CLIFTON PUBLIC SCHOOLS
PUBLIC SCHOOL #1

158 PARK SLOPE
CLIFTON, NEW JERSEY 07011

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: PSEG
Rate: GLP
Meter No: 9197062
Account No: 67 391 277 00 / PE000010583303223036
Third Party Utility Provider: South Jersey Energy / Champion Energy Services LLC
TPS Meter / Acct No: -

MONTH OF USE	CONSUMPTION KWH	DEMAND KW	TOTAL BILL
Mar-12	9,720	44.0	$1,457
Apr-12	9,720	44.0	$1,457
May-12	9,600	40.0	$1,548
Jun-12	880	42.4	$615
Jul-12	12,480	39.2	$1,875
Aug-12	4,320	15.2	$672
Sep-12	4,560	40.8	$658
Oct-12	8,026	41.6	$1,021
Nov-12	8,026	41.6	$1,021
Dec-12	8,026	41.6	$1,021
Jan-13	9,520	38.4	$1,223
Feb-13	8,560	37.6	$1,094
Totals	**93,439**	**44.0 Max**	**$13,662**

AVERAGE DEMAND **38.9 KW average**
AVERAGE RATE **$0.146** **$/kWh**

*Note: Elementary School #1 procured third party supply through South Jersey Energy until April 2012, at which point Champion Energy Services LLC began providing third party supply.

Figure 1
Electricity Usage Profile

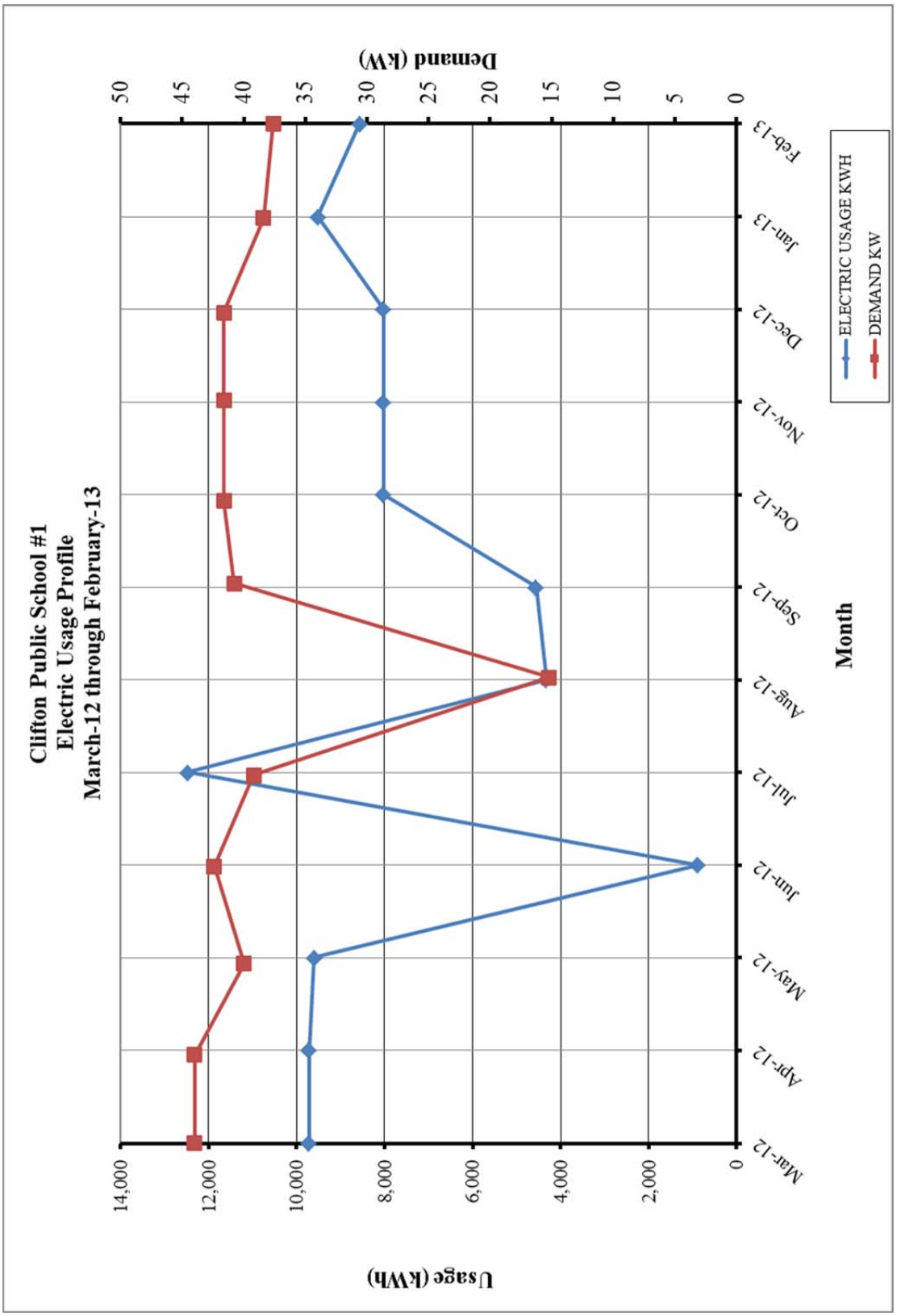
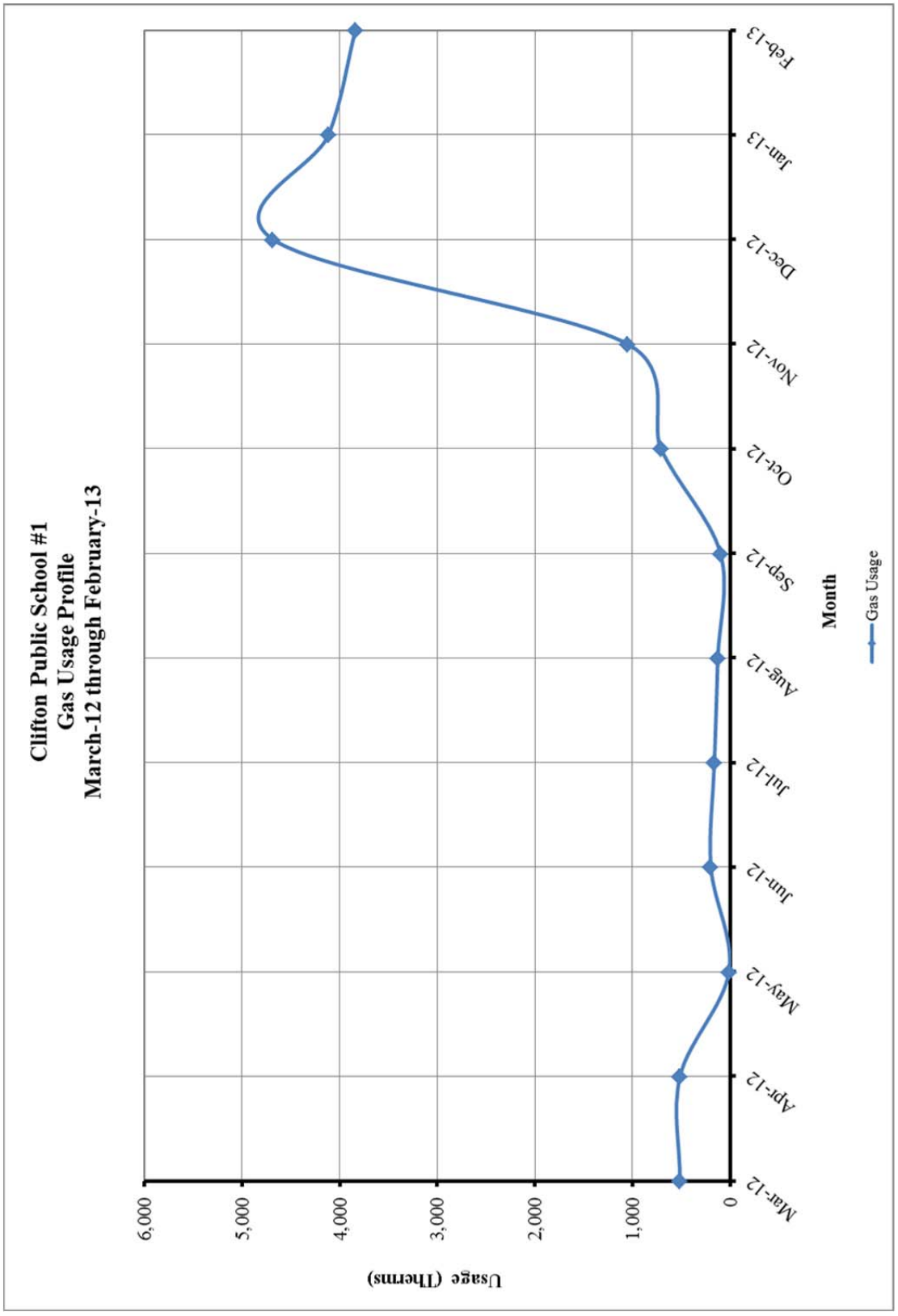


Table 4
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider: Public Service Electric & Gas		
Rate: LVG		
Meter No: 2643488		
Account No: 67 391 277 00 / PG000010583302423036		
Third Party Utility Provider: Hess		
TPS Meter No: 446575/446930		
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Mar-12	512.90	$425.88
Apr-12	512.90	$359.33
May-12	11.04	$104.94
Jun-12	197.30	$207.59
Jul-12	160.70	$193.25
Aug-12	125.10	$174.09
Sep-12	99.80	$156.22
Oct-12	709.70	$1,220.36
Nov-12	1,053.70	$1,420.78
Dec-12	4,689.50	$3,323.78
Jan-13	4,113.90	$3,420.06
Feb-13	3,839.00	$3,443.12
TOTALS	**16,025.54**	**$14,449.40**
AVERAGE RATE:	**$0.90**	**$/THERM**

Figure 2
Natural Gas Usage Profile



II. FACILITY DESCRIPTION

The School #1 Elementary School is located at 158 Park Slope in Clifton, New Jersey. The 32,035 SF school was built in 1930 with an addition in 1967. The building is a two-story facility comprised of administration offices, general classrooms, special education, child study team room, nurse's office, kitchen serving area, all-purpose room, stage, cafeteria, faculty work room, conference room, storage rooms, library/media center and mechanical/electrical rooms.

Occupancy Profile

The typical hours of operation for School #1 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 320 students and has 25 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 are double-section, double pane, operable, ¼" clear glass with aluminum frames. The original building roof is pitched with shingles and the addition roof is a flat built-up, rubber roof with light gravel ballast. The amount of roof insulation is unknown.

HVAC Systems

School #1 HVAC system consists of two steam boilers, classroom heating and ventilating units, a steam-to-hot water converter with two in-line hot water pumps, two thru-the-wall heat pumps and a window air conditioning unit.

The boilers are gas-fired steam boilers approximately 18 years old with an input of 2,449 MBH and an output of 2,400 lbs. /hr. at 212°F. Manufactured by Rockmills Steel Products and having an existing efficiency of approximately 75%, these boilers feed a shell and tube heat exchanger that converts the steam to hot water. Steam condensate is returned to a receiver/pump unit that then pumps the hot water to the boilers. Hot water is circulated via two Bell & Gossett in-line pumps rated at 85 GPM with 1-HP motors. These pumps supply hot water to classroom unit ventilators, fin-tube radiators, cabinet/unit heaters, etc.

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

Exhaust System

Air is exhausted from the toilet rooms through the roof exhausters. There are also several roof exhausters for the offices, storage rooms, mechanical rooms, and corridors. Air is exhausted from the classrooms by the unit ventilators.

HVAC System Controls

The steam boilers are controlled by a Heat-Timer Model MOD-4 with full modulation sequencing controls and an outside temperature reset controller also by Heat-Timer (Model MPC). Each unit ventilator in the classrooms is controlled by a Powers thermostat 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 entire facility is supplied by a Rheem Model 22V40F1 gas-fired, hot water heater with a capacity of 40 gallons and an input of 38 MBH (gas).

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 a milk refrigerator 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	$155	2.6	471.3%
ECM #2	Lighting Upgrade - Gymnasium	$5,000	$331	15.1	-0.7%
ECM #3	Lighting Upgrade - Exterior	$578	$686	0.8	1680.3%
ECM #4	Lighting Controls Upgrade	$5,365	$1,262	4.3	252.8%
ECM #5	Boiler Upgrade	$192,185	$2,296	83.7	-70.1%
ECM #6	Valve Blanket Insulation	$0	$1,314	9.1	173.8%
ECM #7	Energy Star Refrigerator	$760	$89	8.5	75.7%
ECM #8	Window AC Replacements	$700	$100	7.0	42.9%
ECM #9	Replace Condensate Pump Receiver	$21,750	$289	75.3	-80.1%
ECM #10	Water Conservation	$238	$418	0.6	1656.3%
ECM #11	DDC Controls Upgrade	$141,480	$1,303	108.6	-86.2%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	54.05 KW PV System	$364,684	$20,678	17.6	-14.9%
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	1,064	-
ECM #2	Lighting Upgrade - Gymnasium	0.9	2,267	-
ECM #3	Lighting Upgrade - Exterior	1.2	4,700	-
ECM #4	Lighting Controls Upgrade	-	8,647	-
ECM #5	Boiler Upgrade	-	-	2,551
ECM #6	Valve Blanket Insulation	-	-	1,460
ECM #7	Energy Star Refrigerator	-	612	-
ECM #8	Window AC Replacements	0.8	622	-
ECM #9	Replace Condensate Pump Receiver	-	208	287
ECM #10	Water Conservation			225 (43,200 Gallons of Water)
ECM #11	DDC Controls Upgrade		415	1,380
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	**DESCRIPTION**	**ANNUAL UTILITY REDUCTION**		
		ELECTRIC DEMAND (KW)	**ELECTRIC CONSUMPTION (KWH)**	**NATURAL GAS (THERMS)**
REM #1	54.05 KW PV System	54.1	61,345	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	$155	$407	$0	$407	2.6
Lighting Upgrade - Gymnasium	$331	$5,800	$800	$5,000	15.1
Lighting Upgrade - Exterior	$686	$578	$0	$578	0.8
Lighting Controls Upgrade	$1,262	$6,100	$735	$5,365	4.3
~~Boiler Upgrade~~	~~$2,296~~	~~$196,185~~	~~$4,000~~	~~$192,185~~	~~83.7~~
Valve Blanket Insulation	$1,314	$12,000	$0	$12,000	9.1
Energy Star Refrigerator	$89	$760	$0	$760	8.5
Window AC Replacements	$100	$700	$0	$700	7.0
~~Replace Condensate Pump Receiver~~	~~$289~~	~~$21,750~~	~~$0~~	~~$21,750~~	~~75.3~~
Water Conservation	$418	$238	$0	$238	0.6
~~DDC Controls Upgrade~~	~~$1,303~~	~~$141,480~~	~~$0~~	~~$141,480~~	~~108.6~~
Design / Construction Extras (15%)		$3,987		*$3,987*	
Total Project	**$4,355**	**$30,570**	**$1,535**	**$29,035**	**6.7**

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 #1 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):	$155
Total Yearly Savings ($/Yr):	$155
Estimated ECM Lifetime (Yr):	15
Simple Payback	2.6
Simple Lifetime ROI	471.3%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$2,325
Internal Rate of Return (IRR)	38%
Net Present Value (NPV)	$1,443.38

ECM #2: Lighting Upgrade – Gymnasium

Description:

The gymnasium at Clifton Elementary School #1 is currently lit via 400 watt Metal Halide HID fixtures. The space would be better served with a more efficient, fluorescent lighting system. Concord Engineering recommends upgrading the lighting to an energy-efficient T5 high output system that includes new four lamp, 54 watt high output fixtures.

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

Energy Savings Calculations:

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

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$5,800
NJ Smart Start Equipment Incentive ($):	$800
Net Installation Cost ($):	$5,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$331
Total Yearly Savings ($/Yr):	$331
Estimated ECM Lifetime (Yr):	15
Simple Payback	15.1
Simple Lifetime ROI	-0.7%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$4,965
Internal Rate of Return (IRR)	0%
Net Present Value (NPV)	($1,048.54)

ECM #3: Lighting Upgrade – Exterior Lighting

Description:

The exterior lighting at Clifton Elementary School #1 is currently lit via incandescent flood lamps. The exterior would be better served with more efficient LED lighting system. Concord Engineering recommends upgrading the lighting to an energy-efficient LED lighting system that includes LED lamps for the existing 90 and 120 watt incandescent flood lamps on the exterior with 15 and 20 watt PAR 30 and PAR 38 LED lamps.

This measure replaces all the 90 and 120 watt flood lamps fixtures with 15 and 20 Watt LED lamps.

Energy Savings Calculations:

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

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$578
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$578
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$686
Total Yearly Savings ($/Yr):	$686
Estimated ECM Lifetime (Yr):	15
Simple Payback	0.8
Simple Lifetime ROI	1680.3%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$10,290
Internal Rate of Return (IRR)	119%
Net Present Value (NPV)	$7,611.42

ECM #4: Lighting Controls Upgrade – Occupancy Sensors

Description:

Some of the lights in the Clifton Elementary School #1 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 #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$6,100
NJ Smart Start Equipment Incentive ($):	$735
Net Installation Cost ($):	$5,365
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,262
Total Yearly Savings ($/Yr):	$1,262
Estimated ECM Lifetime (Yr):	15
Simple Payback	4.3
Simple Lifetime ROI	252.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$18,930
Internal Rate of Return (IRR)	22%
Net Present Value (NPV)	$9,700.67

ECM #5: Condensing Boiler Installation

Description:

There are two existing Rockmills steam boilers which are used as the primary source of heat for Clifton Elementary School #1. These boilers are connected to a steam to hot water heat exchanger which then distributes hot water to the air handling units and unit ventilators throughout the system. The Rockmills boilers are approximately 18 years old and have not yet surpassed their life expectancy of a typical fire-tube boiler but considering the system can be converted over to hot water without extensive rework of the system, the savings of new hot water condensing boilers can be significant.

New condensing boilers could substantially improve the operating efficiency of the heating system of the building. Condensing boiler's peak efficiency tops out at 99% depending on return water temperature. Due to the operating conditions of the building, the annual average operating efficiency of the proposed condensing boiler is expected to be 92%. The existing boiler's efficiency is approximately 75%, which makes the condensing boilers a 17% increase in efficiency. This ECM is based on variable supply water temperature adjusted based on outdoor temperature.

This ECM includes installation of two condensing gas fired boilers to replace the existing Rockmills steam fire-tube boilers. Additionally, the piping in the boiler room will require some work due to the removal of the heat exchanger from the system, which requires new piping to be laid out from the boilers to the existing loop pumps. The basis for this ECM is Aerco condensing boiler; model number BMK – 2.0. The boiler installation is based on a one for one replacement based on capacity of the existing boiler.

Energy Savings Calculations:

Total Facility Gas Therm Usage: 16,025 Therms

Domestic Hot Water Gas Use: 2,221 Therms

Boiler Gas Usage: 16,025 Therms – 2,221 Domestic HW = 13,804 Therms

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

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

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

CONDENSING BOILER CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Cast Iron Boilers	New Condensing Boilers	
Existing Nat Gas (Therms)	13,805	0	
Boiler Efficiency (%)	75%	92%	17%
Nat Gas Heat Value (BTU/Therm)	100,000	100,000	
Equivalent Building Heat Usage (MMBTUs)	1,035	1,035	
Gas Cost ($/Therm)	0.90	0.90	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Natural Gas Usage (Therms)	13,805	11,254	2,551
Energy Cost ($)	$12,424	$10,128	$2,296
COMMENTS:			

Note: Concord Engineering is utilizing a seasonal average efficiency of 92% to account for efficiencies based on an outside air reset schedule.

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$196,185
NJ Smart Start Equipment Incentive ($):	$4,000
Net Installation Cost ($):	$192,185
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,296
Total Yearly Savings ($/Yr):	$2,296
Estimated ECM Lifetime (Yr):	25
Simple Payback	83.7
Simple Lifetime ROI	-70.1%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$57,400
Internal Rate of Return (IRR)	-8%
Net Present Value (NPV)	($152,204.41)

ECM #6: Valve Blanket Insulation

Description:

The boiler plant at Clifton Elementary School #1, supplies steam to the hot water heat exchanger in the heating season. 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										
2	6"	Gate Valve	220	8.80	448.00	7,884.80	31.54	36.40	640.70	2.56	28.98	$260.79
1	3"	Return Plug Valve	220	2.40	448.00	1,075.20	4.30	36.40	87.37	0.35	3.95	$35.56
2	2"	Control Valve	220	3.40	448.00	3,046.40	12.19	36.40	247.54	0.99	11.20	$100.76
2	3"	Strainer	220	4.80	448.00	4,300.80	17.20	36.40	349.47	1.40	15.81	$142.25
2	8"	Gate Valve	220	11.80	448.00	10,572.80	42.29	36.40	859.12	3.44	38.85	$349.69
2	4"	x 3" Reducer	220	0.59	448.00	528.64	2.11	36.40	42.96	0.17	1.94	$17.48
1	6"	Control Valve	220	6.10	448.00	2,732.80	10.93	36.40	222.06	0.89	10.04	$90.39
2	4"	Steam Trap	220	4.80	448.00	4,300.80	17.20	36.40	349.47	1.40	15.81	$142.25
1	8"	Heat Exhanger	220	11.80	448.00	5,286.40	21.15	36.40	429.56	1.72	19.43	$174.85
15		TOTAL					158.9			12.9	146.0	$1,314

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 #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$12,000
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$12,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,314
Total Yearly Savings ($/Yr):	$1,314
Estimated ECM Lifetime (Yr):	25
Simple Payback	9.1
Simple Lifetime ROI	173.8%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	$32,850
Internal Rate of Return (IRR)	10%
Net Present Value (NPV)	$10,880.88

ECM #7: Refrigerator Replacement

Description:

The Clifton Elementary School #1 has residential style refrigerators in the faculty dining and nurse's office. The Nurses Office unit is an older side by side 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	GE	Frigidaire	
Type	Top/Bottom	Top / Bottom	
Model	TA12SRB	FFPT12F3MB	
Size (Cu-Ft)	11.5	12	
Per Unit Electric Usage (kWh)	900	288	612
Electric Rate ($/kWh)	$0.146	$0.146	
ENERGY SAVINGS CALCULATIONS			
Electric Usage (kWh)	900	288	612
Energy Cost ($)	$131	$42	$89
COMMENTS:	Calculations based Energy Star Website http://www.energystar.gov/index.cfm?fuseaction=refrig.calculator		

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$760
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$760
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$89
Total Yearly Savings ($/Yr):	$89
Estimated ECM Lifetime (Yr):	15
Simple Payback	8.5
Simple Lifetime ROI	75.7%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$1,335
Internal Rate of Return (IRR)	8%
Net Present Value (NPV)	$302.48

ECM #8: 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: $0.16/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	2	800	8	10.8	622	0.78	$100	$700	7.0

Energy Savings Summary:

ECM #8 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$700
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$700
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$100
Total Yearly Savings ($/Yr):	$100
Estimated ECM Lifetime (Yr):	10
Simple Payback	7.0
Simple Lifetime ROI	42.9%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$1,000
Internal Rate of Return (IRR)	7%
Net Present Value (NPV)	$153.02

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 G** for detailed energy savings calculations.

Energy Savings Summary:

ECM #9 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$21,750
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$21,750
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$289
Total Yearly Savings ($/Yr):	$289
Estimated ECM Lifetime (Yr):	15
Simple Payback	75.3
Simple Lifetime ROI	-80.1%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$4,335
Internal Rate of Return (IRR)	-16%
Net Present Value (NPV)	($18,299.94)

ECM #10: 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)	$0.900	$0.900	
Water Rate ($/1000gal)	$5.000	$5.000	
ENERGY SAVINGS CALCULATIONS			
Natural Gas Usage (Therm)	412	187	225
Water Usage (gallons)	79,200	36,000	43,200
Energy Cost ($)	$767	$349	$418
COMMENTS:			

Energy Savings Summary:

ECM #10 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$238
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$238
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$418
Total Yearly Savings ($/Yr):	$418
Estimated ECM Lifetime (Yr):	10
Simple Payback	0.6
Simple Lifetime ROI	1656.3%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$4,180
Internal Rate of Return (IRR)	176%
Net Present Value (NPV)	$3,327.62

ECM #11: Digital Energy Management System (DDC EMS)

Description:

Currently, Clifton Elementary School #1 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)	13,805	-	
Existing Electricity Usage (kWh)	8,297	-	
Energy Savings, Nat Gas	-	10%	
Energy Savings, Electricity	-	5%	
Gas Cost ($/Therm)	*$0.90*	$0.90	
Electricity Cost ($/kWh)	*$0.146*	$0.146	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Nat Gas Usage (Therms)	13,805	12,424	1,380
Electricity Usage (kWh)	8,297	7,882	415
Nat Gas Cost ($)	$12,424	$11,182	$1,242
Electricity Cost ($)	$1,211	$1,151	$61
Energy Cost ($)	$13,635	$12,332	$1,303
COMMENTS:			

Demand savings due to implementation of this ECM is minimal.

The cost of a full DDC system with new field devices, controllers, computer, software, programming, etc. is approximately $4.42 per SF in accordance with recent Contractor pricing for systems of this magnitude. Savings from the implementation of this ECM will be from the reduced energy consumption currently used by the HVAC system by proper control of schedule and temperatures via the DDC system.

Energy Savings Summary:

ECM #11 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$141,480
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$141,480
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,303
Total Yearly Savings ($/Yr):	$1,303
Estimated ECM Lifetime (Yr):	15
Simple Payback	108.6
Simple Lifetime ROI	-86.2%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$19,545
Internal Rate of Return (IRR)	-18%
Net Present Value (NPV)	($125,924.87)

REM #1: 54.05 kW Solar System

Description:

The Clifton Elementary School #1 has available parking lot space that could accommodate a significant amount of solar generation. Based on the available areas a 54.05 kilowatt solar array could be installed. The array will produce approximately 61,345 kilowatt-hours annually that will reduce the overall electric usage of the facility by 65.65%.

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}):	54.05
Electric Generation (KWH/Yr):	61,345
Installation Cost ($):	$364,684
SREC Revenue ($/Yr):	$11,722
Energy Savings ($/Yr):	$8,956
Total Yearly Savings ($/Yr):	$20,678
ECM Analysis Period (Yr):	15
Simple Payback (Yrs):	17.6
Analysis Period Electric Savings ($):	$166,579
Analysis Period SREC Revenue ($):	$169,809
Net Present Value (NPV)	($165,322.66)

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 #1

ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Svaing * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM #1	Lighting Upgrade - General	$297	$110	$0	$407	$155	$0	$155	15	$2,325	$0	471.3%	2.6	37.77%	$1,443.38
ECM #2	Lighting Upgrade - Gymnasium	$1,800	$4,000	$800	$5,000	$331	$0	$331	15	$4,965	$0	-0.7%	15.1	144337.99%	$0.00
ECM #3	Lighting Upgrade - Exterior	$508	$70	$0	$578	$686	$0	$686	15	$10,290	$0	1680.3%	0.8	0.00%	$0.00
ECM #4	Lighting Controls Upgrade	$3,950	$2,150	$735	$5,365	$1,262	$0	$1,262	15	$18,930	$0	252.8%	4.3	0.00%	$0.00
ECM #5	Boiler Upgrade	$87,055	$109,130	$4,000	$192,185	$2,296	$0	$2,296	25	$57,400	$0	-70.1%	83.7	0.00%	$0.00
ECM #6	Valve Blanket Insulation	$6,500	$5,500	$0	$12,000	$1,314	$0	$1,314	25	$32,850	$0	173.8%	9.1	0.00%	$0.00
ECM #7	Energy Star Refrigerator	$660	$100	$0	$760	$89	$0	$89	15	$1,335	$0	75.7%	8.5	0.00%	$0.00
ECM #8	Window AC Replacements	$700	$0	$0	$700	$100	$0	$100	10	$1,000	$0	42.9%	7.0	0.00%	$0.00
ECM #9	Replace Condensate Pump Receiver	$15,000	$6,750	$0	$21,750	$289	$0	$289	15	$4,335	$0	-80.1%	75.3	0.00%	$0.00
ECM #10	Water Conservation	$160	$78	$0	$238	$418	$0	$418	10	$4,180	$0	1656.3%	0.6	0.00%	$0.00
ECM #11	DDC Controls Upgrade	$141,480	$0	$0	$141,480	$1,303	$0	$1,303	15	$19,545	$0	-86.2%	108.6	0.00%	$0.00
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	54.05 KW PV System	$364,684	$0	$0	$364,684	$8,956	$11,722	$20,678	15	$310,177	$175,831	-14.9%	17.6	-1.96%	($117,825.50)

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

APPENDIX B

Concord Engineering Group, Inc.

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

SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives as of February 11, 2013:

Electric Chillers

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

Energy Efficiency must comply with ASHRAE 90.1-2007

Gas Cooling

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

Desiccant Systems

$1.00 per cfm – gas or electric

Electric Unitary HVAC

Unitary AC and Split Systems	$73 - $92 per ton
Air-to-Air Heat Pumps	$73 - $92 per ton
Water-Source Heat Pumps	$81 per ton
Packaged Terminal AC & HP	$65 per ton
Central DX AC Systems	$40- $72 per ton
Dual Enthalpy Economizer Controls	$250
Occupancy Controlled Thermostat (Hospitality & Institutional Facility)	$75 per thermostat
A/C Economizing Controls	≤ 5 tons $85/unit; >5 tons $170/unit

Energy Efficiency must comply with ASHRAE 90.1-2007

Gas Heating

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

Ground Source Heat Pumps

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

Energy Efficiency must comply with ASHRAE 90.1-2007

Variable Frequency Drives

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

Natural Gas Water Heating

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

Prescriptive Lighting

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

Prescriptive Lighting - LED

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

Lighting Controls – Occupancy Sensors

Wall Mounted	$20 per control
Remote Mounted	$35 per control
Daylight Dimmers	$25-$50 per fixture
Occupancy Controlled hi-low Fluorescent Controls	$25 per fixture controlled

Lighting Controls – HID or Fluorescent Hi-Bay Controls

Occupancy hi-low	$75 per fixture controlled
Daylight Dimming	$75 per fixture controlled

Premium Motors

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

Refrigeration Doors/Covers

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

Refrigeration Controls

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

Other Equipment Incentives

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

APPENDIX C

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
1-Clifton BOE - PS 1

Building ID: 3477467
For 12-month Period Ending: February 28, 2013[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: April 11, 2013

Facility
1-Clifton BOE - PS 1
158 Park Slope
Clifton, NJ 07011

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: 1930
Gross Floor Area (ft²): 32,035

Energy Performance Rating[2] (1-100) 61

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	317,776
Natural Gas (kBtu)[4]	1,545,698
Total Energy (kBtu)	1,863,474

Energy Intensity[4]

Site (kBtu/ft²/yr)	58
Source (kBtu/ft²/yr)	84

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	127

Electric Distribution Utility
Public Service Electric & Gas Co

National Median Comparison

National Median Site EUI	65
National Median Source EUI	93
% Difference from National Median Source EUI	-10%
Building Type	K-12 School

Stamp of Certifying Professional

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

Meets Industry 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	1-Clifton BOE - PS 1	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	158 Park Slope, Clifton, NJ 07011	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 1 (K-12 School)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	32,035 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	56 (Default)	Is this the number of personal computers in the K12 School?		☐
Number of walk-in refrigeration/freezer units	0	Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas.		☐
Presence of cooking facilities	No	Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no".		☐
Percent Cooled	0 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐
Months	10(Optional)	Is this school in operation for at least 8 months of the year?		☐

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

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: Public Service Electric & Gas Co

Fuel Type: Electricity

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

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
01/07/2013	02/06/2013	9,520.00
12/07/2012	01/06/2013	8,026.00
11/07/2012	12/06/2012	8,026.00
10/07/2012	11/06/2012	8,026.00
09/07/2012	10/06/2012	4,560.00
08/07/2012	09/06/2012	4,320.00
07/07/2012	08/06/2012	12,480.00
06/07/2012	07/06/2012	880.00
05/07/2012	06/06/2012	9,600.00
04/07/2012	05/06/2012	9,720.00
03/07/2012	04/06/2012	9,720.00

electric Consumption (kWh (thousand Watt-hours))	**84,878.00**
electric Consumption (kBtu (thousand Btu))	**289,603.74**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))	**289,603.74**
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)
01/07/2013	02/06/2013	4,113.90
12/07/2012	01/06/2013	4,689.50
11/07/2012	12/06/2012	1,053.70
10/07/2012	11/06/2012	709.70
09/07/2012	10/06/2012	99.80
08/07/2012	09/06/2012	125.10
07/07/2012	08/06/2012	160.70
06/07/2012	07/06/2012	197.30
05/07/2012	06/06/2012	11.04
04/07/2012	05/06/2012	512.90
03/07/2012	04/06/2012	512.90

gas Consumption (therms)	**12,186.54**
gas Consumption (kBtu (thousand Btu))	**1,218,654.00**
Total Natural Gas Consumption (kBtu (thousand Btu))	**1,218,654.00**
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
1-Clifton BOE - PS 1
158 Park Slope
Clifton, NJ 07011

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

1-Clifton BOE - PS 1	
Gross Floor Area Excluding Parking: (ft^2)	32,035
Year Built	1930
For 12-month Evaluation Period Ending Date:	February 28, 2013

Facility Space Use Summary

Elementary School 1	
Space Type	K-12 School
Gross Floor Area (ft^2)	32,035
Open Weekends?	No
Number of PCs [d]	56
Number of walk-in refrigeration/freezer units	0
Presence of cooking facilities	No
Percent Cooled	0
Percent Heated	100
Months [o]	10
High School?	No
School District [o]	clifton

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 02/28/2013)	**Baseline** (Ending Date 02/28/2013)	**Rating of 75**	**Target**	**National Median**
Energy Performance Rating	61	61	75	N/A	50
Energy Intensity					
Site ($kBtu/ft^2$)	58	58	51	N/A	65
Source ($kBtu/ft^2$)	84	84	73	N/A	93
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	127	127	110	N/A	141
$kgCO_2e/ft^2$/year	4	4	3	N/A	4

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

Notes:
o - This attribute is optional.
d - A default value has been supplied by Portfolio Manager.

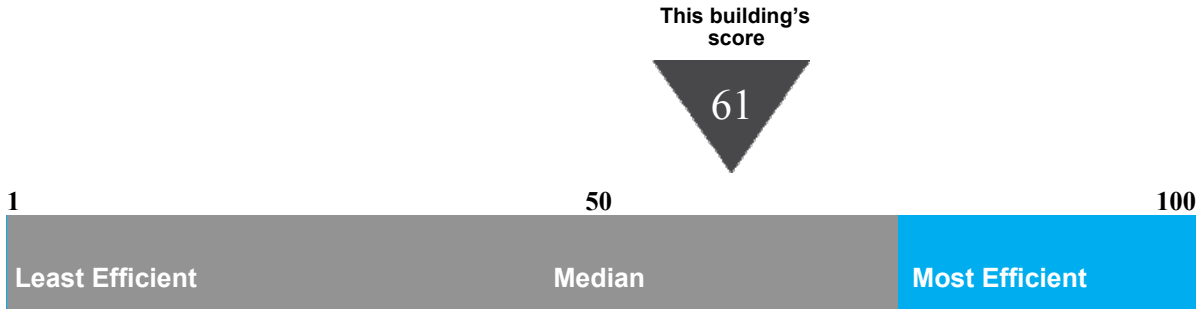
Statement of Energy Performance

2013

1-Clifton BOE - PS 1
158 Park Slope
Clifton, NJ 07011

Portfolio Manager Building ID: 3477467

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 84 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 #1

AC Units

Tag			
Unit Type	PTAC Heat Pump	Window Air Conditioning Units	
Qty	2	1	
Location	2nd Floor Faculty Conf Room	Nurse	
Area Served	2nd Floor Faculty Conf Room	Nurse	
Manufacturer	Trane	Carrier	
Model #	PTHB1501JF	51DZA112101	
Serial #	A95G00261	U44000B	
Cooling Type	DX, R-22	DX, R-22	
Cooling Capacity (Tons)	14,100 Btu/hr	1 Ton	
Cooling Efficiency (SEER/EER)	9.3 EER	8.3 EER	
Heating Type	Heat Pump	N/A	
Heating Input (MBH)	14,500 Btu/hr	N/A	
Efficiency	2.8 COP	N/A	
Fuel	Electric Heat Backup (5 KW)	N/A	
Approx Age	13	29	
ASHRAE Service Life	15	15	
Remaining Life	2	(14)	
Comments			

Note:

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

School #1

Boilers

Tag			
Unit Type	Fire Tube Steam Boilers		
Qty	2		
Location	Boiler Room		
Area Served	Steam-to-Hot Water HX		
Manufacturer	Rockmills		
Model #	MP 60		
Serial #	9522 & 9523		
Boiler Horsepower	60		
Rated Output Capacity (MBH)	2,070 lbs/hr (Steam)		
Approx. Efficiency %	75.0%		
Fuel	Natural Gas		
Approx Age	18		
ASHRAE Service Life	25		
Remaining Life	7		
Comments	Industrial Combustion Burner: MN:MMG-20 SN:35100-2		

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

School #1

Domestic Water Heaters

Tag			
Unit Type	Gas-Fired Domestic Hot Water Heater		
Qty	1		
Location	Boiler Room		
Area Served	Domestic Hot Water		
Manufacturer	Rheem Guardian		
Model #	22V40F1		
Serial #	RHLN1210402720		
Size (Gallons)	40 Gallons		
Input Capacity (MBH/KW)	38 MBH		
Recovery (Gal/Hr)	-		
Efficiency %	80%		
Fuel	Natural Gas		
Approx Age	2		
ASHRAE Service Life	12		
Remaining Life	10		
Comments			

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

School #1

Pumps

Tag			
Unit Type	In-Line Pumps	Condensate Return	
Qty	2	2	
Location	Boiler Room	Boiler Room	
Area Served	Heat Exchanger for HW Loop	Steam Loop	
Manufacturer	Bell & Gossett	National Pump & Controls Inc.	
Model #	-	CVD3020	
Serial #	-	2M06	
Horse Power	1 HP	-	
Flow	-	-	
Motor Info	MagneTeK Century AC motor	-	
Electrical Power	230/115	-	
RPM	1725 RPM	-	
Motor Efficiency %	82.5%	-	
Approx Age	5	29	
ASHRAE Service Life	15	15	
Remaining Life	10	(14)	
Comments			

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

APPENDIX E

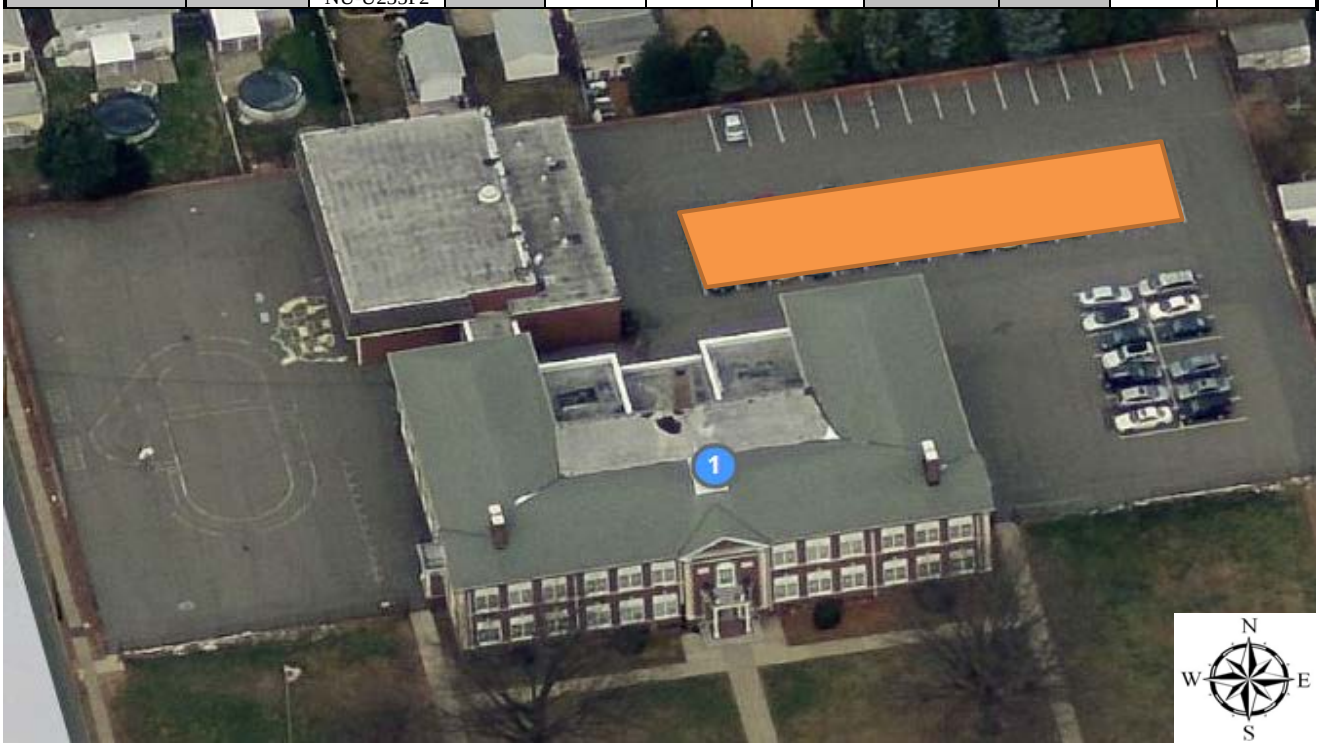
CEG Project #: 9C12066
Facility Name: Clifton Public School #1
Address: 158 Park Slope
City, State, Zip Clifton, NJ 07011

			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	Multi-Purpose Room	2600	400w Metal Halide Recessed	1	460	8	3.68	9,568	Remove & Replace New Fixture	2x4, 6 Lamp, 54w T5, (3) 2/54 Elect. Ballast, Singlepoint Mnt., High Bay, Wire Guard	6	351	8	2.81	7,301	0.87	2,267	$331	0	No New Controls	0	0.0%	0	$0
4	Side Stage 1	2600	60w Incandescent Recessed Prismatic	1	60	1	0.06	156	Re-lamp	12.5w Endura Philips LED	1	12.5	1	0.01	33	0.05	124	$18	0	No New Controls	0	0.0%	0	$0
4	Side Stage 2	2600	60w Incandescent Recessed Prismatic	1	60	2	0.12	312	Re-lamp	12.5w Endura Philips LED	1	12.5	2	0.03	65	0.10	247	$36	0	No New Controls	0	0.0%	0	$0
221.21	Stage Storage 1	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	2	0.12	149	Existing to Remain	Existing to Remain	2	62	0	0.12	149	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.21	Stage Storage 2	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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
4	Stage Storage 2	1200	60w Incandescent Recessed Prismatic	1	60	1	0.06	72	Re-lamp	12.5w Endura Philips LED	1	12.5	1	0.01	15	0.05	57	$8	0	No New Controls	0	0.0%	0	$0
221.21	Stage	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	13	0.81	2,096	Existing to Remain	Existing to Remain	2	62	0	0.81	2,096	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
221.21	MPR Boys Restroom	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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	0	No New Controls	0	0.0%	0	$0
221.21	MPR Girls Restroom	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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	0	No New Controls	0	0.0%	0	$0
221.11	Physed Storage	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
232.21	Hall to Gym	3000	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	7	0.60	1,806	Existing to Remain	Existing to Remain	3	86	0	0.60	1,806	0.00	0	$0	0	No New Controls	0	0.0%	0	$0
232.21	Classroom 107	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	10	0.86	2,236	Existing to Remain	Existing to Remain	3	86	0	0.86	2,236	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	447	$65
232.21	Classroom 105	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	10	0.86	2,236	Existing to Remain	Existing to Remain	3	86	0	0.86	2,236	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	447	$65
232.21	Classroom 103	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	10	0.86	2,236	Existing to Remain	Existing to Remain	3	86	0	0.86	2,236	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	447	$65
232.21	Classroom 101	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	10	0.86	2,236	Existing to Remain	Existing to Remain	3	86	0	0.86	2,236	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	447	$65
232.21	Cafeteria	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	10	0.86	2,236	Existing to Remain	Existing to Remain	3	86	0	0.86	2,236	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	447	$65
242.21	Custodial and General Supplies	1200	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	8	0.86	1,027	Existing to Remain	Existing to Remain	4	107	0	0.86	1,027	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	205	$30
232.21	Classroom 102	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	10	0.86	2,236	Existing to Remain	Existing to Remain	3	86	0	0.86	2,236	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	447	$65
232.21	Classroom 104	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	10	0.86	2,236	Existing to Remain	Existing to Remain	3	86	0	0.86	2,236	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	447	$65
232.21	Classroom 106	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	10	0.86	2,236	Existing to Remain	Existing to Remain	3	86	0	0.86	2,236	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	447	$65

			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, $
232.21	Classroom 108	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	10	0.86	2,236	Existing to Remain	Existing to Remain	3	86	0	0.86	2,236	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	447	$65
221.31	Small Classroom	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Parabolic Lens	2	62	2	0.12	322	Existing to Remain	Existing to Remain	2	62	0	0.12	322	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	64	$9
232.21	Classroom 201	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	10	0.86	2,236	Existing to Remain	Existing to Remain	3	86	0	0.86	2,236	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	447	$65
232.21	Classroom 202	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	10	0.86	2,236	Existing to Remain	Existing to Remain	3	86	0	0.86	2,236	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	447	$65
232.21	Classroom 203	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	10	0.86	2,236	Existing to Remain	Existing to Remain	3	86	0	0.86	2,236	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	447	$65
232.21	Classroom 204	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	10	0.86	2,236	Existing to Remain	Existing to Remain	3	86	0	0.86	2,236	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	447	$65
232.21	Classroom 205	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	10	0.86	2,236	Existing to Remain	Existing to Remain	3	86	0	0.86	2,236	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	447	$65
232.21	Classroom 206	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	10	0.86	2,236	Existing to Remain	Existing to Remain	3	86	0	0.86	2,236	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	447	$65
232.21	Classroom 207	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	10	0.86	2,236	Existing to Remain	Existing to Remain	3	86	0	0.86	2,236	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	447	$65
232.21	Classroom 208	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	10	0.86	2,236	Existing to Remain	Existing to Remain	3	86	0	0.86	2,236	0.00	0	$0	5	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	447	$65
221.31	Side Classroom	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Parabolic Lens	2	62	2	0.12	322	Existing to Remain	Existing to Remain	2	62	0	0.12	322	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	64	$9
221.31	Special Ed Speech	2600	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Parabolic Lens	2	62	4	0.25	645	Existing to Remain	Existing to Remain	2	62	0	0.25	645	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	129	$19
232.21	Faculty Room	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	6	0.52	1,342	Existing to Remain	Existing to Remain	3	86	0	0.52	1,342	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	268	$39
232.21	Main Office	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	2	0.17	447	Existing to Remain	Existing to Remain	3	86	0	0.17	447	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	89	$13
232.21	Principal's Office	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	2	0.17	447	Existing to Remain	Existing to Remain	3	86	0	0.17	447	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	89	$13
232.21	Teacher Prep	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	3	0.26	671	Existing to Remain	Existing to Remain	3	86	0	0.26	671	0.00	0	$0	6	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	134	$20
2	Teacher Prep Closet	1200	60w Incandescent	1	60	1	0.06	72	Re-lamp	12.5w Endura Philips LED	1	12.5	1	0.01	15	0.05	57	$8	0	No New Controls	0	0.0%	0	$0
227.41	Teacher Prep Restroom	1200	2x2, 2 Lamp, 32w T8, Elect. Ballast, Wall 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
7	Exterior	4000	2 Lamp Par38 120w Flood Lamp	2	240	4	0.96	3,840	Re-lamp	20w Par 38 LED	2	40	4	0.16	640	0.80	3,200	$467	0	No New Controls	0	0.0%	0	$0
8	Exterior	4000	150w Quartz Wall Pack	1	150	1	0.15	600	0	0	0	0	1	0.00	0	0.15	600	$88	0	No New Controls	0	0.0%	0	$0
5	Exterior	4000	90w Flood	1	90	3	0.27	1,080	Re-lamp	15w Par 30 LED	1	15	3	0.05	180	0.23	900	$131	0	No New Controls	0	0.0%	0	$0
	TOTAL					**309**	**29**	**75,798**					**27**	**26**	**67,767**	**3**	**8,031**	**$1,173**			**25**	**5**	**8,647**	**$1,262**

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 #1	3900	SHARP NU-U235F2	230	17.5	4,034	54.05	61,345	43.8	9,637	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 #1
Location:
Description: Photovoltaic System 100% Financing - 15 year

Simple Payback Analysis

	Photovoltaic System 100% Financing - 15 year
Total Construction Cost	$364,684
Annual kWh Production	61,345
Annual Energy Cost Reduction	$8,956
Average Annual SREC Revenue	$11,722

Simple Payback: **17.64** Years

Life Cycle Cost Analysis

Analysis Period (years): 15
Discount Rate: 3%
Average Energy Cost ($/kWh) **$0.146**
Financing Rate: 6.00%
Financing %: 100%
Maintenance Escalation Rate: 3.0%
Energy Cost Escalation Rate: 3.0%
Average SREC Value ($/kWh) $0.191

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Interest Expense	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$0	0	0	0	$0	0	0	0	0
1	$0	61,345	$8,956	$0	$15,336	$21,460	$15,469	($12,636)	($12,636)
2	$0	61,038	$9,225	$0	$15,260	$20,506	$16,423	($12,444)	($25,081)
3	$0	60,733	$9,502	$0	$15,183	$19,493	$17,436	($12,244)	($37,324)
4	$0	60,429	$9,787	$0	$15,107	$18,418	$18,511	($12,035)	($49,359)
5	$0	60,127	$10,080	$619	$15,032	$17,276	$19,653	($12,436)	($61,795)
6	$0	59,827	$10,383	$616	$11,965	$16,064	$20,865	($15,197)	($76,992)
7	$0	59,528	$10,694	$613	$11,906	$14,777	$22,152	($14,942)	($91,934)
8	$0	59,230	$11,015	$610	$11,846	$13,411	$23,518	($14,678)	($106,612)
9	$0	58,934	$11,346	$607	$11,787	$11,960	$24,969	($14,403)	($121,015)
10	$0	58,639	$11,686	$604	$8,796	$10,420	$26,509	($17,051)	($138,066)
11	$0	58,346	$12,037	$601	$8,752	$8,785	$28,144	($16,741)	($154,807)
12	$0	58,054	$12,398	$598	$8,708	$7,049	$29,879	($16,421)	($171,229)
13	$0	57,764	$12,770	$595	$8,665	$5,207	$31,722	($16,090)	($187,318)
14	$0	57,475	$13,153	$592	$5,748	$3,250	$33,679	($18,621)	($205,939)
15	$0	57,188	$13,547	$589	$5,719	$1,173	$35,756	($18,252)	($224,191)
	Totals:	888,656	$166,579	$6,645	$169,809	$189,250	$364,684	($224,191)	($1,664,297)

Net Present Value (NPV) **($165,323)**

APPENDIX G

DESCRIPTION: CONDENSATE RETURN PUMP/RECEIVER REPLACEMENT

UNIT #	FUNCTION		MOTOR HP	MOTOR EFF.%	HR/DAY OPER.	ANNUAL KWh	PREMIUM EFF.%	ANNUAL KWh	ANNUAL KWh SAVINGS	$ SAV. $0.146	COND LOSS QT/MIN	ANNUAL HTG $ SAV	**TOTAL $ ENERGY SAV (E&G)**	EQUIP.& INST. COST		TOTAL COST NOTE 2
1	COND. PUMP		0.75	78.5%	11	2,544	85.5%	2,335	208	$30	0.25	$258	$289	$15,000	$6,750	$21,750
TOTALS=										**$30**		**$258**	**$ 289**	**$15,000**	**$6,750**	**$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 $.90/THERM AND 70% EFFICIENT BOILER PLANT