NEW BRUNSWICK
BOARD OF EDUCATION

LIVINGSTON ELEMENTARY SCHOOL

206 DELAVAN STREET
NEW BRUNSWICK, NJ 08901

FACILITY ENERGY REPORT

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I. HISTORIC ENERGY CONSUMPTION/COST

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

Electric Utility Provider:	Public Service Electric & Gas
Electric Utility Rate Structure:	Large Power & Lighting Service (LPLS)
Third Party Supplier:	None

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

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

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

Table 1
Electricity Billing Data

ELECTRIC USAGE SUMMARY

Utility Provider: PSE&G
Rate: GLP
Meter No: 728010136 ; 278004267
Account # 70 055 890 09
Third Party Utility Direct Energy
TPS Meter / Acct No: N/A

MONTH OF USE	CONSUMPTION KWH	DEMAND KW	TOTAL BILL
Nov-11	17,865	98.3	$2,299
Dec-11	24,860	102.4	$3,423
Jan-12	21,010	91.3	$2,918
Feb-12	19,355	92.7	$4,523
Mar-12	15,350	97.6	$2,265
Apr-12	15,385	91.8	$2,486
May-12	15,385	90.6	$3,391
Jun-12	22,990	88.9	$3,687
Jul-12	10,690	93.6	$2,511
Aug-12	16,100	82.4	$3,173
Sep-12	14,015	92.9	$2,106
Oct-12	12,825	101.1	$1,993
Totals	**205,830**	**102.4 Max**	**$34,775**

AVERAGE DEMAND **93.6 KW average**
AVERAGE RATE **$0.169** **$/kWh**

Figure 1
Electricity Usage Profile

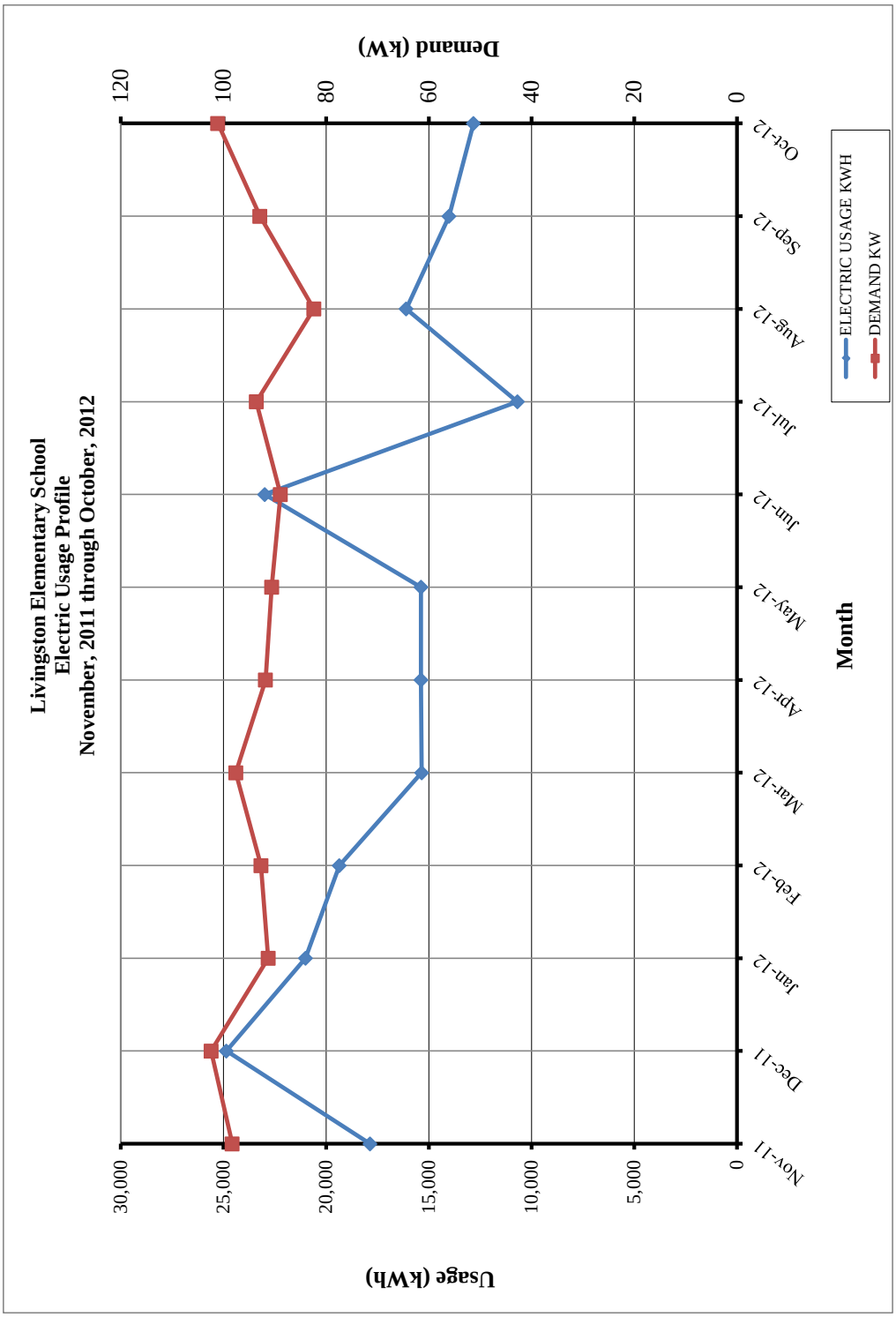
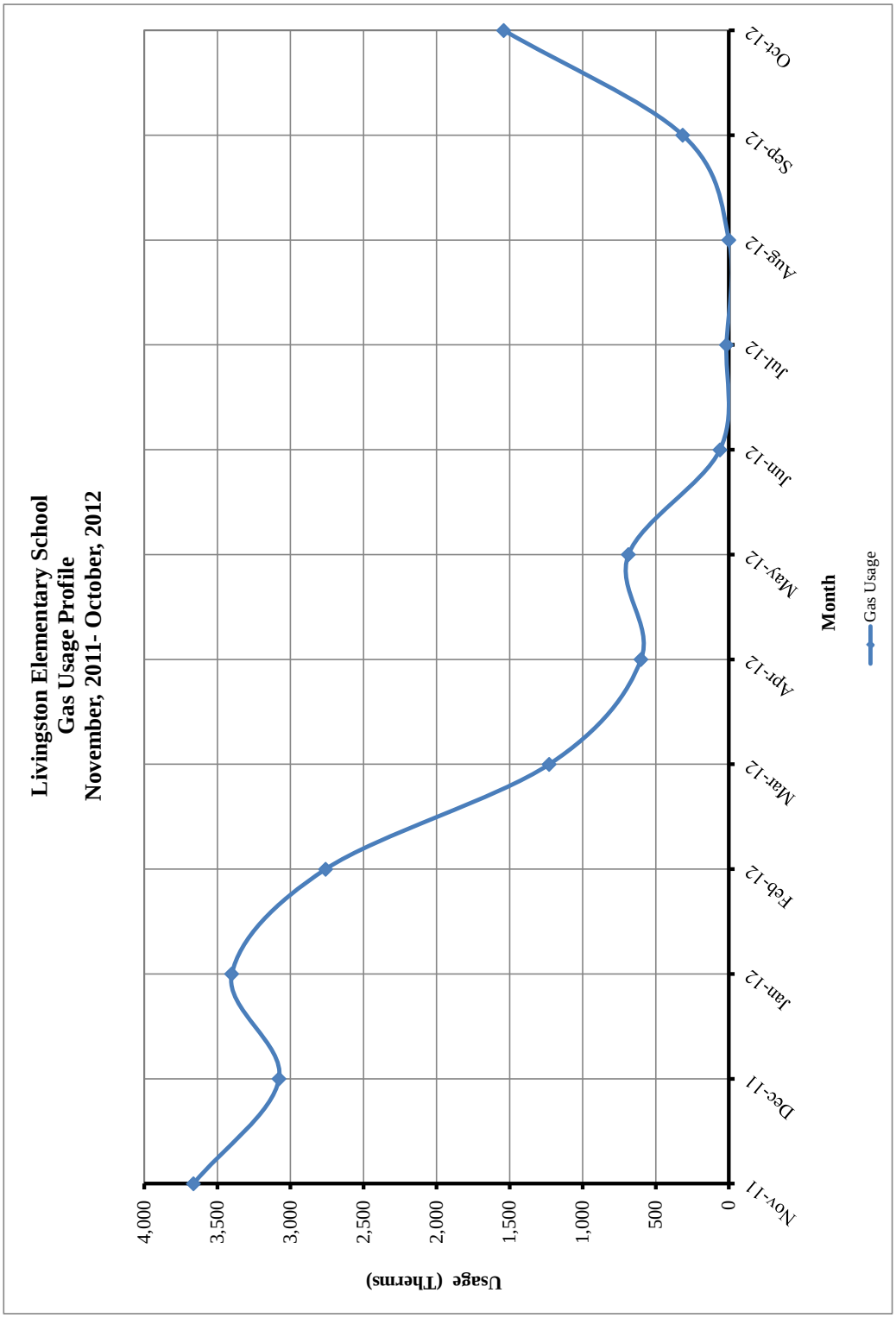


Table 4
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider:	PSE&G	
Rate:	LVG	
Meter No:	2283620	
Point of Delivery ID:	70 055 953 00	
Third Party Utility Provider:	N/A	
TPS Meter No:	N/A	
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Nov-11	3,663.00	$3,246.58
Dec-11	3,078.00	$2,942.72
Jan-12	3,401.00	$3,048.76
Feb-12	2,759.00	$2,459.44
Mar-12	1,229.00	$855.28
Apr-12	601.00	$461.23
May-12	687.00	$528.67
Jun-12	61.00	$238.17
Jul-12	16.00	$110.46
Aug-12	0.00	$115.14
Sep-12	315.00	$316.39
Oct-12	1,540.00	$1,793.71
TOTALS	**17,350.00**	**$16,116.55**
AVERAGE RATE:	**$0.93**	**$/THERM**

Figure 2
Natural Gas Usage Profile



II. FACILITY DESCRIPTION

The Livingston Elementary School is located at 206 Delavan Street in New Brunswick, New Jersey. The 40,000 SF Elementary School was built in 1922 with no additions. The building is a three-story structure with a basement. The building consists of office space for administrative use, multipurpose room, classrooms, kitchen, and mechanical room.

Occupancy Profile

The typical school hours of Livingston Elementary School are Monday through Friday between 8:50 am and 3:15 pm. The building is open and operational between 7:00 am and 8:00 pm. The elementary school has a student population of approximately 429, and 35 administrative staff and teachers.

Building Envelope

Exterior walls for the Livingston Elementary School are brick faced with a concrete block construction. The windows are in below average condition with single pane windows with aluminum frames. Blinds are utilized throughout the facility, per occupant comfort. The roof is a flat, built up roofing system and is need of repair/replacement.

Heating Plant

Heating is provided to the facility from the Mechanical Room which houses two natural gas fired, cast iron sectional steam boilers made by Weil McLain. Both boilers have equivalent heating capacity characteristics having an input capacity of 2,713 MBH and output of 1,882 MBH for a combined output of 3,754 MBH. Both boilers appear to be maintained and in fair condition. Combustion tests were not available for review but based on age the estimated fuel-to-thermal efficiency for the boilers is 70%, based on radiation losses and inefficiencies in operation inherent to the older technology and steam systems. Both boilers are approximately 24 years old which is within the typical ASHRAE service life of 35 years.

The boiler condensate is pumped to the boiler via two (2) 3/4 HP pumps, located on the condensate receiver skid. At the time of the visit, it was observed that this skid (including the tank, pumps and controls) were being replaced.

HVAC Systems

The classrooms within the facility are conditioned via vintage heating only steam fan coil units and perimeter steam radiation. During the survey it was noted that the majority of the fan coil units were not operational. Many of the steam control valves have been replaced. The steam traps that were inspected at the time of the survey had not been replaced and were older.

The Art Room is served by an above ceiling, heating only steam fan coil unit, by American Air Filter.

There are a total of eleven (11) window air conditioning units throughout the school ranging in size from 8,000 Btu/h to 12,000 Btuh.

Exhaust System

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

HVAC System Controls

The boilers of the school are controlled by a Johnson Metasys controller. The controller operates the boilers based on outside air temperature and three zone temperature sensors in the school. The classrooms have thermostats and steam control valves with pneumatic actuators. Many of the steam valves appeared to have been replaced recently and are in good condition. The fans within the majority of the classroom fan coil units are not functional.

Domestic Hot Water

The domestic hot water for Livingston Elementary School is an AO Smith 275 MBH gas fired water heater with storage capacity of 100 gallons. This unit is two (2) years old and is in excellent condition.

Water Conservation

It was observed at the time of the survey that the flush valves on the water closets and urinals in the public restrooms had been replaced with auto-sensor flush valves and the hand sink faucets had been replaced with metered/auto-sensor faucets.

Lighting

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

III. MAJOR EQUIPMENT LIST

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

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

IV. ENERGY CONSERVATION MEASURES

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

Table 1
ECM Financial Summary

ENERGY CONSERVATION MEASURES (ECM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST[A]**	**ANNUAL SAVINGS[B]**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
ECM #1	Lighting Upgrade - Trailers	$16,720	$1,937	8.6	73.8%
ECM #2	Gym Lighting Upgrade	$6,550	$659	9.9	50.9%
ECM #3	Lighting Controls Upgrade	$11,920	$1,956	6.1	146.1%
ECM #4	Window Replacement	$88,920	$1,925	46.2	-67.5%
ECM #5	Computer Automatic Standby or Hibernate Modes	$3,667	$5,739	0.6	682.5%
ECM #6	Boiler Burner and Controls Upgrade	$26,000	$686	37.9	-44.6%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	31.96 KW PV System	$202,527	$13,298	15.2	-1.5%
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 - Trailers	4.4	11,461	-
ECM #2	Gym Lighting Upgrade	1.5	3,900	-
ECM #3	Lighting Controls Upgrade	-	11,571	-
ECM #4	Window Replacement	-	-	2,070
ECM #5	Computer Automatic Standby or Hibernate Modes	-	33,957	-
ECM #6	Boiler Burner and Controls Upgrade	-	-	738
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	**DESCRIPTION**	**ANNUAL UTILITY REDUCTION**		
		ELECTRIC DEMAND (KW)	**ELECTRIC CONSUMPTION (KWH)**	**NATURAL GAS (THERMS)**
REM #1	31.96 KW PV System	32.0	36,931	-

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 - Trailers	$1,937	$16,720	$0	$16,720	8.6
Gym Lighting Upgrade	$659	$7,550	$1,000	$6,550	9.9
Lighting Controls Upgrade	$1,956	$13,050	$1,130	$11,920	6.1
Window Replacement	$1,925	$88,920	$0	$88,920	46.2
Computer Automatic Standby or Hibernate	$5,739	$3,667	$0	$3,667	0.6
Boiler Burner and Controls Upgrade	$686	$26,000	$0	$26,000	37.9
Design / Construction Extras (15%)	*$0*	*$23,386*	*$0*	*$23,386*	
Total Project	**$12,901**	**$179,293**	**$2,130**	**$177,163**	**14**

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 – Trailers

Description:

The majority of the interior lighting throughout Livingston Elementary School is provided with fluorescent fixtures with older generation, 700 series and 741/ECO 32W T8 lamps and electronic ballasts. Although these T8 lamps are considered fairly efficient, further energy savings can be achieved by replacing the existing T8 lamps with new generation, 800 series 28W T8 lamps without compromising light output. Concord Engineering recommends that these fixtures remain unmodified due to the extensive costs which will be incurred if these fixtures are to be re-lamped and re-ballasted, which results in a long payback period unless said fixtures reside in an area which is over-lit, in which case the fixtures will be de-lamped and given a new reflector. In addition, there are a number of older and outdated fixtures in the modular trailers with T12 lamps and magnetic ballasts. It is recommended to replace all of the T12 fixtures in these areas with higher efficiency fluorescent T8 fixtures with electronic ballasts.

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 ($):	$16,720
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$16,720
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,937
Total Yearly Savings ($/Yr):	$1,937
Estimated ECM Lifetime (Yr):	15
Simple Payback	8.6
Simple Lifetime ROI	73.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$29,055
Internal Rate of Return (IRR)	8%
Net Present Value (NPV)	$6,403.78

ECM #2: Lighting & Controls Upgrade – Gymnasium

Description:

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

This measure replaces all the HID, 400 W HID MH fixtures with a well-designed T5HO lighting system. Ten, 54 watt, 6-Lamp T5HO fixtures will be required in order to meet the mandated 50 foot-candle average within the spaces.

Energy Savings Calculations:

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

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$7,550
NJ Smart Start Equipment Incentive ($):	$1,000
Net Installation Cost ($):	$6,550
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$659
Total Yearly Savings ($/Yr):	$659
Estimated ECM Lifetime (Yr):	15
Simple Payback	9.9
Simple Lifetime ROI	50.9%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$9,887
Internal Rate of Return (IRR)	6%
Net Present Value (NPV)	$1,318.29

ECM #3: Lighting Controls Upgrade – Occupancy Sensors

Description:

Some of the lights in the Livingston Elementary School are left on unnecessarily. In many cases the lights are left on because of the inconvenience to manually switch lights off when a room is left or on when a room is first occupied. This is common in rooms that are occupied for only short periods and only a few times per day. In some instances lights are left on due to the misconception that it is better to keep the lights on rather than to continuously switch lights on and off. Although increased switching reduces lamp life, the energy savings outweigh the lamp replacement costs. The payback timeframe for when to turn the lights off is approximately two minutes. If the lights are expected to be off for at least a two minute interval, then it pays to shut them off.

Lighting controls come in many forms. Sometimes an additional switch is adequate to provide reduced lighting levels when full light output is not needed. Occupancy sensors detect motion and will switch the lights on when the room is occupied. Occupancy sensors can either be mounted in place of a current wall switch, or on the ceiling to cover large areas.

The U.S. Department of Energy sponsored a study to analyze energy savings achieved through various types of building system controls. The referenced savings is based on the "Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways," document posted for public use April 2005. The study has found that commercial buildings have the potential to achieve significant energy savings through the use of building controls. The average energy savings are as follows based on the report:

- Occupancy Sensors for Lighting Control 20% - 28% energy savings.

Savings resulting from the implementation of this ECM for energy management controls are estimated to be 20% of the total light energy controlled by occupancy sensors (The majority of the savings is expected to be after school hours when rooms are left with lights on)

This ECM includes installation of ceiling or switch mount sensors for individual offices, classrooms, large bathrooms, and Media Centers. Sensors shall be manufactured by Sensorswitch, Watt Stopper or equivalent. The **Investment Grade Lighting Audit Appendix** of this report includes the summary of lighting controls implemented in this ECM and outlines the proposed controls, costs, savings, and payback periods. The calculations adjust the lighting power usage by the applicable percent savings for each area that includes lighting controls.

Energy Savings Calculations:

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

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

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 ($):	$13,050
NJ Smart Start Equipment Incentive ($):	$1,130
Net Installation Cost ($):	$11,920
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,956
Total Yearly Savings ($/Yr):	$1,956
Estimated ECM Lifetime (Yr):	15
Simple Payback	6.1
Simple Lifetime ROI	146.1%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$29,333
Internal Rate of Return (IRR)	14%
Net Present Value (NPV)	$11,424.70

ECM #4: Window Replacement

Description:

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

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

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

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

Energy Savings Calculations:

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

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

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

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

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

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

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

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

WINDOW REPLACEMENT CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Description:	Existing Single Pane Windows	Double Pane Low-E Windows	
Window (SF)	2,052	2,052	
U-Value (BTU/HR/SF*°F)	1.0	0.45	0.55
Infiltration Rate (CFM/SF)	0.6	0.3	0.30
Indoor Temperature Heating (°F)	70	70	
Average Thermal Loss Rate Heating (BTU/HR)	51,593	23,217	28,376
Heating Degree Days (65°F)	4157	4157	
Thermal Losses Heating (kBtu)	263,428	118,542	144,885
Heating System Efficiency (%)	70.0%	70.0%	
Natural Gas Cost ($/Therm)	$0.93	$0.93	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Natural Gas Usage (Therm)	3,763	1,693	2,070
Energy Cost Savings ($)	$3,500	$1,575	$1,925
Comments:	1. Proposed window U-value Based on ASHRAE 90.1 - 2007 2. Savings Based on Avg. Monthly Temperature for Sep-11 to Aug-12		

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$88,920
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$88,920
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,925
Total Yearly Savings ($/Yr):	$1,925
Estimated ECM Lifetime (Yr):	15
Simple Payback	46.2
Simple Lifetime ROI	-67.5%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$28,874
Internal Rate of Return (IRR)	-12%
Net Present Value (NPV)	($65,940.64)

ECM #5: Set Computers to Automatic Stand-by or Hibernate Modes

Description:

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

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

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

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

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

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

Energy Savings Calculations:

No. of CRT Computers:	220
Operating Weeks per Yr:	42
Estimated percentage of computers left ON over night:	75%

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

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

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

Implementation Costs: = # Computers X Configuration Time X Cost per Hour
= 220 Monitors X 10 Minutes/Computer X $100 per Hour

= $3,667

AUTOMATIC SLEEP OR HIBERNATE MODES FOR COMPUTERS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Manual Operation	Auto Power Save	-
# of Computers	220	220	-
% Computers left ON	75%	75%	-
Power when left ON (Watt)	50	50	-
Power at Stand-by (Watt)	5	5	-
Power at Hibernate (Watt)	4	4	-
Power when OFF (Watt)	0	0	-
Operating Weeks per Yr	42	42	-
Operating Hours per Week	168	168	-
Hours/Wk Computers ON	120	20	-
Hours/Wk at Sleep Mode	0	20	-
Hours/Wk at Hibernate Mode	0	80	-
Hours/Wk at Power Down	48	48	-
Elec Cost ($/kWh)	0.169	0.169	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Electric Usage (kWh)	41,580	7,623	33,957
Energy Cost ($)	$7,027	$1,288	$5,739
COMMENTS:	Calculation assumes computers currently run throughout work week and get shut down over the weekend.		

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$3,667
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$3,667
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$5,739
Total Yearly Savings ($/Yr):	$5,739
Estimated ECM Lifetime (Yr):	5
Simple Payback	0.6
Simple Lifetime ROI	682.5%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$28,695
Internal Rate of Return (IRR)	155%
Net Present Value (NPV)	$22,615.94

ECM #6: STEAM BOILER BURNER & CONTROLS UPGRADE

Description:

All of the heating is provided to the school facility by Weil McLain 65 Boiler Horsepower (BHP) natural gas-fired boilers that produces steam for the heating season. The boilers are 1989 vintage and are well maintained 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, CB780E 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.

Energy Savings Using Hand Calculations:

Annual Heating Energy Savings = Existing Fuel Consumption x 8% Efficiency Increase

Heating Cost Savings = Annual Heating Energy Savings x Fuel Cost ($/Unit)**Error! Bookmark not defined.Error! Bookmark not defined.**
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Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$26,000
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$26,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$686
Total Yearly Savings ($/Yr):	$686
Estimated ECM Lifetime (Yr):	21
Simple Payback	37.9
Simple Lifetime ROI	-44.6%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	$14,403
Internal Rate of Return (IRR)	-5%
Net Present Value (NPV)	($15,427.22)

REM #1: 31.96 kW Solar System

Description:

The Livingston Elementary School has available roof space that could accommodate a significant amount of solar generation. Based on the available areas a 31.96 kilowatt solar array could be installed, assuming the existing roof structure is capable of supporting an array. The array will produce approximately 36,931 kilowatt-hours annually that will reduce the overall electric usage of the facility by 17.94%.

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}):	31.96
Electric Generation (KWH/Yr):	36,931
Installation Cost ($):	$202,527
SREC Revenue ($/Yr):	$7,057
Energy Savings ($/Yr):	$6,241
Total Yearly Savings ($/Yr):	$13,298
ECM Analysis Period (Yr):	15
Simple Payback (Yrs):	15.2
Analysis Period Electric Savings ($):	$116,082
Analysis Period SREC Revenue ($):	$102,228
Net Present Value (NPV)	($68,468.24)

V. ADDITIONAL RECOMMENDATIONS

The following recommendations include no cost/low cost measures, Operation & Maintenance (O&M) items, and water conservation measures with attractive paybacks. These measures are not eligible for the Smart Start Buildings incentives from the office of Clean Energy but save energy none the less.

A. Chemically clean the condenser and evaporator coils periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.

B. Maintain all weather stripping on windows and doors.

C. Clean all light fixtures to maximize light output.

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

E. Turn off computers when not in use. Ensure computers are not running in screen saver mode which saves the monitor screen not energy.

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

G. Replace any older model window air conditioning units with new energy star rated window air conditioning units.

H. Steam Trap Replacement Survey and Analysis by Spirax/Sarco is a recommendation for the school to provide additional energy and operational savings.

APPENDIX A

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

New Brunswick Board of Education - Livingston Elementary School

ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY

ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Svaing * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM #1	Lighting Upgrade - Trailers	$9,120	$7,600	$0	$16,720	$1,937	$0	$1,937	15	$29,055	$0	73.8%	8.6	7.86%	$6,403.78
ECM #2	Gym Lighting Upgrade	$2,500	$5,050	$1,000	$6,550	$659	$0	$659	15	$9,887	$0	50.9%	9.9	5.65%	$1,318.29
ECM #3	Lighting Controls Upgrade	$10,950	$2,100	$1,130	$11,920	$1,956	$0	$1,956	15	$29,333	$0	146.1%	6.1	14.15%	$11,424.70
ECM #4	Window Replacement	$82,080	$6,840	$0	$88,920	$1,925	$0	$1,925	15	$28,874	$0	-67.5%	46.2	-11.60%	($65,940.64)
ECM #5	Computer Automatic Standby or Hibernate Modes	$0	$3,667	$0	$3,667	$5,739	$0	$5,739	5	$28,695	$0	682.5%	0.6	155.05%	$22,615.94
ECM #6	Boiler Burner and Controls Upgrade	$26,000	$0	$0	$26,000	$686	$0	$686	21	$14,403	$0	-44.6%	37.9	-4.84%	($15,427.22)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	31.96 KW PV System	$202,527	$0	$0	$202,527	$6,241	$7,057	$13,298	15	$199,474	$105,854	-1.5%	15.2	-0.19%	($43,773.34)

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
2-New Brunswick BOE - Livingston Elementary School

Building ID: 3415927
For 12-month Period Ending: October 31, 2012[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: February 04, 2013

Facility
2-New Brunswick BOE - Livingston Elementary School
206 Delavan Street
New Brunswick, NJ 08901

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

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

Year Built: 1922
Gross Floor Area (ft²): 40,000

Energy Performance Rating[2] (1-100) 85

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	708,285
Natural Gas (kBtu)[4]	1,726,714
Total Energy (kBtu)	2,434,999

Energy Intensity[4]

Site (kBtu/ft²/yr)	61
Source (kBtu/ft²/yr)	104

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	192

Electric Distribution Utility
Public Service Electric & Gas Co

National Median Comparison

National Median Site EUI	91
National Median Source EUI	155
% Difference from National Median Source EUI	-33%
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-New Brunswick BOE - Livingston Elementary School	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	K-12 School	Is this an accurate description of the space in question?		☐
Location	206 Delavan Street, New Brunswick, NJ 08901	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of a hospital, k-12 school, hotel and senior care facility) nor can they be submitted as representing only a portion of a building.		☐
Livingston ES (K-12 School)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	40,000 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Open Weekends?	No	Is this building normally open at all on the weekends? This includes activities beyond the work conducted by maintenance, cleaning, and security personnel. Weekend activity could include any time when the space is used for classes, performances or other school or community activities. If the building is open on the weekend as part of the standard schedule during one or more seasons, the building should select ?yes? for open weekends. The ?yes? response should apply whether the building is open for one or both of the weekend days.		☐
Number of PCs	220	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	Yes	Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no".		☐
Percent Cooled	20 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐
Months	10(Optional)	Is this school in operation for at least 8 months of the year?		☐

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

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

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

Fuel Type: Electricity		
Meter: Electric Meter # 728010136 (kWh (thousand Watt-hours)) **Space(s):** Entire Facility **Generation Method:** Grid Purchase		
Start Date	**End Date**	**Energy Use (kWh (thousand Watt-hours))**
09/16/2012	10/15/2012	12,080.00
08/16/2012	09/15/2012	9,440.00
07/16/2012	08/15/2012	8,800.00
06/16/2012	07/15/2012	20,800.00
05/16/2012	06/15/2012	13,120.00
04/16/2012	05/15/2012	12,880.00
03/16/2012	04/15/2012	11,120.00
02/16/2012	03/15/2012	11,840.00
01/16/2012	02/15/2012	11,440.00
12/16/2011	01/15/2012	10,640.00
11/16/2011	12/15/2011	12,840.00
Electric Meter # 728010136 Consumption (kWh (thousand Watt-hours))		**135,000.00**
Electric Meter # 728010136 Consumption (kBtu (thousand Btu))		**460,620.00**
Meter: Electric Meter # 278004267 (kWh (thousand Watt-hours)) **Space(s):** Entire Facility **Generation Method:** Grid Purchase		
Start Date	**End Date**	**Energy Use (kWh (thousand Watt-hours))**
09/16/2012	10/15/2012	1,935.00
08/16/2012	09/15/2012	6,660.00
07/16/2012	08/15/2012	1,890.00
06/16/2012	07/15/2012	2,190.00
05/16/2012	06/15/2012	2,265.00
04/16/2012	05/15/2012	2,505.00
03/16/2012	04/15/2012	4,230.00
02/16/2012	03/15/2012	7,515.00
01/16/2012	02/15/2012	9,570.00
12/16/2011	01/15/2012	14,220.00
11/16/2011	12/15/2011	5,025.00
Electric Meter # 278004267 Consumption (kWh (thousand Watt-hours))		**58,005.00**
Electric Meter # 278004267 Consumption (kBtu (thousand Btu))		**197,913.06**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**658,533.06**

Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?	☐

Fuel Type: Natural Gas		
Meter: Gas Meter # 2283620 (therms) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (therms)**
09/16/2012	10/15/2012	315.00
08/16/2012	09/15/2012	0.00
07/16/2012	08/15/2012	16.00
06/16/2012	07/15/2012	61.00
05/16/2012	06/15/2012	687.00
04/16/2012	05/15/2012	601.00
03/16/2012	04/15/2012	1,229.00
02/16/2012	03/15/2012	2,759.00
01/16/2012	02/15/2012	3,401.00
12/16/2011	01/15/2012	3,078.00
11/16/2011	12/15/2011	3,663.00
Gas Meter # 2283620 Consumption (therms)		**15,810.00**
Gas Meter # 2283620 Consumption (kBtu (thousand Btu))		**1,581,000.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**1,581,000.00**
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-New Brunswick BOE - Livingston Elementary School
206 Delavan Street
New Brunswick, NJ 08901

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

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

General Information

2-New Brunswick BOE - Livingston Elementary School	
Gross Floor Area Excluding Parking: (ft^2)	40,000
Year Built	1922
For 12-month Evaluation Period Ending Date:	October 31, 2012

Facility Space Use Summary

Livingston ES	
Space Type	K-12 School
Gross Floor Area (ft^2)	40,000
Open Weekends?	No
Number of PCs	220
Number of walk-in refrigeration/freezer units	0
Presence of cooking facilities	Yes
Percent Cooled	20
Percent Heated	100
Months °	10
High School?	No
School District °	new brunswick

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 10/31/2012)	**Baseline** (Ending Date 10/31/2012)	**Rating of 75**	**Target**	**National Median**
Energy Performance Rating	85	85	75	N/A	50
Energy Intensity					
Site ($kBtu/ft^2$)	61	61	71	N/A	91
Source ($kBtu/ft^2$)	104	104	121	N/A	155
Energy Cost					
$/year	$ 49,059.46	$ 49,059.46	$ 57,062.75	N/A	$ 72,972.62
$/ft²/year	$ 1.23	$ 1.23	$ 1.43	N/A	$ 1.83
Greenhouse Gas Emissions					
$MtCO_2e$/year	192	192	223	N/A	286
$kgCO_2e/ft^2$/year	5	5	6	N/A	7

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

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

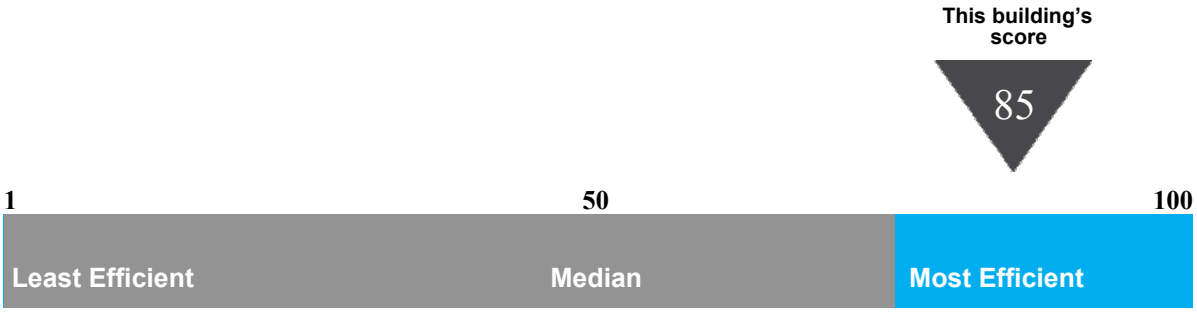
Statement of Energy Performance

2012

2-New Brunswick BOE - Livingston Elementary School
206 Delavan Street
New Brunswick, NJ 08901

Portfolio Manager Building ID: 3415927

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 104 kBtu per square foot per year.*

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

Buildings with a score of 75 or higher may qualify for EPA's ENERGY STAR.

I certify that the information contained within this statement is accurate and in accordance with U.S. Environmental Protection Agency's measurement standards, found at energystar.gov

Date of certification

EPA United States Environmental Protection Agency

Date Generated: 02/04/2013

APPENDIX D

MAJOR EQUIPMENT LIST

Concord Engineering Group

Livingston Elementary School

Boilers

Tag	B-1,2		
Unit Type	Cast Iron Sectional Steam Boilers		
Qty	2		
Location	Boiler Room		
Area Served	Steam Heating Loop		
Manufacturer	Weil McClain		
Model #	H-988-WS		
Serial #	NJ4591-1-H		
Input Capacity (Btu/Hr)	2,713		
Rated Output Capacity (Btu/Hr)	1,882		
Approx. Efficiency %	70.0%		
Fuel	Natural Gas		
Approx Age	24		
ASHRAE Service Life	35		
Remaining Life	11		
Comments	Boilers are in fair condition		

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

Livingston Elementary School

Domestic Water Heaters

Tag	HWH-1		
Unit Type	Domestic Hot Water Heater		
Qty	1		
Location	Boiler Room		
Area Served	Domestic Hot Water Loop		
Manufacturer	A.O. Smith		
Model #	BTR 275 118		
Serial #	1109M000304		
Size (Gallons)	100 Gallons		
Input Capacity (MBH/KW)	275 MBH		
Recovery (Gal/Hr)	266.6 GPH		
Efficiency %	90%		
Fuel	Natural Gas		
Approx Age	2		
ASHRAE Service Life	12		
Remaining Life	10		
Comments	Hot water heater is in good condition		

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

Livingston Elementary School

Pumps

Tag	P-1,2	VP-1,2	
Unit Type	Steam condensate receiver, boiler feed pumps	Steam condensate receiver, vacuum pumps	
Qty	2	2	
Location	Boiler Room	Boiler Room	
Area Served	Condensate return, boiler feed	Condensate return, boiler feed	
Manufacturer	Magnetec, M Century	Magnetec, M Century	
Model #	-	-	
Serial #	-	-	
Horse Power	3/4	3	
Flow	-	-	
Motor Info	Magnetec, M Century	Magnetec, M Century	
Electrical Power	208-230/460/3/60	208-230/460/3/60	
RPM	3450	3450	
Motor Efficiency %	-	-	
Approx Age	25	25	
ASHRAE Service Life	18	18	
Remaining Life	(7)	(7)	
Comments	Condensate tank and pumps are being replaced	Condensate tank and pumps are being replaced	

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

APPENDIX E

CEG Project #: 9C12064
Facility Name: Livingston Elementary School
Address: 206 Delavan Street
City, State, Zip New Brunswick, NJ 08901

			Existing Fixtures						Proposed Fixtures Retrofit						Retrofit Energy Savings			Lighting Retrofit Costs					Proposed Lighting Controls					
Fixture Reference #	Location	Average Burn Hours	Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, $	Material	Total Labor	Total All	Rebate Estimate	Simple Payback	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $
222.21	209 Classroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	290	$49
222.21	208 Classroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	290	$49
222.21	210 Office	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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	$0.00	$0.00	$0.00	$0.00	-	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	97	$16
222.21	210 Office	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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	$0.00	$0.00	$0.00	$0.00	-	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	32	$5
222.21	210 Classroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	7	0.43	1,128	Existing to Remain	Existing to Remain	2	62	0	0.43	1,128	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	226	$38
242.21	211 Classroom	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	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	223	$38
242.21	212 Office	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	2	0.21	556	Existing to Remain	Existing to Remain	4	107	0	0.21	556	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	111	$19
222.21	Main Office	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
221.11	Main Office Restroom	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	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
222.21	Principal Office	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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	$0.00	$0.00	$0.00	$0.00	-	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	97	$16
222.21	Principal Office Restroom	1200	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	1	0.06	74	Existing to Remain	Existing to Remain	2	62	0	0.06	74	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
242.21	205 Classroom	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	6	0.64	1,669	Existing to Remain	Existing to Remain	4	107	0	0.64	1,669	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	334	$56
242.21	204 Classroom	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	6	0.64	1,669	Existing to Remain	Existing to Remain	4	107	0	0.64	1,669	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	334	$56
222.21	203 Classroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	290	$49
222.21	202 Classroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	290	$49
222.21	201 Nurse	2600	2x4, 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	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
221.11	Stairwell Restroom	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	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
221.11	Stairwell Restroom	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	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
222.21	304 Classroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	290	$49
242.21	303 Classroom	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	6	0.64	1,669	Existing to Remain	Existing to Remain	4	107	0	0.64	1,669	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	334	$56
242.21	302 Classroom	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	6	0.64	1,669	Existing to Remain	Existing to Remain	4	107	0	0.64	1,669	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	334	$56
232.21	301 Office	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	$0.00	$0.00	$0.00	$0.00	-	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	134	$23
222.21	305 Classroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	6	0.37	967	Existing to Remain	Existing to Remain	2	62	0	0.37	967	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	193	$33
222.21	306 Classroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	290	$49

			Existing Fixtures						Proposed Fixtures Retrofit							Retrofit Energy Savings			Lighting Retrofit Costs					Proposed Lighting Controls					
Fixture Reference #	Location	Average Burn Hours	Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, $	Material	Total Labor	Total All	Rebate Estimate	Simple Payback	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $
222.21	Library	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	8	0.50	1,290	Existing to Remain	Existing to Remain	2	62	0	0.50	1,290	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
232.21	307 Classroom	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	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	268	$45
242.21	309 Classroom	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	6	0.64	1,669	Existing to Remain	Existing to Remain	4	107	0	0.64	1,669	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	334	$56
222.21	310 Classroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	290	$49
222.21	311 Office	2600	2x4, 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	$0.00	$0.00	$0.00	$0.00	-	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	64	$11
242.21	312 Classroom	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	6	0.64	1,669	Existing to Remain	Existing to Remain	4	107	0	0.64	1,669	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	334	$56
242.21	313 Classroom	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	6	0.64	1,669	Existing to Remain	Existing to Remain	4	107	0	0.64	1,669	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	334	$56
121.11	Trailer 1	2600	1x4, 2 Lamp, 34w T12, Magnetic Ballast, Surface Mnt., Prismatic Lens	2	78	19	1.48	3,853	Reballast & Relamp	Reballast & Relamp; 28w T8 Elec. Ballast	2	49	19	0.93	2,421	0.55	1,433	$242	$1,140.00	$950.00	$2,090.00	$0.00	8.63	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	484	$82
121.11	Trailer 2	2600	1x4, 2 Lamp, 34w T12, Magnetic Ballast, Surface Mnt., Prismatic Lens	2	78	19	1.48	3,853	Reballast & Relamp	Reballast & Relamp; 28w T8 Elec. Ballast	2	49	19	0.93	2,421	0.55	1,433	$242	$1,140.00	$950.00	$2,090.00	$0.00	8.63	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	484	$82
121.11	Trailer 3	2600	1x4, 2 Lamp, 34w T12, Magnetic Ballast, Surface Mnt., Prismatic Lens	2	78	19	1.48	3,853	Reballast & Relamp	Reballast & Relamp; 28w T8 Elec. Ballast	2	49	19	0.93	2,421	0.55	1,433	$242	$1,140.00	$950.00	$2,090.00	$0.00	8.63	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	484	$82
121.11	Trailer 4	2600	1x4, 2 Lamp, 34w T12, Magnetic Ballast, Surface Mnt., Prismatic Lens	2	78	19	1.48	3,853	Reballast & Relamp	Reballast & Relamp; 28w T8 Elec. Ballast	2	49	19	0.93	2,421	0.55	1,433	$242	$1,140.00	$950.00	$2,090.00	$0.00	8.63	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	484	$82
121.11	Trailer 5	2600	1x4, 2 Lamp, 34w T12, Magnetic Ballast, Surface Mnt., Prismatic Lens	2	78	19	1.48	3,853	Reballast & Relamp	Reballast & Relamp; 28w T8 Elec. Ballast	2	49	19	0.93	2,421	0.55	1,433	$242	$1,140.00	$950.00	$2,090.00	$0.00	8.63	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	484	$82
121.11	Trailer 6	2600	1x4, 2 Lamp, 34w T12, Magnetic Ballast, Surface Mnt., Prismatic Lens	2	78	19	1.48	3,853	Reballast & Relamp	Reballast & Relamp; 28w T8 Elec. Ballast	2	49	19	0.93	2,421	0.55	1,433	$242	$1,140.00	$950.00	$2,090.00	$0.00	8.63	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	484	$82
121.11	Trailer 7	2600	1x4, 2 Lamp, 34w T12, Magnetic Ballast, Surface Mnt., Prismatic Lens	2	78	19	1.48	3,853	Reballast & Relamp	Reballast & Relamp; 28w T8 Elec. Ballast	2	49	19	0.93	2,421	0.55	1,433	$242	$1,140.00	$950.00	$2,090.00	$0.00	8.63	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	484	$82
121.11	Trailer 8	2600	1x4, 2 Lamp, 34w T12, Magnetic Ballast, Surface Mnt., Prismatic Lens	2	78	19	1.48	3,853	Reballast & Relamp	Reballast & Relamp; 28w T8 Elec. Ballast	2	49	19	0.93	2,421	0.55	1,433	$242	$1,140.00	$950.00	$2,090.00	$0.00	8.63	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	484	$82
221.34	Basement Boiler Room	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., No Lens	2	62	9	0.56	670	Existing to Remain	Existing to Remain	2	62	0	0.56	670	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
242.21	Basement Kitchen	2600	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	4	107	9	0.96	2,504	Existing to Remain	Existing to Remain	4	107	0	0.96	2,504	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
617	Kitchen Hood	2600	Recessed Down Light, (2)26w Quad CFL Lamp	2	52	2	0.10	270	Existing to Remain	Existing to Remain	2	52	0	0.10	270	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
222.21	Basement Boys Restroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
222.21	Basement Girls Restroom	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
242.11	Basement Custodial Office	1200	2x4, 4 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	4	107	1	0.11	128	Existing to Remain	Existing to Remain	4	107	0	0.11	128	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
222.21	Basement Music Room	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	6	0.37	967	Existing to Remain	Existing to Remain	2	62	0	0.37	967	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	193	$33
221.11	Basement Office 3A	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	$0.00	$0.00	$0.00	$0.00	-	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	64	$11
242.11	Basement Office 3A	2600	2x4, 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	$0.00	$0.00	$0.00	$0.00	-	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	56	$9
221.11	Basement Music 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	$0.00	$0.00	$0.00	$0.00	-	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	64	$11
768	Multi-Purpose Room	2600	2x2,400w MH, Recessed	1	465	10	4.65	12,090	Remove and Return	(1) 6 Lamp, 54w T5HO	6	315	10	3.15	8,190	1.50	3,900	$659	$2,500.00	$5,050.00	$7,550.00	$1,000.00	9.94	0	No New Controls	0	0.0%	0	$0

			Existing Fixtures						Proposed Fixtures Retrofit							Retrofit Energy Savings			Lighting Retrofit Costs					Proposed Lighting Controls					
Fixture Reference #	Location	Average Burn Hours	Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Work Description	Equipment Description	Lamps per Fixture	Watts per Fixture	Qty of Fixtures	Total kW	Usage kWh/Yr	Energy Savings, kW	Energy Savings, kWh	Energy Savings, $	Material	Total Labor	Total All	Rebate Estimate	Simple Payback	Control Ref #	Controls Description	Qty of Controls	Hour Reduction %	Energy Savings, kWh	Energy Savings, $
221.21	Stage	2600	2x4, 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	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
222.21	Girls Locker Room	2600	2x4, 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	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
222.21	Boys Locker Room	2600	2x4, 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	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
221.11	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	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
232.22	Art Room	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	12	1.03	2,683	Existing to Remain	Existing to Remain	3	86	0	1.03	2,683	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	537	$91
241.11	Art Room Office	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	$0.00	$0.00	$0.00	$0.00	-	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	56	$9
241.11	Art Room Storage	1200	1x4, 4 Lamp, 32w T8, Elect. Ballast, Surface Mnt., Prismatic Lens	4	107	1	0.11	128	Existing to Remain	Existing to Remain	4	107	0	0.11	128	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
232.22	5 Classroom	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	3	86	13	1.12	2,907	Existing to Remain	Existing to Remain	3	86	0	1.12	2,907	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	581	$98
221.41	5 Classroom Restroom	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt, Prismatic Lens	2	62	1	0.06	74	Existing to Remain	Existing to Remain	2	62	0	0.06	74	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
232.22	Teachers Room	2600	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic 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	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	268	$45
221.21	Teachers Room	2600	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed 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	$0.00	$0.00	$0.00	$0.00	-	4	Dual Technology Occupancy Sensor - Remote Mnt.	1	20.0%	32	$5
221.41	Teachers Room Restroom	1200	1x4, 2 Lamp, 32w T8, Elect. Ballast, Wall Mnt, Prismatic Lens	2	62	1	0.06	74	Existing to Remain	Existing to Remain	2	62	0	0.06	74	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
222.21	Basement Corridor	3000	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	2	62	15	0.93	2,790	Existing to Remain	Existing to Remain	2	62	0	0.93	2,790	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
232.21	1st Floor Corridor	3000	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	13	1.12	3,354	Existing to Remain	Existing to Remain	3	86	0	1.12	3,354	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
232.21	2nd Floor Corridor	3000	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	3	86	11	0.95	2,838	Existing to Remain	Existing to Remain	3	86	0	0.95	2,838	0.00	0	$0	$0.00	$0.00	$0.00	$0.00	-	0	No New Controls	0	0.0%	0	$0
221.11	Counselor 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	$0.00	$0.00	$0.00	$0.00	-	5	Dual Technology Occupancy Sensor - Switch Mnt.	1	20.0%	32	$5
	TOTAL					**445**	**38**	**99,297**					**162**	**32**	**83,936**	**6**	**15,361**	**2,596**	**11,620**	**12,650**	**24,270**	**1,000**	**9.35**			**42**		**11,571**	**1,956**

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
Livingston ES	3350	SHARP NU-U235F2	136	17.5	2,386	31.96	36,931	25.9	5,698	13.40

.= Proposed PV Layout = Proposed Parking PV Layout

Notes:

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

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

Simple Payback Analysis

	Photovoltaic System 100% Financing - 15 year
Total Construction Cost	$202,527
Annual kWh Production	36,931
Annual Energy Cost Reduction	$6,241
Average Annual SREC Revenue	$7,057

Simple Payback: **15.23** Years

Life Cycle Cost Analysis

Analysis Period (years): 15
Discount Rate: 3%
Average Energy Cost ($/kWh) **$0.169**
Financing Rate: 6.00%
Financing %: 100%
Maintenance Escalation Rate: 3.0%
Energy Cost Escalation Rate: 3.0%
Average SREC Value ($/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	36,931	$6,241	$0	$9,233	$11,918	$8,591	($5,034)	($5,034)
2	$0	36,746	$6,429	$0	$9,187	$11,388	$9,120	($4,893)	($9,928)
3	$0	36,563	$6,621	$0	$9,141	$10,826	$9,683	($4,746)	($14,674)
4	$0	36,380	$6,820	$0	$9,095	$10,228	$10,280	($4,593)	($19,268)
5	$0	36,198	$7,025	$373	$9,049	$9,594	$10,914	($4,807)	($24,075)
6	$0	36,017	$7,235	$371	$7,203	$8,921	$11,587	($6,441)	($30,515)
7	$0	35,837	$7,452	$369	$7,167	$8,206	$12,302	($6,258)	($36,773)
8	$0	35,658	$7,676	$367	$7,132	$7,448	$13,061	($6,068)	($42,841)
9	$0	35,479	$7,906	$365	$7,096	$6,642	$13,866	($5,872)	($48,713)
10	$0	35,302	$8,144	$364	$5,295	$5,787	$14,722	($7,433)	($56,146)
11	$0	35,125	$8,388	$362	$5,269	$4,879	$15,630	($7,214)	($63,360)
12	$0	34,950	$8,639	$360	$5,242	$3,915	$16,594	($6,987)	($70,347)
13	$0	34,775	$8,899	$358	$5,216	$2,891	$17,617	($6,752)	($77,098)
14	$0	34,601	$9,166	$356	$3,460	$1,805	$18,704	($8,239)	($85,337)
15	$0	34,428	$9,441	$355	$3,443	$651	$19,857	($7,980)	($93,317)
	Totals:	534,990	$116,082	$4,000	$102,228	$105,100	$202,527	($93,317)	($677,428)

Net Present Value (NPV) **($68,468)**