic control system with manual boiler start-up controls. This system is very old and offers little more than an on/off cycling control of the heating system.

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. 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 5% of the electricity and 10% for natural gas in these buildings.

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)	20,785	-	
Existing Electricity Usage (kWh)	812	-	
Energy Savings, Nat Gas	-	10%	
Energy Savings, Electricity	-	5%	
Gas Cost ($/Therm)	*$0.97*	$0.97	
Electricity Cost ($/kWh)	*$0.124*	$0.124	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Nat Gas Usage (Therms)	20,785	18,706	2,078
Electricity Usage (kWh)	812	771	41
Nat Gas Cost ($)	$20,161	$18,145	$2,016
Electricity Cost ($)	$101	$96	$5
Energy Cost ($)	$20,262	$18,241	$2,021
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 $5.66 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:

REM #13 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$343,400
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$343,400
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,021
Total Yearly Savings ($/Yr):	$2,021
Estimated ECM Lifetime (Yr):	15
Simple Payback	169.9
Simple Lifetime ROI	-91.2%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$30,315
Internal Rate of Return (IRR)	-21%
Net Present Value (NPV)	($319,273.43)

REM #1: 91.89 kW Solar System

Description:

The Clifton Elementary School #2 has available roof space that could accommodate a significant amount of solar generation. Based on the available areas a 91.89 kilowatt solar array could be installed. The array will produce approximately 106,183 kilowatt-hours annually that will reduce the overall electric usage of the facility by 72.56%.

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}):	91.89
Electric Generation (KWH/Yr):	106,183
Installation Cost ($):	$564,406
SREC Revenue ($/Yr):	$20,290
Energy Savings ($/Yr):	$13,167
Total Yearly Savings ($/Yr):	$33,457
ECM Analysis Period (Yr):	15
Simple Payback (Yrs):	16.9
Analysis Period Electric Savings ($):	$244,886
Analysis Period SREC Revenue ($):	$293,924
Net Present Value (NPV)	($242,085.86)

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. 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.

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

G. Ensure classroom televisions are turned off at the end of the day and while not in use.

H. 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 #2

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 #1	Lighting Upgrade - General	$297	$110	$0	$407	$86	$0	$86	15	$1,290	$0	217.0%	4.7	19.71%	$619.66
ECM #2	Lighting Upgrade - MPR	$2,700	$2,900	$600	$5,000	$213	$0	$213	15	$3,195	$0	-36.1%	23.5	-5.14%	($2,457.22)
ECM #3	Lighting Controls Upgrade	$6,000	$3,250	$1,145	$8,105	$2,494	$0	$2,494	15	$37,410	$0	361.6%	3.2	30.18%	$21,668.21
ECM #4	Thermostatic Controls Valves	$37,500	$0	$0	$37,500	$3,024	$0	$3,024	10	$30,240	$0	-19.4%	12.4	-3.73%	($11,704.67)
ECM #5	Valve Blanket Insulation	$14,400	$0	$0	$14,400	$1,694	$0	$1,694	24	$40,656	$0	182.3%	8.5	10.75%	$14,288.81
ECM #6	Energy Star Refrigerator	$660	$100	$0	$760	$52	$0	$52	15	$780	$0	2.6%	14.6	0.33%	($139.23)
ECM #7	NEMA Premium Motors	$5,090	$0	$0	$5,090	$122	$0	$122	18	$2,196	$0	-56.9%	41.7	-7.66%	($3,412.07)
ECM #8	Steam Trap Replacement	$7,720	$21,000	$0	$28,720	$3,697	($2,134)	$1,563	10	$15,631	-$21,342	-45.6%	18.4	-9.77%	($15,386.33)
ECM #9	Replace Condensate Pump Receiver	$15,000	$21,750	$0	$36,750	$252	$0	$252	15	$3,780	$0	-89.7%	145.8	-20.43%	($33,741.64)
ECM #10	Boiler Burner Controls	$26,000	$25,000	$0	$51,000	$1,008	$0	$1,008	21	$21,168	$0	-58.5%	50.6	-6.91%	($35,461.66)
ECM #11	Water Conservation	$160	$78	$0	$238	$434	$0	$434	15	$6,510	$0	2635.3%	0.5	182.35%	$4,943.06
ECM #12	Window AC Replacements	$1,750	$0	$0	$1,750	$193	$0	$193	15	$2,895	$0	65.4%	9.1	7.07%	$554.02
ECM #13	DDC Controls Upgrade	$343,400	$0	$0	$343,400	$2,021	$0	$2,021	15	$30,315	$0	-91.2%	169.9	-21%	($319,273.43)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	91.89 KW PV System	$564,406	$0	$0	$564,406	$13,167	$20,290	$33,457	15	$501,849	$304,349	-11.1%	16.9	-21.46%	($319,273.43)

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

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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
2-Clifton BOE - PS 2

Building ID: 3477545
For 12-month Period Ending: February 28, 2013[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: April 11, 2013

Facility
2-Clifton BOE - PS 2
1270 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: 1948
Gross Floor Area (ft²): 60,660

Energy Performance Rating[2] (1-100) 73

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	496,328
Natural Gas (kBtu)[4]	2,397,619
Total Energy (kBtu)	2,893,947

Energy Intensity[4]

Site (kBtu/ft²/yr)	48
Source (kBtu/ft²/yr)	69

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	198

Electric Distribution Utility
Public Service Electric & Gas Co

National Median Comparison

National Median Site EUI	60
National Median Source EUI	86
% Difference from National Median Source EUI	-20%
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	2-Clifton BOE - PS 2	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	1270 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 2 (K-12 School)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	60,660 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	109	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	10 %	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))
01/09/2013	02/08/2013	13,680.00
12/09/2012	01/08/2013	15,120.00
11/09/2012	12/08/2012	10,560.00
10/09/2012	11/08/2012	15,420.00
09/09/2012	10/08/2012	13,620.00
08/09/2012	09/08/2012	6,900.00
07/09/2012	08/08/2012	5,820.00
06/09/2012	07/08/2012	10,980.00
05/09/2012	06/08/2012	7,200.00
04/09/2012	05/08/2012	15,480.00
03/09/2012	04/08/2012	17,340.00
Electric Consumption (kWh (thousand Watt-hours))		**132,120.00**
Electric Consumption (kBtu (thousand Btu))		**450,793.44**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**450,793.44**
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)
01/09/2013	02/08/2013	6,895.40
12/09/2012	01/08/2013	3,975.72
11/09/2012	12/08/2012	937.29
10/09/2012	11/08/2012	1,786.99
09/09/2012	10/08/2012	162.82
08/09/2012	09/08/2012	181.55
07/09/2012	08/08/2012	199.59
06/09/2012	07/08/2012	261.35
05/09/2012	06/08/2012	330.35
04/09/2012	05/08/2012	1,600.00
03/09/2012	04/08/2012	3,269.93

gas Consumption (therms)	**19,600.99**
gas Consumption (kBtu (thousand Btu))	**1,960,099.00**
Total Natural Gas Consumption (kBtu (thousand Btu))	**1,960,099.00**
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
2-Clifton BOE - PS 2
1270 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

2-Clifton BOE - PS 2	
Gross Floor Area Excluding Parking: (ft^2)	60,660
Year Built	1948
For 12-month Evaluation Period Ending Date:	February 28, 2013

Facility Space Use Summary

Elementary School 2	
Space Type	K-12 School
Gross Floor Area (ft^2)	60,660
Open Weekends?	No
Number of PCs	109
Number of walk-in refrigeration/freezer units	0
Presence of cooking facilities	No
Percent Cooled	10
Percent Heated	100
Months °	10
High School?	No
School District °	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	73	73	75	N/A	50
Energy Intensity					
Site ($kBtu/ft^2$)	48	48	47	N/A	60
Source ($kBtu/ft^2$)	69	69	67	N/A	86
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	198	198	194	N/A	248
$kgCO_2e/ft^2$/year	3	3	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.

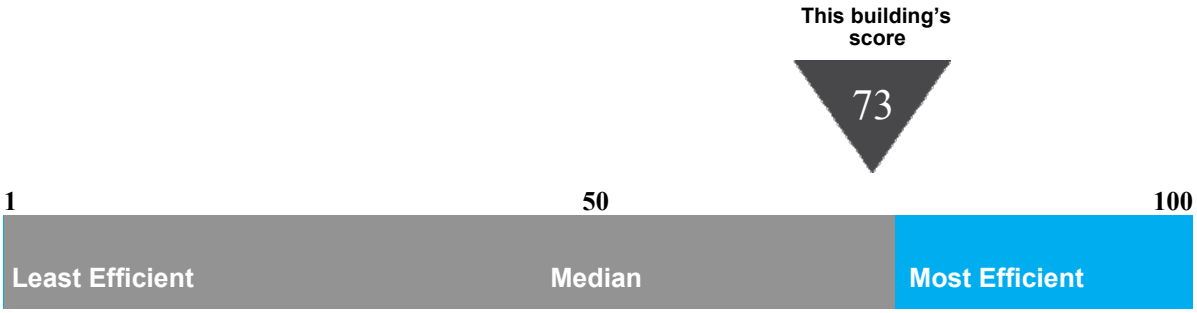
Statement of Energy Performance

2013

2-Clifton BOE - PS 2
1270 Van Houten Avenue
Clifton, NJ 07013

Portfolio Manager Building ID: 3477545

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 69 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

SCHOOL # 2

AC Units

Tag			
Unit Type	Split System Heat Pump	Outdoor Condensing Unit	Window AC Unit
Qty	1	1	11
Location	BSI Office	Outdoor	Classrooms and Offices
Area Served	BSI OFFICE	BSI Office	Classrooms and Offices
Manufacturer	Sanyo	Sanyo	Various
Model #	KHS1222	CH1222	Various
Serial #	58144	55244	Various
Cooling Type	DX Coil	Condensing Unit	DX Coil
Cooling Capacity (Tons)	9,000 BTUH	9,000 BTUH	9,000 to 18,000 BTUH
Cooling Efficiency (SEER/EER)	N/A	SEER = 8.0	SEER=7.0
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	Electric	Electric	Electric
Approx Age	19	19	17
ASHRAE Service Life	15	15	10
Remaining Life	(4)	(4)	(7)
Comments	Very Poor Condition	Very Poor Condition	Very Poor Condition

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

SCHOOL # 2

Boilers

Tag	B-1 & B-2	B-3
Unit Type	Cast Iron Sectional	Fire-Tube
Qty	2	1
Location	Basement Boiler Room	Boiler Room
Area Served	Steam System	Hot Water Heating System
Manufacturer	H.B. Smith	Industrial Boiler
Model #	Series 28 Boiler	Unknown
Serial #	-	-
Input Capacity	4,718 MBH (Max)	2,100 MBH
Rated Output Capacity	3,350 lbs./hr. @ 212 degrees F	1,659 MBH (Hot Water)
Approx. Efficiency %	75.0%	79.0%
Fuel	Gas	Gas
Approx Age	27	18
ASHRAE Service Life	25	25
Remaining Life	(2)	7
Comments	Power Flame Burner: MN: C3-G0-25 SN:088532606 & 088532605	

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

SCHOOL # 2

Domestic Water Heaters

Tag	DHW-1	DHW-2
Unit Type	Modular Gas-Fired	Packaged Water Heater
Qty	1	1
Location	Boiler Room	Boiler Room
Area Served	-	-
Manufacturer	Patterson-Kelley	Rheem
Model #	N-700	22V50F1
Serial #	AH21955192	RHLN1109535681
Size (Gallons)	-	50
Input Capacity	700 MBH	38 MBH
Output Capacity	595 MBH	
Efficiency %	85%	80%
Fuel	gas	gas
Approx Age	18	4
ASHRAE Service Life	15	15
Remaining Life	(3)	11
Comments	1/3 HP Blower Motor	1/3 HP Circulation Pump

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

SCHOOL # 2

Pumps

Tag	P-1	
Unit Type	Base-Mounted Centrifugal	Condensate Return
Qty	1	1
Location	Boiler Room	Boiler Room
Area Served	Heating Hot Water System	Steam Loop
Manufacturer	Bell & Gossett 1531 Series	-
Model #	316TB	-
Serial #	-	-
Horse Power	2	(2) 1 HP
Flow	80 GPM	-
Motor Info	Century AC Motor	A. O. Smith
Electrical Power	208V/3 Phase	208V/3 Phase
RPM	1745	3450
Motor Efficiency %	-	-
Approx Age	10	27
ASHRAE Service Life	20	20
Remaining Life	10	(7)
Comments		30" x 30" x 16" Receiver

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

SCHOOL # 2

Exhaust Fans

Tag	EF	EF
Qty	2	2
Location	Attic Space	Attic Space
Area Served	Entire Facility	Entire Facility
Manufacturer	New York Blower Co	New York Blower
Model #	Type ME Fan	Type ME Fan
Serial #	Size 182	Size 330
CFM	8,430	Unknown
Motor Manufacturer	Peerless Electric Co.	Peerless Electric Co.
Motor HP	3	1
V/Ph	208/3 Phase	208/3 Phase
Frame	P225	P203
RPM	1750	1750
Efficiency	Unknown	Unknown
Approx Age	30	30
ASHRAE Service Life	20	20
Remaining Life	-10	-10
Comments	Very Old Motors	Very Old Motors

APPENDIX E

CEG Project #: 9C12066
Facility Name: School #2
Address: 1270 Van Houten Avenue
City, State, Zip Clifton, NJ 07013

			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, $
4	Basement Side Hallway	3000	15w CFL	1	15	2	0.03	90	Existing to Remain	Existing to Remain	1	15	0	0.03	90	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
211.41	Basement Main Hallway	3000	1x4, 1 Lamp, 32w T8, Elect. Ballast, Wall Mnt., Prismatic Lens	1	33	6	0.20	594	Existing to Remain	Existing to Remain	1	33	0	0.20	594	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
5	Basement Main Hallway	3000	1 Lamp CFL Globe Fixture	1	26	2	0.05	156	Existing to Remain	Existing to Remain	1	26	0	0.05	156	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.14	Basement Mechanical Room	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., No Lens	2	62	12	0.74	893	Existing to Remain	Existing to Remain	2	62	0	0.74	893	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.11	Basement Janitor Office	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	4	0.25	645	Existing to Remain	Existing to Remain	2	62	0	0.25	645	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
1	Basement Kitchen	1200	28w CFL	1	28	5	0.14	168	Existing to Remain	Existing to Remain	1	28	0	0.14	168	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.11	Basement Cafeteria	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic 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	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	290	$36
1	Boys Basement Locker Room	1200	28w CFL	1	28	9	0.25	302	Existing to Remain	Existing to Remain	1	28	0	0.25	302	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
1	Girls Basement Locker room	1200	28w CFL	1	28	9	0.25	302	Existing to Remain	Existing to Remain	1	28	0	0.25	302	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
1	Side Storage Area 1	1200	28w CFL	1	28	3	0.08	101	Existing to Remain	Existing to Remain	1	28	0	0.08	101	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
1	Side Storage Area 2	1200	28w CFL	1	28	3	0.08	101	Existing to Remain	Existing to Remain	1	28	0	0.08	101	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.11	Stairs	3000	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	2	0.12	372	Existing to Remain	Existing to Remain	2	62	0	0.12	372	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
241.11	Stairs	3000	1x4, 4 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	4	107	2	0.21	642	Existing to Remain	Existing to Remain	4	107	0	0.21	642	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.31	Classroom 1	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Parabolic Lens	2	62	14	0.87	2,257	Existing to Remain	Existing to Remain	2	62	0	0.87	2,257	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	451	$56
3	Classroom 1 Restroom	1200	60w Incand	1	60	1	0.06	72	Re-lamp	12.5w Endura Philips LED	1	12.5	1	0.01	15	0.05	57	$7	0	No New Controls	0	0.0%	0	$0
221.31	Classroom 2	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Parabolic Lens	2	62	14	0.87	2,257	Existing to Remain	Existing to Remain	2	62	0	0.87	2,257	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	451	$56
3	Classroom 2 Restroom	1200	60w Incand	1	60	1	0.06	72	Re-lamp	12.5w Endura Philips LED	1	12.5	1	0.01	15	0.05	57	$7	0	No New Controls	0	0.0%	0	$0
221.31	Classroom 3	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Parabolic Lens	2	62	14	0.87	2,257	Existing to Remain	Existing to Remain	2	62	0	0.87	2,257	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	451	$56
3	Classroom 3 Restroom	1200	60w Incand	1	60	1	0.06	72	Re-lamp	12.5w Endura Philips LED	1	12.5	1	0.01	15	0.05	57	$7	0	No New Controls	0	0.0%	0	$0
221.31	Classroom 4	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Parabolic Lens	2	62	19	1.18	3,063	Existing to Remain	Existing to Remain	2	62	0	1.18	3,063	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	613	$76

			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	Classroom 4 Restroom	1200	60w Incand	1	60	1	0.06	72	Re-lamp	12.5w Endura Philips LED	1	12.5	1	0.01	15	0.05	57	$7	0	No New Controls	0	0.0%	0	$0
221.31	Classroom 5	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Parabolic Lens	2	62	14	0.87	2,257	Existing to Remain	Existing to Remain	2	62	0	0.87	2,257	0.00	0	$0	4	Dual Tech. Occupancy Sensor w/2 Powerpacks - Remote Mnt.	0.5	20.0%	451	$56
221.11	Classroom 5	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	2	0.12	322	Existing to Remain	Existing to Remain	2	62	0	0.12	322	0.00	0	$0	4	Dual Tech. Occupancy Sensor w/2 Powerpacks - Remote Mnt.	0.5	20.0%	64	$8
3	Classroom 5 Restroom	1200	60w Incand	1	60	1	0.06	72	Re-lamp	12.5w Endura Philips LED	1	12.5	1	0.01	15	0.05	57	$7	0	No New Controls	0	0.0%	0	$0
1	Classroom 5 Storage	1200	28w CFL	1	28	1	0.03	34	Existing to Remain	Existing to Remain	1	28	0	0.03	34	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.11	Work Room	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	4	0.25	645	Existing to Remain	Existing to Remain	2	62	0	0.25	645	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	129	$16
221.31	Work Room Hallway	3000	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Parabolic Lens	2	62	2	0.12	372	Existing to Remain	Existing to Remain	2	62	0	0.12	372	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.31	Media Center	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Parabolic Lens	2	62	14	0.87	2,257	Existing to Remain	Existing to Remain	2	62	0	0.87	2,257	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	451	$56
3	Media Center Restroom	1200	60w Incand	1	60	1	0.06	72	Re-lamp	12.5w Endura Philips LED	1	12.5	1	0.01	15	0.05	57	$7	0	No New Controls	0	0.0%	0	$0
1	Media Center Storage	1200	28w CFL	1	28	1	0.03	34	Existing to Remain	Existing to Remain	1	28	0	0.03	34	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.11	Mechanical Room	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	4	0.25	298	Existing to Remain	Existing to Remain	2	62	0	0.25	298	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
3	Hallway Restroom	2600	60w Incand	1	60	1	0.06	156	Re-lamp	12.5w Endura Philips LED	1	12.5	1	0.01	33	0.05	124	$15	0	No New Controls	0	0.0%	0	$0
221.21	Hallway	3000	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	11	0.68	2,046	Existing to Remain	Existing to Remain	2	62	0	0.68	2,046	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.11	Hallway	3000	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	3	0.19	558	Existing to Remain	Existing to Remain	2	62	0	0.19	558	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
242.21	Classroom 8	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	18	1.93	5,008	Existing to Remain	Existing to Remain	4	107	0	1.93	5,008	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	1,002	$124
221.11	Classroom 8 Storage	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface 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	No New Controls	0	0.0%	0	$0
242.21	Classroom 24	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	18	1.93	5,008	Existing to Remain	Existing to Remain	4	107	0	1.93	5,008	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	1,002	$124
221.11	Classroom 24 Storage	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface 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	No New Controls	0	0.0%	0	$0
241.11	Boys Restroom	2600	1x4, 4 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	4	107	1	0.11	278	Existing to Remain	Existing to Remain	4	107	0	0.11	278	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
1	Janitor Closet	1200	28w CFL	1	28	1	0.03	34	Existing to Remain	Existing to Remain	1	28	0	0.03	34	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
241.11	Girls Restroom	2600	1x4, 4 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	4	107	1	0.11	278	Existing to Remain	Existing to Remain	4	107	0	0.11	278	0.00	0	$0	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	Janitor Closet	1200	60w Incand	1	60	1	0.06	72	Re-lamp	12.5w Endura Philips LED	1	12.5	1	0.01	15	0.05	57	$7	0	No New Controls	0	0.0%	0	$0
242.21	Principal's Office	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	4	0.43	1,113	Existing to Remain	Existing to Remain	4	107	0	0.43	1,113	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	223	$28
227.21	Principal's Office Restroom	1200	2x2, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	65	1	0.07	78	Existing to Remain	Existing to Remain	2	65	0	0.07	78	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
242.21	General Office	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	4	0.43	1,113	Existing to Remain	Existing to Remain	4	107	0	0.43	1,113	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	223	$28
1	Hallway Storage	1200	28w CFL	1	28	1	0.03	34	Existing to Remain	Existing to Remain	1	28	0	0.03	34	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
242.21	Front Hallway	3000	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	4	0.43	1,284	Existing to Remain	Existing to Remain	4	107	0	0.43	1,284	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
222.21	Main Lobby	3000	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	4	0.25	744	Existing to Remain	Existing to Remain	2	62	0	0.25	744	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
242.21	Front Hallway	3000	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	3	0.32	963	Existing to Remain	Existing to Remain	4	107	0	0.32	963	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.11	Hall Storage	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface 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	No New Controls	0	0.0%	0	$0
1	Gym Storage	1200	28w CFL	1	28	1	0.03	34	Existing to Remain	Existing to Remain	1	28	0	0.03	34	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.11	Teachers Room	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	2	0.12	322	Existing to Remain	Existing to Remain	2	62	0	0.12	322	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	64	$8
221.11	Nurse's Office	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	2	0.12	322	Existing to Remain	Existing to Remain	2	62	0	0.12	322	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	64	$8
221.11	Clasrrom 19 Storage	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface 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	No New Controls	0	0.0%	0	$0
242.21	Classroom 19	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	18	1.93	5,008	Existing to Remain	Existing to Remain	4	107	0	1.93	5,008	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	1,002	$124
242.21	Classroom 13	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	18	1.93	5,008	Existing to Remain	Existing to Remain	4	107	0	1.93	5,008	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	1,002	$124
221.11	Classroom 13 Storage	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface 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	No New Controls	0	0.0%	0	$0
2	Multi-Purpose Room	2600	250w Metal Halide	1	295	12	3.54	9,204	Remove & Replace New Fixture	2x4, 4 Lamp, 54w T5, (2) 2/54 Elect. Ballast, Singlepoint Mnt., High Bay, Wire Guard, Lens	4	240	12	2.88	7,488	0.66	1,716	$213	0	No New Controls	0	0.0%	0	$0
241.11	Multi-Purpose Room	2600	1x4, 4 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	4	107	8	0.86	2,226	Existing to Remain	Existing to Remain	4	107	0	0.86	2,226	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
1	Stage	1200	28w CFL	1	28	2	0.06	67	Existing to Remain	Existing to Remain	1	28	0	0.06	67	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
1	Gym Side Stair 1	3000	28w CFL	1	28	1	0.03	84	Existing to Remain	Existing to Remain	1	28	0	0.03	84	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
241.11	Gym Side Stair 1	3000	1x4, 4 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	4	107	1	0.11	321	Existing to Remain	Existing to Remain	4	107	0	0.11	321	0.00	0	$0	0	No New Controls	0	0.0%	0	$0

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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, $
1	Gym Side Stair 2	3000	28w CFL	1	28	1	0.03	84	Existing to Remain	Existing to Remain	1	28	0	0.03	84	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
241.11	Gym Side Stair 2	3000	1x4, 4 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	4	107	1	0.11	321	Existing to Remain	Existing to Remain	4	107	0	0.11	321	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.11	Gym Office	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	1	0.06	161	Existing to Remain	Existing to Remain	2	62	0	0.06	161	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
1	Gym Office	2600	28w CFL	1	28	1	0.03	73	Existing to Remain	Existing to Remain	1	28	0	0.03	73	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
1	Gym Office Storage	1200	28w CFL	1	28	1	0.03	34	Existing to Remain	Existing to Remain	1	28	0	0.03	34	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.11	Kitchen Prep	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	1	0.06	161	Existing to Remain	Existing to Remain	2	62	0	0.06	161	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
1	Kitchen Prep	2600	28w CFL	1	28	1	0.03	73	Existing to Remain	Existing to Remain	1	28	0	0.03	73	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
1	Kitchen Prep Restroom	1200	28w CFL	1	28	1	0.03	34	Existing to Remain	Existing to Remain	1	28	0	0.03	34	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
1	Gym Equipment Storage	1200	28w CFL	1	28	1	0.03	34	Existing to Remain	Existing to Remain	1	28	0	0.03	34	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.11	Stairs/Hall	3000	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., 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	No New Controls	0	0.0%	0	$0
241.11	Stairs/Hall	3000	1x4, 4 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	4	107	1	0.11	321	Existing to Remain	Existing to Remain	4	107	0	0.11	321	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.11	Hallway	3000	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	9	0.56	1,674	Existing to Remain	Existing to Remain	2	62	0	0.56	1,674	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
242.21	Classroom 14	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed 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	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	779	$97
4	Classroom 14 Restroom	1200	15w CFL	1	15	1	0.02	18	Existing to Remain	Existing to Remain	1	15	0	0.02	18	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
4	Classroom 14 Restroom	1200	15w CFL	1	15	1	0.02	18	Existing to Remain	Existing to Remain	1	15	0	0.02	18	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
4	Storage	1200	15w CFL	1	15	2	0.03	36	Existing to Remain	Existing to Remain	1	15	0	0.03	36	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
242.21	Classroom 18	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	12	1.28	3,338	Existing to Remain	Existing to Remain	4	107	0	1.28	3,338	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	668	$83
4	Classroom 18 Restroom	1200	15w CFL	1	15	1	0.02	18	Existing to Remain	Existing to Remain	1	15	0	0.02	18	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
4	Classroom 18 Storage	1200	15w CFL	1	15	1	1.00	1,200	Existing to Remain	Existing to Remain	1	15	0	1.00	1,200	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
242.21	Classroom 17	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	12	1.28	3,338	Existing to Remain	Existing to Remain	4	107	0	1.28	3,338	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	668	$83
4	Classroom 17 Restroom	1200	15w CFL	1	15	1	0.02	18	Existing to Remain	Existing to Remain	1	15	0	0.02	18	0.00	0	$0	0	No New Controls	0	0.0%	0	$0

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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, $
4	Classroom 17 Storage	1200	15w CFL	1	15	1	0.02	18	Existing to Remain	Existing to Remain	1	15	0	0.02	18	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
242.21	Classroom 16	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	12	1.28	3,338	Existing to Remain	Existing to Remain	4	107	0	1.28	3,338	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	668	$83
4	Classroom 16 Restroom	1200	15w CFL	1	15	1	0.02	18	Existing to Remain	Existing to Remain	1	15	0	0.02	18	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
4	Classroom 16 Storage	1200	15w CFL	1	15	1	0.02	18	Existing to Remain	Existing to Remain	1	15	0	0.02	18	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
242.21	Classroom 15	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	12	1.28	3,338	Existing to Remain	Existing to Remain	4	107	0	1.28	3,338	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	668	$83
4	Classroom 15 Restroom	1200	15w CFL	1	15	1	0.02	18	Existing to Remain	Existing to Remain	1	15	0	0.02	18	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
4	Classroom 15 Storage	1200	15w CFL	1	15	1	0.02	18	Existing to Remain	Existing to Remain	1	15	0	0.02	18	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
241.11	2nd Floor Stair	3000	1x4, 4 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	4	107	2	0.21	642	Existing to Remain	Existing to Remain	4	107	0	0.21	642	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
242.21	2nd Floor Classroom 1	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	16	1.71	4,451	Existing to Remain	Existing to Remain	4	107	0	1.71	4,451	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	890	$110
221.11	2nd Floor Classroom 1 Storage	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface 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	No New Controls	0	0.0%	0	$0
242.21	2nd Floor Classroom 2	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	18	1.93	5,008	Existing to Remain	Existing to Remain	4	107	0	1.93	5,008	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	1,002	$124
221.11	2nd Floor Classroom 2 Storage	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface 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	No New Controls	0	0.0%	0	$0
241.11	2nd Floor Girls Restroom	2600	1x4, 4 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	4	107	1	0.11	278	Existing to Remain	Existing to Remain	4	107	0	0.11	278	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
4	2nd Floor Janitor Closet	1200	15w CFL	1	15	1	0.02	18	Existing to Remain	Existing to Remain	1	15	0	0.02	18	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
242.21	2nd Floor office 1	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	4	0.43	1,113	Existing to Remain	Existing to Remain	4	107	0	0.43	1,113	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	223	$28
242.21	2nd Floor office 2	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	4	0.43	1,113	Existing to Remain	Existing to Remain	4	107	0	0.43	1,113	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	223	$28
242.21	IMC 1	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	10	1.07	2,782	Existing to Remain	Existing to Remain	4	107	0	1.07	2,782	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	556	$69
242.21	IMC 2	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	4	0.43	1,113	Existing to Remain	Existing to Remain	4	107	0	0.43	1,113	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	223	$28
241.11	2nd Floor Boys Restroom	2600	1x4, 4 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	4	107	1	0.11	278	Existing to Remain	Existing to Remain	4	107	0	0.11	278	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
4	2nd Floor Janitor Closet	1200	15w CFL	1	15	1	0.02	18	Existing to Remain	Existing to Remain	1	15	0	0.02	18	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
242.21	2nd Floor Main Hallway	3000	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	6	0.64	1,926	Existing to Remain	Existing to Remain	4	107	0	0.64	1,926	0.00	0	$0	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, $
221.21	2nd Floor Main Hallway	3000	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	7	0.43	1,302	Existing to Remain	Existing to Remain	2	62	0	0.43	1,302	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
4	2nd Floor Storage	1200	15w CFL	1	15	1	0.02	18	Existing to Remain	Existing to Remain	1	15	0	0.02	18	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
4	2nd Floor Mezz	1200	15w CFL	1	15	1	0.02	18	Existing to Remain	Existing to Remain	1	15	0	0.02	18	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
242.21	2nd Floor Classroom 3	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	18	1.93	5,008	Existing to Remain	Existing to Remain	4	107	0	1.93	5,008	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	1,002	$124
221.11	2nd Floor Classroom 3 Storage	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface 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	No New Controls	0	0.0%	0	$0
242.21	2nd Floor Classroom 4	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	18	1.93	5,008	Existing to Remain	Existing to Remain	4	107	0	1.93	5,008	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	1,002	$124
221.11	2nd Floor Classroom 4 Storage	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface 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	No New Controls	0	0.0%	0	$0
242.21	2nd Floor Small Group	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	4	0.43	1,113	Existing to Remain	Existing to Remain	4	107	0	0.43	1,113	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	223	$28
3	2F Storage	1200	60w Incand	1	60	1	0.06	72	Re-lamp	12.5w Endura Philips LED	1	12.5	1	0.01	15	0.05	57	$7	0	No New Controls	0	0.0%	0	$0
3	2F Storage	1200	60w Incand	1	60	1	0.06	72	Re-lamp	12.5w Endura Philips LED	1	12.5	1	0.01	15	0.05	57	$7	0	No New Controls	0	0.0%	0	$0
221.11	2F Hallway	3000	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	3	0.19	558	Existing to Remain	Existing to Remain	2	62	0	0.19	558	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.21	2F Hallway	3000	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	11	0.68	2,046	Existing to Remain	Existing to Remain	2	62	0	0.68	2,046	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.11	2F Restroom	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	2	62	1	0.06	161	Existing to Remain	Existing to Remain	2	62	0	0.06	161	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.11	2F Boys Restroom	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., 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	No New Controls	0	0.0%	0	$0
221.11	2F Girls Restroom	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Surface Mnt., 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	No New Controls	0	0.0%	0	$0
3	2F Janitor Closet	1200	60w Incand	1	60	1	0.06	72	Re-lamp	12.5w Endura Philips LED	1	12.5	1	0.01	15	0.05	57	$7	0	No New Controls	0	0.0%	0	$0
221.31	2F Classroom 5	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Parabolic Lens	2	62	21	1.30	3,385	Existing to Remain	Existing to Remain	2	62	0	1.30	3,385	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	677	$84
221.31	2F Clasroom 6	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Parabolic Lens	2	62	14	0.87	2,257	Existing to Remain	Existing to Remain	2	62	0	0.87	2,257	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	451	$56
221.31	2F Classroom 7	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Parabolic Lens	2	62	14	0.87	2,257	Existing to Remain	Existing to Remain	2	62	0	0.87	2,257	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	451	$56
221.31	2F Clasroom 8	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Parabolic Lens	2	62	14	0.87	2,257	Existing to Remain	Existing to Remain	2	62	0	0.87	2,257	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	451	$56
221.31	2F Classroom 9	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Parabolic Lens	2	62	14	0.87	2,257	Existing to Remain	Existing to Remain	2	62	0	0.87	2,257	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	451	$56

			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, $
221.31	2F Clasroom 10	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Parabolic Lens	2	62	14	0.87	2,257	Existing to Remain	Existing to Remain	2	62	0	0.87	2,257	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	451	$56
221.31	2F Clasroom 11	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Parabolic Lens	2	62	14	0.87	2,257	Existing to Remain	Existing to Remain	2	62	0	0.87	2,257	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	451	$56
	TOTAL					**667**	**55**	**138,211**					**23**	**54**	**135,802**	**1.18**	**2,410**	**$299**			**37**	**8**	**20,109**	**$2,494**

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 #2	9575	SHARP NU-U235F2	391	17.5	6,858	91.89	106,183	74.4	16,383	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 #2**
Location: **Clifton, NJ**
Description: **Photovoltaic System 100% Financing - 15 year**

Simple Payback Analysis

	Photovoltaic System 100% Financing - 15 year
Total Construction Cost	$564,406
Annual kWh Production	106,183
Annual Energy Cost Reduction	$13,167
Average Annual SREC Revenue	$20,290

Simple Payback: **16.87** Years

Life Cycle Cost Analysis

Analysis Period (years):	15	Financing %:	100%
Discount Rate:	3%	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.124**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	6.00%	Average SREC Value ($/kWh)	$0.191

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Interest Expense	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$0	0	0	0	$0	0	0	0	0
1	$0	106,183	$13,167	$0	$26,546	$33,213	$23,940	($17,441)	($17,441)
2	$0	105,652	$13,562	$0	$26,413	$31,737	$25,417	($17,179)	($34,620)
3	$0	105,124	$13,969	$0	$26,281	$30,169	$26,984	($16,904)	($51,523)
4	$0	104,598	$14,388	$0	$26,150	$28,505	$28,649	($16,616)	($68,140)
5	$0	104,075	$14,819	$1,072	$26,019	$26,738	$30,416	($17,387)	($85,527)
6	$0	103,555	$15,264	$1,067	$20,711	$24,862	$32,292	($22,245)	($107,772)
7	$0	103,037	$15,722	$1,061	$20,607	$22,870	$34,283	($21,886)	($129,658)
8	$0	102,522	$16,193	$1,056	$20,504	$20,755	$36,398	($21,512)	($151,169)
9	$0	102,009	$16,679	$1,051	$20,402	$18,510	$38,643	($21,123)	($172,292)
10	$0	101,499	$17,180	$1,045	$15,225	$16,127	$41,026	($25,794)	($198,087)
11	$0	100,992	$17,695	$1,040	$15,149	$13,597	$43,557	($25,350)	($223,437)
12	$0	100,487	$18,226	$1,035	$15,073	$10,910	$46,243	($24,890)	($248,326)
13	$0	99,984	$18,773	$1,030	$14,998	$8,058	$49,095	($24,413)	($272,739)
14	$0	99,484	$19,336	$1,025	$9,948	$5,030	$52,124	($28,894)	($301,633)
15	$0	98,987	$19,916	$1,020	$9,899	$1,815	$55,338	($28,358)	($329,991)
	Totals:	1,538,189	$244,886	$11,501	$293,924	$292,894	$564,406	($329,991)	($2,392,355)

Net Present Value (NPV) **($242,086)**

APPENDIX G

STEAM TRAP REPLACEMENT ANALYSIS

Calculation Assumptions		
Description	**Value**	**Units**
Ann. Gas Usage	24,991	Therm
Less DHW Gas Usage	4,206	Therm
Less Other Gas Usage	0	Therm
Net Heating Gas Usage	20,785	Therm
Est. Steam Production	1,549,578	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)	$0.97	
Trap Failure Rate	15.00%	

Building Area	Estimated Quantity
Boiler Plant	4
Air Handlers	5
Condensate Pumps	1
Various Classrooms	25
TOTAL	35

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	25	4	131,703	1,767	$1,714
1" Trap	1/4"	54.70	5	1	46,933	630	$611
1 -1/2" Trap	3/8"	123.00	5	1	105,534	1,416	$1,373
TOTAL			**35**	**5**	**284,170**	**3,812**	**$3,697**

APPENDIX H

UNIT #	FUNCTION		MOTOR HP	MOTOR EFF.%	HR/DAY OPER.	ANNUAL KWh	PREMIUM EFF.%	ANNUAL KWh	ANNUAL KWh SAVINGS	$ SAV. $0.124	COND LOSS QT/MIN	ANNUAL HTG $ SAV	**TOTAL $ ENERGY SAV (E&G)**	EQUIP.& INST. COST	TOTAL COST NOTE 2
1	COND. PUMP		1	75.5%	11	3,526	77.0%	3,458	69	$9	0.25	$244	$252	$15,000	$21,750
TOTALS=										**$9**		**$244**	**$ 252**		**$21,750**

NOTE 1: KWH= HP / MOTOR% * 746 /1000 * HR/DAY * 365 * 0.8(MOTOR LOAD) * 0.9 PF
NOTE 2: INCLUDES 15% CONTINGENCY + 25% FOR RETROFIT WORK+ 15% CONTR. OH&P+ 10% Cx
NOTE 3: SAVINGS CALCULATED ON HEATING MAKE-UP FROM 60 F TO 200 F AND $.97/THERM AND 70% EFFICIENT BOILER PLANT