



# Local Government Energy Audit: Energy Audit Report



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## ***Westwood Regional Jr.-Sr. High School***

701 Ridgewood Rd

Township of Washington, New Jersey  
07676

**Westwood Regional School District**

October 4, 2018

Final Report by:

**TRC Energy Services**

## Disclaimer

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The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate savings are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

The energy conservation measures and estimates of energy savings have been reviewed for technical accuracy. However, estimates of final energy savings are not guaranteed, because final savings may depend on behavioral factors and other uncontrollable variables. TRC Energy Services (TRC) and New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. The owner of the facility should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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# I EXECUTIVE SUMMARY

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The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Westwood Regional Jr.-Sr. High School.

The goal of an LGEA report is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help facilities implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist the Westwood Board of Education (BOE) in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

## I.1 Facility Summary

Westwood Regional Jr.-Sr. High School is a 196,595 square foot facility comprised of classrooms, office space, two gymnasiums, locker rooms, kitchen, cafeteria, two auditoriums and media center. There is a partial second floor which is all classroom space. The building also has athletic fields and parking lots. The kitchen is used to provide lunch for the students. The building was constructed in 1964 with some additional work performed in 1971. The building is open year round with the bulk of occupancy between September and June. The building is open on weekdays between 6:00 AM and midnight; the schedule varies with the sports season. The facility is on average occupied by 1,100 students and 170 staff members.

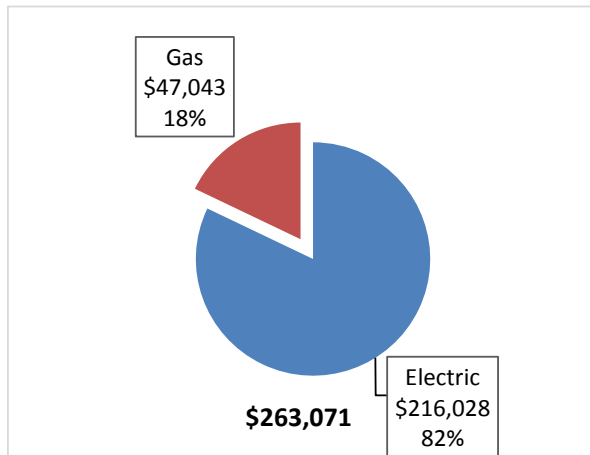
The building is 100% heated and about 40% cooled. The lack of HVAC controls at Westwood Regional Jr.-Sr. High School is a high priority for the facility maintenance team. There are currently no temperature setbacks and there are a variety of system types that serve the building. There is also aging and inefficient HVAC equipment in need of replacement in the gymnasiums and auditoriums. A thorough description of the facility and our observations are located in Section 2.

## I.2 Your Cost Reduction Opportunities

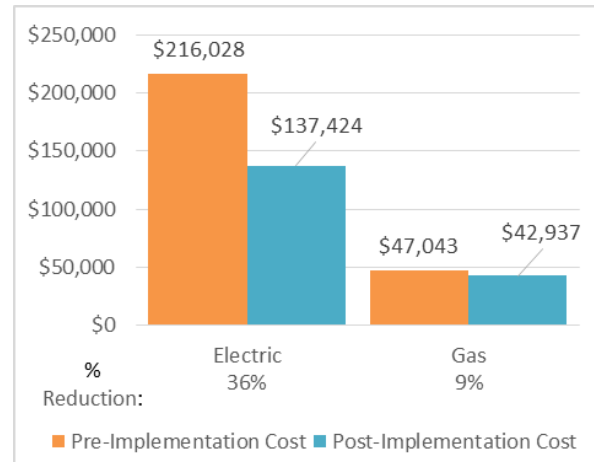
### Energy Conservation Measures

TRC recommends 11 measures which together represent an opportunity for Westwood Regional Jr.-Sr. High School to reduce annual energy costs by \$82,710 and annual greenhouse gas emissions by 687,301 lbs CO<sub>2</sub>e. We estimate that if all recommended measures are implemented, the project would pay for itself in energy savings in 5.8 years. A breakdown of current utility costs is shown in Figure 1. The estimated reduction in utility costs for the proposed measures is shown in Figure 2. Together these measures represent an opportunity to reduce Westwood Regional Jr.-Sr. High School's annual energy costs by 31%.

**Figure 1 – Previous 12 Month Utility Costs**



**Figure 2 – Potential Post-Implementation Costs**



A detailed description of Westwood Regional Jr.-Sr. High School’s existing energy use can be found in Section 3.

Estimates of the total cost, energy savings, and financial incentives for the potential energy efficient upgrades are summarized below in Figure 3. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4.

**Figure 3 – Summary of Energy Reduction Opportunities**

Energy Conservation Measure	Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)*	Estimated Net Cost (\$)	Simple Payback Period (yrs)**	CO <sub>2</sub> e Emissions Reduction (lbs)
<b>Lighting Upgrades</b>		<b>491,569</b>	<b>68.1</b>	<b>0.0</b>	<b>\$63,300.55</b>	<b>\$389,885.98</b>	<b>\$45,330.00</b>	<b>\$344,555.98</b>	<b>5.4</b>	<b>495,007</b>
ECM 1   Install LED Fixtures	Yes	137,482	16.5	0.0	\$17,703.89	\$239,372.55	\$17,890.00	\$221,482.55	12.5	138,443
ECM 2   Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	3,424	0.5	0.0	\$440.91	\$2,700.83	\$80.00	\$2,620.83	5.9	3,448
ECM 3   Retrofit Fixtures with LED Lamps	Yes	349,507	51.0	0.0	\$45,006.86	\$145,446.39	\$27,360.00	\$118,086.39	2.6	351,951
ECM 4   Install LED Exit Signs	Yes	1,156	0.1	0.0	\$148.90	\$2,366.21	\$0.00	\$2,366.21	15.9	1,164
<b>Lighting Control Measures</b>		<b>93,106</b>	<b>12.3</b>	<b>0.0</b>	<b>\$11,989.42</b>	<b>\$63,416.00</b>	<b>\$9,940.00</b>	<b>\$53,476.00</b>	<b>4.5</b>	<b>93,757</b>
ECM 5   Install Occupancy Sensor Lighting Controls	Yes	76,647	10.8	0.0	\$9,869.98	\$60,686.00	\$7,760.00	\$52,926.00	5.4	77,183
ECM 6   Install Daylight Dimming Controls	Yes	16,459	1.5	0.0	\$2,119.44	\$2,730.00	\$2,180.00	\$550.00	0.3	16,574
<b>Electric Unitary HVAC Measures</b>		<b>3,043</b>	<b>4.8</b>	<b>0.0</b>	<b>\$391.83</b>	<b>\$21,628.38</b>	<b>\$1,196.00</b>	<b>\$20,432.38</b>	<b>52.1</b>	<b>3,064</b>
Install High Efficiency Electric AC	No	3,043	4.8	0.0	\$391.83	\$21,628.38	\$1,196.00	\$20,432.38	52.1	3,064
<b>Gas Heating (HVAC/Process) Replacement</b>		<b>0</b>	<b>0.0</b>	<b>25.4</b>	<b>\$168.36</b>	<b>\$11,917.76</b>	<b>\$3,200.00</b>	<b>\$8,717.76</b>	<b>51.8</b>	<b>2,978</b>
Install High Efficiency Furnaces	No	0	0.0	25.4	\$168.36	\$11,917.76	\$3,200.00	\$8,717.76	51.8	2,978
<b>Domestic Water Heating Upgrade</b>		<b>0</b>	<b>0.0</b>	<b>39.3</b>	<b>\$260.33</b>	<b>\$42,858.79</b>	<b>\$1,487.50</b>	<b>\$41,371.29</b>	<b>158.9</b>	<b>4,604</b>
Install High Efficiency Gas Water Heater	No	0	0.0	29.2	\$193.49	\$42,593.50	\$1,487.50	\$41,106.00	212.5	3,422
ECM 7   Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	10.1	\$66.85	\$265.29	\$0.00	\$265.29	4.0	1,182
<b>Plug Load Equipment Control - Vending Machine</b>		<b>1,612</b>	<b>0.0</b>	<b>0.0</b>	<b>\$207.56</b>	<b>\$230.00</b>	<b>\$0.00</b>	<b>\$230.00</b>	<b>1.1</b>	<b>1,623</b>
ECM 8   Vending Machine Control	Yes	1,612	0.0	0.0	\$207.56	\$230.00	\$0.00	\$230.00	1.1	1,623
<b>Custom Measures</b>		<b>24,123</b>	<b>0.0</b>	<b>610.2</b>	<b>\$7,145.95</b>	<b>\$79,756</b>	<b>\$0.00</b>	<b>\$79,756</b>	<b>11.2</b>	<b>95,733</b>
ECM 9   Computer Power Management Software	Yes	12,166	0.0	0.0	\$1,566.63	\$6,610.00	\$0.00	\$6,610.00	4.2	12,251
ECM 10   Building Envelope Weatherization	Yes	801	0.0	261.5	\$1,834.38	\$14,167.00	\$0.00	\$14,167.00	7.7	31,424
ECM 11   Retro-Commissioning Study & HVAC Improvements	Yes	11,156	0.0	348.7	\$3,744.94	\$58,978.50	\$0.00	\$58,978.50	15.7	52,058
<b>TOTALS</b>		<b>613,453</b>	<b>85.2</b>	<b>674.9</b>	<b>\$83,464.01</b>	<b>\$609,692</b>	<b>\$61,153.50</b>	<b>\$548,539</b>	<b>6.6</b>	<b>696,765</b>

\* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

\*\* - Simple Payback Period is based on net measure costs (i.e. after incentives).



**Lighting Upgrades** generally involve the replacement of existing lighting components such as lamps and ballasts (or the entire fixture) with higher efficiency lighting components. These measures save energy by reducing the power used by the lighting components due to improved electrical efficiency.

**Lighting Controls** measures generally involve the installation of automated controls to turn off lights or reduce light output when not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

**Electric Unitary HVAC** measures generally involve replacing older inefficient air conditioning systems with modern energy efficient systems. New air conditioning systems can provide equivalent cooling to older air condition systems at a reduced energy cost. These measures save energy by reducing the power used by the air conditioning systems, due to improved electrical efficiency.

**Gas Heating** (HVAC/Process) measures generally involve replacing older inefficient hydronic heating systems with modern energy efficient systems. Gas heating systems can provide equivalent heating compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel demands for heating, due to improved combustion and heat transfer efficiency.

**Domestic Hot Water** upgrade measures generally involve replacing older inefficient domestic water heating systems with modern energy efficient systems. New domestic hot water heating systems can provide equivalent, or greater, water heating capacity compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel used for domestic hot water heating due to improved heating efficiency or reducing standby losses.

**Plug Load Equipment** control measures generally involve installing automated devices that limit the power usage or operation of equipment that is plugged into an electric outlets when not in use.

### **Energy Efficient Practices**

TRC also identified 19 low cost (or no cost) energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at Westwood Regional Jr.-Sr. High School include:

- Reduce Air Leakage
- Close Doors and Windows
- Use Window Treatments/Coverings
- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Perform Routine Motor Maintenance
- Use Fans to Reduce Cooling Load
- Install Destratification Fans
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Ensure Economizers are Functioning Properly
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Check for and Seal Duct Leakage
- Perform Proper Boiler Maintenance
- Perform Proper Furnace Maintenance
- Perform Proper Water Heater Maintenance



- Install Plug Load Controls
- Water Conservation

For details on these energy efficient practices, please refer to Section 5.

### **On-Site Generation Measures**

TRC evaluated the potential for installing on-site generation for Westwood Regional Jr.-Sr. High School. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array.

*Figure 4 – Photovoltaic Potential*

<b>Potential</b>	High	
<b>System Potential</b>	384	kW DC STC
<b>Electric Generation</b>	457,486	kWh/yr
<b>Displaced Cost</b>	\$39,800	/yr
<b>Installed Cost</b>	\$1,497,600	

For details on our evaluation and on-site generation potential, please refer to Section 6.

## **I.3 Implementation Planning**

To realize the energy savings from the ECMs listed in this report, a project implementation plan must be developed. Available capital must be considered and decisions need to be made whether it is best to pursue individual ECMs separately, groups of ECMs, or a comprehensive approach where all ECMs are implemented together, possibly in conjunction with other facility upgrades or improvements.

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

The ECMs outlined in this report may qualify under the following program(s):

- SmartStart
- Energy Savings Improvement Program
- SREC (Solar Renewable Energy Certificate) Registration Program (SRP)
- Demand Response Energy Aggregator

For facilities wanting to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SmartStart incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 3 are based on the SmartStart program. More details on this program and others are available in Section 8.

Larger facilities with an interest in a more comprehensive whole building approach to energy conservation should consider participating in the Pay for Performance (P4P) program. Projects eligible for this project program must meet minimum savings requirements. Final incentives are calculated based on actual measured performance achieved at the end of the project. The application process is more involved, and it requires working with a qualified P4P contractor, but the process may result in greater energy savings overall and more lucrative incentives, up to 50% of project's total cost.

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 0 for additional information on the ESIP Program.

The Demand Response Energy Aggregator is a (non-NJCEP) program designed to reduce electric loads at commercial facilities, when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak power demand. Demand Response (DR) service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability. By enabling grid operators to call upon commercial facilities to reduce their electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and facilities receive payments whether or not they are called upon to curtail their load during times of peak demand. Refer to Section 7 for additional information on this program.

Additional information on relevant incentive programs is located in Section 8. You may also check the following website for more details: [www.njcleanenergy.com/ci](http://www.njcleanenergy.com/ci).

## 2 FACILITY INFORMATION AND EXISTING CONDITIONS

### 2.1 Project Contacts

*Figure 5 – Project Contacts*

Name	Role	E-Mail	Phone #
<b>Customer</b>			
John Baumann	Director of Buildings and Grounds	john.baumann@wwrsd.org	201-664-0880 ext 2010
Keith Rosado	School Business Administrator / Board Secretary	keith.rosado@wwrsd.org	201-664-0880 ext 2004
<b>TRC Energy Services</b>			
Aimee Lalonde	Auditor	alalonde@trcsolutions.com	(732) 855-0033

### 2.2 General Site Information

On July 17, 2017, TRC performed an energy audit at Westwood Regional Jr.-Sr. High School located in Township of Washington, New Jersey. TRC's team met with John Baumann, Director of Buildings and Grounds to review the facility operations and help focus our investigation on specific energy-using systems.

Westwood Regional Jr.-Sr. High School is a 196,595 square foot facility comprised of classrooms, office space, two gymnasiums, locker rooms, kitchen, cafeteria, two auditoriums and media center. There is a partial second floor which is all classroom space. The building also has athletic fields and parking lots. The kitchen is used to provide lunch for the students. The building was constructed in 1964 with some additional work performed in 1971.

The building is 100% heated and about 40% cooled. The lack of HVAC controls at Westwood Regional Jr.-Sr. High School is a high priority for the facility maintenance team. There are currently no temperature setbacks and there are a variety of system types that serve the building. There are packaged roof tops with DX Coils for cooling, the hydronic heating system serving radiators, Personal Terminal Air Conditioners (PTACs), Unit Ventilators (UVs), window AC units and split AC systems. The efficiency of major and unitary mechanical equipment ranges from low to high. There are aging and inefficient HVAC equipment in need of replacement in the Gymnasiums and Auditoriums. The auditorium is served by old RTUs. The gymnasiums are served by ceiling hung units.

### 2.3 Building Occupancy

The building is open year round with the bulk of occupancy between September and June. The building is open on weekdays between 6:00 AM and midnight; the schedule varies with the sports season. The facility is on average occupied by 1,100 students and 170 staff members.

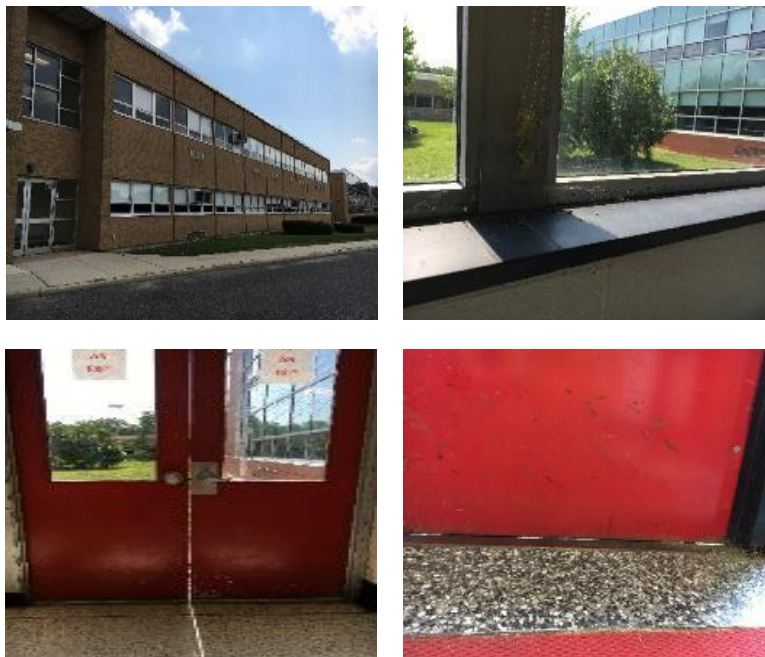
The typical schedule is presented in the table below.

*Figure 6 - Building Schedule*

Building Name	Weekday/Weekend	Operating Schedule
Westwood Regional Jr.Sr. High School	Weekday	6AM to Midnight
Westwood Regional Jr.Sr. High School	Weekend	6AM to 6PM

## 2.4 Building Envelope

The building is constructed of concrete masonry with a brick façade. The building has flat roof sections which appear in fair condition. The building has both single pane and double pane operable windows with metal frames. The sealant around these frames appears to be in poor condition. The exterior doors are typically metal or metal with glass panes and metal frames. The exterior doors have either missing or worn weather-stripping materials which show signs of excessive infiltration. The building envelope has deficiencies and contributes to a significant amount of air infiltration. There is an opportunity for energy savings by properly weather-stripping exterior doors and caulking around frames to reduce air infiltration thus reducing the load on the building's HVAC systems.



## 2.5 On-Site Generation

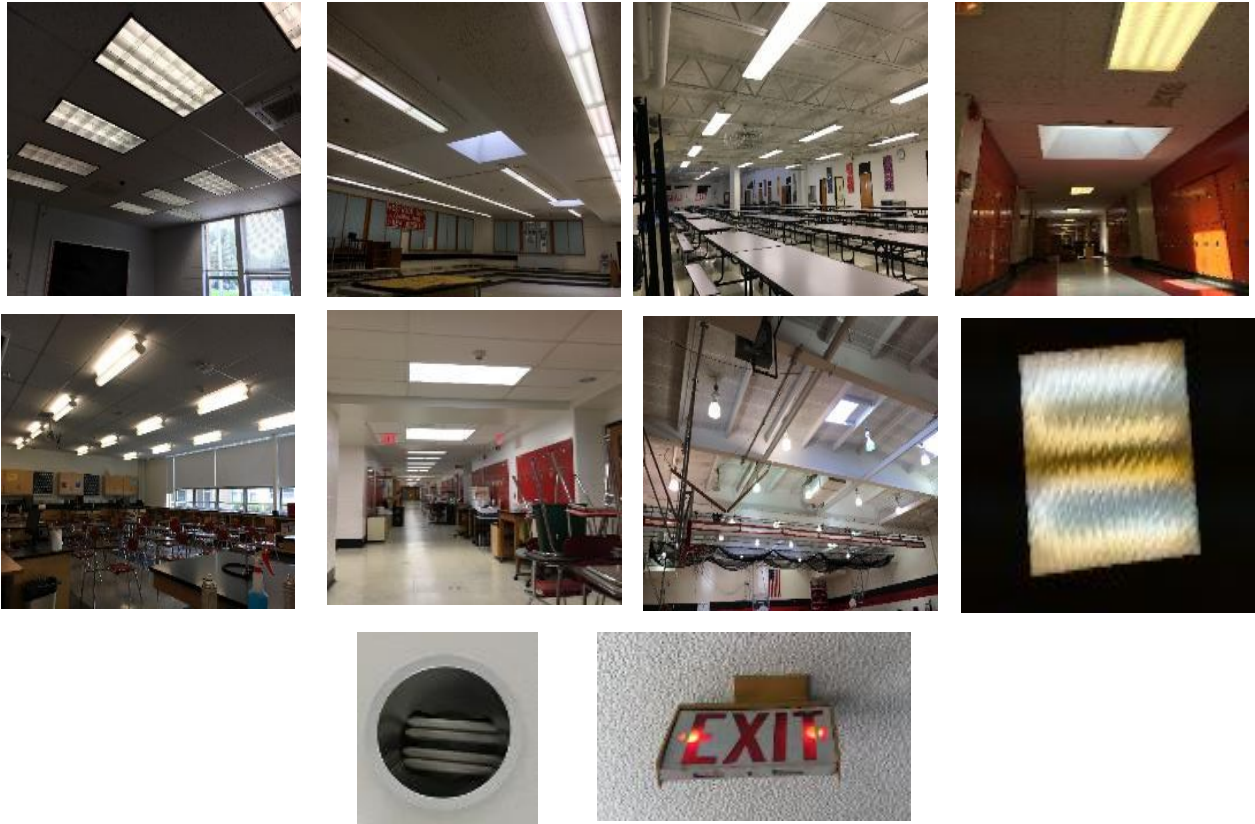
Westwood Regional Jr.-Sr. High School does not have any on-site electric generation capacity.

## 2.6 Energy-Using Systems

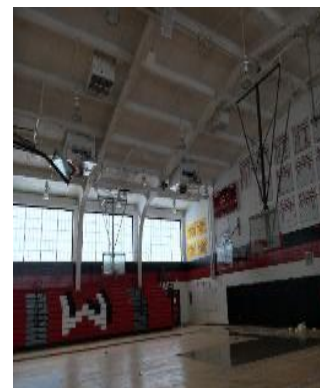
Please see Appendix A: Equipment Inventory & Recommendations for an inventory of the facility's equipment.

### Lighting System

The building is primarily illuminated by linear fluorescent fixtures which contain 32-Watt T8 lamps. Fixtures throughout the building include surface-mounted continuous row-mounted lensed fixtures, recessed troffer fixtures, indirect/direct fixtures and open industrial fixtures. Some areas have recessed can fixtures with compact fluorescent plug in lamps. There are also recessed fixtures with compact fluorescent bi-x lamps. Screw in incandescent lamps provide illumination for storage and restroom areas. Additionally there are some fixtures which contain older, less efficient 40-Watt T12 lamps. About half of the exit signs throughout the building are lit with incandescent lamps; the other half have already been replaced with LEDs. The fixtures are in good condition which provides a great opportunity for energy savings by retrofitting to LED technology.



The auditoriums have dimmable fixtures which appear to be either incandescent or LED technology. The stage also has metal halide lamp recessed can fixtures. The gyms are lit by metal halide high bay fixtures which each contain 250-Watt lamps. There is an opportunity for energy savings by replacing these one-for-one with LED high bay fixtures.





The exterior lighting includes building mounted wall pack, flood, and pole mounted area light fixtures. These are either metal halide or LED technology and some were noted to be operating during daylight hours. There is an opportunity for energy savings by upgrading the remaining metal halide fixtures to LED technology and installing photocell controls to ensure operation is limited to dusk to dawn hours.



The stadium lighting includes 1000-Watt metal halide lamp fixtures.



The lighting in majority of individual rooms are manually controlled via wall switches although there are some occupancy based automatic lighting control sensor switches in place. Several of the occupancy sensors were broken and need to be replaced. The classrooms and office areas are equipped with bi-level switching where each row within the classroom are operated by a different switch. Some hallways and restrooms are controlled by key switches. There is an opportunity for energy savings by the installation of occupancy-based sensors in locations such as hallways, restrooms and private offices. There is also an opportunity for energy savings by installing high/low controls for classrooms. Exterior lighting fixtures are controlled by photocell sensor or timeclock. Some of the controls were not functional at the time of the audit.

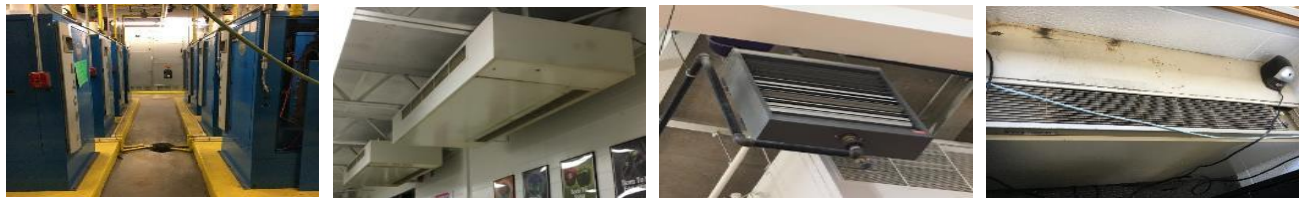


The HVAC systems that serve the building include fan and pump motors which are generally in good condition and of standard to high efficiency. Motors drive equipment including hot water pumps, water supply pumps, supply and exhaust fans. The majority of equipment appears to be in good condition. The hot water pump motors are premium efficient and are controlled by variable frequency drives. However, there are triple-duty valves which appear to still be partially opened. We recommend having this investigated as part of a retro-commissioning study to ensure optimal performance and energy savings by the existing variable frequency drives.



### Hot Water Heating System

The building is heated by a hydronic heating system served by a total of eight gas-fired condensing hot water boilers. The boilers are high efficiency and are in good condition. Hot water is supplied through the system piping and serves unit ventilators, perimeter radiators, unit heaters and some air handling units. There are also a total of nine roof top units which are gas fired, standard efficiency and range in condition.



### Direct Expansion Air Conditioning System (DX)

The unitary HVAC equipment throughout the building is in fair to good condition. There are a number of split AC Systems which serve offices, classrooms and IT rooms. These are in fair to good condition. The newer systems are high efficiency while the older units are much lower in efficiency. There are window AC units serving many rooms; the unit efficiency ranges with the age of the equipment. There is an opportunity for energy savings by replacing the older units with high efficiency systems.





Mechanical equipment is controlled through a variety of means. The boiler plant is controlled through separate controls which vary supply water temperature based on outdoor air temperature. The newer HVAC systems are controlled by thermostats located in the zones served by each system. During the audit, it was noted that some of the HVAC equipment was in operation while the associated space was unoccupied. According to facility staff, the thermostats are to be set at 69°F for heating and 73°F for cooling. However, during the audit (while in cooling season), thermostats were noted as set between 67°F and 69°F even in unoccupied areas. The thermostat in the unoccupied weight room, for example, was set at 56°F, and the system was judged to be in full cooling mode. There is an opportunity for energy savings by performing a retro-commissioning study of the HVAC system and implementing system control improvements. Additionally, there is a significant opportunity for energy savings by installing a comprehensive energy management system.



### Domestic Hot Water Heating System

The majority of the building's domestic hot water is supplied by two gas-fired boilers that circulate hot water to a storage tank. This equipment is in good condition. There is an opportunity for energy savings by replacing the existing equipment with a high efficiency condensing hot water heater, however, this measure is cost prohibitive. There is also a small electric domestic water heater in the kitchenette. This is in fair condition. The sink aerators throughout the building are fit with higher flow devices (2.0 gallons per minute [gpm] or higher). There is an opportunity for energy savings by replacing these aerators with low-flow devices. This is a cost effective approach to reducing energy used to provide hot water throughout the building.



## Food Service & Refrigeration Equipment

There are gas fired and electric cooking equipment and a number of refrigeration equipment including walk-in coolers and a walk-in freezer. One of the walk-in coolers has water cooled equipment which is in poor condition and in need of replacement. Due to insufficient data, the cost effectiveness of replacement based on energy savings cannot be determined. Based on the condition of the equipment, the District should consider this a candidate for capital repair or replacement.



## Building Plug Load

There is general office and café equipment throughout the building. There are also gas-fired and electric food service and additional refrigeration equipment. The refrigerated chests are of standard efficiency and there is an opportunity for energy savings by replacing with high efficiency equipment. There are vending machines which currently operate 24/7. There is an opportunity for energy savings by installing vending machine controls on the refrigerated drink machine. There are a number of computers throughout the building in classrooms, office areas as well as in computer labs. Some of these were noted to be in idle mode or left on while not in use. This provides a potential for implementing computer power management software.



## 2.7 Water-Using Systems

There are many restrooms at this facility. A sampling of restrooms found that the faucets are rated for 2.0 gallons per minute (gpm) or higher. There is an opportunity for energy savings by installing low-flow (0.5 gpm) aerators on sinks throughout the building.

### 3 SITE ENERGY USE AND COSTS

Utility data for electricity and natural gas was analyzed to identify opportunities for savings. In addition, data for electricity and natural gas was evaluated to determine the annual energy performance metrics for the building in energy cost per square foot and energy usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are a number of factors that could cause the energy use of this building to vary from the “typical” energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 3.4 for additional information.

#### 3.1 Total Cost of Energy

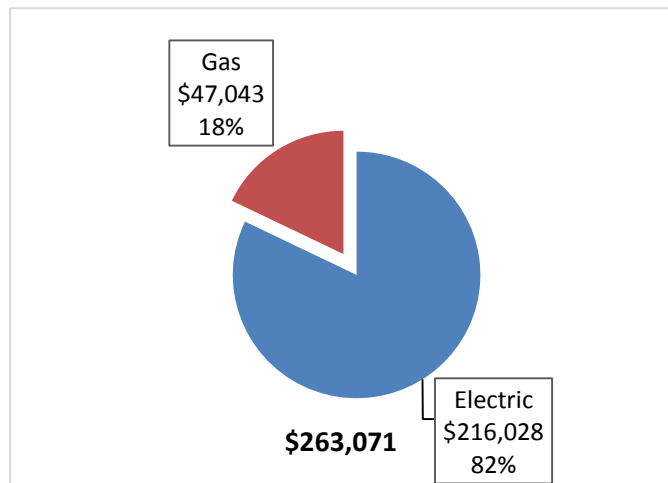
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

*Figure 7 - Utility Summary*

Utility Summary for Westwood Regional Jr.Sr. High School		
Fuel	Usage	Cost
Electricity	1,677,599 kWh	\$216,028
Natural Gas	71,056 Therms	\$47,043
<b>Total</b>		<b>\$263,071</b>

The current annual energy cost for this facility is \$263,071 as shown in the chart below.

*Figure 8 - Energy Cost Breakdown*



### 3.2 Electricity Usage

Electricity is provided by PSE&G. The average electric cost over the past 12 months was \$0.129/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The facility pays electric demand charges. The monthly electricity consumption and peak demand are shown in the chart below. The relatively high summer power demand is typical for year round operation for buildings with a significant cooling load.

Figure 9 - Electric Usage & Demand

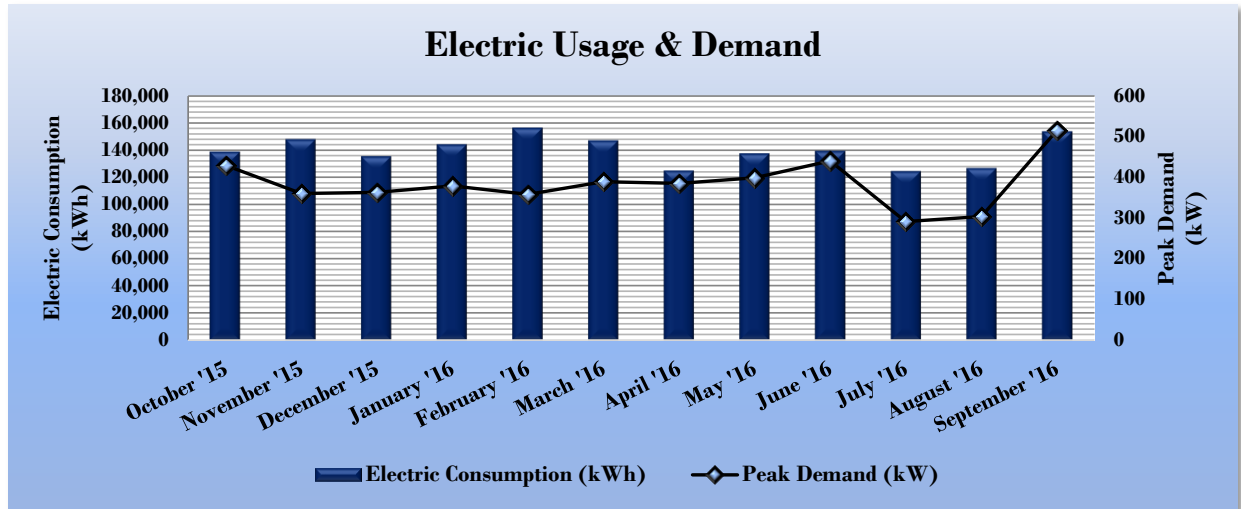


Figure 10 - Electric Usage & Demand

Electric Billing Data for Westwood Regional Jr.Sr. High School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
10/29/15	29	138,489	429	\$3,785	\$17,484
12/1/15	33	147,667	360	\$3,784	\$17,772
12/30/15	29	135,105	363	\$3,784	\$16,589
1/30/16	31	143,800	379	\$3,659	\$17,472
3/2/16	32	156,024	358	\$3,661	\$17,989
4/1/16	30	146,735	389	\$3,876	\$17,980
4/30/16	29	124,661	385	\$3,876	\$15,934
5/31/16	31	137,229	399	\$3,876	\$16,370
6/30/16	30	139,121	441	\$5,454	\$21,119
7/30/16	30	124,211	291	\$3,607	\$17,448
8/30/16	31	126,506	304	\$3,761	\$17,146
9/28/16	29	153,455	515	\$6,470	\$22,134
<b>Totals</b>	<b>364</b>	<b>1,673,003</b>	<b>514.7</b>	<b>\$49,594</b>	<b>\$215,437</b>
<b>Annual</b>	<b>365</b>	<b>1,677,599</b>	<b>514.7</b>	<b>\$49,730</b>	<b>\$216,028</b>

### 3.3 Natural Gas Usage

Natural gas is provided by PSE&G. The average gas cost for the past 12 months is \$0.662/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below. The high winter use typifies a predominant heating-driven gas use profile.

Figure 11 - Natural Gas Usage

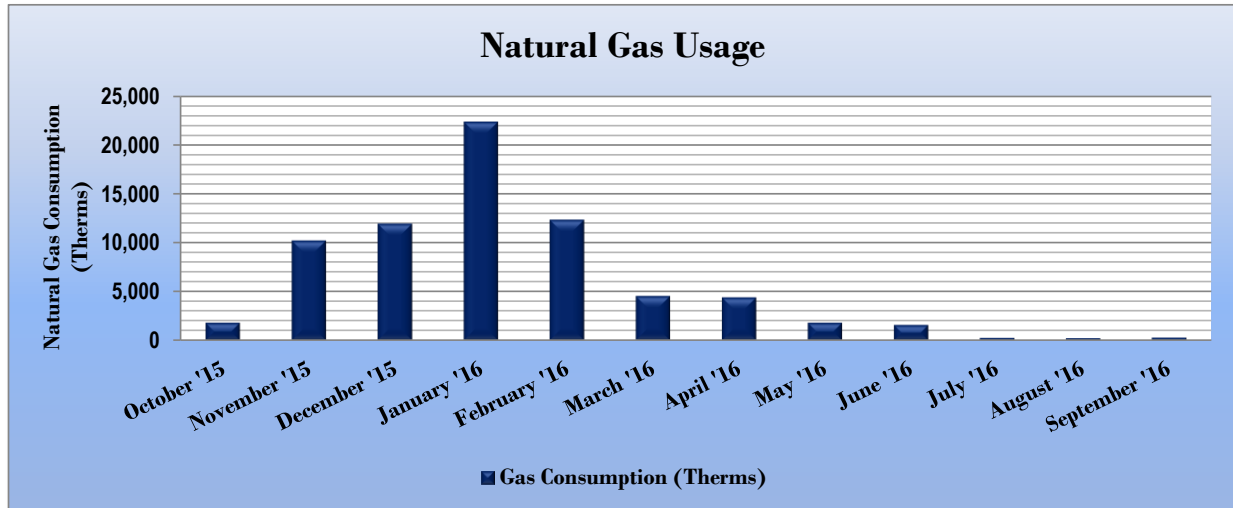


Figure 12 - Natural Gas Usage

Gas Billing Data for Westwood Regional Jr.Sr. High School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
10/27/15	32	1,790	\$1,066
11/25/15	29	10,192	\$7,331
12/26/15	31	11,923	\$8,579
1/27/16	32	22,348	\$14,488
2/29/16	33	12,341	\$8,148
3/30/16	30	4,544	\$3,480
4/28/16	29	4,389	\$1,476
5/26/16	28	1,799	\$1,080
6/27/16	32	1,562	\$1,053
7/27/16	30	251	\$243
8/25/16	29	214	\$223
9/27/16	33	287	\$262
<b>Totals</b>	<b>368</b>	<b>71,640</b>	<b>\$47,430</b>
<b>Annual</b>	<b>365</b>	<b>71,056</b>	<b>\$47,043</b>



### 3.4 Benchmarking

This facility was benchmarked using Portfolio Manager®, an online tool created and managed by the United States Environmental Protection Agency (EPA) through the ENERGY STAR® program. Portfolio Manager® analyzes your building’s consumption data, cost information, and operational use details and then compares its performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR® score for select building types.

The EUI is a measure of a facility’s energy consumption per square foot, and it is the standard metric for comparing buildings’ energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of “site energy” and “source energy.” Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

**Figure 13 - Energy Use Intensity Comparison – Existing Conditions**

Energy Use Intensity Comparison - Existing Conditions		
	Westwood Regional Jr./Sr. High School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft <sup>2</sup> )	129.4	141.4
Site Energy Use Intensity (kBtu/ft <sup>2</sup> )	65.3	58.2

Implementation of all recommended measures in this report would improve the building’s estimated EUI significantly, as shown in the table below:

**Figure 14 - Energy Use Intensity Comparison – Following Installation of Recommended Measures**

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Westwood Regional Jr./Sr. High School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft <sup>2</sup> )	92.8	141.4
Site Energy Use Intensity (kBtu/ft <sup>2</sup> )	51.5	58.2

Many types of commercial buildings are also eligible to receive an ENERGY STAR® score. This score is a percentile ranking from 1 to 100. It compares your building’s energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75% of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. Your building is not is one of the building categories that are eligible to receive a score. This facility has a current score of 74.

A Portfolio Manager® Statement of Energy Performance (SEP) was generated for this facility, see.

For more information on ENERGY STAR® certification go to: <https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1>.

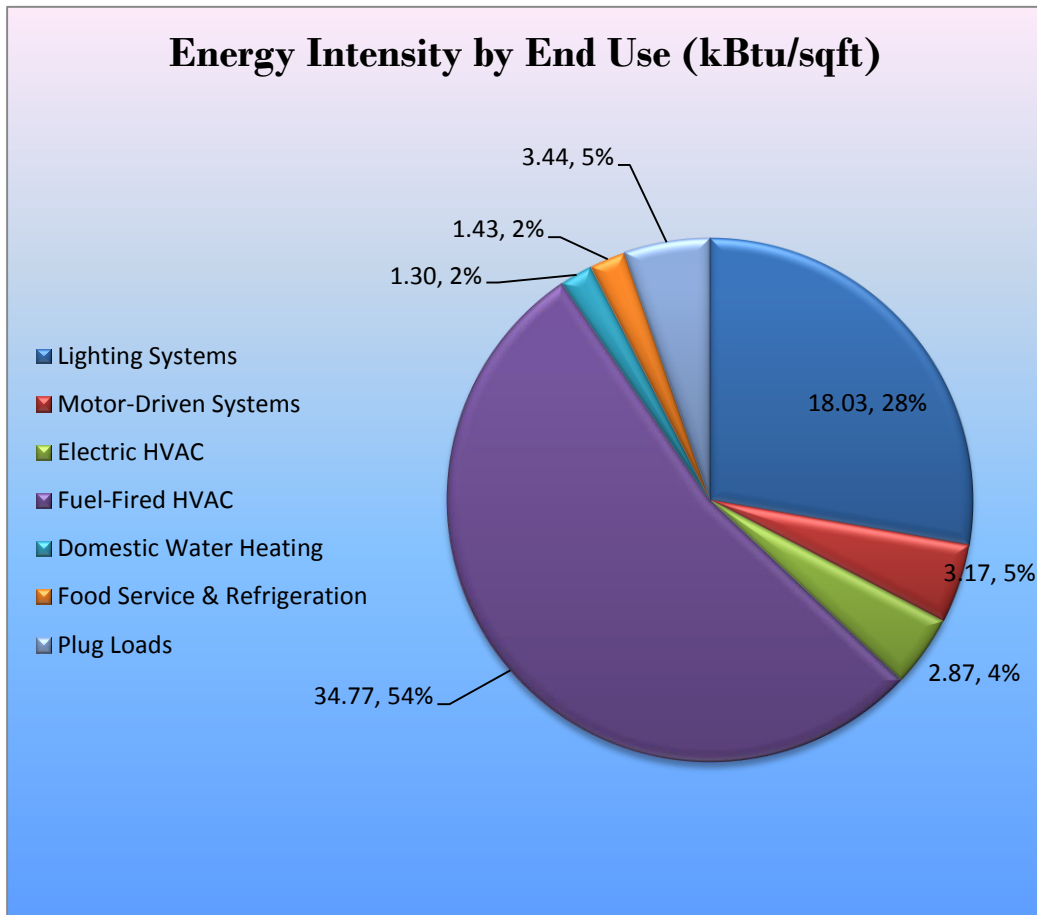
A Portfolio Manager® account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager® regularly, so that you can keep track of your building’s performance. Free online training is available to help you use ENERGY STAR® Portfolio Manager® to track your building’s performance at: <https://www.energystar.gov/buildings/training>.



### 3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

Figure 15 - Energy Balance (% and kBtu/SF)



## 4 ENERGY CONSERVATION MEASURES

### Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Westwood Regional Jr.-Sr. High School regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016 approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

### 4.1 Recommended ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

*Figure 16 – Summary of Recommended ECMs*

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)*	Estimated Net Cost (\$)	Simple Payback Period (yrs)**	CO <sub>2</sub> e Emissions Reduction (lbs)
<b>Lighting Upgrades</b>		<b>491,569</b>	<b>68.1</b>	<b>0.0</b>	<b>\$63,300.55</b>	<b>\$389,885.98</b>	<b>\$45,330.00</b>	<b>\$344,555.98</b>	<b>5.4</b>	<b>495,007</b>
ECM 1	Install LED Fixtures	137,482	16.5	0.0	\$17,703.89	\$239,372.55	\$17,890.00	\$221,482.55	12.5	138,443
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	3,424	0.5	0.0	\$440.91	\$2,700.83	\$80.00	\$2,620.83	5.9	3,448
ECM 3	Retrofit Fixtures with LED Lamps	349,507	51.0	0.0	\$45,006.86	\$145,446.39	\$27,360.00	\$118,086.39	2.6	351,951
ECM 4	Install LED Exit Signs	1,156	0.1	0.0	\$148.90	\$2,366.21	\$0.00	\$2,366.21	15.9	1,164
<b>Lighting Control Measures</b>		<b>93,106</b>	<b>12.3</b>	<b>0.0</b>	<b>\$11,989.42</b>	<b>\$63,416.00</b>	<b>\$9,940.00</b>	<b>\$53,476.00</b>	<b>4.5</b>	<b>93,757</b>
ECM 5	Install Occupancy Sensor Lighting Controls	76,647	10.8	0.0	\$9,869.98	\$60,686.00	\$7,760.00	\$52,926.00	5.4	77,183
ECM 6	Install Daylight Dimming Controls	16,459	1.5	0.0	\$2,119.44	\$2,730.00	\$2,180.00	\$550.00	0.3	16,574
<b>Domestic Water Heating Upgrade</b>		<b>0</b>	<b>0.0</b>	<b>10.1</b>	<b>\$66.85</b>	<b>\$265.29</b>	<b>\$0.00</b>	<b>\$265.29</b>	<b>4.0</b>	<b>1,182</b>
ECM 7	Install Low-Flow Domestic Hot Water Devices	0	0.0	10.1	\$66.85	\$265.29	\$0.00	\$265.29	4.0	1,182
<b>Plug Load Equipment Control - Vending Machine</b>		<b>1,612</b>	<b>0.0</b>	<b>0.0</b>	<b>\$207.56</b>	<b>\$230.00</b>	<b>\$0.00</b>	<b>\$230.00</b>	<b>1.1</b>	<b>1,623</b>
ECM 8	Vending Machine Control	1,612	0.0	0.0	\$207.56	\$230.00	\$0.00	\$230.00	1.1	1,623
<b>Custom Measures</b>		<b>24,123</b>	<b>0.0</b>	<b>610.2</b>	<b>\$7,145.95</b>	<b>\$79,755.50</b>	<b>\$0.00</b>	<b>\$79,755.50</b>	<b>11.2</b>	<b>95,733</b>
ECM 9	Computer Power Management Software	12,166	0.0	0.0	\$1,566.63	\$6,610.00	\$0.00	\$6,610.00	4.2	12,251
ECM 10	Building Envelope Weatherization	801	0.0	261.5	\$1,834.38	\$14,167.00	\$0.00	\$14,167.00	7.7	31,424
ECM 11	Retro-Commissioning Study & HVAC Improvements	11,156	0.0	348.7	\$3,744.94	\$58,978.50	\$0.00	\$58,978.50	15.7	52,058
<b>TOTALS</b>		<b>610,410</b>	<b>80.4</b>	<b>620.2</b>	<b>\$82,710.33</b>	<b>\$533,552.77</b>	<b>\$55,270.00</b>	<b>\$478,282.77</b>	<b>5.8</b>	<b>687,301</b>

\* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

\*\* - Simple Payback Period is based on net measure costs (i.e. after incentives).

### 4.1.1 Lighting Upgrades

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 17 below.

*Figure 17 – Summary of Lighting Upgrade ECMs*

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Reduction (lbs)
<b>Lighting Upgrades</b>		<b>491,569</b>	<b>68.1</b>	<b>0.0</b>	<b>\$63,300.55</b>	<b>\$389,885.98</b>	<b>\$45,330.00</b>	<b>\$344,555.98</b>	<b>5.4</b>	<b>495,007</b>
ECM 1	Install LED Fixtures	137,482	16.5	0.0	\$17,703.89	\$239,372.55	\$17,890.00	\$221,482.55	12.5	138,443
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	3,424	0.5	0.0	\$440.91	\$2,700.83	\$80.00	\$2,620.83	5.9	3,448
ECM 3	Retrofit Fixtures with LED Lamps	349,507	51.0	0.0	\$45,006.86	\$145,446.39	\$27,360.00	\$118,086.39	2.6	351,951
ECM 4	Install LED Exit Signs	1,156	0.1	0.0	\$148.90	\$2,366.21	\$0.00	\$2,366.21	15.9	1,164

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

#### ECM 1: Install LED Fixtures

##### *Summary of Measure Economics*

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
Interior	88,840	10.3	0.0	\$11,440.20	\$216,713.28	\$12,090.00	\$204,623.28	17.9	89,462
Exterior	48,642	6.1	0.0	\$6,263.69	\$22,659.27	\$5,800.00	\$16,859.27	2.7	48,982

##### *Measure Description*

We recommend replacing the compact fluorescent lamp high bay fixtures in the cafeteria and the metal halide lamp fixtures in the gym one-for-one with new LED high bay fixtures. This measure includes the replacement of fixtures and assumes the ability to reuse the existing mounting configuration. The existing lamps frequently burn out and the maintenance is problematic due to the need to use a lift. The proposed fixtures are new high performance LEDs which have much longer lifespans. Therefore, this measure saves energy by reducing the electrical demand. Use of the gymnasium light fixtures will improve light output as well as significantly reduces required maintenance.

This measure also recommends replacing the exterior high intensity discharge (HID) fixtures with LED building mounted fixtures. It also includes replacing the HID flood fixtures along the curved overhang, one-for-one with new LED flood fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable or improved light output. Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice than older technologies.

## **ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers**

### *Summary of Measure Economics*

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
Interior	3,424	0.5	0.0	\$440.91	\$2,700.83	\$80.00	\$2,620.83	5.9	3,448
Exterior	0	0.0	0.0	\$0.00	\$0.00	\$0.00	\$0.00	0.0	0

### *Measure Description*

We recommend retrofitting existing fluorescent T12 fixtures by removing fluorescent tubes and ballasts and replacing them with LEDs and LED drivers (if necessary), which are designed to be used retrofitted fluorescent fixtures. The measure uses the existing fixture housing but replaces the rest of the components with more efficient lighting technology. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space. Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes.

For the purpose of this report, we recommend retrofitting the existing fixtures rather than just replacing the lamps. It should be noted that the existing T8 electronic ballasts may be compatible with turn-key LED lamp replacements which would reduce the estimated installation costs and provide comparable energy savings.

## **ECM 3: Retrofit Fixtures with LED Lamps**

### *Summary of Measure Economics*

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
Interior	349,507	51.0	0.0	\$45,006.86	\$145,446.39	\$27,360.00	\$118,086.39	2.6	351,951
Exterior	0	0.0	0.0	\$0.00	\$0.00	\$0.00	\$0.00	0.0	0

### *Measure Description*

We recommend retrofitting existing incandescent, compact fluorescent and linear fluorescent T8 fixtures with LED lamps. Existing fixtures in the interior and exterior applications are included within this measure. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space. Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent lamps and more than 10 times longer than many incandescent lamps.

## **ECM 4: Install LED Exit Signs**

### *Summary of Measure Economics*

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
Interior	1,156	0.1	0.0	\$148.90	\$2,366.21	\$0.00	\$2,366.21	15.9	1,164
Exterior	0	0.0	0.0	\$0.00	\$0.00	\$0.00	\$0.00	0.0	0

### *Measure Description*

We recommend replacing all incandescent or compact fluorescent exit signs with LED exit signs. LED exit signs require virtually no maintenance and have a life expectancy of at least 20 years. This measure saves energy by installing LED fixtures, which use less power than other technologies with an equivalent lighting output.

## 4.1.2 Lighting Control Measures

Our recommendations for upgrades to existing lighting controls are summarized in Figure 18 below.

*Figure 18 – Summary of Lighting Control ECMs*

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
<b>Lighting Control Measures</b>		<b>93,106</b>	<b>12.3</b>	<b>0.0</b>	<b>\$11,989.42</b>	<b>\$63,416.00</b>	<b>\$9,940.00</b>	<b>\$53,476.00</b>	<b>4.5</b>	<b>93,757</b>
ECM 5	Install Occupancy Sensor Lighting Controls	76,647	10.8	0.0	\$9,869.98	\$60,686.00	\$7,760.00	\$52,926.00	5.4	77,183
ECM 6	Install Daylight Dimming Controls	16,459	1.5	0.0	\$2,119.44	\$2,730.00	\$2,180.00	\$550.00	0.3	16,574

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

### ECM 5: Install Occupancy Sensor Lighting Controls

#### *Summary of Measure Economics*

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
76,647	10.8	0.0	\$9,869.98	\$60,686.00	\$7,760.00	\$52,926.00	5.4	77,183

#### *Measure Description*

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in offices, classrooms, hallways, locker rooms, weight room, gyms, cafeteria and lounges. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are recommended for single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

## **ECM 6: Install Daylight Dimming Controls**

### *Summary of Measure Economics*

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
16,459	1.5	0.0	\$2,119.44	\$2,730.00	\$2,180.00	\$550.00	0.3	16,574

### *Measure Description*

We recommend installing daylight dimming controls that use photo sensors to reduce electric lighting in the window filled hallway when ample daylight lighting is present. Photo sensor controls are recommended for fixtures that are adjacent to windows that receive lots of sunlight. As sunlight level increase in the room, fixture lighting is decreased or turned off. This measure reduces energy use in spaces where sufficient lighting levels can be met by ambient daylight.

Optimum light levels and the method of dimming should be determined during lighting design. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.



### 4.1.3 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic hot water heating system improvements are summarized in Figure 19 below.

*Figure 19 - Summary of Domestic Water Heating ECMs*

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
<b>Domestic Water Heating Upgrade</b>		<b>0</b>	<b>0.0</b>	<b>10.1</b>	<b>\$66.85</b>	<b>\$265.29</b>	<b>\$0.00</b>	<b>\$265.29</b>	<b>4.0</b>	<b>1,182</b>
ECM 9	Install Low-Flow Domestic Hot Water Devices	0	0.0	10.1	\$66.85	\$265.29	\$0.00	\$265.29	4.0	1,182

#### **ECM 7: Install Low-Flow DHW Devices**

##### *Summary of Measure Economics*

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
0	0.0	10.1	\$66.85	\$265.29	\$0.00	\$265.29	4.0	1,182

##### *Measure Description*

We recommend installing low-flow domestic hot water devices to reduce overall hot water demand. Energy demand from domestic hot water heating systems can be reduced by reducing water usage in general. Faucet aerators can reduce hot water usage, relative to standard aerators, which saves energy.

Low-flow devices reduce the overall water flow from the fixture, while still providing adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings.

#### 4.1.4 Plug Load Equipment Control - Vending Machines

Our recommendations for upgrades to plug load equipment control are summarized in Figure 20 below.

*Figure 20 - Summary of Domestic Water Heating ECMs*

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)*	Estimated Net Cost (\$)	Simple Payback Period (yrs)**	CO <sub>2</sub> e Emissions Reduction (lbs)
<b>Plug Load Equipment Control - Vending Machine</b>		1,612	0.0	0.0	\$207.56	\$230.00	\$0.00	\$230.00	1.1	1,623
ECM 8	Vending Machine Control	1,612	0.0	0.0	\$207.56	\$230.00	\$0.00	\$230.00	1.1	1,623

#### ECM 8: Vending Machine Control

##### *Summary of Measure Economics*

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
1,612	0.0	0.0	\$207.56	\$230.00	\$0.00	\$230.00	1.1	1,623

##### *Measure Description*

Vending machines operate continuously, even during non-business hours. We recommend installing occupancy sensor controls to reduce the energy use. These controls power down vending machines when the vending machine area has been vacant for some time, then power up at regular intervals, as needed, to turn machine lights on or keep the product cool. Energy savings are a dependent on vending machine and activity level in the area surrounding the machines.

## 4.1.5 Custom Measures

Additional custom measure energy saving opportunities are addressed in this section. Our recommendations for custom measures are summarized in Figure 21 below.

*Figure 21 - Summary of Custom ECMs*

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
<b>Custom Measures</b>		<b>24,123</b>	<b>0.0</b>	<b>610.2</b>	<b>\$7,145.95</b>	<b>\$79,755.50</b>	<b>\$0.00</b>	<b>\$79,755.50</b>	<b>11.2</b>	<b>95,733</b>
ECM 9	Computer Power Management Software	12,166	0.0	0.0	\$1,566.63	\$6,610.00	\$0.00	\$6,610.00	4.2	12,251
ECM 10	Building Envelope Weatherization	801	0.0	261.5	\$1,834.38	\$14,167.00	\$0.00	\$14,167.00	7.7	31,424
ECM 11	Retro-Commissioning Study & HVAC Improvements	11,156	0.0	348.7	\$3,744.94	\$58,978.50	\$0.00	\$58,978.50	15.7	52,058

### ECM 9: Computer Power Management Software

#### *Summary of Measure Economics*

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
12,166	0.0	0.0	\$1,566.63	\$6,610.00	\$0.00	\$6,610.00	4.2	12,251

#### *Measure Description*

We recommend the implementation of computer power management software. The computing environment in most school and office facilities includes desktops, which are typically left on over nights, weekends and holidays. Screen savers are commonly confused as a power management strategy. This contributes to excessive electrical energy consumption, which may be avoided by proper management.

There are innovative software packages available in the market today that are designed to deliver significant energy saving and provide ongoing tracking measurements. Operational and maintenance benefits are captured through the use of a central power management platform where issues may be diagnosed and problematic devices may be isolated. Energy savings policies may be enforced as well as identifying and eliminating underutilized devices. This measure investigates the potential benefits to implementing computer power management software to better match the energy use to user needs.

## **ECM 10: Building Envelope Weatherization**

### *Summary of Measure Economics*

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
801	0.0	261.5	\$1,834.38	\$14,167.00	\$0.00	\$14,167.00	7.7	31,424

### *Measure Description*

We recommend weather-stripping the exterior doors throughout the building. There are 15 double doors and five single doors which were noted to have missing or worn weather-stripping with clear air gaps. There is approximately 2,448 linear feet of window frames which is recommended to be caulked.

Building envelopes that limit air infiltration and that have adequate insulation play a key role in optimizing heating and cooling efficiency, controlling moisture, and providing occupant comfort. Cracks and gaps throughout your building around windows and doors, through utility openings, at the foundation and roof, may not seem significant, but their effects add up. Reducing uncontrolled air infiltration through air sealing is a cost effective way to improve the performance and energy efficiency of your facility. The proper sealing of sources for air infiltration and exfiltration will mitigate the air through the building and thus reduce the load on the facility's heating and cooling equipment. Exterior doors should be properly weather-stripped which may include the installation of a bottom sweep, center sweep and weather-stripping around the perimeter of the door.

## **ECM 11: Retro-Commissioning Study & HVAC Improvements**

### *Summary of Measure Economics*

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
11,156	0.0	348.7	\$3,744.94	\$58,978.50	\$0.00	\$58,978.50	15.7	52,058

### *Measure Description*

Due to the complexity of today's HVAC systems and controls, it is likely for systems to be operating incorrectly or not as efficiently as they could be. Retro-commissioning studies reveal hidden deficiencies and highlights operational and maintenance issues that could have been avoided as well as exposes hidden control system problems. There are valuable benefits to retro-commissioning in existing buildings. It is a detailed and specialized process that reviews how an HVAC system is controlled and designed to operate. Applying retro-commissioning to existing facilities includes planning, discovering root causes of inefficiencies, development of a cost-effective project delivery and a focus on optimizing value to the building owner.

The study includes functional system testing under various modes, such as heating or cooling loads, occupied and unoccupied modes, varying outside air temperature and space temperatures. This is a systematic process to ensure that the building energy systems perform interactively according to the original design intent and the current operational needs of the facility. Retro-commissioning is a common practice recommended by the American Society of Heating Refrigeration and Energy (ASHRAE) to be revisited every couple of years.

We recommend that an engineering firm who specializes in energy control systems and retro-commissioning be contacted for a detailed evaluation and implementation costs. Facility operations personnel would work with the engineers to develop goals and objectives. During on site testing, the qualified personnel conducting the study would immediately make any low (or no)-cost improvements as identified. Furthermore, any suggested corrective actions which require the purchase of material, a contractor who specializes in that scope of work would be contacted to implement the remaining improvements. Part of the retro-commissioning study should include an evaluation of the cost effectiveness of installing a comprehensive building management system (BMS) or energy management system (EMS). Typically, such a system would replace all manual dial thermostats with a networked series of input sensors and solid state control points, including for valves and dampers.

## 4.2 ECMs Evaluated But Not Recommended

The measures below have been evaluated by the auditor but are not recommended for implementation at the facility. Reasons for exclusion can be found in each measure description section.

*Figure 22 – Summary of Measures Evaluated, But Not Recommended*

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)*	Estimated Net Cost (\$)	Simple Payback Period (yrs)**	CO <sub>2</sub> e Emissions Reduction (lbs)
<b>Electric Unitary HVAC Measures</b>	<b>3,043</b>	<b>4.8</b>	<b>0.0</b>	<b>\$391.83</b>	<b>\$21,628.38</b>	<b>\$1,196.00</b>	<b>\$20,432.38</b>	<b>52.1</b>	<b>3,064</b>
Install High Efficiency Electric AC	3,043	4.8	0.0	\$391.83	\$21,628.38	\$1,196.00	\$20,432.38	52.1	3,064
<b>Gas Heating (HVAC/Process) Replacement</b>	<b>0</b>	<b>0.0</b>	<b>25.4</b>	<b>\$168.36</b>	<b>\$11,917.76</b>	<b>\$3,200.00</b>	<b>\$8,717.76</b>	<b>51.8</b>	<b>2,978</b>
Install High Efficiency Furnaces	0	0.0	25.4	\$168.36	\$11,917.76	\$3,200.00	\$8,717.76	51.8	2,978
<b>Domestic Water Heating Upgrade</b>	<b>0</b>	<b>0.0</b>	<b>29.2</b>	<b>\$193.49</b>	<b>\$42,593.50</b>	<b>\$1,487.50</b>	<b>\$41,106.00</b>	<b>212.5</b>	<b>3,422</b>
Install High Efficiency Gas Water Heater	0	0.0	29.2	\$193.49	\$42,593.50	\$1,487.50	\$41,106.00	212.5	3,422
<b>TOTALS</b>	<b>3,043</b>	<b>4.8</b>	<b>54.7</b>	<b>\$753.68</b>	<b>\$76,139.64</b>	<b>\$5,883.50</b>	<b>\$70,256.14</b>	<b>93.2</b>	<b>9,464</b>

\* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

\*\* - Simple Payback Period is based on net measure costs (i.e. after incentives).

### Install High Efficiency Air Conditioning Units

#### *Summary of Measure Economics*

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
3,043	4.8	0.0	\$391.83	\$21,628.38	\$1,196.00	\$20,432.38	52.1	3,064

#### *Measure Description*

We recommend replacing standard efficiency packaged air conditioning units with high efficiency packaged air conditioning units. There have been significant improvements in both compressor and fan motor efficiencies over the past several years. Therefore, electricity savings can be achieved by replacing older units with new high efficiency units. A higher EER or SEER rating indicates a more efficient cooling system. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling load, and the estimated annual operating hours.

#### *Reasons for not Recommending*

Replacement of the units now is not recommended on the basis of energy savings alone because the payback period for replacing them exceeds the useful life of the equipment.



## Install High Efficiency Furnaces

### *Summary of Measure Economics*

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
0	0.0	25.4	\$168.36	\$11,917.76	\$3,200.00	\$8,717.76	51.8	2,978

### *Measure Description*

We recommend replacing existing standard efficiency furnaces with condensing furnaces. Improved combustion technology and heat exchanger design optimize heat recovery from the combustion gases which can significantly improve furnace efficiency. Savings result from improved system efficiency.

### *Reasons for not Recommending*

Replacement of the furnaces now is not recommended on the basis of energy savings alone because the payback period for replacing them exceeds the useful life of the equipment.

## Install High Efficiency Gas Water Heater

### *Summary of Measure Economics*

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
0	0.0	29.2	\$193.49	\$42,593.50	\$1,487.50	\$41,106.00	212.5	3,422

### *Measure Description*

We recommend replacing the existing tank water heater with a high efficiency tank water heater. Improvements in combustion efficiency and reductions in heat losses have improved the overall efficiency of storage water heaters. Energy savings results from using less gas to heat water, due to higher unit efficiency, and fewer run hours to maintain the tank water temperature.

### *Reasons for not Recommending*

Replacement of the gas water heater now is not recommended on the basis of energy savings alone because the payback period for replacing it exceeds the useful life of the equipment.

## 5 ENERGY EFFICIENT PRACTICES

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In addition to the quantifiable savings estimated in Section 4, a facility's energy performance can also be improved through application of many low cost or no-cost energy efficiency strategies. By employing certain behavioral and operational changes and performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and energy and O&M costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your facility. Consult with qualified equipment specialists for details on proper maintenance and system operation.

### Reduce Air Leakage

Air leakage, or infiltration, occurs when outside air enters a building uncontrollably through cracks and openings. Properly sealing such cracks and openings can significantly reduce heating and cooling costs, improve building durability, and create a healthier indoor environment. This includes caulking or installing weather stripping around leaky doors and windows allowing for better control of indoor air quality through controlled ventilation.

### Close Doors and Windows

Ensure doors and windows are closed in conditioned spaces. Leaving doors and windows open leads to a significant increase in heat transfer between conditioned spaces and the outside air. Reducing a facility's air changes per hour (ACH) can lead to increased occupant comfort as well as significant heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

### Use Window Treatments/Coverings

A substantial amount of heat gain can occur through uncovered or untreated windows, especially older single pane windows and east or west-facing windows. Treatments such as high-reflectivity films or covering windows with shades or shutters can reduce solar heat gain and, consequently, cooling load and can reduce internal heat loss and the associated heating load.

### Perform Proper Lighting Maintenance

In order to sustain optimal lighting levels, lighting fixtures should undergo routine maintenance. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust on lamps, fixtures and reflective surfaces. Together, these factors can reduce total illumination by 20%-60% or more, while operating fixtures continue drawing full power. To limit this reduction, lamps, reflectors and diffusers should be thoroughly cleaned of dirt, dust, oil, and smoke film buildup approximately every 6–12 months.

### Develop a Lighting Maintenance Schedule

In addition to routine fixture cleaning, development of a maintenance schedule can both ensure maintenance is performed regularly and can reduce the overall cost of fixture re-lamping and re-ballasting. By re-lamping and re-ballasting fixtures in groups, lighting levels are better maintained and the number of site visits by a lighting technician or contractor can be minimized, decreasing the overall cost of maintenance.

## **Ensure Lighting Controls Are Operating Properly**

Lighting controls are very cost effective energy efficient devices, when installed and operating correctly. As part of a lighting maintenance schedule, lighting controls should be tested annually to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight sensors, maintenance involves cleaning of sensor lenses and confirming setpoints and sensitivity are appropriately configured.

## **Perform Routine Motor Maintenance**

Motors consist of many moving parts whose collective degradation can contribute to a significant loss of motor efficiency. In order to prevent damage to motor components, routine maintenance should be performed. This maintenance consists of cleaning surfaces and ventilation openings on motors to prevent overheating, lubricating moving parts to reduce friction, inspecting belts and pulleys for wear and to ensure they are at proper alignment and tension, and cleaning and lubricating bearings. Consult a licensed technician to assess these and other motor maintenance strategies.

## **Use Fans to Reduce Cooling Load**

Utilizing ceiling fans to supplement cooling is a low cost strategy to reduce cooling load considerably. Thermostat settings can be increased by 4°F with no change in overall occupant comfort when the wind chill effect of moving air is employed for cooling.

## **Install Destratification Fans**

Allowing air to thermally stratify in spaces with high ceilings results in additional energy consumption by requiring the heating system to heat a volume of space much larger than the actual occupied space. Additional inefficiencies also occur because there are higher temperatures at the ceiling level than at the floor level. Higher temperatures at the ceiling accelerate heat loss through the roof, requiring additional energy consumption by the heating equipment in order to compensate for the accelerated heat transfer.

Destratification fans are specially designed to deliver a columnar, laminar flow of air balancing the air temperature from floor to ceiling. In addition to fuel savings, the use of destratification fans will reduce the recovery time necessary to warm the space after nightly temperature setbacks and will increase the comfort level of the occupants.

## **Practice Proper Use of Thermostat Schedules and Temperature Resets**

Ensure thermostats are correctly set back. By employing proper set back temperatures and schedules, facility heating and cooling costs can be reduced dramatically during periods of low or no occupancy. As such, thermostats should be programmed for a setback of 5°F-10°F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced further by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

## **Ensure Economizers are Functioning Properly**

Economizers, when properly configured, can be used to significantly reduce mechanical cooling. However, if the outdoor thermostat or enthalpy control is malfunctioning or the damper is stuck or improperly adjusted, benefits from the economizer may not be fully realized. As such, periodic inspection and maintenance is required to ensure proper operation. This maintenance should be scheduled with maintenance of the facility's air conditioning system and should include proper setting of the outdoor thermostat/enthalpy control, inspection of control and damper operation, lubrication of damper connections, and adjustment of minimum damper position. A malfunctioning economizer can significantly increase the amount of heating and mechanical cooling required by introducing excess amounts of cold or hot outside air.

## **Clean Evaporator/Condenser Coils on AC Systems**

Dirty evaporators and condensers coils cause a restriction to air flow and restrict heat transfer. This results in increased evaporator and condenser fan load and a decrease in cooling system performance. Keeping the coils clean allows the fans and cooling system to operate more efficiently.

## **Clean and/or Replace HVAC Filters**

Air filters work to reduce the amount of indoor air pollution and increase occupant comfort. Over time, filters become less and less effective as particulate buildup increases. In addition to health concerns related to clogged filters, filters that have reached saturation also restrict air flow through the facility's air conditioning or heat pump system, increasing the load on the distribution fans and decreasing occupant comfort levels. Filters should be checked monthly and cleaned or replaced when appropriate.

## **Check for and Seal Duct Leakage**

Duct leakage in commercial buildings typically accounts for 5% to 25% of the supply airflow. In the case of rooftop air handlers, duct leakage can occur to the outside of the building, significantly increasing cooling and heating costs. By sealing sources of leakage, cooling, heating, and ventilation energy use can be reduced significantly, depending on the severity of air leakage.

## **Perform Proper Boiler Maintenance**

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to retain proper functionality and efficiency of the heating system. Fuel burning equipment should undergo yearly tune-ups to ensure they are operating as safely and efficiently as possible from a combustion standpoint. A tune-up should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Buildup of dirt, dust, or deposits on the internal surfaces of a boiler can greatly affect its heat transfer efficiency. These deposits can accumulate on the water side or fire side of the boiler. Boilers should be cleaned regularly according to the manufacturer's instructions to remove this build up in order to sustain efficiency and equipment life.

## **Perform Proper Furnace Maintenance**

Preventative furnace maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. Following the manufacturer's instructions, a yearly tune-up should include tasks such as checking for gas/carbon monoxide leaks; changing the air and fuel filters; checking components for cracks, corrosion, dirt, or debris build-up; ensuring the ignition system is working properly; testing and adjusting operation and safety controls; inspecting the electrical connections; and ensuring proper lubrication for motors and bearings.

## **Perform Proper Water Heater Maintenance**

At least once a year, drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot or charred metal, this is a sign you may be having combustion issues and you should have the unit serviced by a professional. For electric water heaters, look for any signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank. For water heaters over three to four years old have a technician inspect the sacrificial anode annually.

## **Plug Load Controls**

There are a variety of ways to limit the energy use of plug loads including increasing occupant awareness, removing under-utilized equipment, installing hardware controls, and using software controls. Some control steps to take are to enable the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips. For additional information refer to “Plug Load Best Practices Guide” <http://www.advancedbuildings.net/plug-load-best-practices-guide-offices>.

## **Water Conservation**

Installing low-flow faucets or faucet aerators, low-flow showerheads, and kitchen sink pre-rinse spray valves saves both energy and water. These devices save energy by reducing the overall amount of hot water used hence reducing the energy used to heat the water. The flow ratings for EPA WaterSense™ (<http://www3.epa.gov/watersense/products>) labeled devices are 1.5 gpm for bathroom faucets, 2.0 gpm for showerheads, and 1.28 gpm for pre-rinse spray valves.

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

## 6 ON-SITE GENERATION MEASURES

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On-site generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) on-site technologies that generate power to meet all or a portion of the electric energy needs of a facility, often repurposing any waste heat where applicable. Also referred to as distributed generation, these systems contribute to Greenhouse Gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, resulting in the electric system reliability through improved transmission and distribution system utilization.

The State of New Jersey's Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines a goal of 70% of the State's electrical needs to be met by renewable sources by 2050.

Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.



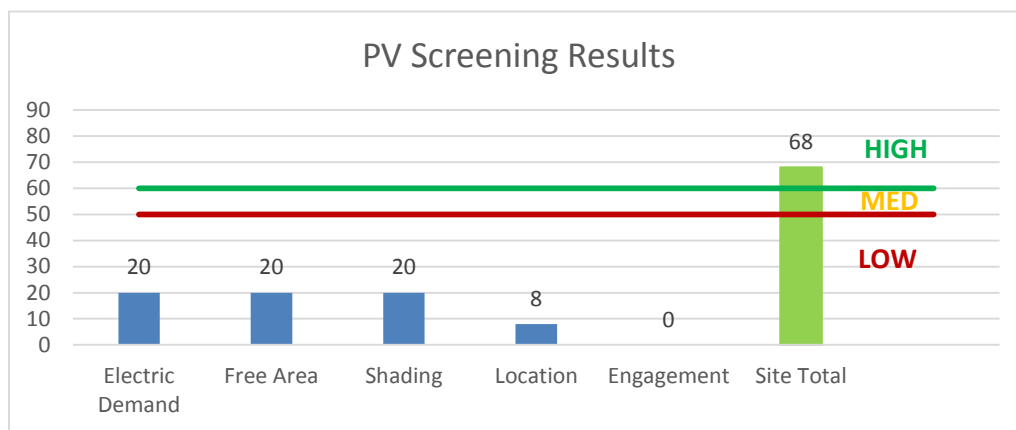
## 6.1 Photovoltaic

Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility’s electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

A preliminary screening based on the facility’s electric demand, size and location of free area, and shading elements shows that the facility has a High potential for installing a PV array.

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the high potential for PV at the site. A PV array located on the roof of the main building/ground next to the building/over the main parking lot may be feasible. If Westwood Regional Jr.-Sr. High School is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

**Figure 23 - Photovoltaic Screening**



<b>Potential</b>	High	
<b>System Potential</b>	384	kW DC STC
<b>Electric Generation</b>	457,486	kWh/yr
<b>Displaced Cost</b>	\$39,800	/yr
<b>Installed Cost</b>	\$1,497,600	

Solar projects must register their projects in the SREC (Solar Renewable Energy Certificate) Registration Program (SRP) prior to the start of construction in order to establish the project’s eligibility to earn SRECs. Registration of the intent to participate in New Jersey’s solar marketplace provides market participants with information about developed new solar projects and insight into future SREC pricing. Refer to Section 8.3 for additional information.

For more information on solar PV technology and commercial solar markets in New Jersey, or to find a qualified solar installer, who can provide a more detailed assessment of the specific costs and benefits of solar develop of the site, please visit the following links below:

- **Basic Info on Solar PV in NJ:** <http://www.njcleanenergy.com/whysolar>
- **NJ Solar Market FAQs:** <http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs>

- **Approved Solar Installers in the NJ Market:** [http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved\\_vendorsearch/?id=60&start=1](http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/?id=60&start=1)

## 6.2 Combined Heat and Power

Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric generation from a CHP system is typically interconnected to local power distribution systems. Heat is recovered from exhaust and ancillary cooling systems and interconnected to the existing hot water (or steam) distribution systems.

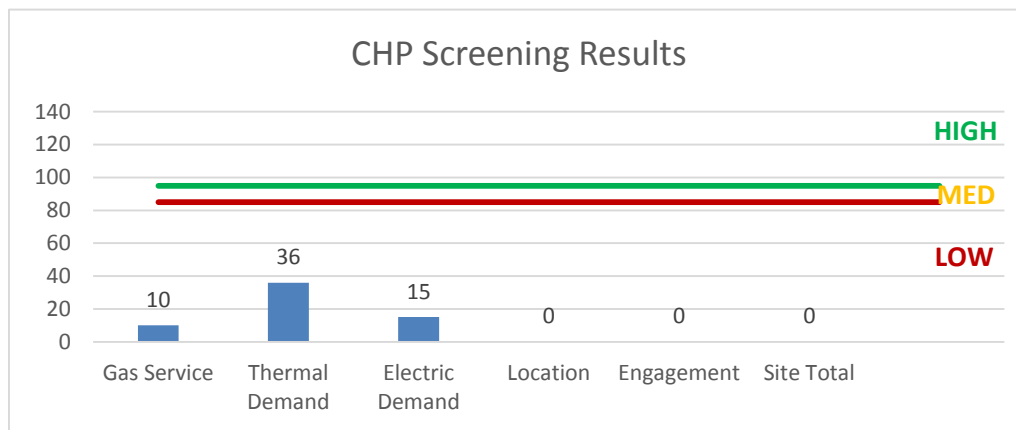
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for the purpose of space cooling. The key criteria used for screening, however, is the amount of time the system operates at full load and the facility's ability to use the recovered heat. Facilities with continuous use for large quantities of waste heat are the best candidates for CHP.

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has a Low potential for installing a cost-effective CHP system.

Due to low or infrequent thermal load, and lack of space near the existing boilers are the most significant factors contributing to the potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

For a list of qualified firms in New Jersey specializing in commercial CHP cost assessment and installation, go to: [http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved\\_vendorsearch/](http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/).

**Figure 24 - Combined Heat and Power Screening**



## 7 DEMAND RESPONSE

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Demand Response (DR) is a program designed to reduce the electric load of commercial facilities when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability.

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail their electric usage.

Typically an electric customer needs to be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with a greater capability to quickly curtail their demand during peak hours will receive higher payments. Customers with back-up generators onsite may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in a DR programs often find it to be a valuable source of revenue for their facility because the payments can significantly offset annual electric costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature set points on thermostats, so that air conditioning units run less frequently, or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR curtailment event. DR program participants may need to install smart meters or may need to also sub-meter larger energy-using equipment, such as chillers, in order to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a demand response activity in most situations.

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (<http://www.pjm.com/markets-and-operations/demand-response/csps.aspx>). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (<http://www.pjm.com/training/training%20material.aspx>), along with a variety of other DR program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding program rules and requirements for metering and controls, assess a facility's ability to temporarily reduce electric load, and provide details on payments to be expected for participation in the program. Providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment of their own to help ensure compliance with all terms and conditions of a DR contract.

## 8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey’s Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 255 for a list of the eligible programs identified for each recommended ECM.

*Figure 25 - ECM Incentive Program Eligibility*

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings	Large Energy Users Program	Combined Heat & Power and Fuel Cell
ECM 1	Install LED Fixtures	x					
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	x					
ECM 3	Retrofit Fixtures with LED Lamps	x					
ECM 4	Install LED Exit Signs	x					
ECM 5	Install Occupancy Sensor Lighting Controls	x					
ECM 6	Install Daylight Dimming Controls	x					
ECM 7	Install Low-Flow Domestic Hot Water Devices	x					
ECM 8	Vending Machine Control	x					
ECM 9	Computer Power Management Software						
ECM 10	Building Envelope Weatherization						
ECM 11	Retro-Commissioning Study & HVAC Improvements						

SmartStart is generally well-suited for implementation of individual measures or small group of measures. It provides flexibility to install measures at your own pace using in-house staff or a preferred contractor. Direct Install caters to small to mid-size facilities that can bundle multiple ECMs together. This can greatly simplify participation and may lead to higher incentive amounts, but requires the use of pre-approved contractors. The Pay for Performance (P4P) program is a “whole-building” energy improvement program designed for larger facilities. It requires implementation of multiple measures meeting minimum savings thresholds, as well as use of pre-approved consultants. The Large Energy Users Program (LEUP) is available to New Jersey’s largest energy users giving them flexibility to install as little or as many measures, in a single facility or several facilities, with incentives capped based on the entity’s annual energy consumption. LEUP applicants can use in-house staff or a preferred contractor.

Generally, the incentive values provided throughout the report assume the SmartStart program is utilized because it provides a consistent basis for comparison of available incentives for various measures, though in many cases incentive amounts may be higher through participation in other programs.

Brief descriptions of all relevant financing and incentive programs are located in the sections below. Further information, including most current program availability, requirements, and incentive levels can be found at: [www.njcleanenergy.com/ci](http://www.njcleanenergy.com/ci).

## 8.1 SmartStart

### Overview

The SmartStart program offers incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

### **Equipment with Prescriptive Incentives Currently Available:**

*Electric Chillers*

*Electric Unitary HVAC*

*Gas Cooling*

*Gas Heating*

*Gas Water Heating*

*Ground Source Heat Pumps*

*Lighting*

*Lighting Controls*

*Refrigeration Doors*

*Refrigeration Controls*

*Refrigerator/Freezer Motors*

*Food Service Equipment*

*Variable Frequency Drives*

Most equipment sizes and types are served by this program. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades.

### Incentives

The SmartStart prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the custom SmartStart program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentive offerings for specific devices.

Since your facility is an existing building, only the retrofit incentives have been applied in this report. Custom measure incentives are calculated at \$0.16/kWh and \$1.60/therm based on estimated annual savings, capped at 50% of the total installed incremental project cost, or a project cost buy down to a one year payback (whichever is less). Program incentives are capped at \$500,000 per electric account and \$500,000 per natural gas account, per fiscal year.

### How to Participate

To participate in the SmartStart program you will need to submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. Applicants may work with a contractor of their choosing and can also utilize internal personnel, which provides added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in this report.

Detailed program descriptions, instructions for applying and applications can be found at: [www.njcleanenergy.com/SSB](http://www.njcleanenergy.com/SSB).

## 8.2 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract," whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs can be leveraged to help further reduce the total project cost of eligible measures.

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

- (1) Use an Energy Services Company or "ESCO."
- (2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations.
- (3) Use a hybrid approach of the two options described above where the ESCO is utilized for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the Energy Savings Plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program descriptions and application can be found at: [www.njcleanenergy.com/ESIP](http://www.njcleanenergy.com/ESIP).

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize NJCEP incentive programs to help further reduce costs when developing the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.



### 8.3 SREC Registration Program

The SREC (Solar Renewable Energy Certificate) Registration Program (SRP) is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SRP prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

After the registration is accepted, construction is complete, and final paperwork has been submitted and is deemed complete, the project is issued a New Jersey certification number which enables it to generate New Jersey SRECs. SRECs are generated once the solar project has been authorized to be energized by the Electric Distribution Company (EDC).

Each time a solar installation generates 1,000 kilowatt-hours (kWh) of electricity, an SREC is earned. Solar project owners report the energy production to the SREC Tracking System. This reporting allows SRECs to be placed in the customer's electronic account. SRECs can then be sold on the SREC Tracking System, providing revenue for the first 15 years of the project's life.

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar RPS. One way they can meet the RPS requirements is by purchasing SRECs. As SRECs are traded in a competitive market, the price may vary significantly. The actual price of an SREC during a trading period can and will fluctuate depending on supply and demand.

Information about the SRP can be found at: [www.njcleanenergy.com/srec](http://www.njcleanenergy.com/srec).

### 8.4 Demand Response Energy Aggregator

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (<http://www.pjm.com/markets-and-operations/demand-response/csps.aspx>). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (<http://www.pjm.com/training/training%20material.aspx>), along with a variety of other DR program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding the program rules and requirements for metering and controls, a facility's ability to temporarily reduce electric load, as well as the payments involved in participating in the program. Also, these providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment to help ensure compliance of all terms and conditions of a DR contract. See Section 7 for additional information.

## 9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

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### 9.1 Retail Electric Supply Options

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law deregulated the retail electric markets, allowing all consumers to shop for service from competitive electric suppliers. The intent was to create a more competitive market for electric power supply in New Jersey. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party (i.e., non-utility) energy supplier.

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. So, though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third party supplier, consider shopping for a reduced rate from third party electric suppliers. If your facility is purchasing electricity from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party electric suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: [www.state.nj.us/bpu/commercial/shopping.html](http://www.state.nj.us/bpu/commercial/shopping.html).

### 9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a third party supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier is typically dependent upon whether a customer seeks budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your facility is purchasing natural gas from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party natural gas suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: [www.state.nj.us/bpu/commercial/shopping.html](http://www.state.nj.us/bpu/commercial/shopping.html).

# Appendix A: Equipment Inventory & Recommendations

## Lighting Inventory & Recommendations

Location	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Transition Areas	22	Exit Signs: Incandescent	None	12	8,760	Fixture Replacement	No	22	LED Exit Signs: 2 W Lamp	None	6	8,760	0.08	1,156	0.0	\$148.90	\$2,366.21	\$0.00	15.89
Boiler Room	11	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,000	Relamp	No	11	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,000	0.40	708	0.0	\$91.22	\$1,046.47	\$220.00	9.06
Boiler Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.04	76	0.0	\$9.77	\$117.00	\$20.00	9.92
Vestibule	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,928	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,928	0.09	900	0.0	\$115.88	\$234.00	\$40.00	1.67
Lobby	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,928	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,928	0.35	3,599	0.0	\$463.51	\$936.00	\$160.00	1.67
Waiting Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,800	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,800	0.04	245	0.0	\$31.52	\$95.13	\$20.00	2.38
Open Office	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,150	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,905	0.62	4,477	0.0	\$576.56	\$1,398.00	\$260.00	1.97
Private Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,775	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,943	0.16	798	0.0	\$102.82	\$467.00	\$80.00	3.76
Private Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,775	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,943	0.08	399	0.0	\$51.41	\$291.50	\$50.00	4.70
Private Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,775	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,943	0.05	266	0.0	\$34.27	\$233.00	\$20.00	6.21
Private Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,775	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,943	0.05	266	0.0	\$34.27	\$233.00	\$20.00	6.21
Private Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,943	0.12	599	0.0	\$77.11	\$341.60	\$65.00	3.59
Private Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,943	0.16	798	0.0	\$102.82	\$416.80	\$80.00	3.28
Conference Room	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,943	0.49	2,395	0.0	\$308.46	\$1,018.40	\$200.00	2.65
Private Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,943	0.08	399	0.0	\$51.41	\$266.40	\$50.00	4.21
Hallways	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	5,928	Relamp	No	5	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	5,928	0.06	597	0.0	\$76.81	\$179.50	\$25.00	2.01
Private Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,943	0.16	798	0.0	\$102.82	\$416.80	\$80.00	3.28
Private Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,943	0.08	399	0.0	\$51.41	\$266.40	\$50.00	4.21
Women's Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,775	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,775	0.01	56	0.0	\$7.19	\$35.90	\$5.00	4.30
Women's Restroom	1	Compact Fluorescent: Screw in Lamp	Wall Switch	23	2,775	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	11	2,775	0.01	38	0.0	\$4.93	\$53.75	\$0.00	10.90
Kitchenette	1	Compact Fluorescent: Plug in Lamps	Wall Switch	26	2,775	Relamp	No	1	LED Screw-In Lamps: Plug in Lamps	Wall Switch	14	2,775	0.01	38	0.0	\$4.93	\$107.51	\$0.00	21.80
Men's Restroom	1	Compact Fluorescent: Plug in Lamps	Wall Switch	26	2,775	Relamp	No	1	LED Screw-In Lamps: Plug in Lamps	Wall Switch	14	2,775	0.01	38	0.0	\$4.93	\$107.51	\$0.00	21.80
Private Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,943	0.16	798	0.0	\$102.82	\$416.80	\$80.00	3.28
Hallway	1	Linear Fluorescent - T12: 2' T12 (20W) - 4L	Wall Switch	100	5,928	Relamp & Reballast	No	1	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	34	5,928	0.04	450	0.0	\$57.94	\$143.83	\$20.00	2.14
Hallway	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,928	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,150	0.30	3,127	0.0	\$402.68	\$913.50	\$110.00	2.00

Location	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Hallway	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,928	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,150	0.27	2,843	0.0	\$366.07	\$855.00	\$100.00	2.06
Closet	1	Incandescent Screw in Lamp	Wall Switch	60	5,928	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	7	5,928	0.03	361	0.0	\$46.53	\$53.75	\$5.00	1.05
Men's Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,775	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,775	0.01	56	0.0	\$7.19	\$35.90	\$5.00	4.30
Women's Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,775	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,775	0.01	56	0.0	\$7.19	\$35.90	\$5.00	4.30
Storage	2	Incandescent Screw in Lamp	Wall Switch	60	1,000	Relamp	No	2	LED Screw-In Lamps: Screw in Lamp	Wall Switch	7	1,000	0.07	122	0.0	\$15.70	\$107.51	\$10.00	6.21
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,943	0.08	399	0.0	\$51.41	\$266.40	\$50.00	4.21
Hallway	13	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	5,928	Relamp	No	13	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	5,928	0.48	4,963	0.0	\$639.09	\$1,236.73	\$260.00	1.53
Kin Room	3	Incandescent Screw in Lamp	Wall Switch	100	1,000	Relamp	No	3	LED Screw-In Lamps: Screw in Lamp	Wall Switch	9	1,000	0.18	314	0.0	\$40.43	\$161.26	\$15.00	3.62
Bandroom	61	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,775	Relamp	No	61	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,775	1.32	6,424	0.0	\$827.23	\$3,568.50	\$610.00	3.58
Storage Rooms	8	Compact Fluorescent: Screw in Lamp	Wall Switch	32	1,000	Relamp	No	8	LED Screw-In Lamps: Screw in Lamp	Wall Switch	14	1,000	0.09	166	0.0	\$21.32	\$430.02	\$0.00	20.17
Music Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,775	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,943	0.11	532	0.0	\$68.55	\$350.00	\$60.00	4.23
Aud Stage	10	Incandescent Screw in Lamp	High/Low Control	300	1,000	None	No	10	Incandescent Screw in Lamp	High/Low Control	300	1,000	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Hallway	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,928	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,928	0.11	1,125	0.0	\$144.85	\$292.50	\$50.00	1.67
Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	5,928	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	5,928	0.04	382	0.0	\$49.16	\$95.13	\$20.00	1.53
Main Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,150	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,905	0.08	597	0.0	\$76.87	\$243.00	\$38.75	2.66
Open Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,150	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,905	0.05	350	0.0	\$45.10	\$117.63	\$22.92	2.10
Open Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,150	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,905	0.16	1,194	0.0	\$153.75	\$390.80	\$71.67	2.08
Open Office	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	4,150	Relamp & Reballast	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,905	0.10	743	0.0	\$95.62	\$558.00	\$11.67	5.71
Copy Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	Yes	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,943	0.04	200	0.0	\$25.70	\$191.20	\$35.00	6.08
Conference Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,943	0.25	1,198	0.0	\$154.23	\$567.20	\$110.00	2.96
Private Offices	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,943	0.41	1,996	0.0	\$257.05	\$1,100.00	\$210.00	3.46
Office Hallway	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	5,928	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	4,150	0.53	5,543	0.0	\$713.84	\$1,247.60	\$195.00	1.47
Kitchenette	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,775	0.06	316	0.0	\$40.68	\$150.40	\$30.00	2.96
File Storage	2	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	2,775	Relamp & Reballast	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,943	0.05	229	0.0	\$29.46	\$312.00	\$30.00	9.57
Private Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,943	0.08	399	0.0	\$51.41	\$266.40	\$50.00	4.21

Location	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Private Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,943	0.08	399	0.0	\$51.41	\$266.40	\$50.00	4.21
Private Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,943	0.08	399	0.0	\$51.41	\$266.40	\$50.00	4.21
Private Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,943	0.08	399	0.0	\$51.41	\$266.40	\$50.00	4.21
Hallway	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,928	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,150	0.41	4,264	0.0	\$549.11	\$1,147.50	\$150.00	1.82
Hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	5,928	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	4,150	0.29	3,002	0.0	\$386.61	\$840.80	\$120.00	1.86
Classroom 150	28	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	28	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.77	5,103	0.0	\$657.12	\$2,448.00	\$385.00	3.14
Classroom 152	32	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	32	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.87	5,832	0.0	\$750.99	\$2,682.00	\$425.00	3.01
Hallway	7	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	5,928	Relamp	Yes	7	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	4,150	0.34	3,503	0.0	\$451.05	\$935.93	\$140.00	1.76
Wood Work Shop 154	13	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,800	None	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.07	494	0.0	\$63.65	\$810.00	\$105.00	11.08
Wood Work Shop 156	9	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,800	None	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.05	342	0.0	\$44.07	\$810.00	\$105.00	16.00
Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	5,928	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	4,150	0.19	2,002	0.0	\$257.74	\$650.53	\$80.00	2.21
Classroom 157	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.82	5,467	0.0	\$704.06	\$2,314.00	\$405.00	2.71
Classroom 155	38	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	38	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	1.04	6,925	0.0	\$891.80	\$3,033.00	\$485.00	2.86
Storage Rooms	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,775	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,775	0.04	211	0.0	\$27.12	\$117.00	\$20.00	3.58
Storage Rooms	2	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	2,775	Fixture Replacement	No	2	LED - Fixtures: Ambient - 4' - Indirect/Direct Fixture	Wall Switch	29	2,775	0.08	377	0.0	\$48.49	\$1,897.28	\$90.00	37.27
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,775	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,943	0.05	266	0.0	\$34.27	\$233.00	\$20.00	6.21
Storage	1	Incandescent Screw in Lamp	Wall Switch	60	1,000	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	7	1,000	0.03	61	0.0	\$7.85	\$53.75	\$5.00	6.21
Water Room	1	Incandescent Screw in Lamp	Wall Switch	60	1,000	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	7	1,000	0.03	61	0.0	\$7.85	\$53.75	\$5.00	6.21
Women's Restroom	5	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Occupancy Sensor	72	3,320	Relamp & Reballast	No	5	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,320	0.13	744	0.0	\$95.86	\$585.00	\$0.00	6.10
Men's Restroom	4	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Occupancy Sensor	72	3,320	Relamp & Reballast	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,320	0.10	596	0.0	\$76.69	\$468.00	\$0.00	6.10
Hallway	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,928	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,150	0.27	2,843	0.0	\$366.07	\$855.00	\$100.00	2.06
Classroom 100	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.70	4,647	0.0	\$598.45	\$2,088.40	\$360.00	2.89
Classroom 100	1	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	60	3,800	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,800	0.02	135	0.0	\$17.45	\$58.50	\$10.00	2.78
Classroom 100	3	Compact Fluorescent: Plug in Lamps	Wall Switch	26	3,800	Relamp	No	3	LED Screw-In Lamps: Plug in Lamps	Wall Switch	14	3,800	0.02	157	0.0	\$20.26	\$322.52	\$0.00	15.92
Prep Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	5,928	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	5,928	0.13	1,350	0.0	\$173.82	\$300.80	\$60.00	1.39

Location	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,928	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,928	0.06	675	0.0	\$86.91	\$175.50	\$30.00	1.67
Classroom 102	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,320	Relamp	No	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,320	0.55	3,213	0.0	\$413.69	\$1,278.40	\$255.00	2.47
Classroom 101	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,320	Relamp	No	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,320	0.52	3,024	0.0	\$389.35	\$1,203.20	\$240.00	2.47
Classroom 103	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,320	Relamp	No	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,320	0.42	2,457	0.0	\$316.35	\$977.60	\$195.00	2.47
Classroom 105	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,320	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,320	0.39	2,268	0.0	\$292.01	\$902.40	\$180.00	2.47
Hallway	3	Linear Fluorescent - T5: 4' T5 (28W) - 4L	Wall Switch	120	5,928	Relamp	No	3	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	5,928	0.12	1,288	0.0	\$163.28	\$285.40	\$60.00	1.38
Hallway	17	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	60	5,928	Relamp	No	17	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,928	0.35	3,593	0.0	\$462.64	\$994.50	\$170.00	1.78
Boy's Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,320	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,320	0.10	567	0.0	\$73.00	\$225.60	\$45.00	2.47
Girl's Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,320	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,320	0.10	567	0.0	\$73.00	\$225.60	\$45.00	2.47
Girl's Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	3,320	Relamp & Reballast	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,320	0.02	111	0.0	\$14.26	\$117.00	\$0.00	8.21
Girl's Restroom	3	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Occupancy Sensor	27	3,320	Relamp	No	3	LED - Linear Tubes: (1) 3' Lamp	Occupancy Sensor	11	3,320	0.03	189	0.0	\$24.33	\$104.40	\$0.00	4.29
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	500	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	500	0.03	28	0.0	\$3.67	\$75.20	\$15.00	16.42
Prep Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	4,150	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	4,150	0.13	945	0.0	\$121.67	\$300.80	\$60.00	1.98
Classroom 107	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.37	2,460	0.0	\$316.83	\$1,486.80	\$240.00	3.94
Classroom 108	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.41	2,734	0.0	\$352.03	\$1,562.00	\$255.00	3.71
Classroom 104	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.70	4,647	0.0	\$598.45	\$2,088.40	\$360.00	2.89
Classroom 106	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.70	4,647	0.0	\$598.45	\$2,088.40	\$360.00	2.89
Hallway	19	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	5,928	Relamp	Yes	19	LED - Linear Tubes: (3) 4' Lamps	Daylight Dimming	44	2,964	0.89	9,229	0.0	\$1,188.41	\$1,678.80	\$1,140.00	0.45
Tech Offices	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.37	2,460	0.0	\$316.83	\$946.80	\$170.00	2.45
Computer Lab	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.74	4,921	0.0	\$633.65	\$1,623.60	\$305.00	2.08
Media Center	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.21	1,367	0.0	\$176.01	\$646.00	\$110.00	3.05
Media Center	32	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,800	Relamp	Yes	32	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,660	1.54	10,265	0.0	\$1,321.89	\$3,584.27	\$710.00	2.17
Computer Lab	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.33	2,187	0.0	\$281.62	\$972.00	\$155.00	2.90
Auditorium	13	Incandescent Screw in Lamp	High/Low Control	300	500	None	No	13	Incandescent Screw in Lamp	High/Low Control	300	500	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Auditorium	10	Linear Fluorescent - T5: 4' T5 (28W) - 1L	Wall Switch	30	500	Relamp	No	10	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	500	0.10	89	0.0	\$11.48	\$359.00	\$50.00	26.92

Location	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Auditorium	20	Metal Halide: (1) 50W Lamp	Wall Switch	72	500	None	No	20	Metal Halide: (1) 50W Lamp	Wall Switch	72	500	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Auditorium	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	None	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Aud Stage	8	Halogen Incandescent: Screw in Lamp	Wall Switch	150	500	Relamp	No	8	LED Screw-In Lamps: <Enter Fixture Description>	Wall Switch	25	500	0.66	575	0.0	\$74.04	\$509.21	\$40.00	6.34
Aud Stage	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	500	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	500	0.44	386	0.0	\$49.76	\$1,141.60	\$240.00	18.12
Health Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,800	0.06	433	0.0	\$55.72	\$150.40	\$30.00	2.16
Resting Rooms	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,800	0.39	2,596	0.0	\$334.30	\$902.40	\$180.00	2.16
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,800	0.04	288	0.0	\$37.14	\$117.00	\$20.00	2.61
Closet	1	Incandescent: Screw in Lamp	Wall Switch	60	500	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	7	500	0.03	30	0.0	\$3.92	\$53.75	\$5.00	12.42
Classroom 136	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.41	2,734	0.0	\$352.03	\$1,687.50	\$255.00	4.07
Classroom 138	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.49	3,280	0.0	\$422.43	\$1,863.00	\$285.00	3.74
Athletic Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,320	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,320	0.04	252	0.0	\$32.45	\$117.00	\$20.00	2.99
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,320	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,320	0.09	504	0.0	\$64.89	\$234.00	\$40.00	2.99
Hallway	16	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	5,928	Relamp	Yes	16	LED - Linear Tubes: (4) 4' Lamps	Daylight Dimming	58	2,964	0.89	9,271	0.0	\$1,193.90	\$1,772.13	\$1,040.00	0.61
Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	5,928	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Daylight Dimming	58	2,964	0.22	2,318	0.0	\$298.47	\$630.53	\$260.00	1.24
Hallway	30	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,928	Relamp	Yes	30	LED - Linear Tubes: (2) 4' Lamps	Daylight Dimming	29	2,964	0.93	9,715	0.0	\$1,250.96	\$2,505.00	\$1,650.00	0.68
Boy's Locker Room	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.66	4,374	0.0	\$563.24	\$2,214.00	\$345.00	3.32
Coaches Offices	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,320	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,320	0.19	1,134	0.0	\$146.01	\$451.20	\$90.00	2.47
Coaches Offices	4	LED Screw-In Lamps: Screw in Lamp	Occupancy Sensor	7	3,320	None	No	4	LED Screw-In Lamps: Screw in Lamp	Occupancy Sensor	7	3,320	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,320	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,320	0.04	252	0.0	\$32.45	\$117.00	\$20.00	2.99
Restroom	1	LED Screw-In Lamps: Screw in Lamp	Occupancy Sensor	7	3,320	None	No	1	LED Screw-In Lamps: Screw in Lamp	Occupancy Sensor	7	3,320	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	5,928	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	5,928	0.03	337	0.0	\$43.45	\$75.20	\$15.00	1.39
Hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	5,928	Relamp	No	2	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	5,928	0.07	764	0.0	\$98.32	\$190.27	\$40.00	1.53
Weight Room	17	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	17	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.46	3,098	0.0	\$398.96	\$1,264.50	\$205.00	2.66
Upper Gym	42	Metal Halide: (1) 250W Lamp	Wall Switch	295	5,928	Fixture Replacement	Yes	42	LED - Fixtures: High-Bay	Occupancy Sensor	70	4,150	6.77	70,435	0.0	\$9,070.12	\$114,098.40	\$6,510.00	11.86
Girl's Locker Room	26	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,928	Relamp	Yes	26	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,150	0.71	7,391	0.0	\$951.78	\$2,331.00	\$365.00	2.07



Location	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	500	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.09	76	0.0	\$9.77	\$234.00	\$40.00	19.85
Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	5,928	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	5,928	0.04	382	0.0	\$49.16	\$95.13	\$20.00	1.53
Men's Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,320	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,320	0.03	189	0.0	\$24.33	\$75.20	\$15.00	2.47
Men's Restroom	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,320	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,320	0.11	630	0.0	\$81.11	\$292.50	\$50.00	2.99
Women's Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,320	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,320	0.03	189	0.0	\$24.33	\$75.20	\$15.00	2.47
Women's Restroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,320	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,320	0.09	504	0.0	\$64.89	\$234.00	\$40.00	2.99
Classroom 134	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.41	2,734	0.0	\$352.03	\$1,687.50	\$255.00	4.07
Classroom 132	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.41	2,734	0.0	\$352.03	\$1,687.50	\$255.00	4.07
Closet	1	Incandescent: Screw in Lamp	Wall Switch	60	500	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	7	500	0.03	30	0.0	\$3.92	\$53.75	\$5.00	12.42
Classroom 130	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.41	2,734	0.0	\$352.03	\$1,687.50	\$255.00	4.07
Classroom 128	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.41	2,734	0.0	\$352.03	\$1,687.50	\$255.00	4.07
Computer Lab 126	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.66	4,374	0.0	\$563.24	\$2,214.00	\$345.00	3.32
Faculty Restroom	2	Incandescent: Screw in Lamp	Wall Switch	60	3,800	Relamp	No	2	LED Screw-In Lamps: Screw in Lamp	Wall Switch	7	3,800	0.07	463	0.0	\$59.66	\$107.51	\$10.00	1.63
Faculty Restroom	2	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	3,800	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,800	0.09	621	0.0	\$79.92	\$214.00	\$20.00	2.43
Hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	5,928	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,928	0.11	1,159	0.0	\$149.24	\$117.00	\$20.00	0.65
Hallway	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	5,928	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	5,928	0.02	215	0.0	\$27.65	\$98.00	\$5.00	3.36
Cafeteria	60	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	5,039	Relamp	Yes	60	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,527	2.89	25,520	0.0	\$3,286.21	\$6,788.00	\$1,340.00	1.66
Kitchen	67	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,800	Relamp	No	67	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,800	2.46	16,398	0.0	\$2,111.60	\$6,373.93	\$1,340.00	2.38
Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,800	0.02	144	0.0	\$18.57	\$58.50	\$10.00	2.61
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,800	0.02	144	0.0	\$18.57	\$58.50	\$10.00	2.61
Lounge	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,800	0.06	433	0.0	\$55.72	\$175.50	\$30.00	2.61
Large Lounge	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.86	5,741	0.0	\$739.26	\$2,119.20	\$385.00	2.35
Storage Rooms	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	500	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.02	19	0.0	\$2.44	\$58.50	\$10.00	19.85
Hallway	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	5,928	Relamp	No	8	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	5,928	0.09	954	0.0	\$122.90	\$287.20	\$40.00	2.01
Classroom 122	30	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	No	30	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,800	0.65	4,327	0.0	\$557.17	\$1,755.00	\$300.00	2.61

Location	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Girl's Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,800	Relamp	No	3	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,800	0.11	734	0.0	\$94.55	\$285.40	\$60.00	2.38
Girl's Locker Room	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.66	4,374	0.0	\$563.24	\$1,944.00	\$310.00	2.90
Lower Gym	38	Metal Halide: (1) 250W Lamp	Wall Switch	295	3,800	Fixture Replacement	Yes	38	LED - Fixtures: High-Bay	Occupancy Sensor	70	2,660	6.13	40,855	0.0	\$5,261.00	\$102,917.60	\$5,840.00	18.45
Boy's Restroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,800	Relamp	No	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,800	0.15	979	0.0	\$126.07	\$380.53	\$80.00	2.38
Boy's Locker Room	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.66	4,374	0.0	\$563.24	\$1,944.00	\$310.00	2.90
Closet	2	Incandescent Screw in Lamp	Wall Switch	60	500	Relamp	No	2	LED Screw-In Lamps: Screw in Lamp	Wall Switch	7	500	0.07	61	0.0	\$7.85	\$107.51	\$10.00	12.42
Classroom 119	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.57	3,827	0.0	\$492.84	\$2,038.50	\$315.00	3.50
Classroom 120	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.41	2,734	0.0	\$352.03	\$1,687.50	\$255.00	4.07
Classroom 117	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.41	2,734	0.0	\$352.03	\$1,687.50	\$255.00	4.07
Classroom 118	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.41	2,734	0.0	\$352.03	\$1,687.50	\$255.00	4.07
Office Room 116	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.41	2,734	0.0	\$352.03	\$1,147.50	\$185.00	2.73
Classroom 114	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.57	3,827	0.0	\$492.84	\$2,038.50	\$315.00	3.50
Office Room 115	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.41	2,734	0.0	\$352.03	\$1,147.50	\$185.00	2.73
Guidance Offices	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.41	2,734	0.0	\$352.03	\$1,022.00	\$185.00	2.38
Private Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.16	1,093	0.0	\$140.81	\$416.80	\$80.00	2.39
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	500	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	500	0.06	57	0.0	\$7.33	\$150.40	\$30.00	16.42
Private Offices	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,943	0.49	2,395	0.0	\$308.46	\$1,598.40	\$300.00	4.21
Private Offices	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,943	0.16	798	0.0	\$102.82	\$764.80	\$140.00	6.08
Conference Rooms	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,943	0.66	3,194	0.0	\$411.27	\$1,435.20	\$280.00	2.81
Open Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,943	0.25	1,198	0.0	\$154.23	\$567.20	\$110.00	2.96
Copy Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,943	0.08	399	0.0	\$51.41	\$266.40	\$50.00	4.21
Large Private Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,943	0.16	798	0.0	\$102.82	\$416.80	\$80.00	3.28
Special Services	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,943	0.16	798	0.0	\$102.82	\$416.80	\$80.00	3.28
Hallway	10	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	5,928	Relamp	Yes	10	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	4,150	0.48	5,004	0.0	\$644.35	\$1,221.33	\$200.00	1.59
Classroom 113	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.66	4,374	0.0	\$563.24	\$2,214.00	\$345.00	3.32

Location	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,775	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,775	0.06	316	0.0	\$40.68	\$150.40	\$30.00	2.96
Closets	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	500	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.02	19	0.0	\$2.44	\$58.50	\$10.00	19.85
Faculty Restrooms	2	Incandescent: Screw in Lamp	Wall Switch	60	3,800	Relamp	No	2	LED Screw-In Lamps: Screw in Lamp	Wall Switch	7	3,800	0.07	463	0.0	\$59.66	\$107.51	\$10.00	1.63
Classroom 111	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.57	3,827	0.0	\$492.84	\$2,038.50	\$315.00	3.50
Classroom 110	33	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	33	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.90	6,014	0.0	\$774.46	\$2,740.50	\$435.00	2.98
Classroom 109	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.57	3,827	0.0	\$492.84	\$2,038.50	\$315.00	3.50
Restroom	1	Incandescent: Screw in Lamp	Wall Switch	60	1,000	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	7	1,000	0.03	61	0.0	\$7.85	\$53.75	\$5.00	6.21
Hurley Theater	30	LED - Fixtures: Ambient 2x2 Fixture	High/Low Control	40	3,320	None	No	30	LED - Fixtures: Ambient 2x2 Fixture	High/Low Control	40	3,320	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Hurley Theater	8	LED - Fixtures: Downlight Recessed	High/Low Control	9	3,320	None	No	8	LED - Fixtures: Downlight Recessed	High/Low Control	9	3,320	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Stage	14	Metal Halide: (1) 1000W Lamp	High/Low Control	1,080	100	None	No	14	Metal Halide: (1) 1000W Lamp	High/Low Control	1,080	100	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Stage	36	Halogen Incandescent: Screw in Lamp	Wall Switch	150	500	None	No	36	Halogen Incandescent: Screw in Lamp	Wall Switch	150	500	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Stairs	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	5,928	Relamp	No	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	5,928	0.15	1,527	0.0	\$196.64	\$380.53	\$80.00	1.53
Stairs	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,928	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,928	0.17	1,800	0.0	\$231.76	\$468.00	\$80.00	1.67
2nd Floor Hallway	26	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	5,928	Relamp	Yes	26	LED - Linear Tubes: (4) 4' Lamps	Day light Dimming	58	2,964	1.45	15,066	0.0	\$1,940.09	\$3,223.47	\$1,690.00	0.79
Boy's Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.08	547	0.0	\$70.41	\$445.50	\$65.00	5.40
Girl's Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.08	547	0.0	\$70.41	\$445.50	\$65.00	5.40
Closet	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	500	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.04	34	0.0	\$4.37	\$117.00	\$10.00	24.49
Faculty Restroom	3	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	3,800	Relamp & Reballast	Yes	3	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,660	0.07	470	0.0	\$60.53	\$564.00	\$50.00	8.49
Faculty Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,800	Relamp	Yes	3	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,660	0.04	286	0.0	\$36.89	\$377.70	\$50.00	8.88
Closet	1	Incandescent: Screw in Lamp	Wall Switch	60	500	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	7	500	0.03	30	0.0	\$3.92	\$53.75	\$5.00	12.42
Boy's Restroom	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,800	Relamp	Yes	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,660	0.07	477	0.0	\$61.49	\$449.50	\$60.00	6.33
Girl's Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,800	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,800	0.01	76	0.0	\$9.85	\$35.90	\$5.00	3.14
Girl's Restroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.11	729	0.0	\$93.87	\$504.00	\$75.00	4.57
Restroom	1	Incandescent: Screw in Lamp	Wall Switch	60	3,800	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	7	3,800	0.03	232	0.0	\$29.83	\$53.75	\$5.00	1.63
IT Room / Office	2	Incandescent: Screw in Lamp	Wall Switch	60	3,800	Relamp	No	2	LED Screw-In Lamps: Screw in Lamp	Wall Switch	7	3,800	0.07	463	0.0	\$59.66	\$107.51	\$10.00	1.63

Location	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
IT Room / Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,800	Relamp	No	2	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,800	0.07	489	0.0	\$63.03	\$190.27	\$40.00	2.38
Classroom 201	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.74	4,921	0.0	\$633.65	\$2,163.60	\$375.00	2.82
Computer Lab 202	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.86	5,741	0.0	\$739.26	\$2,389.20	\$420.00	2.66
Classroom 203	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.74	4,921	0.0	\$633.65	\$2,163.60	\$375.00	2.82
Classroom 204	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.74	4,921	0.0	\$633.65	\$2,163.60	\$375.00	2.82
Classroom 205	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.74	4,921	0.0	\$633.65	\$2,163.60	\$375.00	2.82
Classroom 206	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.74	4,921	0.0	\$633.65	\$2,163.60	\$375.00	2.82
Classroom 207	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.74	4,921	0.0	\$633.65	\$2,163.60	\$375.00	2.82
Classroom 208A	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.74	4,921	0.0	\$633.65	\$2,163.60	\$375.00	2.82
Classroom 208B	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.74	4,921	0.0	\$633.65	\$2,163.60	\$375.00	2.82
Classroom 209	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.74	4,921	0.0	\$633.65	\$2,163.60	\$375.00	2.82
Classroom 210	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.74	4,921	0.0	\$633.65	\$2,163.60	\$375.00	2.82
Classroom 211	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.74	4,921	0.0	\$633.65	\$2,163.60	\$375.00	2.82
Classroom 212	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.74	4,921	0.0	\$633.65	\$2,163.60	\$375.00	2.82
Classroom 213	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.74	4,921	0.0	\$633.65	\$2,163.60	\$375.00	2.82
Classroom 214	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.62	4,101	0.0	\$528.04	\$1,938.00	\$330.00	3.05
Classroom 215	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.74	4,921	0.0	\$633.65	\$2,163.60	\$375.00	2.82
Classroom 216	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.74	4,921	0.0	\$633.65	\$2,163.60	\$375.00	2.82
Classroom 217	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.74	4,921	0.0	\$633.65	\$2,163.60	\$375.00	2.82
Classroom 218	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.74	4,921	0.0	\$633.65	\$2,163.60	\$375.00	2.82
Classroom 219	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.74	4,921	0.0	\$633.65	\$2,163.60	\$375.00	2.82
Classroom 220	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.74	4,921	0.0	\$633.65	\$2,163.60	\$375.00	2.82
Classroom 221	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.74	4,921	0.0	\$633.65	\$2,163.60	\$375.00	2.82
Classroom 222	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,800	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,660	0.74	4,921	0.0	\$633.65	\$2,163.60	\$375.00	2.82
Classroom 223	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,320	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,320	0.26	1,512	0.0	\$194.68	\$702.00	\$120.00	2.99

Location	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 224	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.14	911	0.0	\$117.34	\$1,102.50	\$155.00	8.07
Classroom 225	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,800	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,660	0.41	2,734	0.0	\$352.03	\$1,687.50	\$255.00	4.07
Transition Areas	12	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	12	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Stadium Lights	132	Metal Halide: (1) 1000W Lamp	None	1,080	250	None	No	132	Metal Halide: (1) 1000W Lamp	None	1,080	250	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Building Mounted	20	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	10	5,928	None	No	20	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	10	5,928	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Building Mounted	4	High-Pressure Sodium: (1) 70W Lamp	None	95	8,760	Fixture Replacement	Yes	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	25	4,000	0.22	3,368	0.0	\$433.72	\$1,802.71	\$400.00	3.23
Building Mounted	8	High-Pressure Sodium: (1) 70W Lamp	None	95	4,000	Fixture Replacement	No	8	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	25	4,000	0.37	2,576	0.0	\$331.72	\$3,125.42	\$800.00	7.01
Building Mounted	2	High-Pressure Sodium: (1) 250W Lamp	None	295	8,760	Fixture Replacement	Yes	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	120	4,000	0.31	4,840	0.0	\$623.21	\$901.35	\$200.00	1.13
Building Mounted	7	High-Pressure Sodium: (1) 250W Lamp	None	295	4,000	Fixture Replacement	No	7	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	120	4,000	0.80	5,635	0.0	\$725.63	\$2,734.74	\$700.00	2.80
Parking Lots	6	High-Pressure Sodium: (1) 400W Lamp	None	465	4,000	Fixture Replacement	No	6	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	200	4,000	1.04	7,314	0.0	\$941.84	\$2,344.06	\$600.00	1.85
Parking Lots	3	High-Pressure Sodium: (1) 400W Lamp	None	465	4,000	Fixture Replacement	No	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	200	4,000	0.52	3,657	0.0	\$470.92	\$1,172.03	\$300.00	1.85
Parking Lots	16	High-Pressure Sodium: (1) 250W Lamp	None	295	4,000	Fixture Replacement	No	16	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	120	4,000	1.84	12,880	0.0	\$1,658.59	\$6,250.83	\$1,600.00	2.80
Parking Lots	3	High-Pressure Sodium: (1) 400W Lamp	None	465	4,000	Fixture Replacement	No	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	200	4,000	0.52	3,657	0.0	\$470.92	\$1,172.03	\$300.00	1.85
Parking Lots	2	High-Pressure Sodium: (1) 400W Lamp	None	465	8,760	Fixture Replacement	Yes	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	200	4,000	0.48	7,529	0.0	\$969.50	\$901.35	\$200.00	0.72
Parking Lots	7	High-Pressure Sodium: (1) 400W Lamp	None	465	4,000	Fixture Replacement	No	7	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	200	4,000	1.22	8,533	0.0	\$1,098.81	\$2,734.74	\$700.00	1.85

### Motor Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
		Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Hydronic System - Supply	1	Heating Hot Water Pump	7.5	91.7%	Yes	2,543	No	91.7%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Boiler Room	Hydronic System - Supply	2	Heating Hot Water Pump	10.0	91.7%	Yes	2,543	No	91.7%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Boiler Room	Hydronic System - Return	3	Heating Hot Water Pump	15.0	93.0%	Yes	2,543	No	93.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Boiler Room	Domestic Water	2	Water Supply Pump	0.3	72.0%	No	2,059	No	72.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Roof	Exhaust Fans	73	Exhaust Fan	0.3	72.0%	No	2,059	No	72.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Roof	RTU #1	1	Supply Fan	2.0	85.0%	No	2,059	No	85.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Roof	RTU #2	1	Supply Fan	2.0	85.0%	No	2,059	No	85.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Roof	RTU #3	1	Supply Fan	2.0	85.0%	No	2,059	No	85.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Roof	RTU #4	1	Supply Fan	2.0	85.0%	No	2,059	No	85.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Roof	Exhaust Fans	8	Exhaust Fan	1.0	85.5%	No	2,059	No	85.5%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Unitary HVAC	Supply Fan	63	Supply Fan	0.2	72.0%	No	2,059	No	72.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Unitary HVAC	Supply Fan	8	Supply Fan	0.2	72.0%	No	2,059	No	72.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Roof	RTU 3 & 4	2	Supply Fan	10.0	90.0%	No	2,543	No	90.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Roof	RTU 1 & 2	2	Supply Fan	10.0	90.0%	No	2,543	No	90.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

## Electric HVAC Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions		Proposed Conditions										Energy Impact & Financial Analysis						
		System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Lower Roof	Interior	1	Split-System AC	1.00		Yes	1	Split-System AC	1.00		14.00		No	0.38	241	0.0	\$31.02	\$1,496.22	\$92.00	45.27
Lower Roof	Interior	1	Split-System AC	2.00		Yes	1	Split-System AC	2.00		14.00		No	0.65	411	0.0	\$52.90	\$2,992.44	\$184.00	53.09
Lower Roof	Interior	2	Split-System AC	2.75		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Lower Roof	Interior	1	Split-System Air-Source HP	10.00	13.50	No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Lower Roof	Interior	1	Split-System AC	2.00		Yes	1	Split-System AC	2.00		14.00		No	0.65	411	0.0	\$52.90	\$2,992.44	\$184.00	53.09
Lower Roof	Interior	2	Split-System Air-Source HP	1.00	14.00	No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Lower Roof	Interior	2	Split-System AC	1.50		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Lower Roof	Interior	2	Split-System AC	1.50		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Lower Roof	Interior	2	Split-System AC	1.50		Yes	2	Split-System AC	1.50		14.00		No	0.98	616	0.0	\$79.34	\$4,488.66	\$276.00	53.09
Lower Roof	Interior	2	Split-System AC	2.00		Yes	2	Split-System AC	2.00		14.00		No	1.31	822	0.0	\$105.79	\$5,984.88	\$368.00	53.09
Lower Roof	Interior	1	Split-System AC	1.00		Yes	1	Split-System AC	1.00		14.00		No	0.33	205	0.0	\$26.45	\$1,496.22	\$92.00	53.09
Home Ec Classroom	Classroom	2	Window AC	2.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Classroom	Classroom	1	Window AC	1.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Computer Lab	Computer Lab	1	Window AC	2.00		Yes	1	Window AC	2.00		12.00		No	0.54	337	0.0	\$43.43	\$2,177.52	\$0.00	50.14
Lounge	Lounge	2	Window AC	2.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Classroom	Classroom	7	Window AC	2.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Upper Roof	2nd Floor Classrooms	10	Split-System AC	4.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Upper Roof	2nd Floor Classrooms	11	Split-System AC	3.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Upper Roof	2nd Floor Classrooms	1	Split-System AC	2.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Upper Roof	2nd Floor Classrooms	4	Split-System AC	5.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00



		Existing Conditions				Proposed Conditions							Energy Impact & Financial Analysis							
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Upper Roof	Interior	1	Split-System AC	4.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Upper Roof	Interior	1	Split-System AC	2.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Upper Roof	Interior	2	Split-System AC	1.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Roof	RTU #1	1	Packaged AC	4.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Roof	RTU #2	1	Packaged AC	7.50		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Roof	RTU #3	1	Packaged AC	8.50		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Roof	RTU #4	1	Packaged AC	5.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Roof	RTU 3 & 4	2	Packaged AC	30.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Roof	RTU 1 & 2	2	Packaged AC	20.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

### Fuel Heating Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
		System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Hydronic Heating System	8	Condensing Hot Water Boiler	1,920.00	No						0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Roof	RTU #1	1	Furnace	47.00	No						0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Roof	RTU #2	1	Furnace	96.00	Yes	1	Furnace	96.00	95.00%	AFUE	0.00	0	4.9	\$32.12	\$2,175.10	\$400.00	55.26
Roof	RTU #3	1	Furnace	96.00	Yes	1	Furnace	96.00	95.00%	AFUE	0.00	0	4.9	\$32.12	\$2,175.10	\$400.00	55.26
Roof	RTU #4	1	Furnace	64.00	Yes	1	Furnace	64.00	95.00%	AFUE	0.00	0	3.2	\$21.41	\$1,450.07	\$400.00	49.04
Roof	RTU	1	Furnace	38.00	Yes	1	Furnace	38.00	95.00%	AFUE	0.00	0	2.0	\$13.56	\$860.98	\$400.00	33.99
Roof	RTU	1	Furnace	100.00	Yes	1	Furnace	100.00	95.00%	AFUE	0.00	0	3.8	\$24.98	\$2,265.73	\$400.00	74.68
Roof	RTU	1	Furnace	32.00	Yes	1	Furnace	32.00	95.00%	AFUE	0.00	0	1.6	\$10.71	\$725.03	\$400.00	30.36
Roof	RTU	2	Furnace	50.00	Yes	2	Furnace	50.00	95.00%	AFUE	0.00	0	5.1	\$33.46	\$2,265.73	\$800.00	43.81
Roof	RTU 3 & 4	2	Furnace	188.00	No						0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Roof	RTU 1 & 2	2	Furnace	376.00	No						0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

### DHW Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis					
		System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Majority of the Building	2	Storage Tank Water Heater (≤ 50 Gal)	Yes	1	Storage Tank Water Heater (> 50 Gal)	Natural Gas	96.00%	Et	0.00	0	29.2	\$193.49	\$42,593.50	\$1,487.50	212.45
Kitchenette	Kitchenette	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

### Low-Flow Device Recommendations

Location	Recommendation Inputs				Energy Impact & Financial Analysis						
	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restrooms	3	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	0.8	\$5.42	\$21.51	\$0.00	3.97
Restrooms	4	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	1.1	\$7.23	\$28.68	\$0.00	3.97
Restrooms	7	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	1.9	\$12.65	\$50.19	\$0.00	3.97
Restrooms	4	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	1.1	\$7.23	\$28.68	\$0.00	3.97
Restrooms	2	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	0.5	\$3.61	\$14.34	\$0.00	3.97
Restrooms	4	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	1.1	\$7.23	\$28.68	\$0.00	3.97
Restrooms	3	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	0.8	\$5.42	\$21.51	\$0.00	3.97
Restrooms	4	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	1.1	\$7.23	\$28.68	\$0.00	3.97
Restrooms	2	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	0.5	\$3.61	\$14.34	\$0.00	3.97
Restrooms	4	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	1.1	\$7.23	\$28.68	\$0.00	3.97

### Walk-In Cooler/Freezer Inventory & Recommendations

Location	Existing Conditions		Proposed Conditions			Energy Impact & Financial Analysis						
	Cooler/Freezer Quantity	Case Type/Temperature	Install EC Evaporator Fan Motors?	Install Electric Defrost Control?	Install Evaporator Fan Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Low Temp Freezer (-35F to -5F)	No	No	No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Kitchen	1	Medium Temp Freezer (0F to 30F)	No	No	No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Kitchen	1	Medium Temp Freezer (0F to 30F)	No	No	No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

### Cooking Equipment Inventory & Recommendations

Location	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis							
	Quantity	Equipment Type	High Efficiency Equipment?	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years	
Kitchen	2	Electric Convection Oven (Half Size)	No	No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00	
Kitchen	2	Insulated Food Holding Cabinet (1/2 Size)	No	No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00	
Kitchen	2	Gas Combination Oven/Steam Cooker (<15 Pans)	No	No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00	
Kitchen	2	Gas Fryer	No	No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00	
Kitchen	1	Gas Griddle (≤2 Feet Width)	No	No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00	
Home Ec Classroom	7	Gas Combination Oven/Steam Cooker (<15 Pans)	No	No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00	
Classroom	1	Electric Convection Oven (Half Size)	No	No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00	

### Plug Load Inventory

Existing Conditions				
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
High School	274	Computers	120.0	
High School	31	Projector	350.0	
High School	12	TV	120.0	
High School	24	Printer	250.0	
High School	26	Smart Board	200.0	
High School	5	Mini Fridge	260.0	
High School	3	Coffee Maker	1,100.0	
High School	10	Microwave	1,500.0	
High School	4	Toaster	1,200.0	
High School	35	Fan	100.0	
High School	11	Speakers	150.0	
High School	2	Water Cooler	120.0	
High School	2	Large Speakers	250.0	
High School	2	Electric Unit Heaters	1,500.0	
High School	726	Laptops	90.0	

### Vending Machine Inventory & Recommendations

Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis							
Location	Quantity	Vending Machine Type	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Cafeteria	1	Refrigerated	Yes	0.00	1,612	0.0	\$207.56	\$230.00	\$0.00	1.11

## Custom Recommendations

### Computer Power Management Software

Normal Running Mode					Idle Running Mode					Suspended/Off Mode				
Mon - Fri 8AM-5PM	Mon - Fri 5PM-8AM	Weekends & Holidays	Energy Rate (W)*	Weekly Run Hours	Mon - Fri 8AM-5PM	Mon - Fri 5PM-8AM	Weekends & Holidays	Energy Rate (W)*	Weekly Run Hours	Mon - Fri 8AM-5PM	Mon - Fri 5PM-8AM	Weekends & Holidays	Energy Rate (W)*	Weekly Run Hours
50%	5%	5%	120	26	5%	12%	6%	80	14	45%	83%	89%	5	127
45%	5%	0%	120	22	5%	5%	0%	80	6	50%	90%	100%	5	140

Usage per Device			Energy Impact & Financial Analysis					
Weeks of Use	Annual kWh Usage	Diversity Factor**	Total Annual kWh Savings	Total Annual Energy Cost Savings	Cost per Desktop	Add'l Hardware Cost	Total Installation Cost	Simple Payback Period (Years)
48	238	90%	12,166	\$1,567	\$15.00	\$2,500.0	\$6,610	4.22
48	189							

### Retro-Commissioning Study & HVAC Improvements

Existing Conditions			Proposed Conditions			Energy Impact & Financial Analysis				
Annual Electric HVAC Energy Use (kWh)	Annual Heating Energy Use (mmBtu)	Annual Fan Energy Use (kWh)	Assumed % Cooling Savings	Assumed % Heating Savings	Assumed % Motor Savings	Total Annual kWh Savings	Total Annual mmBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Simple Payback Period (Years)
160,205	5,811.0	237,409	4%	6%	2%	11,156	349	\$3,745	\$58,979	15.75

### Equations: (Based on Industry Standards)

Average Cost for retro-commissioning studies and control improvements is \$0.30/sqft

Energy savings range between 5% and 20% with a typical payback of two years or less

Based on a comprehensive study by the Environmental Protection Agency, the value of energy savings range from \$0.11 and \$0.72/sqft

### Installation of an Energy Management System

Existing Conditions			Proposed Conditions			Energy Impact & Financial Analysis				
Annual Electric HVAC Energy Use (kWh)	Annual Heating Energy Use (mmBtu)	Annual Fan Energy Use (kWh)	Assumed % Cooling Savings	Assumed % Heating Savings	Assumed % Motor Savings	Total Annual kWh Savings	Total Annual mmBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Simple Payback Period (Years)
160,205	5,811.0	237,409	6%	9%	5%	21,483	523	\$6,229	\$294,893	47.34

#### Equations: (Based on Industry Standards)

Average Cost for EMS installation is \$1.50/sqft  
 Energy savings range between 10% and 30%


### Building Envelope Weatherization


Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis				
Annual Electric HVAC Energy Use (kWh)	Annual Heating Energy Use (mmBtu)	Assumed % Electric HVAC Savings	Assumed % Gas HVAC Savings	Total Annual kWh Savings	Total Annual mmBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Simple Payback Period (Years)
160,205	5,811.0	0.5%	4.5%	801	261	\$1,834	\$14,167	7.72

	qty	\$/unit	est costs
Weather-strip Exterior Double Doors	15	250	\$ 3,750
Weather-strip Exterior Single Doors	5	125	\$ 625
Caulk the Perimeter of Windows	2448	4	\$ 9,792
<b>Total Estimated Costs</b>			<b>\$ 14,167</b>



## Appendix B: ENERGY STAR® Statement of Energy Performance


ENERGY STAR® Statement of Energy Performance



**ENERGY STAR®  
Score<sup>1</sup>**

**Westwood Regional Jr./Sr. High School**

**Primary Property Type:** K-12 School  
**Gross Floor Area (ft²):** 196,595  
**Built:** 1964

**For Year Ending:** August 31, 2016  
**Date Generated:** August 02, 2017

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information		
<b>Property Address</b> Westwood Regional Jr./Sr. High School 701 Ridgewood Rd Township of Washington, New Jersey 07675	<b>Property Owner</b> Westwood BOE 701 Ridgewood Rd Township of Washington, NJ 07675 201-864-0880 ext 2010	<b>Primary Contact</b> John Baumann 701 Ridgewood Rd Township of Washington, NJ 07675 201-864-0880 ext 2010 john.baumann@wwrsd.org
<b>Property ID:</b> 5969168		

Energy Consumption and Energy Use Intensity (EUI)				
<b>Site EUI</b> 65.9 kBtu/ft²	<b>Annual Energy by Fuel</b>		<b>National Median Comparison</b>	
	Electric - Grid (kBtu)	5,689,892 (44%)	National Median Site EUI (kBtu/ft²)	83.6
	Natural Gas (kBtu)	7,268,316 (56%)	National Median Source EUI (kBtu/ft²)	164.5
			% Diff from National Median Source EUI	-21%
<b>Source EUI</b> 129.7 kBtu/ft²			<b>Annual Emissions</b>	
			Greenhouse Gas Emissions (Metric Tons CO2e/year)	696

### Signature & Stamp of Verifying Professional

I \_\_\_\_\_ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

#### Licensed Professional

Aimee Lalonde  
 1430 Broadway  
 10th Floor  
 New York, NY 10018  
 347-913-2422  
 alalonde@trcsolutions.com



Professional Engineer Stamp  
(if applicable)