Steven Winter Associates, Inc.
Building Systems Consultants
www.swinter.com

293 Route 18 South, Suite 330
East Brunswick, NJ 08816

Telephone (866) 676-1972
Facsimile (203) 852-0741

April 30, 2012

Local Government Energy Program
Energy Audit Report

Washington Township Public School District

Washington Township High School
509/519/529 Hurffville Cross Keys Road
Sewell, NJ 08080

Project Number: LGEA95

Table of Contents

EXECUTIVE SUMMARY

The Washington Township High School facility consists of 3 separate buildings connected through common hallways with a gross floor area of 412,000 square feet. Space types within the school buildings consist of classrooms, administrative offices, a theater, multiple gymnasiums and cafeterias as well as science and shop classrooms. The following chart provides a comparison of the current building energy usage based on the period from September 2010 through September 2011 with the proposed energy usage resulting from the installation of recommended Energy Conservation Measures (ECMs) excluding any renewable energy:

Table 1: State of Building—Energy Usage

	Electric Usage (kWh/yr)	Gas Usage (therms/ yr)	Current Annual Cost of Energy ($)	Site Energy Use Intensity (kBtu/sq ft. /yr)	Source Energy Use Intensity (kBtu/sq ft. /yr)	Joint Energy Consumption (MMBtu/yr)
Current	6,005,399	150,934	$1,108,659	87.0	205.0	35,699
Proposed	5,744,249	150,934	$1,064,751	84.8	197.6	34,808
Savings	261,150	0	$43,908	2.2	7.4	891
% Savings	4%	0%	4%	2%	4%	2%
Proposed Renewable Energy**	118,920	-	$89,697	1.0	3.4	406
*Includes operation and maintenance savings; **Includes SRECS						

SWA has entered energy information about the High School facility into the U.S. Environmental Protection Agency's (EPA) Energy Star Portfolio Manager Energy Benchmarking system. The building has an Energy Star Rating of 41 and a Site Energy Utilization of 87 kBtu/sqft/yr.

Recommendations

Based on the current state of the building and its energy use, SWA recommends implementing the following Energy Conservation Measures:

Table 2: Energy Conservation Measure Recommendations

Measures	First Year Savings ($)	Initial Investment ($)	Simple Payback Period	CO2 Savings (lbs/yr)
ECMs	$43,908	$102,543	2.3	467,589
Capital Improvements	$0	$2,974,207	0.0	0
Proposed Renewable Energy	$34,358	$586,500	17.1	212,927
Total	**$78,266**	**$3,663,250**	**46.8**	**680,516**

In addition to these ECMs, SWA recommends the following:

- Capital Improvement opportunities – measures that would contribute to reducing energy usage but require significant capital resources as well as long-term financial planning
    - CI #1 – Install 97.75 kW Solar Photovoltaic system - $586,500

- CI #2 – Replace existing roof sections (9/10 Building) - $305,960
- CI #3 – Replace existing exterior light fixtures (9/10 Building) - $60,640
- CI #4 – Replace existing windows with Energy Star® certified windows (9/10 Building) - $117,856
- CI #5 – Replace existing roof sections (11/12 Building) - $553,575
- CI #6 – Replace existing exterior light fixtures (11/12/ Building) - $70,747
- CI #7 – Replace existing windows with Energy Star® certified windows (11/12 Building) - $538,285
- CI #8 – Replace existing roof sections (Core Building) - $232,200
- CI #9 – Replace existing exterior light fixtures (Core Building) - $20,213
- CI #10 – Replace End-of-Life RTUs and Condensing Units (9/10 Building) - $28,928
- CI #11 – Replace End-of-Life RTUs and Condensing Units (11/12 Building) - $737,499
- CI #12 – Replace End-of-Life AHU (Core Building) - $18,570
- CI #13 – Replace two End-of-Life 10,400 MBH cast iron boilers (11/12 Building) - $56,369
- CI #14 – Install BMS system (9/10 Building) - $75,000
- CI #15 – Optimize chilled water and ice storage plant (Core building) - $7,500
- CI #16 – Replace 59 EDPAC heat pumps and glycol system - $93,173
- CI #17 – Replace 250 MBH Bradford-White domestic hot water heater (Core Building) - $9,381
- CI #18 – Replace domestic hot water heater and tank (9/10 Building) - $48,311
- CI #19 – Replace BAC cooling tower (9/10 Building) - $17,025

- Operation and Maintenance (O&M) measures that would contribute to reducing energy usage at low cost – no cost
  - Calibrate humidity sensors twice per year
  - Check and adjust timers and time clocks monthly
  - Replace or install exterior door weather-stripping
  - Replace motors with NEMA premium efficiency models
  - Retrofit 2 vending machines with SnackMiserTM devices
  - Provide water-efficient fixtures and controls
  - Inspect and replace cracked/ineffective caulk.
  - Inspect and maintain sealants at all windows for airtight performance.
  - Inspect and maintain weather-stripping around all exterior doors and roof hatches.
  - Purchase Energy Star® appliances when available
  - Use smart power electric strips
  - Create an energy educational program

There may be energy procurement opportunities for the Washington Township Public School District to reduce annual utility costs, which are $30,027 higher, when compared to the average estimated NJ commercial utility rates. SWA recommends further evaluation with energy suppliers, listed in Appendix K.

Environmental Benefits

SWA estimates that implementing the recommended ECMs is equivalent to removing approximately 57 cars from the roads each year or is equivalent of planting 1,657 trees to absorb CO_2 from the atmosphere.

Energy Conservation Measure Implementation

SWA recommends that Washington Township implement the following Energy Conservation Measures using an appropriate Incentive Program for reduced capital cost:

Recommended ECMs	Incentive Program (APPENDIX K for details)
Replace 8 incandescent lamps with CFLs (9/10 Building)	Direct Install
Replace 100 incandescent lamps with CFLs (11/12 Building)	Direct Install, Smart Start
Replace 140 incandescent lamps with CFLs (Core building)	Direct Install, Smart Start
Replace 35 high bay metal halide fixtures with T5s (9/10 Building)	Direct Install, Smart Start
Replace 92 high bay metal halide fixtures with T5s (11/12 Building)	Direct Install, Smart Start
Install 127 new occupancy sensors (9/10 Building)	Direct Install, Smart Start
Install 62 new bi-level fixtures in stairwells (9/10 Building)	Direct Install, Smart Start
Replace 45 old LED exit signs with newer LED exit signs (11/12 Building)	Direct Install, Smart Start
Install 100 new occupancy sensors (11/12 Building)	Direct Install, Smart Start
Install 20 new bi-level fixtures in stairwells (Core Building)	Direct Install, Smart Start
Replace 30 old LED exit signs with newer LED exit signs (Core Building)	Direct Install, Smart Start
Install 49 new occupancy sensors (Core Building)	Direct Install, Smart Start
Install 97.75 kW Solar Photovoltaic System (Core and 9/10 Building)	NJ SREC program

Appendix L contains an Energy Conservation Measures table

INTRODUCTION

Launched in 2008, the Local Government Energy Audit (LGEA) Program provides subsidized energy audits for municipal and local government-owned facilities, including offices, courtrooms, town halls, police and fire stations, sanitation buildings, transportation structures, schools and community centers. The Program will subsidize up to 100% of the cost of the audit. The Board of Public Utilities (BPUs) Office of Clean Energy has assigned TRC Energy Services to administer the Program.

Steven Winter Associates, Inc. (SWA) is a 39-year-old architectural/engineering research and consulting firm, with specialized expertise in green technologies and procedures that improve the safety, performance, and cost effectiveness of buildings. SWA has a long-standing commitment to creating energy-efficient, cost-saving and resource-conserving buildings. As consultants on the built environment, SWA works closely with architects, developers, builders, and local, state, and federal agencies to develop and apply sustainable, 'whole building' strategies in a wide variety of building types: commercial, residential, educational and institutional.

SWA performed an energy audit and assessment for the Washington Township High School at 509/519/529 Hurffville Cross Keys Road, Sewell, NJ. The process of the audit included a facility visit on January 11th and 12th, benchmarking and energy bill analysis, assessment of existing conditions, energy conservation measures and other recommendations for improvements. The scope of work includes providing a summary of current building conditions, current operating costs, potential savings, and investment costs to achieve these savings. The facility description includes energy usage, occupancy profiles and current building systems along with a detailed inventory of building energy systems, recommendations for improvement and recommendations for energy purchasing and procurement strategies.

The goal of this Local Government Energy Audit is to provide sufficient information to the Washington Township Public School District to make decisions regarding the implementation of the most appropriate and most cost-effective energy conservation measures for the High School facility.

HISTORICAL ENERGY CONSUMPTION

Energy usage, load profile and cost analysis

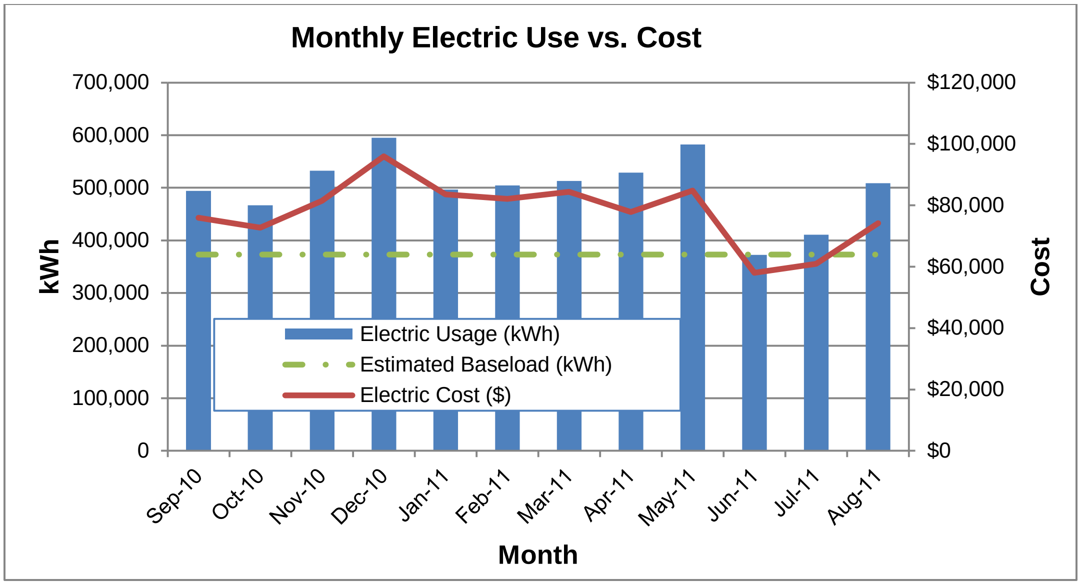
High School Site

SWA reviewed utility bills from October 2009 through September 2011 for the entire High School site including the 9/10 Wing, 11/12 Wing and Core section of the building. For the purpose of meeting LGEA requirements, a utility analysis was completed for the entire site as a whole. Utility usage and costs are calculated for the entire site and used for the calculations of Energy Conservation Measures and to describe the quantity of energy used by the Washington Township High School. At the request of Washington Township Public Schools and hired consultants, SWA has also presented the parameters related to energy for each of the distinct high school sections (9/10 Wing, 11/12 Wing and Core Section) in the sections below to represent energy use and cost trends for each section.

The entire High School site uses both electricity and natural gas. SWA reviewed a 24 month period of analysis from October 2009 through September 2011 and all calculations are based on the most recent 12 month period (September 2010 through September 2011) of utility data available at the time of the energy audit.

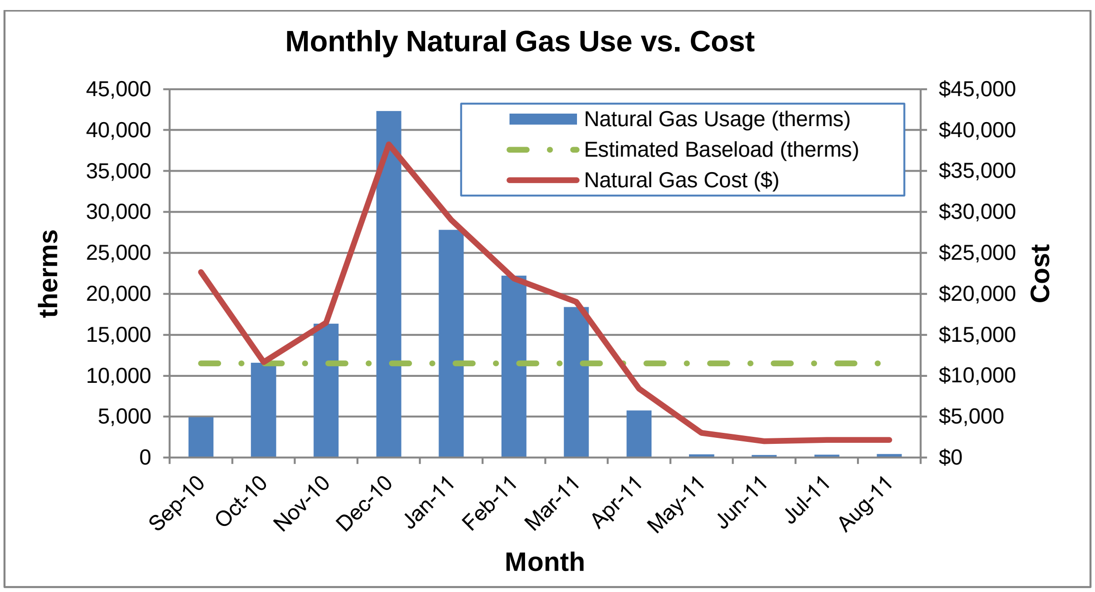
High School Site Electricity – The high school is currently served by a total of 6 electric meters. Electricity is purchased from Atlantic City Electric which is responsible for transmission and distribution and from South Jersey Electric which acts as a third party energy supplier. Electricity was purchased at an average aggregated cost of $0.155/kWh based on the consumption of 6,005,399 kWh at a total cost of $931,870, in the previous year. The annual monthly peak demand was 2,483.0 kW, while the average monthly demand was 1,908.0 kW.

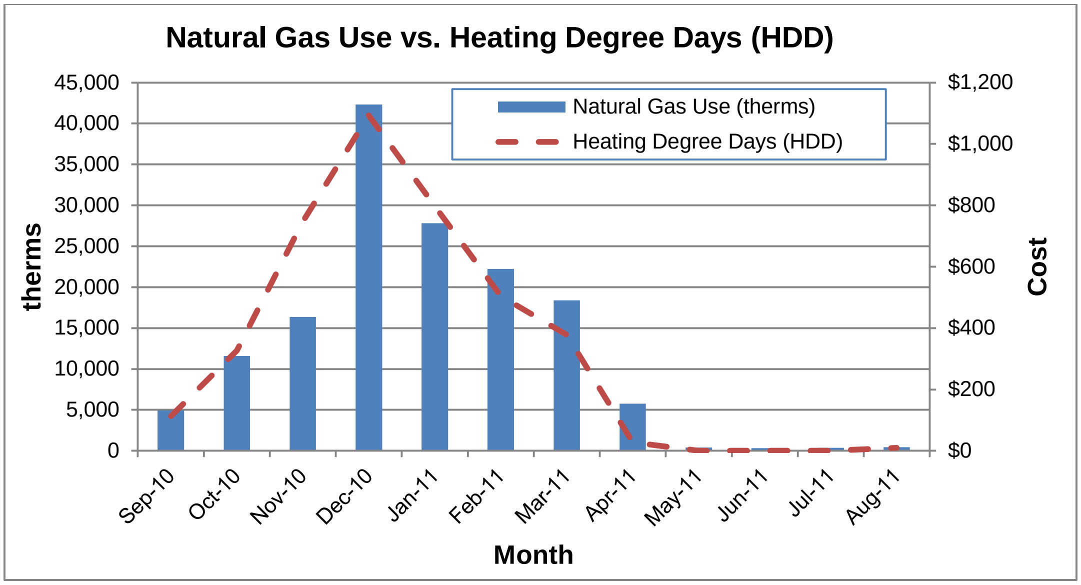
The chart below shows the monthly electric usage and costs. The dashed green line represents the approximate baseload or minimum electric usage required to operate the High School. The baseline usage for the facility is approximately 373,000 kWh per month. As expected usage peaks during in December when outside air temperatures are coldest and electric heating is used the most and also peaks in May when outside air temperatures during the normal school year are at their highest and require a significant cooling load.



High School Site Natural gas – The High School is currently served by two meters for natural gas and currently purchases natural gas from South Jersey Gas which is responsible for transmission and distribution and from Hess which acts as a third party energy supplier. Natural gas was purchased at an average aggregated cost of $1.171/therm based on the consumption of 150,934 therms at a total cost of $176,788, in the previous year.

The chart below shows the monthly natural gas usage and costs. The dashed green line represents the approximate monthly heating baseload or minimum natural gas usage required to heat the building during colder months. As expected usage peaks in the winter months in conjunction with the coldest outside air temperatures and partial loads occur during fall and spring months, when temperatures fluctuate around a milder average temperature.

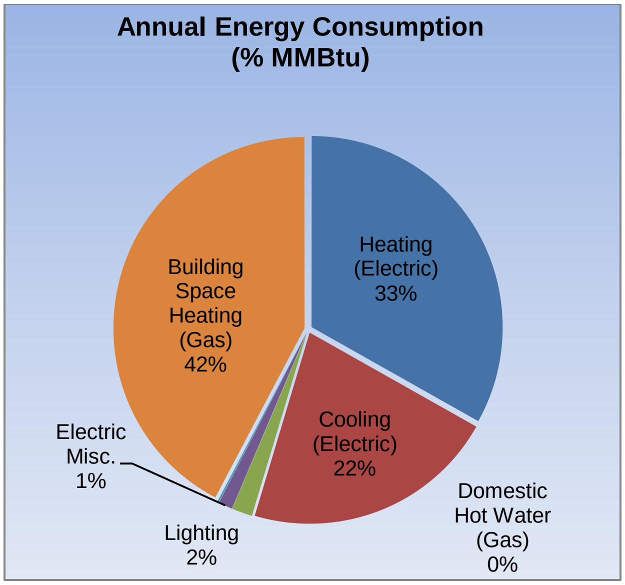


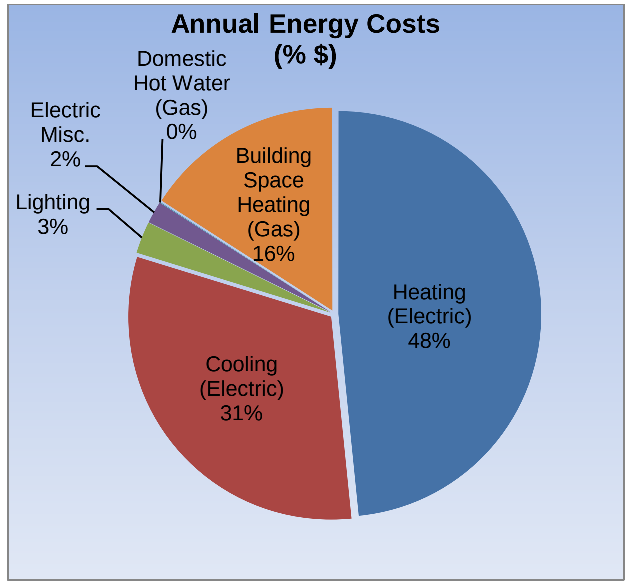


The chart above shows the monthly natural gas usage along with the heating degree days or HDD. Heating degree days are the difference of the average daily temperature and a base temperature, on a particular day. The heating degree days are zero for the days when the average temperature exceeds the base temperature. As expected, the natural gas consumption profile follows a curve similar to the HDD curve except for November. November is an anomaly month with usage lower than expected based on the HDD curve. After further investigation, the period in the chart titled November 2010 represents the period of time from 11/22/2010 through 12/22/2010. During this period, it was likely that the heating system was setback for much of the time period due to students on holiday breaks.

The following graphs, pie charts, and table show energy use for High School based on utility bills for the 12 month period. Note: electrical cost at $45/MMBtu of energy is almost 3 times as expensive as natural gas at $12/MMBtu

Annual Energy Consumption / Costs					
	MMBtu	**% MMBTu**	**$**	**% $**	**$/MMBtu**
Heating (Electric)	3,501	10%	$159,214	14%	$45
Cooling (Electric)	8,074	23%	$367,176	33%	$45
Lighting	4,637	13%	$210,896	19%	$45
Electric Misc.	4,279	12%	$194,584	18%	$45
Domestic Hot Water (Gas)	504	1%	$5,903	1%	$12
Building Space Heating (Gas)	14,589	41%	$170,885	15%	$12
Totals	35,584	100%	$1,108,659	100%	-
Total Electric Usage	20,490	58%	$931,870	84%	$45
Total Gas Usage	15,093	42%	$176,788	16%	$12
Totals	35,584	100%	$1,108,659	100%	-



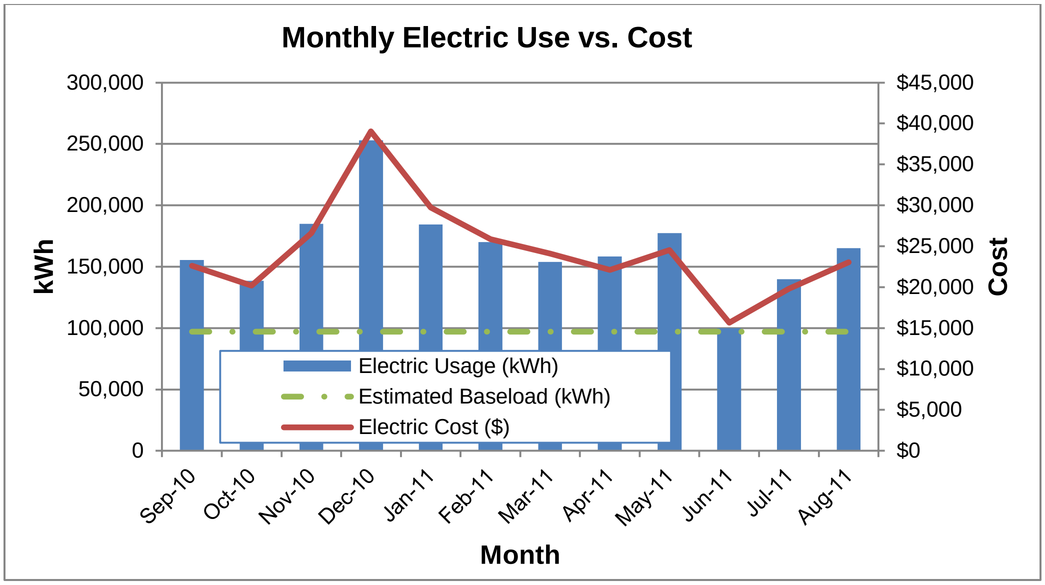


9/10 Wing

The 9/10 Wing of the school currently has electric service only and does not have natural gas service. SWA reviewed utility bills from October 2009 through September 2011 that were received from the utility companies supplying the 9/10 Wing with electricity. The 9/10 Wing of the school uses electricity only and does not use natural gas. A 12 month period of analysis from September 2010 through September 2011 was used for all calculations and for purposes of benchmarking the building.

9/10 Wing Electricity –The 9/10 Wing currently purchases electricity from Atlantic City Electric which is responsible for transmission and distribution and from South Jersey Electric which acts as a third party energy supplier. Electricity was purchased at an average aggregated rate of $0.148/kWh and consumed approximately 1,980,600 kWh, or $293,291 worth of electricity, in the previous year. The annual monthly peak demand was 903.0 kW, while the average monthly demand was 609.0 kW.

The chart below shows the monthly electric usage and costs. The dashed green line represents the approximate monthly baseload or minimum electric usage required to operate the 9/10 Wing. The baseline usage for the facility is approximately 97,000 kWh. As expected usage peaks in the December when outside air temperatures are coldest and electric heating is used. There are also several smaller peaks in May and August when outside air temperatures are high requiring an increased amount of electricity used for cooling.

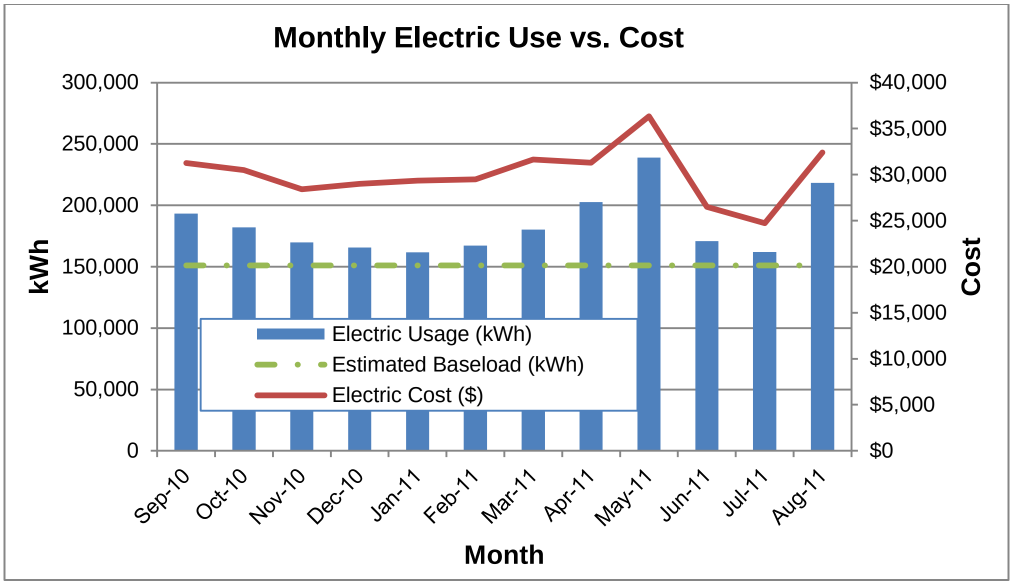


11/12 Wing

The 11/12 Wing of the school currently has both electricity and natural gas service. SWA reviewed utility bills from October 2009 through September 2011 that were received from the utility companies supplying the 11/12 Wing of the High School with electricity and natural gas. A 12 month period of analysis from September 2010 through September 2011 was used for all calculations and for purposes of benchmarking the building.

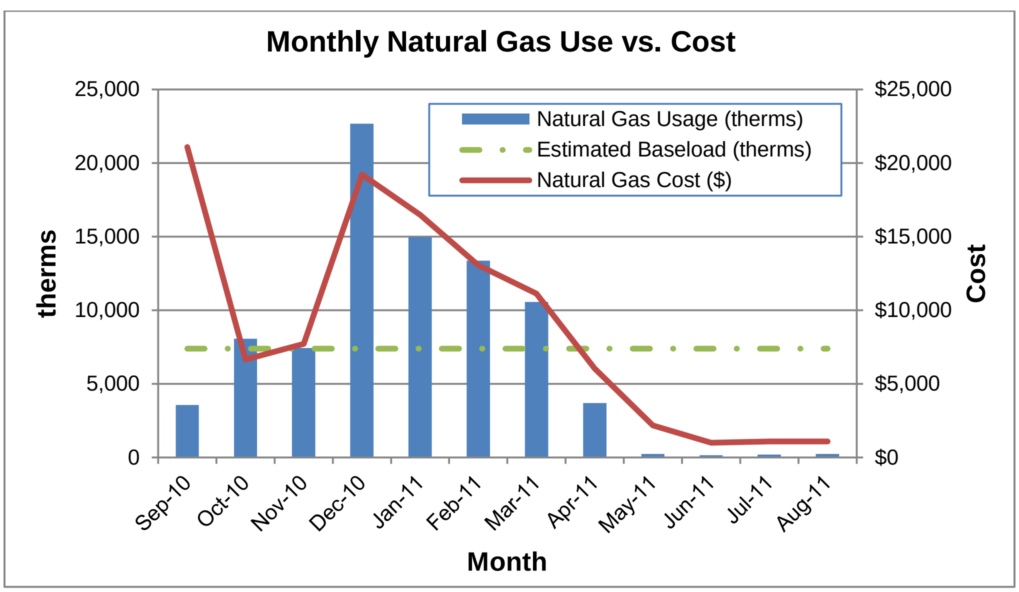
11/12 Wing Electricity –The 11/12 Wing currently purchases electricity from Atlantic City Electric which is responsible for transmission and distribution and from South Jersey Electric which acts as a third party energy supplier. Electricity was purchased at an average aggregated rate of $0.163/kWh and consumed approximately 2,212,159 kWh, or $360,328 worth of electricity, in the previous year. The annual monthly peak demand was 1,147.0 kW, while the average monthly demand was 672.0 kW.

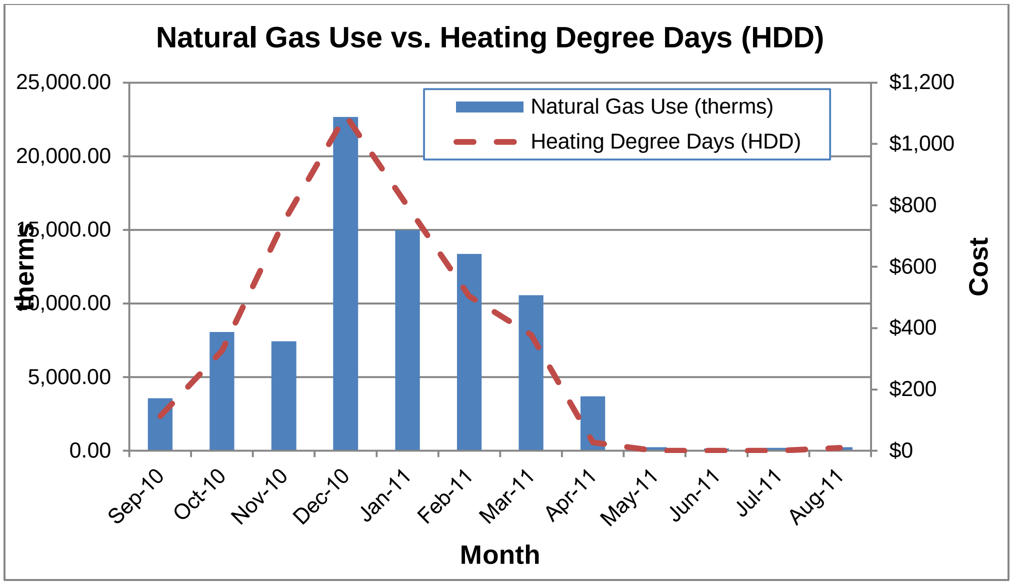
The chart below shows the monthly electric usage and costs. The dashed green line represents the approximate baseload or minimum electric usage required to operate the 11/12 Wing. The baseline usage for the facility is approximately 151,000 kWh. As expected usage peaks in May, when school is in session full time and summer is beginning requiring a higher amount of cooling. There is also a second peak in August when outside air temperatures peak, requiring additional cooling.



11/12 Wing Natural gas – The 11/12 Wing is currently served by one meter for natural gas and currently purchases natural gas from South Jersey Gas which is responsible for transmission and distribution and from Hess which acts as a third party energy supplier. Natural gas was purchased at an average aggregated rate of $1.253/therm and the school consumed approximately 85,191 therms, or $106,766 worth of natural gas, in the previous year.

The chart below shows the monthly natural gas usage and costs. The green line represents the approximate monthly baseload or minimum natural gas usage required to operate the 11/12 Wing during the heating season. The heating season gas baseload for the 11/12 Wing is approximately 150 therms. As expected usage peaks in the winter months in conjunction with the operation of the gas fired hot water boiler. The monthly natural gas costs also peak in the winter months in correlation with the increased natural gas usage.





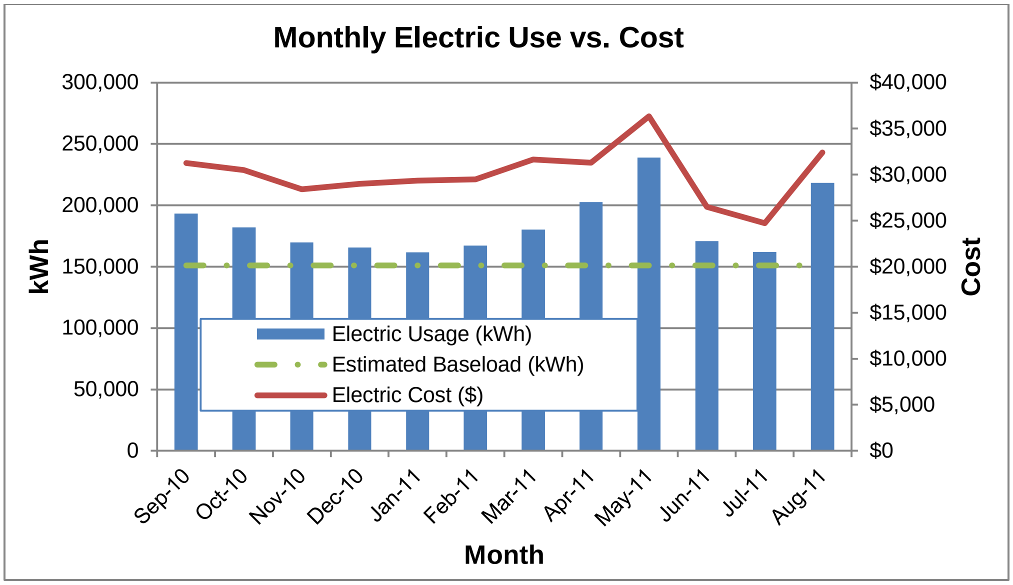
The chart above shows the monthly natural gas usage along with the heating degree days or HDD. Heating degree days is the difference of the average daily temperature and a base temperature, on a particular day. The heating degree days are zero for the days when the average temperature exceeds the base temperature. As expected, the natural gas consumption profile follows a curve similar to the HDD curve except for November. November is an anomaly month with usage lower than expected based on the HDD curve. After further investigation, the period in the chart titled November 2010 represents the period of time from 11/22/2010 through 12/22/2010. During this period, it was likely that the heating system was setback for much of the time period due to students on holiday breaks.

Core Section

The Core Section of the school currently has both electricity and natural gas service. SWA reviewed utility bills from October 2009 through September 2011 that were received from the utility companies supplying the Core Section of the High School with electricity and natural gas. A 12 month period of analysis from September 2010 through September 2011 was used for all calculations and for purposes of benchmarking the building.

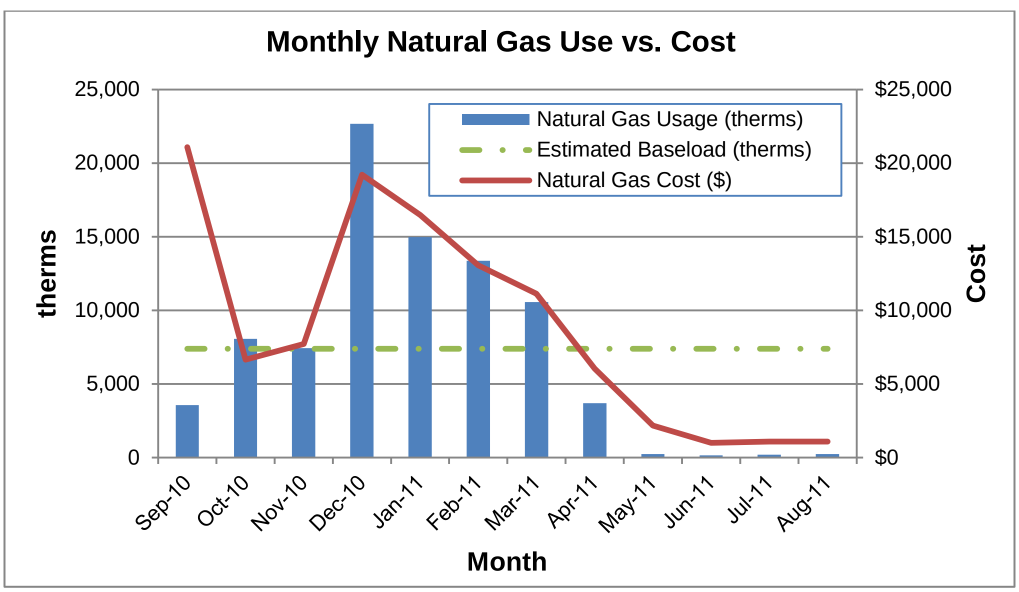
Core Section Electricity –The 11/12 Wing currently purchases electricity from Atlantic City Electric which is responsible for transmission and distribution and from South Jersey Electric which acts as a third party energy supplier. Electricity was purchased at an average aggregated rate of $0.153/kWh and consumed approximately 1,812,640 kWh, or $277,687 worth of electricity, in the previous year. The annual monthly peak demand was 774.0 kW, while the average monthly demand was 626.6 kW.

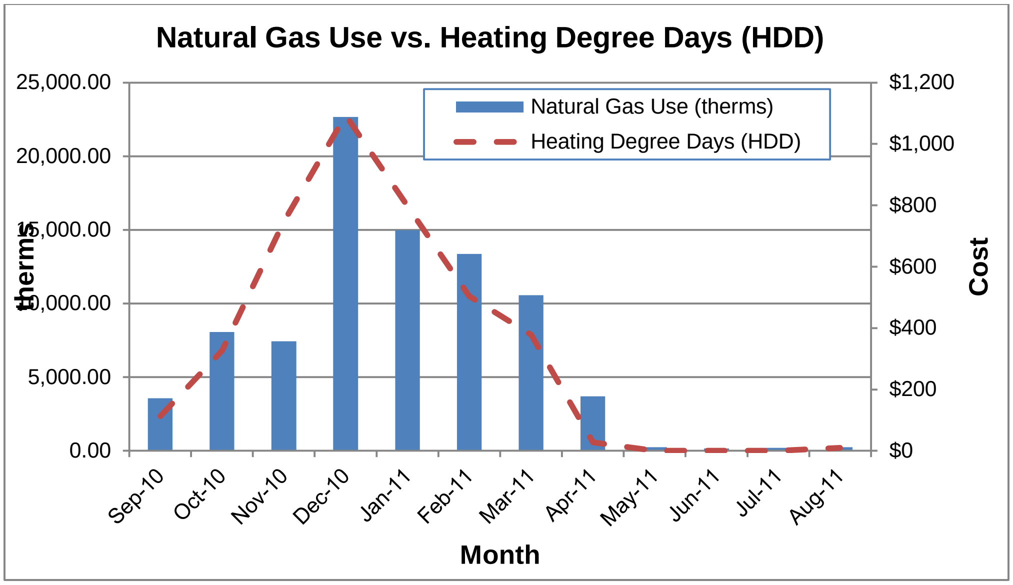
The chart below shows the monthly electric usage and costs. The dashed green line represents the approximate baseload or minimum electric usage required to operate the Core Section. The baseline monthly usage for the facility is approximately 85,500 kWh. As expected usage peaks in May, when school is in session full time and summer is beginning requiring a higher amount of cooling. There is also a second peak in August when outside air temperatures peak, requiring additional cooling.



Core Section Natural gas – The 11/12 Wing is currently served by one meter for natural gas and currently purchases natural gas from South Jersey Gas which is responsible for transmission and distribution and from Hess which acts as a third party energy supplier. Natural gas was purchased at an average aggregated rate of $1.070/therm and the school consumed approximately 65,743 therms, or $70,022 worth of natural gas, in the previous year.

The chart below shows the monthly natural gas usage and costs. The green line represents the approximate baseload or minimum natural gas usage required to operate the Core Section during the heating season. The heating season gas baseload for the Core Section is approximately 8,500 therms. As expected usage peaks in the winter months in conjunction with the operation of the gas fired hot water boiler. The monthly natural gas costs also peak in the winter months in correlation with the increased natural gas usage.





The chart above shows the monthly natural gas usage along with the heating degree days or HDD. Heating degree days is the difference of the average daily temperature and a base temperature, on a particular day. The heating degree days are zero for the days when the average temperature exceeds the base temperature. As expected, the natural gas consumption profile follows a curve similar to the HDD curve except for November. November is an anomaly month with usage lower than expected based on the HDD curve. After further investigation, the period in the chart titled November 2010 represents the period of time from 11/22/2010 through 12/22/2010. During this period, it was likely that the heating system was setback for much of the time period due to students on holiday breaks.

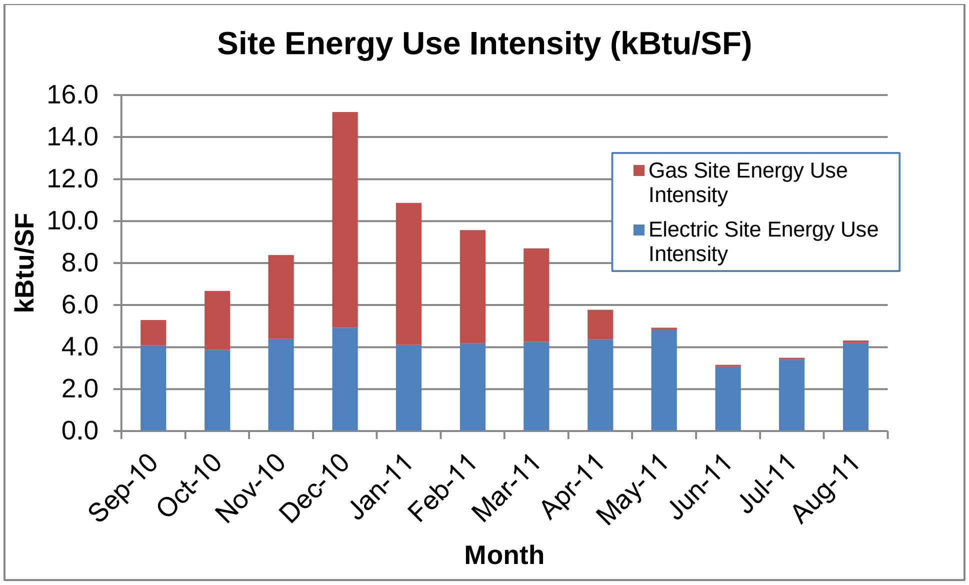
Energy Benchmarking

SWA has entered energy information about the High School in the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® Portfolio Manager energy benchmarking system. This school facility is categorized as a "K-12 School" space type. Based on the data entered into the Portfolio Manager software, the building has an Energy Performance Rating of 41 out of a possible 100 points. For reference, a score of 69 is required for LEED for Existing Buildings certification and a score of 75 is required for ENERGY STAR® certification.

A score of 41 is expected for the High School based on the current operations and energy use of the school. The 9-10 Wing of the school is entirely electrically heated which causes the school to have higher energy use intensity than a typical school with 100% gas heating. SWA recommends that Washington Township track utility bills on a monthly basis and contact Atlantic City Electric whenever there are anomalies in the utility bills due to estimated readings.

The ENERGY STAR® Portfolio Manager uses a national survey conducted by the U.S. Energy Information Administration (EIA). This national survey, known as the Commercial Building Energy Consumption Survey (CBECS), is conducted every four years, and gathers data on building characteristics and energy use from thousands of buildings across the United States. The Portfolio Manager software uses this data to create a database by building type. By entering the building parameters and utility data into the software, Portfolio Manager is able to generate a performance scale from 1-100 by comparing it to similar office buildings. This 100 point scale determines how well the building performs relative to other buildings across the country, regardless of climate and other differentiating factors. A score of 41 shows the building performs 8% below the national average.

The Site Energy Use Intensity is 87 kBtu/sqft/yr compared to the national average of a “K-12 School" building consuming 81 kBtu/sqft/yr. This is an 8% difference between the buildings intensity and the national average. See the recommendations presented in this report for guidance on how to improve the building’s rating.



Per the LGEA program requirements, SWA has assisted the Washington Township Public School District to create an ENERGY STAR® Portfolio Manager account and share the High School information to allow future data to be added and tracked using the benchmarking tool. SWA has shared this Portfolio Manager account information with the Washington Township Public School District (user name of “washingtontownship” with a password of “washingtontownship”) and TRC Energy Services (user name of “TRC-LGEA”).

Tariff analysis

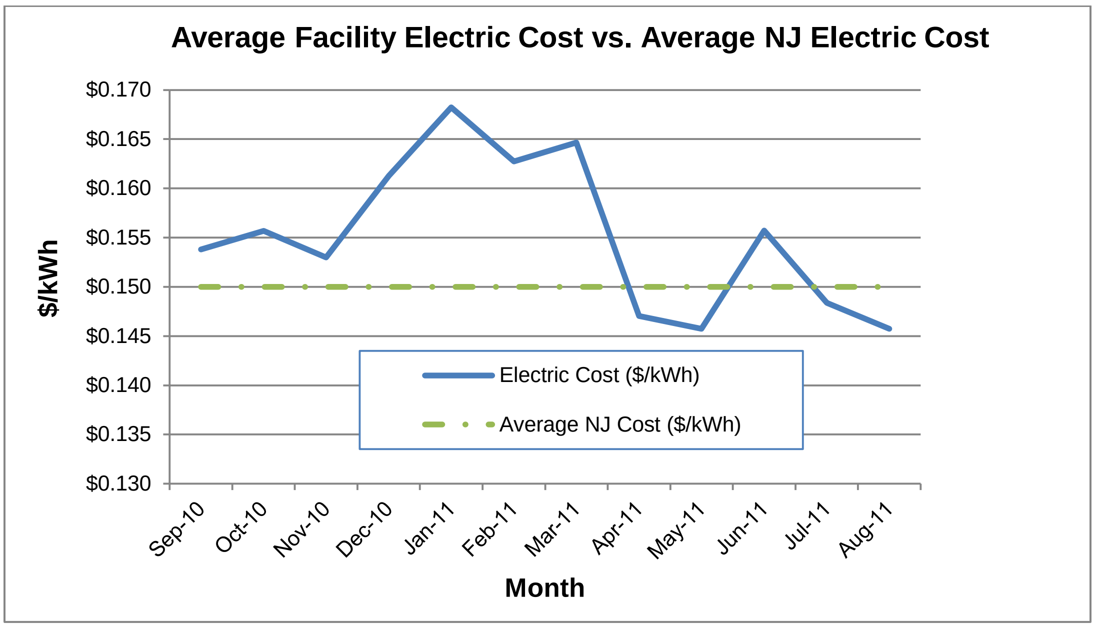
Tariff analysis can help determine if the municipality is paying the lowest rate possible for electric and gas service. Tariffs are typically assigned to buildings based on size and building type. Rate fluctuations are expected during periods of peak usage. Natural gas prices often increase during winter months since large volumes of natural gas is needed for heating equipment. Similarly, electricity prices often increase during the summer months when additional electricity is needed for cooling equipment.

As part of the utility bill analysis, SWA evaluated the current utility rates and tariffs for the Township of Washington. The High School is currently paying a general service rate for natural gas including fixed costs such as meter reading charges. The electric use for the building is direct-metered and purchased at a general service rate with an additional charge for electrical demand factored into each monthly bill. The general service rate is a market-rate based on electric usage and electric demand. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year.

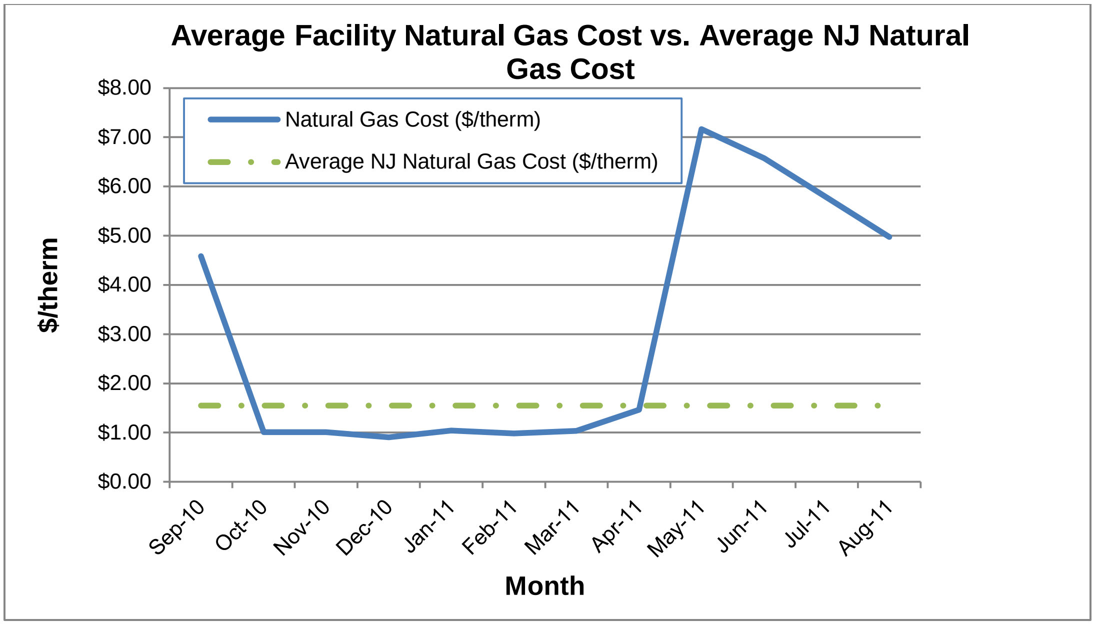
Energy Procurement strategies

Billing analysis was conducted using an average aggregated rate which is estimated based on the total cost divided by the total energy usage for each utility over a 12 month period. Average aggregated rates do not separate demand charges from usage, and instead provide a metric of inclusive cost per unit of energy. Average aggregated rates are used in order to equitably compare building utility rates to average utility rates throughout the state of New Jersey.

The average estimated NJ commercial utility rates for electric are $0.150/kWh, while the High School pays a rate of $0.155/kWh. The High School annual electric utility costs are $30,027 higher, when compared to the average estimated NJ commercial utility rates. Electric bill analysis shows fluctuations up to 15% over the most recent 12 month period. Electric rate fluctuations in the winter and spring can be attributed to a combination of demand charges and market rate changes.



The average estimated NJ commercial utility rates for gas are $1.550/therm, while the High School pays a rate of $1.171/therm. The High School pays a competitive rate for natural gas compared to the NJ State average for commercial buildings. Natural gas bill analysis shows fluctuations up to 38% over the most recent 12 month period. Utility rate fluctuations in the spring and summer months may have been caused by a combination of low usage and the assessment of fixed fees and costs.



SWA recommends that the High School further explore opportunities of purchasing electricity from third-party suppliers in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for Washington Township School District. Appendix H contains a complete list of third-party energy suppliers for the Township of Washington service area.

EXISTING FACILITY AND SYSTEMS DESCRIPTION

This section gives an overview of the current state of the facility and systems. Please refer to the Proposed Further Recommendations section for recommendations for improvement.

The school consists of three separate buildings that are directly connected for a total floor area of 412,000 ft^2. The 11/12 building is the original portion of the school built in 1962 and consists of a floor area of 198,000 ft^2 and is connected directly to the Core building. The 9/10 building was constructed in 1972 and built as a separate building with a floor are of 131,000 ft^2. In 1997, the Core building was built to connect the 9/10 and 11/12 buildings. The Core building consists of a floor are of 83,000 ft^2.

Based on visits from SWA on Wednesday, January 11th and 12th, 2012, the following data was collected and analyzed.

Building Characteristics

9/10 Building - The two-story slab on grade 131,000 square feet 9/10 building was built in 1972. It is the second school building to be built near the original high school building, and was originally a middle school. The two buildings were joined together in 1997 by means of the Core building and sits on the eastern end of the entire high school facility. Additionally the building received a window retrofit in 2001. The building houses classes for the 9th and 10th grades, as well as a cafeteria and gymnasium.

South West Façade

South East Façade

East Façade

North Façade

11/12 Building – The two-story slab on grade 198,000 square feet 11/12 building was built in 1962. It is the original high school building, and was initially open for grades 6-9 in 1963. From the opening year to 1966, additional grades were added, as the building sections were completed. The school completed a second floor addition to the east side section, as well as a library and auxiliary gymnasium. The school continued to be overcrowded forcing multiple additions and resulted in the 9/10 expansion, as well as the connection with the Core building in 1997. Other building renovations include a window retrofit in 1993, classroom renovations in 1994 and a roof modification for mechanical equipment. The building houses classes for the 11th and 1th grades, as well as two gymnasiums, an auditorium, two cafeterias, a band room and administrative offices.


Partial South Façade


Partial East Façade


Partial North West Façade


Partial North West Façade

Core Building - The two-story slab on grade 83,000 square feet Core Building was built in 1997. It is the most recent addition to the Washington Township High School, connecting the 9/10 grade section with the 11/12 grade section. The building was built in between the two existing buildings, providing additional classrooms for the increasing school population. This building houses two cafeterias, the main auditorium known as the TD Bank arts center, guidance offices, an instructional media center, various classrooms, and other faculty offices.

South Façade

East Façade

North Façade

North West Façade (Cafeteria)

Building Occupancy Profiles

9/10 Building – Occupancy is approximately 1,498 students from 7:15 AM to 2:30 PM Monday through Friday, 139 teachers, faculty, and staff members from 8:00 AM to 3:00 PM Monday through Friday. Building operations personnel are present from 6:00 AM to 4:00 PM Monday through Friday and during the nighttime cleaning hours of 3:00 PM to 11:00 PM Monday through Friday.

11/12 Building – Occupancy is approximately 1,727 students from 7:15 AM to 2:30 PM Monday through Friday, 139 teachers, faculty, and staff members from 8:00 AM to 4:00 PM Monday through Friday. Building operations personnel are present from 6:00 AM to 4:00 PM Monday through Friday and during the nighttime cleaning hours of 3:00 PM to 11:00 PM Monday through Friday.

Core Building – Occupancy is approximately 1,727 students from 7:15 AM to 3:30 PM Monday through Friday, 139 teachers, faculty, and staff members from 8:00 AM to 4:00 PM Monday through Friday. Building operations personnel are present from 6:00 AM to 4:00 PM Monday through Friday and during the nighttime cleaning hours of 3:00 PM to 11:00 PM Monday through Friday.

Building Envelope

Due to favorable weather conditions (min. 18 deg. F delta-T in/outside and no/low wind), exterior envelope infrared (IR) images were taken during the field audit. The images are used to find potential areas with deficiencies.

General Note: All findings and recommendations on the exterior envelope (base, walls, roofs, doors and windows) are based on the energy auditors' experience and expertise, on construction document reviews and on detailed visual analysis, as far as accessibility and weather conditions allowed at the time of the field audit.

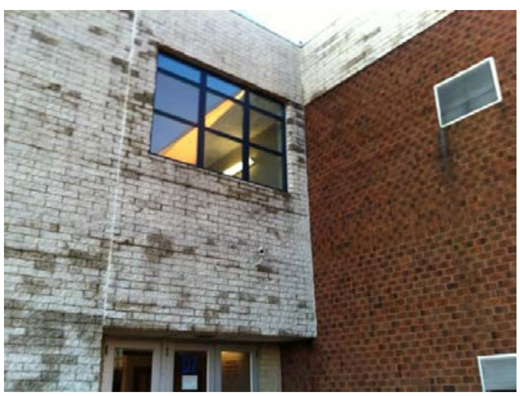
Exterior Walls

9/10 Building – The exterior wall envelope is mostly constructed of brick veneer and exposed CMU (concrete masonry units), over concrete block with an unconfirmed level of detectable insulation. Other wall sections are constructed with split-blocks over concrete block. The interior is predominantly painted CMU. Other interior walls are finished with tiles.

Note: Wall insulation levels could not be verified in the field and are based on construction plans.

Exterior and interior wall surfaces were inspected during the field audit. They were found to be in overall fair age-appropriate condition with only a few signs of uncontrolled moisture, air-leakage or other energy-compromising issues detected on all facades.

The following specific exterior wall problem spots and areas were identified:



Dark spots or discoloration of the exterior wall surfaces indicates moisture retention in the wall, which shortens the exterior façade material, which may be an indication of minimal insulation levels

11/12 Building – The exterior wall envelope is mostly constructed of brick veneer with some concrete block and corrugated metal accents, over concrete block with an unconfirmed level of detectable insulation. Other wall sections are constructed of split face block, over concrete block. The interior is predominantly painted CMU (Concrete Masonry Units). Other interior walls are finished with tiles.

Note: Wall insulation levels could not be verified in the field and are based on construction plans.

Exterior and interior wall surfaces were inspected during the field audit. They were found to be in overall fair condition with only a few signs of uncontrolled moisture, air-leakage or other energy-compromising issues detected on all facades.

The following specific exterior wall problem spots and areas were identified:

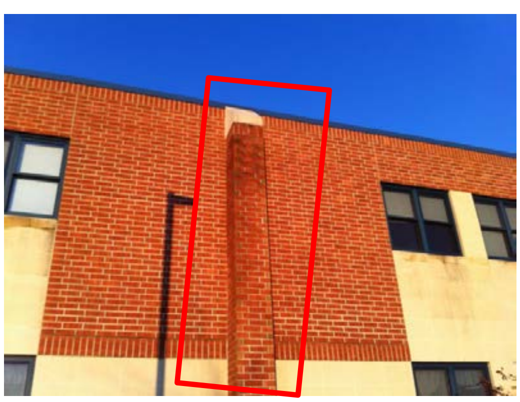
Overgrown ground vegetation touching exterior wall surfaces indicates moisture in the wall and contributes to façade deterioration

Core Building – The exterior wall envelope is mostly constructed of brick veneer and exposed CMU (concrete masonry units) and some split-face stone veneer accents, over concrete block with 1" of rigid insulation. The interior is predominantly painted CMU (Concrete Masonry Units). Other interior walls are finished with tiles and gypsum board.

Note: Wall insulation levels could not be verified in the field and are based on construction plans.

Exterior and interior wall surfaces were inspected during the field audit. They were found to be in overall fair condition with only a few signs of uncontrolled moisture, air-leakage or other energy-compromising issues detected on all facades.

The following specific exterior wall problem spots and areas were identified:



Trapped moisture in the wall and indicates minimal wall insulation.(L) Discoloration of the exterior wall surfaces indicates moisture in the wall, which shortens the exterior façade material and may be an indication of minimal insulation levels.(R)

Roof

9/10 Building – The building's roof is predominantly a flat and parapet type over steel decking, with a dark-colored EPDM single membrane from Carlisle and Hy Load. According to the Board of Education maintenance reports, the roof above the gymnasium has surpassed it's warranty period in 2008, while the high and low roofs received a new roof in 2011.

Note: Roof insulation levels for the 9/10 building could not be visually verified in the field are based on similar building types during the time of construction.

Roofs, related flashing, gutters and downspouts were inspected during the field audit. They were reported to be in overall fair condition, with some signs of uncontrolled moisture, air-leakage or other energy-compromising issues on any roof areas.

The following specific roof problem spots were identified:

Pooling/standing water at the base of the Westinghouse dry cooler (L), and foliage on roof surface may lead to clogged roof drains (R).

11/12 Building – The building's roof is predominantly a flat and low parapet type over steel decking, with a dark-colored EPDM single membrane from Goodyear. Some sections have a low-pitched roof, also with a dark-colored EPDM membrane. The roof above the new gymnasium is made up of dark-EPDM, but also has stone ballasts. According to the Board of Education maintenance records, half of the roof surfaces were replaced in 2010 and 2011.

Note: Roof insulation levels for the old building could visually be verified in the field by non-destructive methods.

Roofs, related flashing, gutters and downspouts were inspected during the field audit. They were reported to be in overall fair condition, with a few signs of uncontrolled moisture, air-leakage or other energy-compromising issues on any roof areas.

The following specific roof problem spots were identified:

Pooling/standing water (L), and foliage on roof surface has clogged roof drains (R).

Core Building –

The building's roof is predominantly a flat and parapet type over steel decking, with a dark-colored EPDM single membrane from Carlisle, over 3" of rigid insulation. According to the Board of Education maintenance records, the roof above the new section is scheduled to be replaced in 2014.

Note: Roof insulation levels for the old building could not visually be verified in the field and are based on available drawings.

Roofs, related flashing, gutters and downspouts were inspected during the field audit. They were reported to be in overall fair condition, with a few signs of uncontrolled moisture, air-leakage or other energy-compromising issues on any roof areas.

The following specific roof problem spots were identified:

Pooling/standing water at the base of a roof top unit (L), and foliage on roof surface may clog roof drains (R).

Base

9/10 Building – The building's base is composed of a slab-on-grade floor with a perimeter footing with concrete block foundation walls and no detectable slab edge/perimeter insulation.

Slab and perimeter insulation levels could not be verified in the field or on construction plans, and are based upon similar wall types and time of construction.

The building's base and its perimeter were inspected for signs of uncontrolled moisture or water presence and other energy-compromising issues. Overall the base was reported to be in good condition with no signs of uncontrolled moisture, air-leakage and/or other energy-compromising issues neither visible on the interior nor exterior.

11/12 Building – The building's base is composed of a slab-on-grade floor with a perimeter footing with concrete block foundation walls and no detectable slab edge/perimeter insulation.

Slab and perimeter insulation levels could not be verified in the field or on construction plans, and are based upon similar wall types and time of construction.

The building's base and its perimeter were inspected for signs of uncontrolled moisture or water presence and other energy-compromising issues. Overall the base was reported to be in fair condition with a few signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues neither visible on the interior nor exterior.

The following specific base problem spots were identified:

Biological growth due to poor sight drainage

Core Building – The building's base is composed of a slab-on-grade floor with a perimeter footing with concrete block foundation walls and no detectable slab edge/perimeter insulation.

Slab and perimeter insulation levels could not be verified in the field or on construction plans, and are based upon similar wall types and time of construction.

The building's base and its perimeter were inspected for signs of uncontrolled moisture or water presence and other energy-compromising issues. Overall the base was reported to be in good condition with no signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues neither visible on the interior nor exterior.

Windows

9/10 Building – The building received a window retrofit in 2001 which comprised of installing a mix of single-hung, fixed and project type windows, with low-E glazing. The building contains the following types of windows installed during the retrofit:

1. Single-hung type windows with a non-insulated aluminum frame, low-E coated double glazing and interior roller blinds. The windows sit below insulated fiberglass reinforced panels or FRP, and are located throughout the classrooms and offices in this building.

2. Fixed type windows with a non-insulated frame, low-E coated double glazing and with no interior or exterior shading devices. The windows are located by the stairwells.

3. Project in type windows with a non-insulated, low-E coated double glazing and with interior roller blinds. The windows are located on the second floor art rooms, on the North facing façade.

11/12 Building – The building contains several different types of windows:

1. Double-hung type windows with a non-insulated aluminum frame, low-E coated double glazing and interior mini blinds. The majority of the windows sit next insulated fiberglass reinforced panels, or FRP. The windows are located throughout the building in the classrooms and offices.

2. Fixed type windows with a non-insulated frame, low-E coated double glazing and with no interior or exterior shading devices. The windows are located around the main entrance doors and above some of the hallway exits.

Core Building – The building contains several different types of windows:

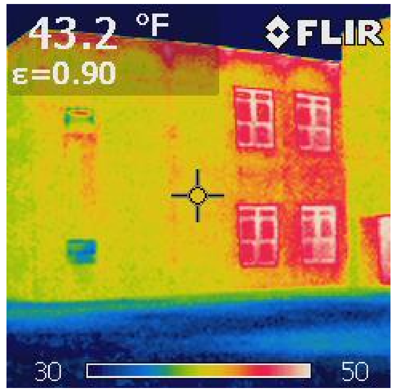
1. Double-hung type windows with a non-insulated aluminum frame, low-E coated double glazing and interior roller blinds. The windows are located throughout the building in the classrooms and offices.

2. Fixed type windows with a non-insulated frame, clear tempered glass glazing and with no interior or exterior shading devices. The windows are located around the main entrance doors and above some of the hallway exits.

3. Fixed type windows with a non-insulated frame, clear single glazing and with no interior or exterior shading devices. The windows are located around the main entrance doors and above some of the hallway exits.

Windows, shading devices, sills, related flashing and caulking were inspected as far as accessibility allowed for signs of moisture, air-leakage and other energy compromising issues. Overall, the windows were found to be in fair age appropriate condition, with only a few signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

The following specific window problem spots were identified:



Typical single-hung type windows with a non-insulated frame allow heat transfer as shown by the red and white areas.

Exterior doors

9/10 Building – The building contains several different types of exterior doors:

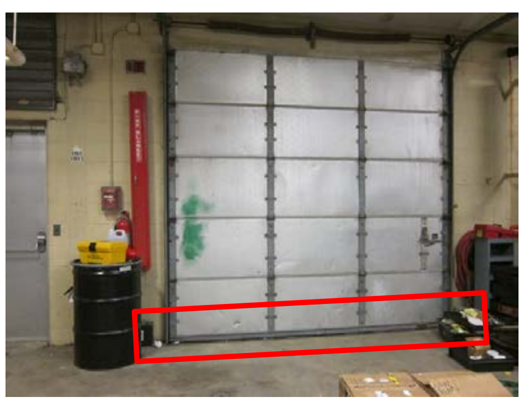
1. Glass exterior doors with single-pane glass panels and a non-insulated aluminum frame. They are located at the main entrance and hallway exits.

2. Overhead exterior type door. This door is located on the North side of the building in the mechanical room.

3. Solid metal type exterior doors with a non-insulated metal frame. They are located in the mechanical room, receiving/storage room and in the kitchen.

All exterior doors, thresholds, related flashing, caulking and weather-stripping were inspected for signs of moisture, air-leakage and other energy-compromising issues. Overall, the doors were found to be in good condition with only a few signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

The following specific door problem spots were identified:


Deteriorating weather stripping allows conditioned air to escape.

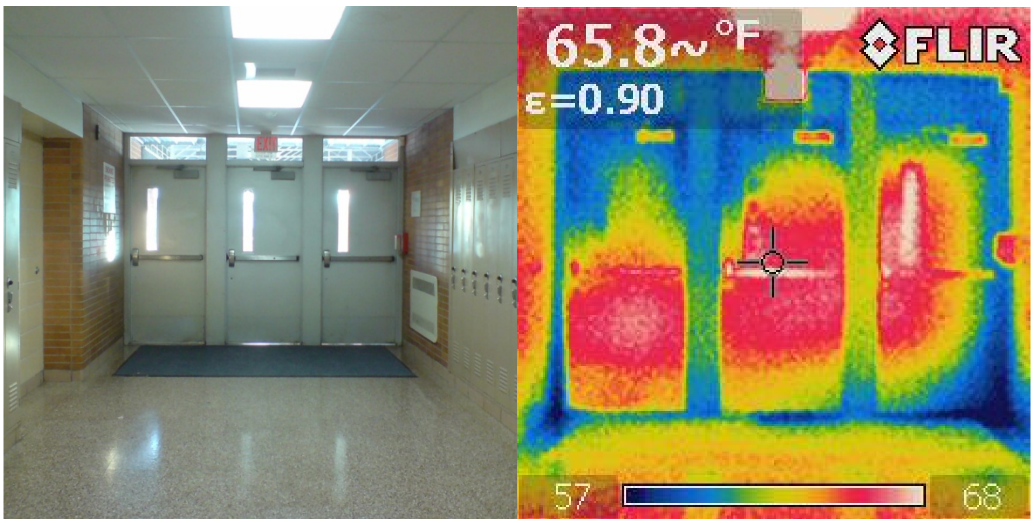
11/12 Building – The buildings contain several different types of exterior doors:

1. Aluminum type exterior doors with single-pane glass panels and a non-insulated frame. They are located at the main entrance and hallway exits.

2. Metal type exterior doors with a non-insulated frame. They are located at the hallway exits and other emergency exits.

All exterior doors, thresholds, related flashing, caulking and weather-stripping were inspected for signs of moisture, air-leakage and other energy-compromising issues. Overall, the doors were found to be in fair condition with some signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

The following specific door problem spots were identified:



Single-pane glass panels above the main doors have poor insulating properties and deteriorating weather-stripping allows warm air to escape in the winter and warm air to enter in the summer. The window and door frames are also non-insulated, allowing heat transfer.

Core Building – The buildings contain several different types of exterior doors:

1. Aluminum type exterior doors with single-pane tempered glass panels and a non-insulated frame. They are located at the main entrance.

2. Fiber-reinforced plastic (FRP) type doors with tempered insulating glass and a non-insulated frame. They are located in west end and east end entrances, on the south façade, as well as other entrances on the north façade.

3. Insulated galvanized steel exterior doors with non-insulated aluminum frames. These doors are located in the mechanical room and cafeteria, on the north side of the building.

4. Insulated overhead galvanized steel door with non-insulated aluminum frames. This door is located on the north façade in the auditorium.

All exterior doors, thresholds, related flashing, caulking and weather-stripping were inspected for signs of moisture, air-leakage and other energy-compromising issues. Overall, the doors were found to be in good condition with only a few signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

The following specific door problem spots were identified:

Single-pane glass panels above the main doors have poor insulating properties and deteriorating weather-stripping allows warm air to escape in the winter and warm air to enter in the summer. The window and door frames are also non-insulated, allowing heat transfer.

Building air-tightness

Overall the field auditors found all of the buildings to be reasonably air-tight with only a few areas of suggested improvements, as described in more detail earlier in this chapter.

The air tightness of buildings helps maximize all other implemented energy measures and investments, and minimizes potentially costly long-term maintenance, repair and replacement expenses.

Mechanical Systems

Heating Ventilation Air Conditioning

All spaces in the High School are mechanically ventilated, heated and cooled. Since the High School consists of three separate buildings; there is a separate HVAC system for each building. The 9/10 building is the only all-electric building, while the 11/12 and Core buildings both receive natural gas service. In general, the 11/12 and Core buildings are conditioned via unit ventilators, air handling units and packaged rooftop units while the 9/10 building contains individual heat pumps, air handling units and packaged rooftop units.

Equipment

9/10 Building – The building contains package rooftop units, condensing units and heat pumps to condition each space within the building. Corridors and areas with large volume such as gymnasiums are ventilated and conditioned via rooftop packaged units. All classroom and office spaces are conditioned with the use of electric "Classmate" heat pumps. The building contains both an older model Classmate that is connected to the 70 ton Baltimore Air Coil (Model #VXI-70) cooling tower via a glycol loop for cooling and a newer model Classmate that is entirely electric. Each heat pump is connected to an air shaft that receives ventilation via central supply fans.

Typical older "Classmate" heat pump (L); Typical newer "Classmate" heat pump (R)

11/12 Building – The building is served by a central heating plant with two 10,400 MBH Superior Steam Generator cast iron boilers installed in 1962. Each boiler has an 80% nameplate thermal efficiency. Additionally, there is a 1,040 MBH HB Smith (Model #6500 Mills) boiler that was installed in 1992 with a thermal efficiency of 80% that also serves a portion of this building. Each heating plant at this building serves a hot water loop that provides heating hot water to unit ventilators and baseboard heaters located throughout the building. The building is cooled by a combination of rooftop package units and condensing units that serve unit ventilators located in classrooms.

Core Building – The building is served by two 4,100 MBH output Bryan boilers (Model #RV500-WFDG) each with a thermal efficiency of 80%. Each boiler produces hot water that is circulated with two Marathon Electric 25 HP and one Marathon Electric 7.5 HP pump motors controlled with Variable Frequency Drives (VFDs). The boilers are original to the Core building and were installed in 1996.

The Core building contains 2 Trane chillers; one 275 ton (Model #RTAC2754) and one 250 ton (Model #RTAC2504). Each electric rotary chiller contains air cooled condensers and uses R-134A refrigerant. The 250 Trane chiller is connected to a block of 6 ice storage units to provide free cooling at the school between 7:30 AM and 12 PM. This chiller fires between the hours of 1 AM and 3:30 AM to build ice and the building uses free cooling via ice until 12 PM on most days. Under extreme hot temperatures, mechanical cooling may begin as early as 11am based on the burn rate of ice storage. Chilled water is circulated through the building via 2 US Electrical 60 HP chilled water return pumps controlled by VFDs.

Ventilation is provided to the Core building via packaged rooftop units and 2 large Heat Recovery Ventilators (HRVs). The HRVs were custom built and installed in 1998 to provide ventilation while maintaining energy efficiency.

Controls

9/10 Building – All HVAC equipment in the 9/10 building is controlled locally via thermostats and time clocks. Equipment is operated based on time of day. There is no central control equipment for this building and therefore no central BMS system.

11/12 Building – Boilers using a Heat-Timer (Model #HWRQ Platinum) controller. The Heat-Timer controls heating parameters such as hot water supply temperature via control logic based on outside air temperature and hot water return temperature. The heating system has an outside air temperature cutoff of 55°F to ensure heating does not occur above this outside air temperature. Building equipment including rooftop packaged units and unit ventilators are controlled centrally via the Niagara Talon BMS system. The BMS system divides the schools into zones labeled A-F Wings. Packaged rooftop units are equipped with control logic for warm up and cool down modes as well as enthalpy control for economizer mode. All unit ventilators and packaged units serve single zones and are controlled by thermostats located in the areas that each piece of equipment serves. The thermostat is generally set for 72°F during the winter and 74°F during the summer; however, occupants are only capable of adjusting the temperature +/- 2°F in either direction from the setpoint.

Core Building – All building equipment including boilers, chillers, ice storage, fan coil units, air handling units, water systems, cooling towers, heat recovery units, VAVs, exhaust fans, chemical fume hoods and the theater equipment are operated by a centralized Johnson Metasys BMS control.

All unit ventilators and packaged units are controlled by thermostats located in the areas that each piece of equipment serves. Thermostats are generally set for 72°F during the winter and 74°F during the summer; however, occupants are only capable of adjusting the temperature +/- 2°F in either direction from the setpoint.

Unit ventilators and packaged units are equipped rigorous controls. These units contain additional controls that allow for economizer mode based on outside air temperature and enthalpy. The building has one temperature and humidity sensor mounted outside the boiler room as well as a humidity sensor mounted in the courtyard. The humidity sensors allow the building to read enthalpy at the perimeter of the building as well as the courtyard.

All BMS-connected units are equipped with both a warm-up and cool-down mode to pre-condition the spaced using return air while the building is not occupied. The BMS ensures that minimum ventilation requirements are met during occupied mode and closes outside air dampers and disables interconnected exhaust fans when the building is in unoccupied mode. In unoccupied mode, teachers and staff can press a manual override switch to allow units to turn on for a maximum of 2 hours if required.

Rooftop units monitor return air humidity and control humidity in the space via reheat coils. Valves located in the units allow both hot water reheat as well as refrigerant to flow in the reheat coils to dehumidify. Rooftop units have an unoccupied setback of 85°F during the cooling season and 55°F during the heating season, with night cycling.

Domestic Hot Water

9/10 Building – The building contains one Patterson-Kelly (Model #531-5) gas-fired storage water heater with an input of 650 MBH. The Patterson-Kelly boiler is equipped with a heat exchanger that uses flue gases to preheat domestic cold water. The unit is also attached to a 1,000 gallon storage tank and is programmed to shut off on nights and weekends by the use of an Intermatic time clock.

11/12 Building – The building contains 3 identical Bradford-White Commercial Hydrojet (Model #EF100T300) gas-fired domestic hot water heaters. Each domestic hot water has an input of 300 MBH with 100 gallons storage and 378.5 gallons per hour recovery. Each unit was installed in 2008 and serves a central domestic hot water loop.

Core Building – The core building is fed domestic hot water from a Bradford-White gas-fired, domestic hot water heater (Model #D100T2503NA). This unit has an input of 250 MBH with 98 gallons of storage and 227.3 gallons per hour recovery. This unit was installed in 1997 and is currently operating beyond its useful lifetime.

Electrical systems

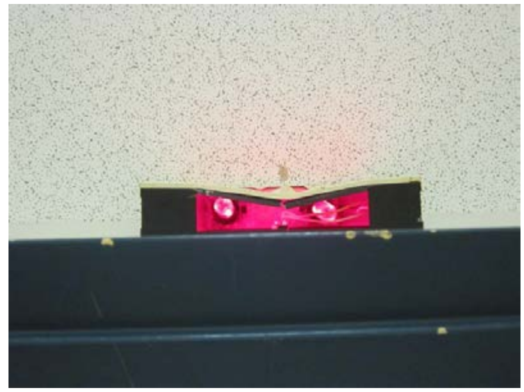
Lighting

See attached lighting schedule in Appendix C for a complete inventory of lighting throughout the building including estimated power consumption and proposed lighting recommendations.

9/10 Building – Interior lighting - The primary interior lighting in the 9/10 Building is electronically ballasted T8 lamped fixtures. The hallways, classrooms and offices are predominantly illuminated using recessed T8 fixtures. Based on measurements of lighting levels for each space, there are no vastly over-illuminated areas.

Typical interior T8 lighting)

Exit Lights - Exit signs were found to be LED types with uncommon LED tube lamps.



Typical old LED exit signs

Exterior Lighting - The exterior lighting surveyed during the building audit was found to be a combination of high pressure sodium and CFL fixtures. Exterior lighting is controlled by both photocells and timers.


Typical recessed and wall pack high pressure sodium fixtures.

11/12 Building – Interior lighting – The primary interior lighting in the 11/12 Building is electronically ballasted T8 lamped fixtures. The hallways currently have recessed T8 fixtures in the hallways, while the classrooms have ceiling mounted linear T8 fixtures. Based on measurements of lighting levels for each space, there are no vastly over-illuminated areas.


Typical interior T8 lighting in classrooms and hallways

Exit Lights - Exit signs were found to be LED types, however many were found to be an older LED type.

Typical old (L) LED exit signs

Exterior Lighting - The exterior lighting surveyed during the building audit was found to be a combination of high pressure sodium and incandescent lamped fixtures. Exterior lighting is controlled by both photocells and timers.

Typical recessed incandescent lamped fixture (L) and wall pack high pressure sodium fixture (R).

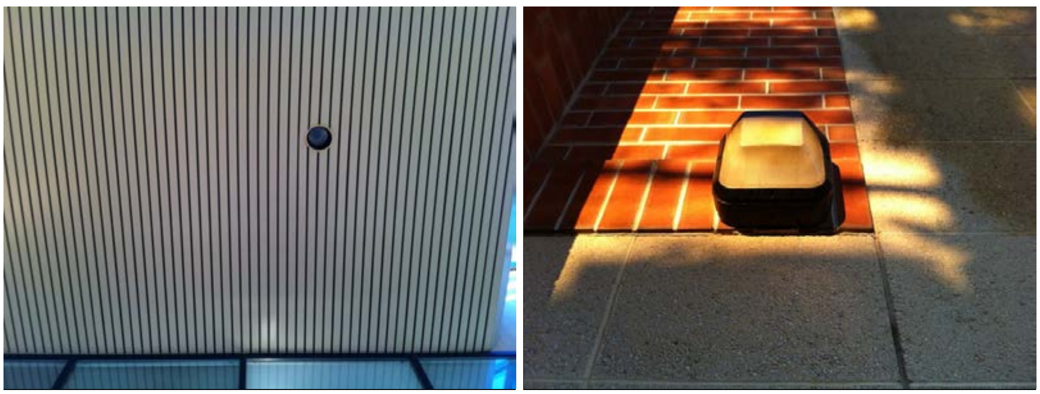
Core Building – Interior lighting - The primary interior lighting in the Core Building is electronically ballasted T8 lamped fixtures. The hallways currently have T8 u-shaped lamps, while the classrooms have suspended linear T8 fixtures. Based on measurements of lighting levels for each space, there are no vastly over-illuminated areas.

Typical interior T8 lighting)

Exit Lights - Exit signs were found to be LED types, however many were found to be an older LED type.

Typical old (L) LED exit signs

Exterior Lighting - The exterior lighting surveyed during the building audit was found to be a combination of high pressure sodium and CFL fixtures. Exterior lighting is controlled by both photocells and timers.



Typical recessed and wall pack high pressure sodium fixtures.

Appliances and process

9/10 Building – SWA has conducted a general survey of larger, installed equipment. Appliances and other miscellaneous equipment account for a significant portion of electrical usage within the building. Typically, appliances are referred to as “plug-load” equipment, since they are not inherent to the building’s systems, but rather plug into an electrical outlet. Equipment such as process motors, computers, computer servers, radio and dispatch equipment, refrigerators, vending machines and printers all create an electrical load on the building that is hard to separate out from the rest of the building’s energy usage based on utility analysis.

Installed at 9/10 Building are several refrigerators, washing machines, and walk-in refrigerator and freezer.

Washing machines and walk-in freezer

10/11 Wing – SWA has conducted a general survey of larger, installed equipment. Appliances and other miscellaneous equipment account for a significant portion of electrical usage within the building. Typically, appliances are referred to as "plug-load" equipment, since they are not inherent to the building's systems, but rather plug into an electrical outlet. Equipment such as process motors, computers, computer servers, radio and dispatch equipment, refrigerators, vending machines and printers all create an electrical load on the building that is hard to separate out from the rest of the building's energy usage based on utility analysis.

Installed at 11/12 Building are several a beverage and snack vending machines, and walk-in freezers.

Walk-in freezers

Core Section – SWA has conducted a general survey of larger, installed equipment. Appliances and other miscellaneous equipment account for a significant portion of electrical usage within the building. Typically, appliances are referred to as "plug-load" equipment, since they are not inherent to the building's systems, but rather plug into an electrical outlet. Equipment such as process motors, computers, computer servers, radio and dispatch equipment, refrigerators, vending machines and printers all create an electrical load on the building that is hard to separate out from the rest of the building's energy usage based on utility analysis.

Installed at Core Building are several refrigerators, a beverage vending machine, and walk-in freezers.

Walk-in freezers and kitchen refrigerator

Elevators

9/10 Building – The building is equipped with a hydraulic elevator providing access between the first and second levels for faculty and the handicapped.

11/12 Building – The building is equipped with a hydraulic elevator, located on the Eastern section, providing access between the first and second levels for faculty and the handicapped.

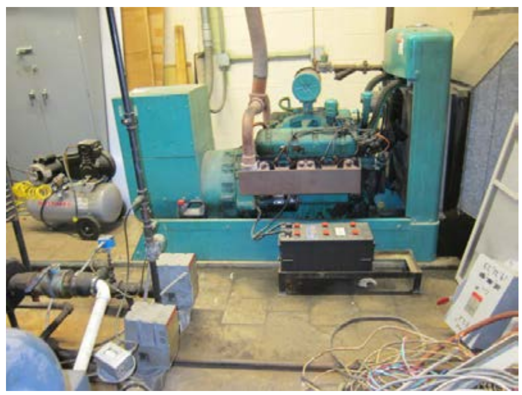
Core Building – The building is equipped with a hydraulic elevator, providing access between the first and second levels for faculty and the handicapped.

Other electrical systems

9/10 Building - There are not currently any other significant energy-impacting electrical systems installed at 9/10 Building School other than a 30 kW natural gas Kohler Emergency Generator located in the boiler room. This Onan emergency generator is operated once per week as a functional test for 30 minutes.

30 kW natural gas generator

11/12 Building – There are not currently any other significant energy-impacting electrical systems installed at 11/12 Building School other than a 85 kW natural gas Onan Emergency Generator located in the boiler room. This Onan emergency generator is operated once per week as a functional test for 30 minutes.



85 kW natural gas generator

Core Building – There are not currently any other significant energy-impacting electrical systems installed at the Core Building.

RENEWABLE AND DISTRIBUTED ENERGY MEASURES

Renewable energy is defined as any power source generated from sources which are naturally replenished, such as sunlight, wind and geothermal. Technology for renewable energy is improving and the cost of installation is decreasing due to both demand and the availability of government-sponsored funding. Renewable energy reduces the need for using either electricity or fossil fuel, therefore lowering costs by reducing the amount of energy purchased from the utility company. Solar photovoltaic panels and wind turbines use natural resources to generate electricity. Geothermal systems offset the thermal loads in a building by using water stored in the ground as either a heat sink or heat source. Cogeneration or Combined Heat and Power (CHP) allows for heat recovery during electricity generation.

Existing systems

Currently there are no renewable energy systems installed in the building.

Evaluated Systems

Solar Photovoltaic

Photovoltaic panels convert light energy received from the sun into a usable form of electricity. Panels can be connected into arrays and mounted directly onto building roofs, as well as installed onto built canopies over areas such as parking lots, building roofs or other open areas. Electricity generated from photovoltaic panels is generally sold back to the utility company through a net meter. Net-metering allows the utility to record the amount of electricity generated in order to pay credits to the consumer that can offset usage and demand costs on the electric bill. In addition to generation credits, there are incentives available called Solar Renewable Energy Credits (SRECs) that are subsidized by the state government. Specifically, the New Jersey State government pays a market-rate SREC to facilities that generate electricity in an effort to meet state-wide renewable energy requirements.

Based on utility analysis and a study of roof conditions, the Washington Township High School facility is a good candidate for a 97.75 kW Solar Panel installation. See CI# 1.

Solar Thermal Collectors

Solar thermal collectors are not cost-effective for this building and would not be recommended due to the insufficient and intermittent use of domestic hot water throughout the building to justify the expenditure.

Wind

The High School is not a good candidate for wind power generation due to insufficient wind conditions in this area of New Jersey.

Geothermal

The High School is not a good candidate for geothermal installation since it would require replacement of the entire existing HVAC system, as well as extensive installation of geothermal wells and pumping equipment.

Combined Heat and Power

The High School is not a good candidate for CHP installation and would not be cost-effective due to the size and operations of the building. Typically, CHP is best suited for buildings with a constant electrical baseload to accommodate the electricity generated, as well as a means for using waste heat generated. Additionally, the seasonal occupancy schedule of the High School is not well suited for a CHP installation.

PROPOSED ENERGY CONSERVATION MEASURES

Energy Conservation Measures (ECMs) are recommendations determined for the building based on improvements over current building conditions. ECMs have been determined for the building based on installed cost, as well as energy and cost-savings opportunities.

Capital Improvements are recommendations for the building that may not be cost-effective at the current time, but that could yield a significant long-term payback. Capital improvements may also constitute equipment that is currently being operated beyond its useful lifetime. These recommendations should typically be considered as part of a long-term capital improvement plan. Capital improvements should be considered if additional funds are made available, or if the installed costs can be shared with other improvements, such as major building renovations.

Recommendations: Energy Conservation Measures

#	Energy Conservation Measures
ECM 1	Replace 8 incandescent lamps with CFLs (9/10 Building)
ECM 2	Replace 100 incandescent lamps with CFLs (11/12 Building)
ECM 3	Replace 140 incandescent lamps with CFLs (Core building)
ECM 4	Replace 35 high bay metal halide fixtures with T5s (9/10 Building)
ECM 5	Replace 92 high bay metal halide fixtures with T5s (11/12 Building)
ECM 6	Install 127 new occupancy sensors (9/10 Building)
ECM 7	Install 62 new bi-level fixtures in stairwells (9/10 Building)
ECM 8	Replace 45 old LED exit signs with newer LED exit signs (11/12 Building)
ECM 9	Install 100 new occupancy sensors (11/12 Building)
ECM 10	Install 20 new bi-level fixtures in stairwells (Core Building)
ECM 11	Replace 30 old LED exit signs with newer LED exit signs (Core Building)
ECM 12	Install 49 new occupancy sensors (Core Building)
	Capital Improvement Measures
CI 1	Install 97.75 kW Solar Photovoltaic System (Core and 9/10 Building)
CI 2	Replace existing roof (9/10 Building)
CI 3	Replace existing exterior light fixtures (9/10 Building)
CI 4	Replace existing windows with Energy Star certified windows (9/10 Building)
CI 5	Replace existing roof (11/12 Building)
CI 6	Replace existing exterior light fixtures (11/12 Building)
CI 7	Replace existing windows with Energy Star certified windows (11/12 Building)
CI 8	Replace existing roof (Core Building)
CI 9	Replace existing exterior light fixtures (Core Building)
CI 10	Replace End-of-Life RTUs and Condensing Units (9/10 Building)
CI 11	Replace End-of-Life RTUs and Condensing Units (11/12 Building)
CI 12	Replace End-of-Life AHU (Core Building)
CI 13	Replace two End-of-Life 10,400 cast iron boilers (11/12 Building)

CI 14	**Install BMS system (9/10 Building)**
CI 15	**Optimize chilled water and ice storage plant (Core Building)**
CI 16	**Replace 59 EDPAC heat pumps and glycol system**
CI 17	**Replace 250 MBH Bradford-White domestic hot water heater (Core building)**

In order to clearly present the overall energy opportunities for the building and ease the decision of which ECM to implement, SWA calculated each ECM independently and did not incorporate slight/potential overlaps between some of the listed ECMs (i.e. lighting change influence on heating/cooling.

ECM #1: Replace 8 incandescent lamps with CFLs (9/10 Building)

On the day of the site visit, SWA completed a lighting inventory of the 9/10 Building (see Appendix C). The existing lighting inventory contained a total of 8 inefficient incandescent lamps. SWA recommends that each incandescent lamp is replaced with a more efficient, Compact Fluorescent Lamp (CFL). CFLs are capable of providing equivalent or better light output while using less power.

Installation cost:

Estimated installed cost: $72 (includes $54 of labor)
Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$72	501	0.0	0	0.0	$0	$78	5	$389	0.9	440%	88%	105%	$24	897

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis.

Rebates/financial incentives:

- NJ Clean Energy – Direct Install program (Up to 70% of installed costs)

Please see APPENDIX K for more information on Incentive Programs.

ECM #2: Replace 100 incandescent lamps with CFLs (11/12 Building)

On the day of the site visit, SWA completed a lighting inventory of the 11/12 Building (see Appendix C). The existing lighting inventory contained a total of 100 inefficient incandescent lamps. SWA recommends that each incandescent lamp is replaced with a more efficient, Compact Fluorescent Lamp (CFL). CFLs are capable of providing equivalent or better light output while using less power.

Installation cost:

Estimated installed cost: $900 (includes $400 of labor)
Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$900	6,479	0.0	0	0.1	$0	$1,005	5	$5,027	0.9	459%	92%	109%	$314	11,601

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis.

Rebates/financial incentives:

- NJ Clean Energy – Direct Install program (Up to 70% of installed costs)

Please see APPENDIX K for more information on Incentive Programs.

ECM #3: Replace 140 incandescent lamps with CFLs (Core Building)

On the day of the site visit, SWA completed a lighting inventory of the Core Building (see Appendix C). The existing lighting inventory contained a total of 100 inefficient incandescent lamps. SWA recommends that each incandescent lamp is replaced with a more efficient, Compact Fluorescent Lamp (CFL). CFLs are capable of providing equivalent or better light output while using less power.

Installation cost:

Estimated installed cost: $1,290 (includes $550 of labor)
Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$1,290	12,331	0.0	0	0.1	$0	$1,913	5	$9,567	0.7	642%	128%	147%	$597	22,079

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis.

Rebates/financial incentives:

- NJ Clean Energy – Direct Install program (Up to 70% of installed costs)

Please see APPENDIX K for more information on Incentive Programs.

ECM #4: Replace 35 high bay metal halide fixtures with T5 fluorescent pendant lights (9/10 Building)

On the day of the site visit, SWA completed a lighting inventory of the 9/10 Building (see Appendix C). The gymnasium lighting consists of standard probe start Metal Halide (MH) lamps. SWA recommends replacing the interior higher wattage MH fixtures with T5 pendant lamps which offer better performance characteristics. They produce higher light output both initially and over time, operate more efficiently, produce whiter light, last much longer and turn on and re-strike faster. Due to these characteristics, energy savings can be realized via one-to-one substitution of lower-wattage systems, or by taking advantage of higher light output and reducing the number of fixtures required in the space. The labor for the recommended installations is assumed to be performed by in-house electricians.

Installation cost:

Estimated installed cost: $8,660
Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$8,660	10,430	2.0	0	0.1	$875	$2,493	10	$24,934	3.5	188%	19%	14%	$779	18,675

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis.

Rebates/financial incentives:

- NJ Clean Energy – Direct Install program (Up to 70% of installed costs)
- NJ Clean Energy – SmartStart program – High Bay T5 fixtures with electronic ballasts ($16 per fixture – Maximum incentive amount is $560

Please see APPENDIX K for more information on Incentive Programs.

ECM #5: Replace 92 high bay metal halide fixtures with T5 fluorescent pendant lights (11/12 Building)

On the day of the site visit, SWA completed a lighting inventory of the 11/12 Building (see Appendix C). The gymnasium lighting consists of standard probe start Metal Halide (MH) lamps. SWA recommends replacing the interior higher wattage MH fixtures with T5 pendant lamps which offer better performance characteristics. They produce higher light output both initially and over time, operate more efficiently, produce whiter light, last much longer and turn on and re-strike faster. Due to these characteristics, energy savings can be realized via one-to-one substitution of lower-wattage systems, or by taking advantage of higher light output and reducing the number of fixtures required in the space. The labor for the recommended installations is assumed to be performed by in-house electricians.

Installation cost:

Estimated installed cost: $14,343
Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$14,343	27,416	3.0	0	0.2	$2,300	$6,554	10	$65,542	2.2	357%	36%	36%	$2,047	49,088

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis.

Rebates/financial incentives:

- NJ Clean Energy – Direct Install program (Up to 70% of installed costs)
- NJ Clean Energy – SmartStart program – High Bay T5 fixtures with electronic ballasts ($16 per fixture – Maximum incentive amount is $1,472

Please see APPENDIX K for more information on Incentive Programs.

ECM #6: Install 127 new occupancy sensors (9/10 Building)

On the days of the site visits, SWA completed a lighting inventory of the 9/10 Building (see Appendix C). The building contains several areas that could benefit from the installation of occupancy sensors. These areas consisted of various storage rooms, bathrooms and offices that are used sporadically throughout the day and could show energy savings by having the lights turn off after a period of no occupancy. Typically, occupancy sensors have an adjustable time delay that shuts down the lights automatically if no motion is detected within a set time period. Advanced micro-phonic lighting sensors include sound detection as a means to controlling lighting operation.

Installation cost:

Estimated installed cost: $25,400 (includes $17,350 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$25,400	77,297	0.0	0	0.6	$0	$11,994	10	$119,943	2.1	372%	37%	38%	$3,745	138,400

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis.

Rebates/financial incentives:

- NJ Clean Energy – SmartStart – Wall-mounted Occupancy Sensors ($20 per control)
    - Maximum Incentive Amount: $2,540
- NJ Clean Energy – Direct Install (Up to 70% of installed costs)

Please see APPENDIX K for more information on Incentive Programs.

ECM #7: Install 62 new bi-level fixtures in stairwells (9/10 Building)

On the day of the site visit, SWA completed a lighting inventory of the 9/10 building (see Appendix C). The school currently contains T8 fluorescent lighting fixtures that are operated 16 hours per day in stairwells. Technology called bi-level lighting, combines fluorescent lighting fixtures with an occupancy sensor. These efficient light fixtures operate at a minimal light level in order to meet code and safety requirements and power up to a higher level when any motion is detected in the stairwells. The 9/10 building would be an appropriate application for these fixtures since there are large periods of time when the stairwells should be unoccupied.

Installation cost:

Estimated installed cost: $9,400 (includes $3,600 of labor)
Source of cost estimate: RS Means, Published and established costs, NJ Clean Energy Program

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$9,400	13,234	0.0	0	0.1	$0	$2,054	15	$30,803	4.6	228%	15%	3%	$641	23,695

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis.

Rebates/financial incentives:

- NJ Clean Energy – Smart Start – Occupancy controlled hi-low fluorescent controls ($25 per control)
- NJ Clean Energy – Direct Install (Up to 70% of installed cost)

Please see APPENDIX K for more information on Incentive Programs.

ECM #8: Replace 45 old LED Exit Signs with Newer LED Exit Signs (11/12 Building)

During the field audit, SWA completed a building lighting inventory (see Appendix C). SWA observed that the building contains a number of old LED Exit signs. SWA recommends replacing these with newer low wattage LED types. Replacing existing Exit signs with newer LED Exit signs can result in lower kilowatt-hour consumption, as well as lower maintenance costs. Since Exit signs operate 24 hours per day, they can consume large amounts of energy. In addition, older Exit signs require frequent maintenance due to the short life span of the lamps that light them. LED Exit signs last at least 5 years. In addition, LED Exit signs offer better fire code compliance because they are maintenance free in excess of 10 years. LED Exit signs are usually brighter than comparable incandescent or fluorescent signs, and have a greater contrast with their background due to the monochromatic nature of the light that LEDs emit. The building owner may decide to perform this work with in-house resources from the Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor.

Installation cost:

Estimated installed cost: $5,873 (includes $1,800 of labor)
Source of cost estimate: RS Means, Published and established costs, NJ Clean Energy Program

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$5,873	8,475	1.0	0	0.1	$126	$1,441	15	$21,616	4.1	268%	18%	7%	$450	15,174

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis.

Rebates/financial incentives:

- NJ Clean Energy – Smart Start - $20 per fixture – Maximum incentive amount is $900.
- NJ Clean Energy – Direct Install (Up to 70% of installed cost)

Please see APPENDIX K for more information on Incentive Programs.

ECM #9: Install 100 new occupancy sensors (11/12 Building)

On the days of the site visits, SWA completed a lighting inventory of the 11/12 Building (see Appendix C). The building contains several areas that could benefit from the installation of occupancy sensors. These areas consisted of various storage rooms, bathrooms and offices that are used sporadically throughout the day and could show energy savings by having the lights turn off after a period of no occupancy. Typically, occupancy sensors have an adjustable time delay that shuts down the lights automatically if no motion is detected within a set time period. Advanced micro-phonic lighting sensors include sound detection as a means to controlling lighting operation.

Installation cost:

Estimated installed cost: $20,000 (includes $5,000 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$20,000	57,908	0.0	0	0.5	$0	$8,986	10	$89,857	2.2	349%	35%	35%	$2,806	103,684

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis.

Rebates/financial incentives:

- NJ Clean Energy – SmartStart – Wall-mounted Occupancy Sensors ($20 per control)
  - Maximum Incentive Amount: $2,000
- NJ Clean Energy – Direct Install (Up to 70% of installed costs)

Please see APPENDIX K for more information on Incentive Programs.

ECM #10: Install 20 new bi-level fixtures in stairwells (Core Building)

On the day of the site visit, SWA completed a lighting inventory of the Core Building (see Appendix C). The school currently contains T8 fluorescent lighting fixtures that are operated 16 hours per day in stairwells. Technology called bi-level lighting, combines fluorescent lighting fixtures with an occupancy sensor. These efficient light fixtures operate at a minimal light level in order to meet code and safety requirements and power up to a higher level when any motion is detected in the stairwells. The Core Building would be an appropriate application for these fixtures since there are large periods of time when the stairwells should be unoccupied.

Installation cost:

Estimated installed cost: $9,400 (includes $3,600 of labor)
Source of cost estimate: RS Means, Published and established costs, NJ Clean Energy Program

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$2,890	3,128	0.0	0	0.0	$0	$485	15	$7,281	6.0	152%	10%	-6%	$152	5,601

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis.

Rebates/financial incentives:

- NJ Clean Energy – Smart Start – Occupancy controlled hi-low fluorescent controls ($25 per control)
- NJ Clean Energy – Direct Install (Up to 70% of installed cost)

Please see APPENDIX K for more information on Incentive Programs.

ECM #11: Replace 30 old LED Exit Signs with Newer LED Exit Signs (Core Building)

During the field audit, SWA completed a building lighting inventory (see Appendix C). SWA observed that the building contains a number of old LED Exit signs. SWA recommends replacing these with newer low wattage LED types. Replacing existing Exit signs with newer LED Exit signs can result in lower kilowatt-hour consumption, as well as lower maintenance costs. Since Exit signs operate 24 hours per day, they can consume large amounts of energy. In addition, older Exit signs require frequent maintenance due to the short life span of the lamps that light them. LED Exit signs last at least 5 years. In addition, LED Exit signs offer better fire code compliance because they are maintenance free in excess of 10 years. LED Exit signs are usually brighter than comparable incandescent or fluorescent signs, and have a greater contrast with their background due to the monochromatic nature of the light that LEDs emit. The building owner may decide to perform this work with in-house resources from the Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor.

Installation cost:

Estimated installed cost: $3,915 (includes $970 of labor)
Source of cost estimate: RS Means, Published and established costs, NJ Clean Energy Program

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$3,915	5,913	0.8	0	0.0	$84	$1,002	15	$15,023	3.9	284%	19%	9%	$313	10,587

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis.

Rebates/financial incentives:

- NJ Clean Energy – Smart Start - $20 per fixture – Maximum incentive amount is $600.
- NJ Clean Energy – Direct Install (Up to 70% of installed cost)

Please see APPENDIX K for more information on Incentive Programs.

ECM #12: Install 49 new occupancy sensors (Core Building)

On the days of the site visits, SWA completed a lighting inventory of the Core Building (see Appendix C). The building contains several areas that could benefit from the installation of occupancy sensors. These areas consisted of various storage rooms, bathrooms and offices that are used sporadically throughout the day and could show energy savings by having the lights turn off after a period of no occupancy. Typically, occupancy sensors have an adjustable time delay that shuts down the lights automatically if no motion is detected within a set time period. Advanced micro-phonic lighting sensors include sound detection as a means to controlling lighting operation.

Installation cost:

Estimated installed cost: $9,800 (includes $3,100 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$9,800	38,038	0.0	0	0.3	$0	$5,902	10	$59,024	1.7	502%	50%	53%	$1,843	68,107

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis.

Rebates/financial incentives:

- NJ Clean Energy – SmartStart – Wall-mounted Occupancy Sensors ($20 per control)
    - Maximum Incentive Amount: $980
- NJ Clean Energy – Direct Install (Up to 70% of installed costs)

Please see APPENDIX K for more information on Incentive Programs.

CI #1: Install 97.75 kW Solar Photovoltaic system

Currently, the High School does not use any renewable energy systems. Renewable energy systems such as photovoltaic (PV) panels can be mounted on the building roof facing south which can offset a portion of the purchased electricity for the building. Power stations generally have two separate electrical charges: usage and demand. Usage is the amount of electricity in kilowatt-hours that a building uses from month to month. Demand is the amount of electrical power that a building uses at any given instance in a month period. During the summer periods, electric demand at a power station is high, due to the amount of air conditioners, lights, and other equipment being used within the region. Demand charges increase to offset the utility's cost to provide enough electricity at that given time. Photovoltaic systems offset the amount of electricity used by a building and help to reduce the building's electric demand, resulting in a higher cost savings. Installing a PV system will offset electric demand and reduce annual electric consumption, while utilizing available state incentives. PV systems are modular and readily allow for future expansions.

The size of the system was determined considering the available roof surface area, without compromising service space for roof equipment and safety, as well as the facilities' annual base load and mode of operation. A commercial multi-crystalline 230 watt panel has 17.5 square feet of surface area (providing 13.1 watts per square foot). A 97.75 kW system needs approximately 425 panels which would take up 7,438 square feet. Additionally, PV system installations should be accompanied by an evaluation of the roof's structural stability.

A PV system would reduce the building's electric load and allow more capacity for surrounding buildings as well as serve as an example of energy efficiency for the community. The building is not eligible for a residential 30% federal tax credit. The building owner may want to consider applying for a grant and / or engage a PV generator / leaser who would install the PV system and then sell the power at a reduced rate. Utility companies in New Jersey buy Solar Renewable Energy Credits (SRECs) at the best market rate. In addition to selling electricity generated by the solar PV system, SRECs are earned every time that 1 MWh or 1,000 kWh are generated from the renewable system. Based on the lowest market value of SRECs sold in NJ in the past 12 months, SRECs are currently valued at $145/MWh.

A Solar PV system, while providing revenue from the generation of electricity, would not be justified by energy savings alone. Extensive capital planning is required to implement a successful Solar PV system. Revenue generated from the sale of SRECs is not guaranteed and the value of SRECs is determined by a highly fluctuating and unpredictable SREC market.

The red rectangles above represent potential space for a PV system installation.

Installation cost:
Net estimated installed cost: $586,500 (includes $387,090 of labor)
Source of cost estimate: RS Means; Published and established costs; Similar projects

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
$586,500	118,920	78.2	0	1.0	-$500	$34,358	25	$694,699	17.1	18%	2%	2%	-$87,802	212,927

Annual Solar PV Financial Breakdown		
Rated Capacity (kW)	97.75	SRECs are earned for the first 15 years of Solar PV lifetime only
Rated Capacity (kWh)	118,920.00	
Annual Capacity Loss	0%	
Electric Cost ($/kWh)	$0.155	
SRECs Value ($/MWh)	$145	
SREC Sales	4%	

Commission (%)						
Year	kWh generated	kWh revenue	SRECs earned	SRECs Revenue - Commission	Installation and Maintenance Costs	Total Costs
0	0	$0	0	$0	($180,000)	($180,000)
1	118,920	$18,433	118	$16,426	($500)	$34,358
2	118,920	$18,433	118	$16,426	($500)	$34,358
3	118,920	$18,433	118	$16,426	($500)	$34,358
4	118,920	$18,433	118	$16,426	($500)	$34,358
5	118,920	$18,433	118	$16,426	($500)	$34,358
6	118,920	$18,433	118	$16,426	($500)	$34,358
7	118,920	$18,433	118	$16,426	($500)	$34,358
8	118,920	$18,433	118	$16,426	($500)	$34,358
9	118,920	$18,433	118	$16,426	($500)	$34,358
10	118,920	$18,433	118	$16,426	($500)	$34,358
11	118,920	$18,433	118	$16,426	($500)	$34,358
12	118,920	$18,433	118	$16,426	($500)	$34,358
13	118,920	$18,433	118	$16,426	($500)	$34,358
14	118,920	$18,433	118	$16,426	($500)	$34,358
15	118,920	$18,433	118	$16,426	($500)	$34,358
16	118,920	$18,433	0	$0	($500)	$17,933
17	118,920	$18,433	0	$0	($500)	$17,933
18	118,920	$18,433	0	$0	($500)	$17,933
19	118,920	$18,433	0	$0	($500)	$17,933
20	118,920	$18,433	0	$0	($500)	$17,933
21	118,920	$18,433	0	$0	($500)	$17,933
22	118,920	$18,433	0	$0	($500)	$17,933
23	118,920	$18,433	0	$0	($500)	$17,933
24	118,920	$18,433	0	$0	($500)	$17,933
25	118,920	$18,433	0	$0	($500)	$17,933
TOTAL	**2,973,000**	**460,815**	**1770**	**$246,384**	**-$192,500**	**$514,699**

Month	SREC Auction Price
Apr-11	$640.00
May-11	$640.00
Jun-11	$640.00
Jul-11	$555.00
Aug-11	$564.99
Sep-11	$606.56
Oct-11	$670.00
Nov-11	$670.00

Dec-11	$225.00
Jan-12	$245.00
Feb-12	$250.00
Mar-12	$145.00
LOW	**$145.00**

Assumptions: SWA estimated the cost and savings of the system based on past PV projects. Installed costs were estimated at $6/Watt installed. In order to remain conservative due to fluctuating market prices, SRECs are evaluated for calculations at $145/MWh based on the lowest SREC value occurring during the previous 12 month period (March 2012). SWA projected physical dimensions based on a typical Polycrystalline Solar Panel (230 Watts, Model ND-U23-C1). PV systems are sized based on 27.6 kW and physical dimensions for an array will differ with the efficiency of a given solar panel (W/sq ft.).

Rebates/financial incentives:

- NJ Clean Energy - Solar Renewable Energy Certificate Program. Each time a solar electric system generates 1,000kWh (1MWh) of electricity, a SREC is issued which can then be sold or traded separately from the power. The buildings must also become net-metered in order to earn SRECs as well as sell power back to the electric grid. A total of $16,526/year, based on $145/SREC, has been incorporated in the above costs for a period of 15 years; however it requires proof of performance, application approval and negotiations with the utility.

Please see APPENDIX K for more information on Incentive Programs.

CI #2: Replace existing roof sections (9/10 Building)

The existing roof is a dark-colored built-up type roof surface. Based on maintenance records, the roof surfaces of the high and low roofs were recently replaced in 2011. The roof above the gymnasium was due for a replacement in 2008 and has not yet been replaced. At the time of replacement, SWA recommends upgrading the existing roof surfaces with a high solar reflectance and increased insulation. Replacing the roof will result in some energy savings; however, due to the high capital cost this measure will not be justified based on energy savings alone. SWA estimates the roof replacements to cost $305,960 based on the total footprint of the building.

CI #3: Replace existing exterior light fixtures (9/10 Building)

Exterior lighting is predominantly made up of high pressure sodium fixtures. Although the rugged exterior fixtures are meant to endure long runtime hours, better technology is now available that can reduce energy consumption, as well as operation and maintenance costs. SWA recommends replacing the existing fixtures with LED type lighting. Replacing the existing fixtures will result in energy savings; however, due to the nature of exterior lighting, the existing lights are in okay condition and are not expected to fail in the near future. The high cost of replacing the existing fixtures is not justified at this time by energy savings alone. The project is estimated to cost $60,640 to replace the existing wall pack and wall-mounted.

CI #4: Replace existing windows with Energy Star certified windows (9/10 Building)

The entire building is currently outfitted with windows that have double glazing and a low-E coating. Although these characteristics provide good thermal insulation and solar radiation performance, the windows still have non-insulated aluminum frames, which permit heat loss in the winter and heat gain in the summer. SWA recommends replacing the windows with double or triple glazing, low-E coating and an insulated frame, which may reduce the heating and cooling load. Ideally the windows should be Energy Star certified, which meets strict requirements for energy saving performance. Replacement of windows will have a sufficient energy savings but due to the high installation cost, replacement will not be justified by energy savings alone. The project is estimated to cost $117,856.

CI #5: Replace existing roof sections (11/12 Building)

The existing roof is a dark-colored EPDM rubber type roof surface. Based on maintenance records, half of the roof surfaces were replaced in 2010 and 2011. At the time of replacement, SWA recommends upgrading the existing roof with a high solar reflectance and increased insulation. Replacing the roof will result in some energy savings; however, due to the high capital cost this measure will not be justified based on energy savings alone. SWA estimates the roof replacements to cost $553,575 based on the total footprint of the building.

CI #6: Replace existing exterior light fixtures (11/12 Building)

Exterior lighting is predominantly made up of high pressure sodium fixtures. Although the rugged exterior fixtures are meant to endure long runtime hours, better technology is now available that can reduce energy consumption, as well as operation and maintenance costs. SWA recommends replacing the existing fixtures with LED street-type lighting. Replacing the existing fixtures will result in energy savings; however, due to the nature of exterior lighting, the existing lights are in okay condition and are not expected to fail in the near future. The high cost of replacing the existing fixtures is not justified at this time by energy savings alone. The project is estimated to cost $70,747 to replace the existing wall pack and wall-mounted fixtures.

CI #7: Replace existing windows with Energy Star certified windows (11/12 Building)

The entire building is currently outfitted with windows that have double glazing and a low-E coating. Although these characteristics provide good thermal insulation and solar radiation performance, the windows still have non-insulated aluminum frames, which permit heat loss in the winter and heat gain in the summer. SWA recommends replacing the windows with double or triple glazing, low-E coating and an insulated frame, which may reduce the heating and cooling load. Ideally, the windows should be Energy Star certified, which meets strict requirements for energy saving performance. Replacement of windows will have a sufficient energy savings but due to the high installation cost, replacement will not be justified by energy savings alone. The project is estimated to cost $538,285.

CI #8: Replace existing roof sections (Core Building)

The existing roof is a dark-colored EPDM rubber type roof surface. Based on maintenance records, this roof surface is due to be replaced in 2014. At the time of replacement, SWA recommends upgrading the existing roof with a high solar reflectance and increased insulation. Replacing the roof will result in some energy savings; however, due to the high capital cost this measure will not be justified based on energy savings alone. SWA estimates the roof replacements to cost $232,200 based on the total footprint of the building.

CI #9: Replace existing exterior light fixtures (Core Building)

Exterior lighting is predominantly made up of high pressure sodium fixtures. Although the rugged exterior fixtures are meant to endure long runtime hours, better technology is now available that can reduce energy consumption, as well as operation and maintenance costs. SWA recommends replacing the existing fixtures with LED type lighting. Replacing the existing fixtures will result in energy savings; however, due to the nature of exterior lighting, the existing lights are in okay condition and are not expected to fail in the near future. The high cost of replacing the existing fixtures is not justified at this time based on energy savings alone. The project is estimated to cost $20,213 to replace the existing wall pack, wall-mounted and parking lot pole-mounted fixtures.

CI #10: Replace End-of-Life RTUs and Condensing Units (9/10 Building)

During the audit, a complete mechanical inventory was completed and all equipment was evaluated for replacement. In total, there were 7 HVAC units that were found to be operating beyond their useful lifetime and are recommended for replacement as they fail. Equipment to be replaced consists of equipment located on the roof or within the building that has exceeded its useful lifetime according to manufacturer's recommendations. SWA recommends that this equipment is replaced with in-kind units of the same capacity with the highest efficiency achievable. In addition to a better performing unit, new units will also utilize R-410A refrigerant that has a smaller negative impact on the environment compared to R-22 that is no longer being manufactured and is slated to be phased out completely by January 1, 2010. Due to the high replacement costs, the increased efficiency will not provide an attractive payback. The units recommended for replacement are currently operating beyond their useful lifetime and although they are operating beyond their useful lifetime, the units have not failed and are still operable. Due to the current state of operation and the high capital cost, this measure is not justified based on energy savings alone. Implementation costs and units to be replaced are presented below:

Replacement Component	Installed Cost
Replacement of two 2 ton condensing units	$4,441
Replacement of one 3 ton condensing unit	$2,206
Replacement of two 4 ton condensing units	$7,541
Replacement of one 10 ton condensing units	$8,573
Replacement of one 2-3 ton condensing unit	$6,167
Total Replacement Costs	**$28,928**

CI #11: Replace End-of-Life RTUs and Condensing Units (11/12 Building)

During the audit, a complete mechanical inventory was completed and all equipment was evaluated for replacement. In total, there were 117 HVAC units that were found to be operating beyond their useful lifetime and are recommended for replacement as they fail. Equipment to be replaced consists of equipment located on the roof or within the building that has exceeded its useful lifetime according to manufacturer's recommendations. SWA recommends that this equipment is replaced with in-kind units of the same capacity with the highest efficiency achievable. In addition to a better performing unit, new units will also utilize R-410A refrigerant that has a smaller negative impact on the environment compared to R-22 that is no longer being manufactured and is slated to be phased out completely by January 1, 2010. Due to the high replacement costs, the increased efficiency will not provide an attractive payback. The units recommended for replacement are currently operating beyond their useful lifetime and although they are operating beyond their useful lifetime, the units have not failed and are still operable. Due to the current state of operation and the high capital cost, this measure is not justified based on energy savings alone. Implementation costs and units to be replaced are presented below:

Replacement Component	Installed Cost
Replacement of eleven 1-1.5 ton condensing units	$20,348
Replacement of one 2 ton condensing unit	$2,221
Replacement of one 2.5 ton condensing unit	$2,420
Replacement of thirty-two 3 ton condensing units	$88,056
Replacement of forty-six 3.5 ton condensing units	$147,653
Replacement of one 4 ton roof top unit	$9,864
Replacement of five 5 ton roof top units	$55,580
Replacement of nine 7.5 ton roof top units	$104,263
Replacement of six 10 ton roof top units	$91,394
Replacement of one 12.5 ton roof top unit	$18,570
Replacement of four 30 ton roof top units	$197,130
Total Replacement Costs	**$737,499**

CI #12: Replace End-of-Life AHU (Core Building)

During the audit, a complete mechanical inventory was completed and all equipment was evaluated for replacement. In total, there was 1 HVAC unit that was found to be operating beyond its useful lifetime. This 12.5 ton air handling unit is recommended to be replaced as it fails with an in-kind unit of the same capacity with the highest efficiency achievable. In addition to a better performing unit, new units will also utilize R-410A refrigerant that has a smaller negative impact on the environment compared to R-22 that is no longer being manufactured and is slated to be phased out completely by January 1, 2010. Due to the high replacement costs, the increased efficiency will not provide an attractive payback. The unit recommended for replacement is currently operating beyond its useful lifetime, the unit has not failed and is still operable. Due to the current state of operation and the high capital cost, this measure is not justified based on energy savings alone. Implementation costs and unit to be replaced are presented below:

Replacement Component	Installed Cost
Replacement of one 12.5 ton air handling unit	$18,570
Total Replacement Costs	**$18,570**

CI #13: Replace two End-of-Life 10,400 MBH cast iron boilers (11/12 Building)

The 11/12 Building contains two Superior Steam Generator gas-fired boilers that were installed in 1962. Although these boilers have been well maintained, they are operating well beyond their useful lifetime and require fire tubes to be replaced each year. On the day of the site visit, 8 tubes were currently being replaced. This measure is recommended as a capital improvement due to the high installation costs and the recommendation of a heating plant with similar thermal efficiency. SWA reviewed the option of installing a condensing boiler; however, additional energy savings are not substantial based on the amount of actual time that the unit would spend in condensing mode. Typical sealed combustion boilers that would be available for an in-kind replacement presently have thermal efficiencies of up to 84% compared to the 80% thermal efficiency of the current boilers. The units recommended for replacement are currently operating beyond their useful lifetime, the units have not failed and are still operable. Replacement will have a significant impact on energy savings; however, due to the high capital cost, this measure would not be justified based on energy savings alone. The estimated installed costs to replace these 2 boilers with in-kind boilers is $56,369

CI #14: Install BMS system (9/10 Building)

The 9/10 building contains approximately 69 heat pump units and various smaller equipment that is controlled by local controls only. SWA recommends that Washington Township explore the option of installing a central BMS system to tie all classroom, office and rooftop units into a central control system. This measure is recommended as a Capital Improvement due to the high implementation cost and extensive capital improvement planning required to successfully implement a new control system. This measure has the potential to provide a framework for future energy savings; however, more planning is needed and the savings are not quantifiable at this point in time. This measure is estimated to cost $75,000 based on recent projects with similar scopes of work.

CI #15: Optimize chilled water and ice storage plant (Core building)

Currently, the Core building uses ice created by a chiller during off-peak hours to offset morning cooling usage. The Trane chiller used to build ice is operated from 1 AM to 3:30 AM every morning to building ice. When the school begins operation at 7 AM, thermal storage is used as the means of cooling until 12pm. SWA recommends conducting a study to determine total ice storage capacity and optimized control logic in order to use ice storage for cooling during periods of high demand during the day. Typically, the warmest outside air temperatures are reached between the hours of 12 PM and 2 PM and coincide with peak electric demand cost periods. It is possible to use mechanical cooling in the morning before electricity demand cost spikes and use thermal storage in the afternoon to offset peak demand. It may also be possible and more efficient to use partial mechanical cooling and partial thermal storage for cooling in order to optimize plant operation. This measure requires an intensive cooling plant study that includes trending of interval data for power consumption as well as chilled water flow and chilled water loop temperatures. This measure is estimated to cost $7,500 based on an analyst’s time of 50 hours at a billable rate of $150/hour.

CI #16: Replace 59 EDPAC heat pumps and glycol system

Classrooms and offices in the 9/10 building are heated, cooled and ventilated using both water- and air-sourced heat pumps. In total, there are approximately 69 heat pumps within the building. Facilities staffs have begun replacing the existing water-sourced heated pumps with air-source units that are more efficient. It is estimated that the school has replace 10 units so far, leaving 59 more units remaining to be replaced. SWA recommends replacing the remaining 59 EDPAC heat pumps with air-sourced heat pumps. In addition to removing the EDPAC heat pumps, it will be possible to reduce maintenance costs since they glycol refrigerant loop is no longer necessary. The cooling tower and associated plumbing can be removed from the building once all water-sourced heat pumps have been replaced. This measure has the potential to provide future energy savings; however, more planning is needed and the savings are not quantifiable at this time. This measure is estimated to cost $93,173.

CI #17: Replace 250 MBH Bradford-White domestic hot water heater (Core Building)

The Core Building contains a 250 MBH Bradford-White domestic hot water heater with 99 gallons of storage. This unit is original to the Core building and was installed in 1997. SWA recommends replacing this unit with a more efficient model as an end-of-lifetime replacement. It is recommended that the school consider installing a Lochinvar – Shield condensing domestic hot water similar to new units that are currently being installed in the Washington Township Elementary schools. This measure is recommended as a capital improvement due to the high installation costs and the recommendation of a heating plant with similar thermal efficiency. Replacement of the domestic hot water heater is an end of lifetime measure and although provides energy savings, this measure will not be justified by energy savings alone. This measure is estimated to cost $9,381

CI #18: Replace domestic hot water heater and tank (9/10 Building)

The 9/10 building contains a 650 MBH DHW heater and 1,000 gallon storage tank. This unit is original to the 9/10 building and should be replaced. SWA recommends replacing this unit with a more efficient model as an end-of-lifetime replacement. This measure is recommended as a Capital Improvement due to the high implementation cost and the recommendation of a DHW heating plant with similar thermal efficiency. Replacement of the DHW heater is an end of lifetime measure and although provide energy savings, this measure will not be justified by energy savings alone. This measure is estimated to cost $48,311.

CI #19: Replace BAC cooling tower (9/10 Building)

The 9/10 building contains a 70 ton Baltimore Aircoil Company centrifugal cooling tower that has exceeded the expected useful lifetime. The cooling tower still functions and should be replaced upon failure. This measure is recommended as a Capital Improvement because it is an ned of lifetime measure and although it provides energy savings, this measure will not be justified by energy savings alone. This measure is recommended as a Capital Improvement at the request of Washington Township Public Schools; however, if Capital Improvement #16 is pursued, it will eliminate the need for a cooling tower. This measure is estimated to cost $17,025.

Operations and Maintenance

Operations and Maintenance measures consist of low/no cost measures that are within the capability of the current building staff to handle. These measures typically require little investment, and they yield a short payback period. These measures may address equipment settings or staff operations that, when addressed will reduce energy consumption or costs.

- Calibrate humidity sensors twice per year – There are humidity sensors installed for packaged rooftop units and the BMS system throughout all 3 buildings. SWA recommends calibrating these sensors to ensure the accuracy of the control system. Humidity sensors are sensitive and are susceptible to changes in the way that they measure relative humidity. Small changes in humidity readings can result in a significant impact on energy use when control logic is based on enthalpy.

- Check and adjust timers and time clocks monthly – During the site visit, several exterior lights were observed to be left on during the day due to incorrect timer settings. In addition to exterior lights, several time clocks that control HVAC equipment were also left on due to incorrect time settings. During power surges or outages, digital clocks are reset and require setting to ensure that timers remain accurate.

- Replace or install exterior door weather-stripping – SWA observed several doors with poor or deficient weather-stripping that allows excessive infiltration. Specifically, there were several hallway doors and overhead doors located in mechanical areas that should be examined further for infiltration. SWA recommends that facility staff include inspection of exterior door weather-stripping in their preventative maintenance program and replace or install as needed.

- Replace motors with NEMA premium efficiency models – SWA observed several motors as that were not NEMA premium efficiency models and are beyond their useful lifetime. Since these motors have been maintained well, SWA recommends replacing them with high efficiency models as part of routine O&M the next time that they fail.

- Retrofit vending machines with SnackMiser™ devices – SWA observed that there two older vending machines located in the 11/12 building with display lights that are operate 24 hours per day. SWA recommends retrofitting these units with SnackMiser™ devices to achieve maximum energy savings that result in reduced operating costs and decreased greenhouse gas emissions with existing machines. These devices use a Passive Infrared Sensor (PIR) to determine if there is anyone within 25 feet of the machine. It waits for 15 minutes of vacancy, then powers down unnecessary display lighting. This measure is estimated to cost $320 for installation and can save up to $153 per year in utility costs.

- Provide water-efficient fixtures and controls – Adding controlled on/off timers on all lavatory faucets is a cost-effective way to reduce domestic hot water demand and save water. Building staff can also easily install faucet aerators and/or low-flow fixtures to reduce water consumption. There are many retrofit options, which can be installed now or incorporated as equipment is replaced. Routine maintenance practices that identify and quickly address water leaks are a low-cost way to save water and energy. Retrofitting with more efficient water-consumption fixtures/appliances will reduce energy consumption for water heating, while also decreasing water/sewer bills.

- Inspect and replace cracked/ineffective caulk.

- Inspect and maintain sealants at all windows for airtight performance.

- Inspect and maintain weather-stripping around all exterior doors and roof hatches.

- SWA recommends that the building considers purchasing the most energy-efficient equipment, including ENERGY STAR® labeled appliances, when equipment is installed or replaced. More information can be found in the “Products” section of the ENERGY STAR® website at: http://www.energystar.gov.

- Use smart power electric strips - in conjunction with occupancy sensors to power down computer equipment when left unattended for extended periods of time.

- Create an energy educational program - that teaches how to minimize energy use. The U.S. Department of Energy offers free information for hosting energy efficiency educational programs and plans. For more information please visit: http://www1.eere.energy.gov/education/.

APPENDIX A: EQUIPMENT LIST

Inventory

Building System	Description	Model #	Fuel	Location	Space Served	Date Installed	Expected Useful Lifetime (Years)	Estimated Remaining Useful Life %
Heating	B-1; Bryan boiler, 5,125 MBH input, 4,100 MBH output, 80% nominal thermal efficiency	Bryan, Model #RV500-WFDG, Bryan #960641, Serial #79173	Natural Gas	Core - Boiler Room	Core Building	1996	30	47%
Heating	Gordon-Piatt burner attached to B-1 in Core building, 5,125 MBH firing rate	Gordon-Piatt, Burner Model #R10.2-G-50, Serial #N/A	Natural Gas	Core - Boiler Room	Core Building	1996	30	47%
Heating	B-2; Bryan boiler, 5,125 MBH input, 4,100 MBH output, 80% nominal thermal efficiency	Bryan, Model #RV500-WFDG, Bryan #960641, Serial #79189	Natural Gas	Core - Boiler Room	Core Building	1996	30	47%
Cooling	CHWR-A; US Electrical Motor chilled water return pump motor, 60 HP, 1780 RPM, DP enclosed, 92.4% NEMA nominal efficiency, controlled by Danfoss VLT HVAC Drive VFD drives	US Electrical Motors, ID #H010Y02X325R246M	Electricity	Core - Boiler Room	Core Building	2006	10	40%
Cooling	CHWR-B; US Electrical Motor chilled water return pump motor, 60 HP, 1780 RPM, DP enclosed, 92.4% NEMA nominal efficiency, controlled by Danfoss VLT HVAC Drive VFD drives	US Electrical Motors, ID #H010-2052043R174M	Electricity	Core - Boiler Room	Core Building	2006	10	40%
Heating	HWS-1A; Marathon Electric hot water supply pump motor, 25 HP, 89.5% NEMA nominal efficiency, 1755 RPM, TEC DP enclosed, controlled by	Marathon Electric, Model #3VF 284TTDC7026AA S, Serial #N/A	Electricity	Core - Boiler Room	Core Building	2006	10	40%

	Danfoss VLT HVAC Drive VFD drives							
Heating	HWS-1; Marathon Electric hot water supply pump motor, 25 HP, 89.5% NEMA nominal efficiency, 1755 RPM, TEC DP enclosed, controlled by Danfoss VLT HVAC Drive VFD drives	Marathon Electric, Model #3VF 284TTDC7026AA S, Serial #N/A	Electricity	Core - Boiler Room	Core Building	2006	10	40%
Heating	HWS-2; Marathon Electric hot water supply pump motor, 7.5 HP, 84.0% NEMA nominal efficiency, 1750 RPM, controlled by Danfoss VLT HVAC Drive VFD drives	Marathon Electric, Cat. #-H125, Model #3VH213TTDR7026GP	Electricity	Core - Boiler Room	Core Building	2006	10	40%
Cooling	CHWR-P5; Teco Westinghouse chilled water return pump motor, 30 HP, 22 kW, ODP, 92.4% NEMA nominal efficiency, not on VFD	Teco Westinghouse, Type ASHEUW, Cat. #DH0302, Serial #FR6066530001	Electricity	Core - Boiler Room	Core Building	2006	10	40%
Domestic Hot Water	Bradford-White domestic hot water heater, atmospheric, 98 gallons storage, 250,000 Btuh input, 227.3 gallons per hours recovery	Bradford-White, Model #D100T2503NA, Serial #PF0816794	Electricity	Core - Boiler Room	Core Building	1997	10	0%
Cooling	CH-1; Trane rotary chiller for school, air-cooled, 250 nominal tons, 2 compressors, R-134A refrigerant, also feeds 6 blocks of thermal storage	Trane, Series R, Model #RTAC 2504 UL0H UAGN WITY 1CDN ND6E A11N R0EX N, Serial #U06D07026, Operation Manual #RTAC-SVX01F-EN	Electricity	Exterior, On-Grade	Core Building	2006	25	76%

Cooling	CH-2; Trane rotary chiller, air-cooled, 275 nominal tons, 3 compressors, R-134A	Trane, Series R, Model #RTAC 2754UP0HUAGPLITY 1CDN ND6E A11N ROEX N, Serial #U06L00406, Operation Manual #RTAC-SVX01F-EN	Electricity	Exterior, On-Grade	Core Building	2006	25	76%
HVAC	HRV-2; Heat Recovery Ventilator, no nameplate, large	No Nameplate Data	Electricity	Roof	Core Building	1998	15	7%
HVAC	AHU-B; McQuay packaged rooftop unit, cooling only, 47 sf of cooling coil face area	McQuay, Model #RAH047CSY, Serial #37A01401 02, Unit #C9631433020	Electricity	Roof	9/10 Cafeteria	1998	15	7%
HVAC	AHU-A; McQuay packaged rooftop unit, cooling only, 47 sf of cooling coil face area	McQuay, Model #RAH047CSY, Serial #37A01400 02, Unit #C9631433020	Electricity	Roof	9/10 Cafeteria	1998	15	7%
HVAC	AHU-C; York packaged rooftop unit, cooling only, 1 compressor, R-22, 3 tons	York, Model #D4CE036A25A, Serial #NKGM112121	Electricity	Roof	9/10 Cafeteria	1998	15	7%
HVAC	AHU-6; Trane packaged rooftop unit, cooling only, 12.5 tons, 2 compressors, R-22	Trane, Model #TCD150C30AAA, Serial #L31101111D	Electricity	Roof	9/10 Kitchen	1996	15	0%
HVAC	AHU-E; York packaged rooftop unit, cooling only, 1 compressor, R-22, 3 tons	York, Model #D4CE036A25A, Serial #NKGM115877	Electricity	Roof	9/10 Kitchen	1998	15	7%
Cooling	CU-1; Arcoaire condensing unit, 3 tons, R-410A, 1 compressor	Arcoaire, Model #N4A360GLC300, Serial #E11806948	Electricity	Roof	Core Building	2011	15	93%
Cooling	CU-2; EMI condensing unit, 2 tons, R-22, 1 compressor	EMI, Model #SCC04DF0000AA0A, Serial #1-01-F-8019-25	Electricity	Roof	Core Building	2001	15	27%
Cooling	CU-3; York condensing unit, 5 tons, 1 compressor, R-22	York, Model #H1RA060S46A, Serial #WKLM042003	Electricity	Roof	Core Building	2003	15	40%
Cooling	CU-4; EMI condensing unit, 1.5 tons, 1 compressor, R-22	EMI, Model #SHC18DI0000AA0A, Serial #1-03-E-1521-22	Electricity	Roof	Core Building	2003	15	40%

HVAC	AHU-2B; McQuay packaged rooftop unit, 4,000 to 16,000 CFM, 1 compressor, R-22, cooling only	McQuay, Model #RDS800CYY, Serial #37A01405 00, Part #C9 631433040	Electricity	Roof	Core Building	2003	15	40%
HVAC	HRV-1; Heat Recovery Ventilator, no nameplate, large	No Nameplate Data	Electricity	Roof	Core Building	1998	15	7%
HVAC	McQuay packaged rooftop unit, 4,000 to 16,000 CFM, 1 compressor, R-22, cooling only	McQuay, Model #RDS800CYY, Serial #37A01404 00, Part #C9 631433040	Electricity	Roof	Core Building	1998	15	7%
HVAC	AHU-3B, McQuay packaged rooftop unit, 4,000 to 16,000 CFM, 1 compressor, R-22, cooling only	McQuay, Model #RDS708BY, Serial #37A01403 03, Part #C9 631433030	Electricity	Roof	Core Building	1998	15	7%
HVAC	AHU-3A, McQuay packaged rooftop unit, 4,000 to 16,000 CFM, 1 compressor, R-22, cooling only	McQuay, Model #RDS708BY, Serial #37A01402 03, Part #C9 631433030	Electricity	Roof	Core Building	1998	15	7%

Building System	Description	Model #	Fuel	Location	Space Served	Date Installed	Expected Useful Lifetime (Years)	Estimated Remaining Useful Life %
Domestic Hot Water	Patterson-Kelly gas-fired storage water heater, 650 MBH fuel input, heat exchanger uses flue gases to preheat domestic cold water, programmed to shut off on nights and weekends with Intermatic time clock, Model #ET171C, with 1,000 gallons storage tank	Patterson-Kelly, Model #531-5, Serial #254043	Natural Gas	Room H-114; DHW storage	9/10 Wing	1979	10	0%
Domestic Hot Water	Peabody Gordon-Piatt burner, 650 MBH firing rate	Peabody Gordon-Piatt, Model #R6-2-G0-05	Natural Gas	Room H-114; DHW storage	9/10 Wing	2009	10	70%

Generato r	Kohler 30 kW generator, natural gas, tested once per week for 30 minutes	Kohler, Model #30RZ82, Serial #083683	Natural Gas	Boiler Room	9/10 Wing	1996	30	47%
Cooling	Marathon Electric chilled water pump #2, circulates glycol loop for cooling tower, 25 HP, 1760 RPM, Type TDR-BE, (2 pumps but 1 being replaced)	Marathon Electric, Model #HJ284TTDR702, Serial #1496608	Electricity	Boiler Room	9/10 Wing	2006	10	40%
Cooling	Marathon Electric chilled water pump #1, circulates glycol loop for cooling tower, 25 HP, 1760 RPM, Type TDR-BE, (2 pumps but 1 being replaced)	Marathon Electric, Model #HJ284TTDR7026ED-F1W, Serial #1496608	Electricity	Boiler Room	9/10 Wing	2006	10	40%
HVAC	Large air handling unit to serve adaptive gym, controlled by a single wall thermostat located in boiler room but controlling gym. Set for 70F. AHUs contain Electroduct 150 kW, 480V electric duct heaters Cat. #FV9-11128	No Nameplate Data	Electricity	Boiler Room	9/10 Wing; Adaptive Gym	1992	15	0%
Domestic Hot Water	Bell & Gossett Circulating Pump, 1/6 HP, 1725 RPM,	Bell & Gossett, M74794, Ident. No. M10711	Electricity	Boiler Room	9/10 Wing	2002	20	50%
Domestic Hot Water	GE 1st Floor return pump, 1/4 HP, 1725 RPM,	GE, Model #5KH39QN9725BT, Serial No. #PPJ230028	Electricity	Boiler Room	9/10 Wing	2002	20	50%
Domestic Hot Water	GE 1st Floor return pump, 1/4 HP, 1725 RPM,	GE, Model #5KH39QN9725BT, Serial No. #PPJ230029	Electricity	Boiler Room	9/10 Wing	2002	20	50%
Unit Heater	UNH 10-13, #8, Berko Electric Heater, 7.5 kW	Berko, Cat. No. #HUH-748-A	Electricity	Boiler Room	9/10 Wing	1979	25	0%
Cooling	Glycol Tank, Wood Ind., 100 gallons, Marathon Electric pump, 1755 RPM, 82.9% Eff.	Wood Ind. Prod. Co., 749742/ Marathon Electric, Model #JM145TTDR8661AB W	Electricity	Boiler Room	9/10 Wing	1979	10	0%
Cooling	AC-1, Custom McQuay Air Handling Unit	McQuay, Model #N/A, Serial # N/A	Electricity	Storage/Re ceiving Room	9/10 Wing	1992	20	0%

Unit Heater	UNH 10-17, Berko Electric Heater, 2.5 kW	Berko, Cat. No. #HUH-227-A	Electricity	Storage/Receiving Room	9/10 Wing	1979	25	0%
Unit Heater	UNH 10-15, Berko Electric Heater, 2.5 kW	Berko, Cat. No. #HUH-227-A	Electricity	Storage/Receiving Room	9/10 Wing	1979	25	0%
Cooling	Baltimore Air Coil, Cooling Tower/ Emerson motor, 3 HP, 1745 RPM, 84% NEMA Eff.	BAC Model #VXI-70-2, Serial #79-4804/ Emerson motor, Model #B071, Catalog # UJ3S2AM	Electricity	Roof above mechanical room	9/10 Wing	1979	25	0%
Cooling	Coleman Condensing Unit, R-22	N/A	Electricity	Roof above mechanical room	9/10 Wing	1979	15	0%
Cooling	EMIO Condensing unit, 2 compressors, R-22	EMIO, Model #MH2D9900AA0000J, Serial #1-02-G-3287-28	Electricity	Roof above mechanical room	9/10 Wing	1992	15	0%
Cooling	Heatcraft Condensing Unit, 2 compressors	Heatcraft, Model #PFG5WP, Serial #T11H09108	Electricity	Roof above mechanical room	9/10 Wing	1992	15	0%
Cooling	Sanyo Condensing Unit, 4 tons, 1 compressor, R-22, SEER 9.5	Sanyo, Model #SAP483C, Serial #0005201	Electricity	Roof	9/10 Wing	1996	15	0%
Cooling	Sanyo Condensing Unit, 4 tons, 1 compressor, R-22, SEER 9.5	Sanyo, Model #SAP483C, Serial #0029004	Electricity	Roof	9/10 Wing	1996	15	0%
Cooling	CU-1 Lennox condensing unit, 10 tons, 1 compressor, R-22	Lennox, Model #LSA120C-1G/ Serial #5697C01347	Electricity	Roof above mechanical room	9/10 Wing	1996	15	0%
Cooling	Westinghouse dry cooler, 1 HP, 1 compressor, R-22	Westinghouse, Model #ST050A0Q, Serial #MLX21	Electricity	Roof above mechanical room	9/10 Wing	1996	15	0%
Cooling	Westinghouse air handling unit	Westinghouse, Model #AHV241LF, Serial BGA7108	Electricity	Gymnasium	9/10 Wing	1996	15	0%
Heating/ Cooling	EDPAC air handling unit, 1 compressor, glycol	EDPAC, Model # SEHA-04, Code No. 40695-001 S	Electricity	Computer Lab	9/10 Wing	1979	25	0%
Heating/ Cooling	Airedale, air handling unit, 1 compressor, R-410a	Airedale, Model #SHG48/2-460/410, Serial #737732 210100300154510-6037	Electricity	Main Office	9/10 Wing	2010	20	90%
Heating/ Cooling	EDPAC air handling unit, 1 compressor, glycol	EDPAC, Model # SEXC-06, Code No. 40695-006 G	Electricity	Orchestra Room	9/10 Wing	1979	25	0%

Building System	Description	Model #	Fuel	Location	Space Served	Date Installed	Expected Useful Lifetime (Years)	Estimated Remaining Useful Life %
Heating	B-1; Superior Steam Generator, cast iron fire tube boiler, 10,500 MBH max input	Superior Steam Generator, NJ #33481H, Serial #4150-410010	Natural Gas	B7 - Boiler Room	11/12 Wing	1961	30	0%
Heating	Gordon-Piatt burner for B-1; 10,400 MBH max input	Gordon-Piatt , Model #F14-G0-50.4, Serial #NA	Natural Gas	B7 - Boiler Room	11/12 Wing	1961	30	0%
Heating	B-2; Superior Steam Generator, cast iron fire tube boiler, 10,400 MBH, currently having 8 fire tubes replaced	Superior Steam Generator, NJ #33482H, Serial #4150-10009	Natural Gas	B7 - Boiler Room	11/12 Wing	1961	30	0%
Heating	Gordon-Piatt burner for B-2; 10,400 MBH max input	Gordon-Piatt , Model #F14-G0-50.4, Serial #NA	Natural Gas	B7 - Boiler Room	11/12 Wing	1961	30	0%
Domestic Hot Water	DHW-3; Bradford-White commercial domestic hot water heater, 300,000 Btuh input, 100 gallons storage, 334.5 gallons per hour recovery, 92% Thermal Eff.	Bradford-White, Commercial Hydrojet, NJ #105718H, Model #EF100T300E3NA2, Serial #EF10711039	Natural Gas	B7 - Boiler Room	11/12 Wing	2008	10	60%
Domestic Hot Water	DHW-2; Bradford-White commercial domestic hot water heater, 300,000 Btuh input, 100 gallons storage, 334.5 gallons per hour recovery, 92% Thermal Eff.	Bradford-White, Commercial Hydrojet, NJ #105717H, Model #EF100T300E3NA2, Serial #EF10711040	Natural Gas	B7 - Boiler Room	11/12 Wing	2008	10	60%

Domestic Hot Water	DHW-1; Bradford-White commercial domestic hot water heater, 300,000 Btuh input, 100 gallons storage, 334.5 gallons per hour recovery, 92% Thermal Eff.	Bradford-White, Commercial Hydrojet, NJ #105716H, Model #EF100T300E 3NA2, Serial #EG10849209	Natural Gas	B7 - Boiler Room	11/12 Wing	2008	10	60%
Domestic Hot Water	DHW Circulating Pump, Armstrong, 1/6 HP, 1725 RPM,	Armstrong, 119937-061, 160287	Electricity	B7 - Boiler Room	11/12 Wing	2001	10	0%
Controls	Heat-Timer control; HWRQ Platinum	Heat-Timer, Model #HWRQ Platinum	Electricity	B7 - Boiler Room	11/12 Wing	2006	10	40%
Heating	HWP-1, Hot Water Pump, Baldor Motor, 15 HP, 1760 RPM, 89% Eff.	Baldor, Cat.No. #M2523, Spec. #40B3X70	Electricity	B7 - Boiler Room	11/12 Wing	2006	10	40%
Heating	HWP-2, 15 HP, 1750 RPM	N/A	Electricity	B7 - Boiler Room	11/12 Wing	2006	10	40%
Heating	HWP-3, Hot Water Pump, Marathon motor, 7.5 HP, 1750 RPM, 84% Eff.	Marathon, Model #ZVB213TTD R7026GP, Cat.No. #H125	Electricity	B7 - Boiler Room	11/12 Wing	2006	10	40%
Heating	HWP-4, Hot Water Pump, Marathon motor, 7.5 HP, 1750 RPM, 84% Eff.	Marathon, Model #ZVB213TTD R7026GP, Cat.No. #H125	Electricity	B7 - Boiler Room	11/12 Wing	2006	10	40%
Heating	HB Smith boiler, 1050 Btuh input rating	HB Smith, 6500 Mills Boiler, Model #650 Series, NJ #000005456H	Natural Gas	B6 - Boiler Room	11/12 Wing	2006	25	76%
Heating	Burner attached to HB Smith boiler, No brand name, 1050 Btuh input rating	No brand name, Model #XS92 3M4, Serial #28643	Natural Gas	B6 - Boiler Room	11/12 Wing	2006	25	76%
Generator	Onan generator, 85 kW, used for backup, tested for 30 minutes once per week	Onan, Model 85KR, Model #85.0 KR-15R/ 13P, Serial #0773666149	Natural Gas	B6 - Boiler Room	11/12 Wing	1992	30	33%

HVAC	RTU-11; York packaged rooftop unit, 7.5 tons, 2 compressors, R-22, cooling only	York, Model #DR090C00Q 4TZZ30001D, Serial #N0F6542951	Electricity	Rooftop	11/12 Wing; Room B13	1996	15	0%
HVAC	RTU-12; York packaged rooftop unit, 7.5 tons, 2 compressors, R-22, cooling only	York, Model #DR090C00Q 4TZZ30001D, Serial #N0F6542954	Electricity	Rooftop	11/12 Wing; Room B11	1996	15	0%
Cooling	Lennox condensing unit, R-22, 2 tons, 1 compressor	Lennox, Model #HS7-1853V-2R, Serial #5478F00094	Electricity	Rooftop	11/12 Wing; Cafeteria B	2002	15	33%
Cooling	Lennox condensing unit, R-22, 2 tons, 1 compressor	Lennox, Model #HS7-1853V-2R, Serial #5478K01502	Electricity	Rooftop	11/12 Wing; Cafeteria B	2002	15	33%
HVAC	RTU-15; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #DR036C00P 4TZZ20001A, Serial #N0F6494104	Electricity	Rooftop	11/12 Wing	1996	15	0%
HVAC	RTU-13; York packaged rooftop unit, 10 tons, 2 compressors, R-22	York, Model #DR120C00Q 4TZZ30001D, Serial #N0F6541414	Electricity	Rooftop	11/12 Wing	1996	15	0%
Cooling	CU-24; Addison Products Company condensing unit, 5 tons, 1 compressor, R-22	Addison Products Company, Model #RCU960-3L, B/Ml #3166-10-40A, Serial #2890722407 4	Electricity	Rooftop	11/12 Wing	2006	15	60%
HVAC	RTU-9; York packaged rooftop unit, 5 tons, 1 compressor, R-22, cooling only	York, Model #DR060C00P 4TZZ20001A, Serial #N0F6499409	Electricity	Rooftop	11/12 Wing	1996	15	0%
HVAC	RTU-6; York packaged rooftop unit, 4 tons, 1 compressor, R-22, cooling only	York, Model #DR048C00P 4TZZ20001A, Serial #N0F6499285	Electricity	Rooftop	11/12 Wing	1996	15	0%
HVAC	Carrier packaged rooftop unit, 10 tons, 2 compressors, R-22	Carrier, Model #50TFF012---501GA, Serial #1401G34201	Electricity	Rooftop	11/12 Wing; Cafeteria A	1996	15	0%

HVAC	Carrier packaged rooftop unit, 10 tons, 2 compressors, R-22	Carrier, Model #50TFF012---501GA, Serial #1201G30441	Electricity	Rooftop	11/12 Wing; Cafeteria A	1996	15	0%
HVAC	RTU-5; York packaged rooftop unit, 7.5 tons, R-22, 2 compressors, cooling only	York, Model #DR090C00Q 4TZZ30001D, Serial #N0F6542955	Electricity	Rooftop	11/12 Wing	1996	15	0%
HVAC	RTU-4; York packaged rooftop unit, 7.5 tons, R-22, 2 compressors, cooling only	York, Model #DR090C00Q 4TZZ30001D, Serial #N0F6542953	Electricity	Rooftop	11/12 Wing	1996	15	0%
HVAC	RTU-3; York packaged rooftop unit, 10 tons, R-22, 2 compressors, cooling only	York, Model #DR120C00Q 4TZZ30001D, Serial #N0F6541414 5	Electricity	Rooftop	11/12 Wing	1996	15	0%
Cooling	CU-24; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S4 6G, Serial #W0F642144 0	Electricity	Rooftop	11/12 Wing	1996	15	0%
HVAC	RTU-7; York packaged rooftop unit, 7.5 tons, R-22, 2 compressors, cooling only	York, Model #DR090C005 4TZZ30001D, Serial #N0F6541403	Electricity	Rooftop	11/12 Wing	1996	15	0%
Cooling	CU-22; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S4 6G, Serial #W0F650192 1	Electricity	Rooftop	11/12 Wing	1996	15	0%
Cooling	CU-21; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S4 6G, Serial #W0F650191 7	Electricity	Rooftop	11/12 Wing	1996	15	0%
Cooling	CU-20; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S4 6G, Serial #W0F650191 8	Electricity	Rooftop	11/12 Wing	1996	15	0%
Cooling	CU-18; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #H1RA042S4 6G, Serial #W0F650109 4	Electricity	Rooftop	11/12 Wing; B2, B4, B6	1996	15	0%
Cooling	CU-19; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA04246 G, Serial #W0F650191 6	Electricity	Rooftop	11/12 Wing; B2, B4, B6	1996	15	0%

HVAC	RTU-8; York packaged rooftop unit, 7.5 tons, R-22, 2 compressors, cooling only	York, Model #DR090C005 4TZZ30001D, Serial #N0F6541402	Electricity	Rooftop	11/12 Wing; B2, B4, B6	1996	15	0%
Cooling	CU-17; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #H1RA036S4 6G, Serial #W0F650107 5	Electricity	Rooftop	11/12 Wing	1996	15	0%
HVAC	RTU-10; York packaged rooftop unit, 5 tons, R-22, 1 compressor, cooling only	York, Model #DR060C00P 4TZZ20001A, Serial #N0F6541531	Electricity	Rooftop	11/12 Wing	1996	15	0%
HVAC	RTU-3; Arcoaire packaged rooftop unit, 3 tons, 1 compressor, R-22, cooling only	Arcoaire, Model #PAMA036H1 , Serial #R91500022	Electricity	Rooftop	11/12 Wing	1996	15	0%
HVAC	RTU-2; York packaged rooftop, 3 tons, 1 compressor, R-22, cooling only	York, Model #DR036C00P 4TZZ20001A, Serial #N0F6499755	Electricity	Rooftop	11/12 Wing	1996	15	0%
Cooling	CU-16; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #H1RA036S4 6G, Serial #W0F650108 1	Electricity	Rooftop	11/12 Wing	1996	15	0%
Cooling	CU-P; Trane condensing unit, 1.5 tons, 1 compressor, R-22	Trane, XE1000, Model #TTR018C10 0A0, Serial #G47260176	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-Q; Trane condensing unit, 1.5 tons, 1 compressor, R-22	Trane, XE1000, Model #TTR018C10 0A0, Serial #G02251219	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-15; York condensing unit, 3.5 tons, 1 compressors, R-22	York, Model #H1RA042S4 6G, Serial #W0F642144 2	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-8; York condensing unit, 3.5 ton, R-22, 1 compressor	York, Model #H1RA042S4 6G, Serial #W0F642144 1	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-7; York condensing unit, 3.5 ton, R-22, 1 compressor	York, Model #H1RA042S4 6G, Serial #W0F650193 9	Electricity	Rooftop	11/12 Wing	1992	15	0%

Cooling	CU-14; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6501940	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-56; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6501923	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-39; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6421422	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-66; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0E6284968	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-40; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6421426	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-57; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6421437	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-62; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #H1RA036S46G, Serial #W0F6501086	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-45; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #H1RA036S46G, Serial #W0F6501088	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-41; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6421436	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-63; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #H1RA036S46G, Serial #W0F6501083	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-58; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6421421	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-46; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #H1RA036S46G, Serial #W0F6501091	Electricity	Rooftop	11/12 Wing	1992	15	0%

Cooling	CU-64; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #H1RA036S46G, Serial #W0F6501104	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	RTU-27; York roof top unit, 7.5 tons, 2 compressors, R-22	York, Model #DR090C00Q4TZZ30001D, Serial #N0F6542952	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-47; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #H1RA036S46G, Serial #W0F6501085	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-65; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #H1RA036S46G, Serial #W0F6501098	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-59; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6421417	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-42; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6501933	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-60; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6421427	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-43; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6501938	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-68; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #H1RA036S46G, Serial #W0F6501089	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-61; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6421425	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-44; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6421438	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-67; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #H1RA036S46G, Serial #W0F6501087	Electricity	Rooftop	11/12 Wing	1992	15	0%

Cooling	CU-69; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #H1RA036S4 6G, Serial #W0F650108 4	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	RTU-30; York roof top unit, 7.5 tons, 2 compressors, R-22	York, Model #DR090C00S 4TZZ30001D, Serial #N0F6541400	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	Sanyo condensing unit, 1.5 tons, 1 compressor, R-22	Sanyo, Model #SAP183C, Serial #0002973	Electricity	Rooftop	11/12 Wing	1985	15	0%
Cooling	CU-72; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #H1RA036S4 6G, Serial #W0F650108 2	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-71; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA036S4 6G, Serial #W0F642143 1	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	RTU-32; York roof top unit, 3 tons, 1 compressor, R-22	York, Model #DR036C00P 4TZZ20001A, Serial #N0F6499154	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	RTU-36; York roof top unit, 3 tons, 1 compressor, R-22	York, Model #DR036C00P 4TZZ20001A, Serial #N0F6494193	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-52; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S4 6G, Serial #W0F642144 5	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-48; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA018S4 6G, Serial #W0F650193 2	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-53; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S4 6G, Serial #W0F642141 9	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-79; York condensing unit, 1.5 tons, 1 compressor, R-22	York, Model #H1RA018S4 6G, Serial #W0B696882 3	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-49; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S4 6G, Serial #W0F642143 3	Electricity	Rooftop	11/12 Wing	1992	15	0%

Cooling	RTU-29; York roof top unit, 3 tons, 1 compressor, R-22	York, Model #DR048C00P4TZZ20001A, Serial #N0F6541527	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-54; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6421430	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-70; York condensing unit, 2.5 tons, 1 compressor, R-22	York, Model #H2RD030S06B, Serial #W0F6549688	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-51; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6501924	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-55; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6501929	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	RTU-31; York roof top unit, 5 tons, 1 compressor, R-22	York, Model #DR060C00P4TZZ20001A, Serial #N0F6499410	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-38; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6421435	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-35; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6421424	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-37; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6421423	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-34; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #H1RA036S46G, Serial #W0F6501092	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-36; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6421418	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-33; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6421434	Electricity	Rooftop	11/12 Wing	1992	15	0%

Cooling	York roof top unit, 3 tons, 1 compressor, R-22	York, Model #D1EE036A25BDC, Serial #NKHM128625	Electricity	Rooftop	11/12 Wing	1990	15	0%
Cooling	York roof top unit, 3 tons, 1 compressor, R-22	York, Model #D1EE036A25BDC, Serial #NCJM040515	Electricity	Rooftop	11/12 Wing	1990	15	0%
Cooling	CU-73; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #H1RA036S46G, Serial #W0F6501099	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	Inter-City Products condensing unit, 3 tons, 1 compressor, R-22	Inter-City, Model #AD036GD, Serial #L931836404	Electricity	Rooftop	11/12 Wing	1993	15	0%
Cooling	Aaon condensing unit, 30 tons	N/A	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	Carrier condensing unit, 1 ton, 1 compressor, R-22	Carrier, Model #38AKS012---501--, Serial #1400G04106	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	Magic Aire condensing unit, 1 ton, 1 compressor, R-22	N/A	Electricity	Rooftop	11/12 Wing	1998	15	7%
Cooling	RTU-25, Aaon condensing unit, 3 tons, 2 compressors, R-410a	Aaon, Model #RM-015-3-0-BA02-EJN, Serial #200606-AMWL01685	Electricity	Rooftop	11/12 Wing	2006	15	60%
Cooling	CU-74; EMIO condensing unit, .75 tons, 1 compressor, R-22	EMIO, Model #S1HA9000D10, Serial #1-06-D-2687-15	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	RTU-21, Aaon condensing unit, 13 tons, 2 compressors, R-410a	Aaon, Model #RM-013-3-0-BA02,EJN, Serial #200606-AMWK01683	Electricity	Rooftop	11/12 Wing	2006	15	60%
Cooling	CU-72; EMIO condensing unit, .75 tons, 1 compressor, R-22	EMIO, Model #S1HA9000D10, Serial #1-06-D-2685-15	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	RTU-14, York condensing unit, 10 tons, 1 compressor, R-22	York, Model #DR120C00S4TZZ30001D, Serial #N0F6542956	Electricity	Rooftop	11/12 Wing	1992	15	0%

Cooling	RTU-19, York condensing unit, 30 tons, 2 compressors, R-22	York, Model #DR300C00C4TZZ20001B, Serial #N0F6539031	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	RTU-18, York condensing unit, 30 tons, 2 compressors, R-22	York, Model #DR300C00C4TZZ20001B, Serial #N0F6539032	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	RTU-26, York condensing unit, 5 tons, 1 compressor, R-22	York, Model #DR060C00P4TZZ20001B, Serial #N0F65494133	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	RTU-22, York condensing unit, 5 tons, 2 compressors, R-22	York, Model #DR300C00C4TZZ20001B, Serial #N0F6539030	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	RTU-23, York condensing unit, 30 tons, 2 compressors, R-22	York, Model #DR300C00C4TZZ20001B, Serial #N0F6539029	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	RTU-1 NEW, Aaon condensing unit, 60 tons, 4 compressors, R-410a	Aaon, Model #N/A, Serial #200602-BNWX00260	Electricity	Rooftop	11/12 Wing	2006	15	60%
Cooling	CU-31; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #H1RA036S46G, Serial #W0F6501097	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-32; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #H1RA036S46G, Serial #W0F6501093	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	RTU-16, York condensing unit, 10 tons, 2 compressors, R-22	York, Model #DR120C00S4TZZ30001D, Serial #N0F6542957	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	RTU-24, Aaon condensing unit, 13 tons, 2 compressors, R-410a	Aaon, Model #RM-015-3-0-BA02-EJN, Serial #200606-AMWL01684	Electricity	Rooftop	11/12 Wing	2006	15	60%
Cooling	CU-80; EMIO condensing unit, .75 tons, 1 compressor,	EMIO, Model #S1HA9000D10, Serial #1-06-D-2688-15	Electricity	Rooftop	11/12 Wing	1992	15	0%

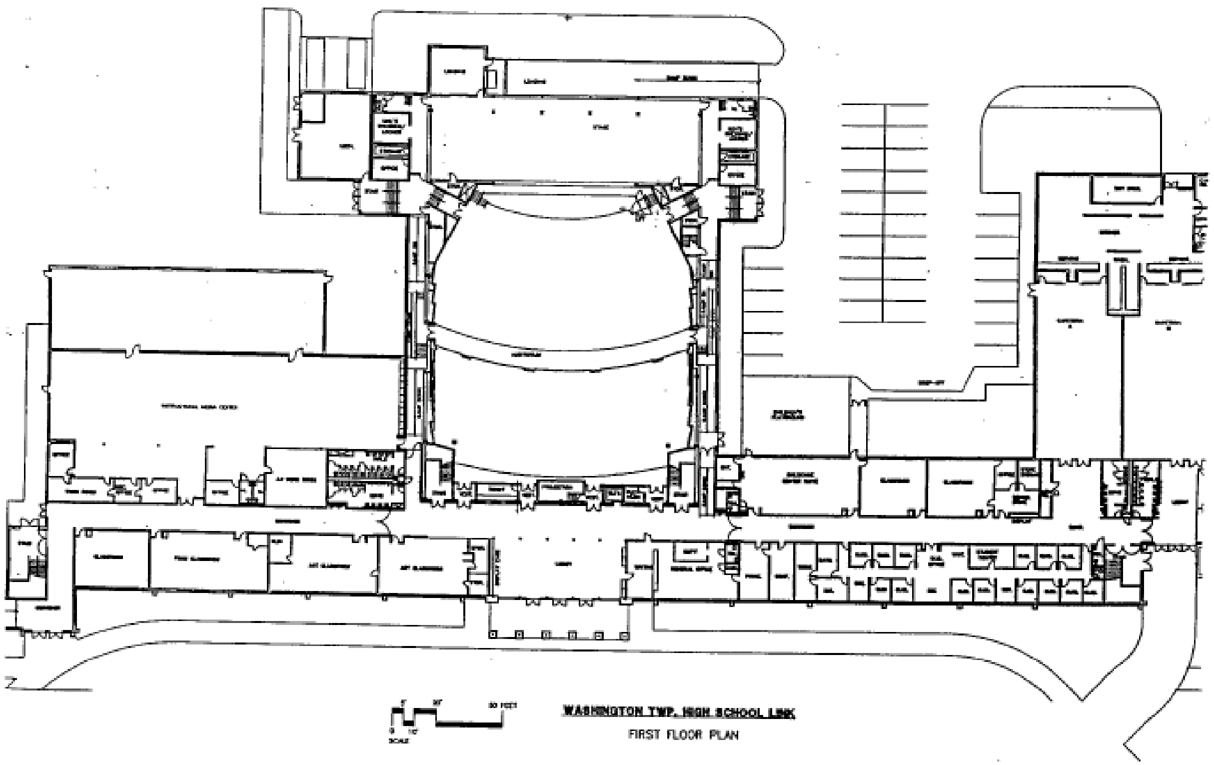
	R-22							
Cooling	CU-72; EMIO condensing unit, .75 tons, 1 compressor, R-22	EMIO, Model #S1HA9000D 10, Serial #N/A	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	RTU-20, Aaon condensing unit, 13 tons, 2 compressors, R-410a	Aaon, Model #RM-013-3-0-BB02-EJN, Serial #200606-AMWK01682	Electricity	Rooftop	11/12 Wing	2006	15	60%
Cooling	RTU-17, York condensing unit, 7.5 tons, 2 compressors, R-22	York, Model #DR090C00S 4TZZ30001D, Serial #N0F6541401	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	EMIO condensing unit, .75 tons, 1 compressor, R-22	EMIO, Model #SHC09DA00 00AA0A, Serial #1-02-M-0872-49	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	Sanyo condensing unit, 2 tons, 1 compressor, R-22	Sanyo, Model #SAP243CL, Serial #0001001	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-71, EMIO condensing unit, .75 tons, 1 compressor, R-22	EMIO, Model #N/A, Serial #N/A	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-28; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S4 6G, Serial #W0F650192 6	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-27; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S4 6G, Serial #W0F642141 5	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-26; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S4 6G, Serial #W0F650192 7	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-25; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S4 6G, Serial #W0F642144 3	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-1; York condensing unit, 3.5 tons, 1	York, Model #H1RA042S4 6G, Serial #W0F642143	Electricity	Rooftop	11/12 Wing	1992	15	0%

	compressor, R-22	9						
Cooling	CU-9; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6501937	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	RTU-1, York condensing unit, 12.5 tons, 2 compressors, R-22	York, Model #DR150C00S4TZZ40001B, Serial #N0F6542958	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-2; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6501922	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-10; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #H1RA036S46G, Serial #W0F6501095	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-11; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #H1RA036S46G, Serial #W0F6501077	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-3; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6501920	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-4; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6501934	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-12; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #H1RA036S46G, Serial #W0F6501090	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-5; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6501928	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-6; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #H1RA036S46G, Serial #W0F6501100	Electricity	Rooftop	11/12 Wing	1992	15	0%
Cooling	CU-13; York condensing unit, 3.5 tons, 1 compressor, R-22	York, Model #H1RA042S46G, Serial #W0F6501925	Electricity	Rooftop	11/12 Wing	1992	15	0%

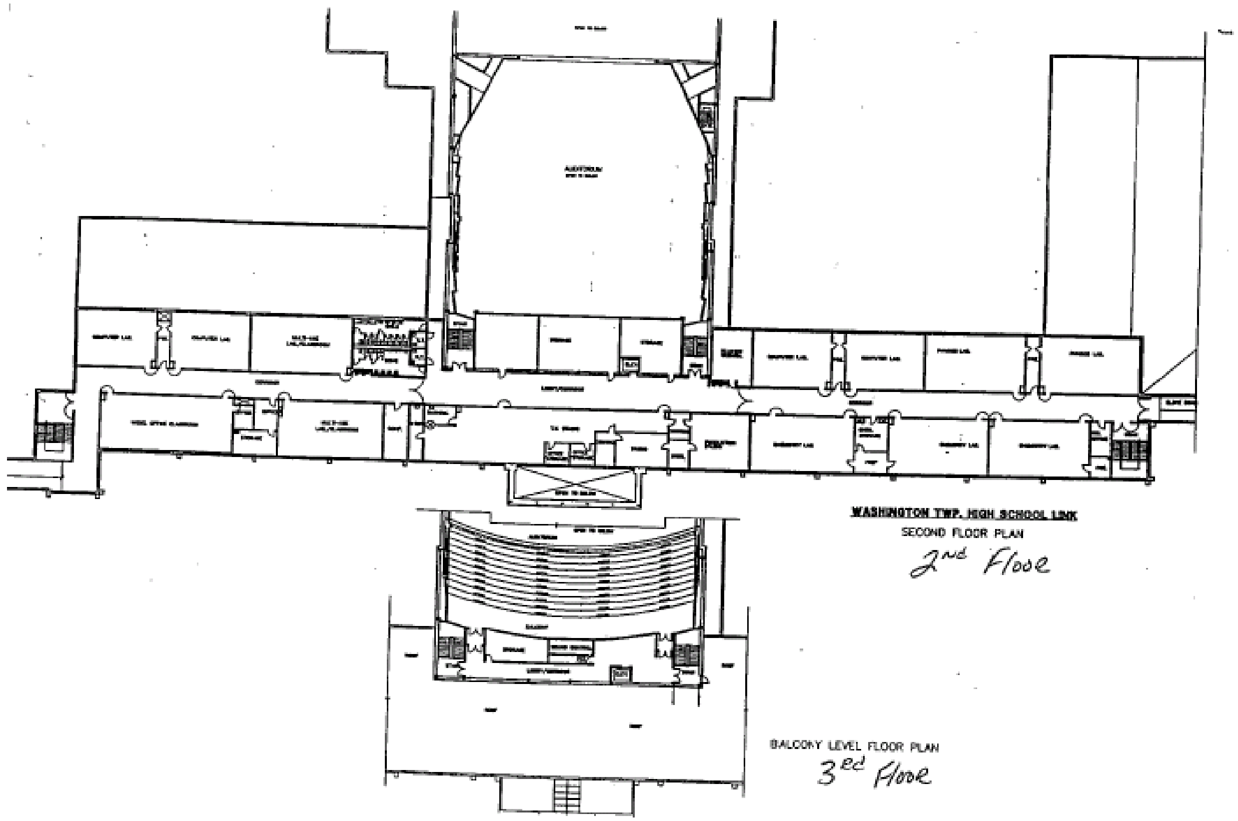
Cooling	CU-30; York condensing unit, 3 tons, 1 compressor, R-22	York, Model #H1RA036S46G, Serial #W0F6501096	Electricity	Rooftop	11/12 Wing	1992	15	0%

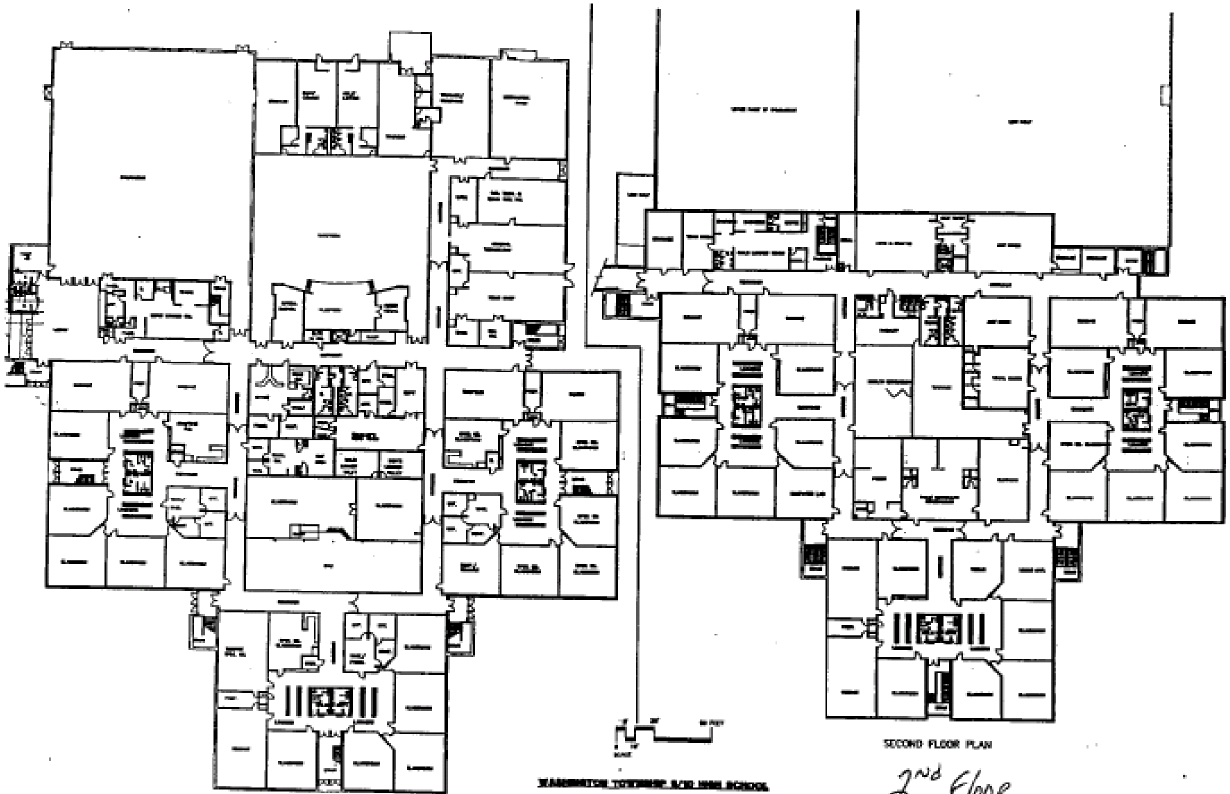
Note: The remaining useful life of a system (in %) is an estimate based on the system date of built and existing conditions derived from visual inspection.

Appendix B: High School Floor Plan



H.S. CORE


WASHINGTON TWP. HIGH SCHOOL LINK
SECOND FLOOR PLAN
2nd Floor
BALCONY LEVEL FLOOR PLAN
3rd Floor



WASHINGTON TOWNSHIP 9/10 HIGH SCHOOL

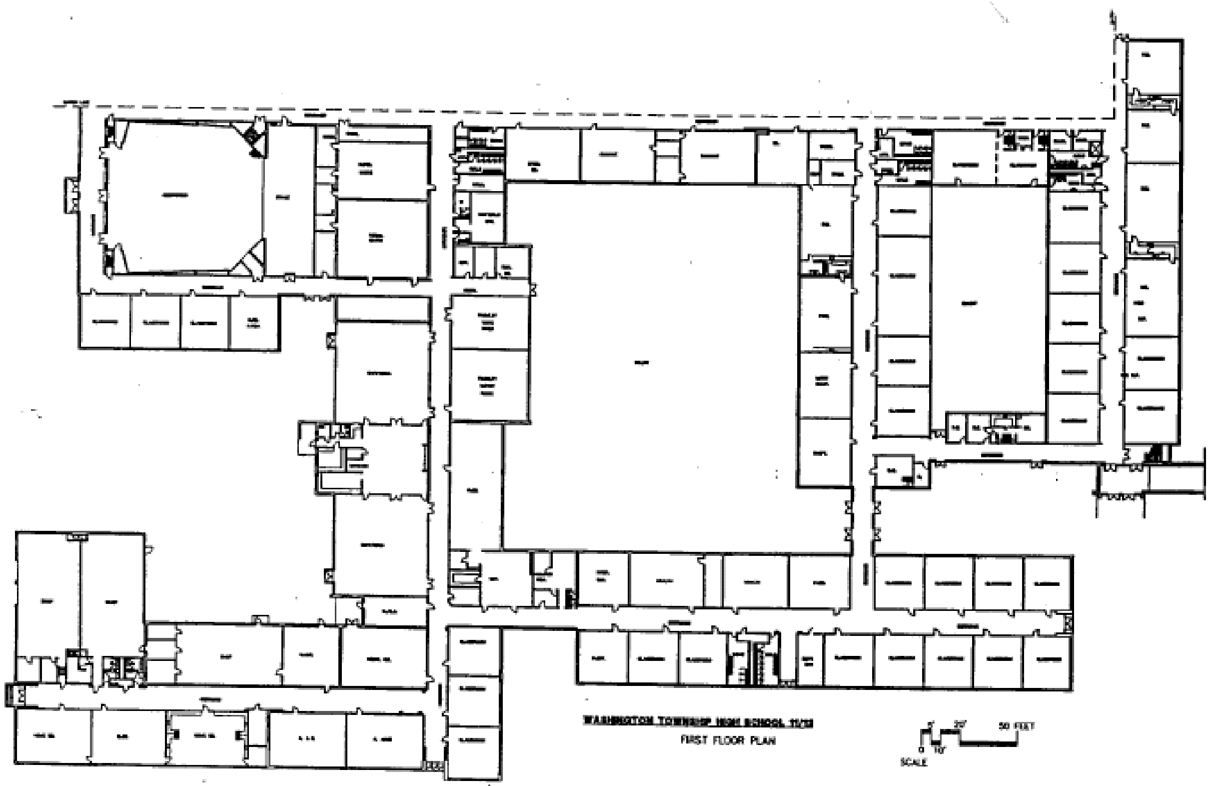
SECOND FLOOR PLAN

2nd Floor

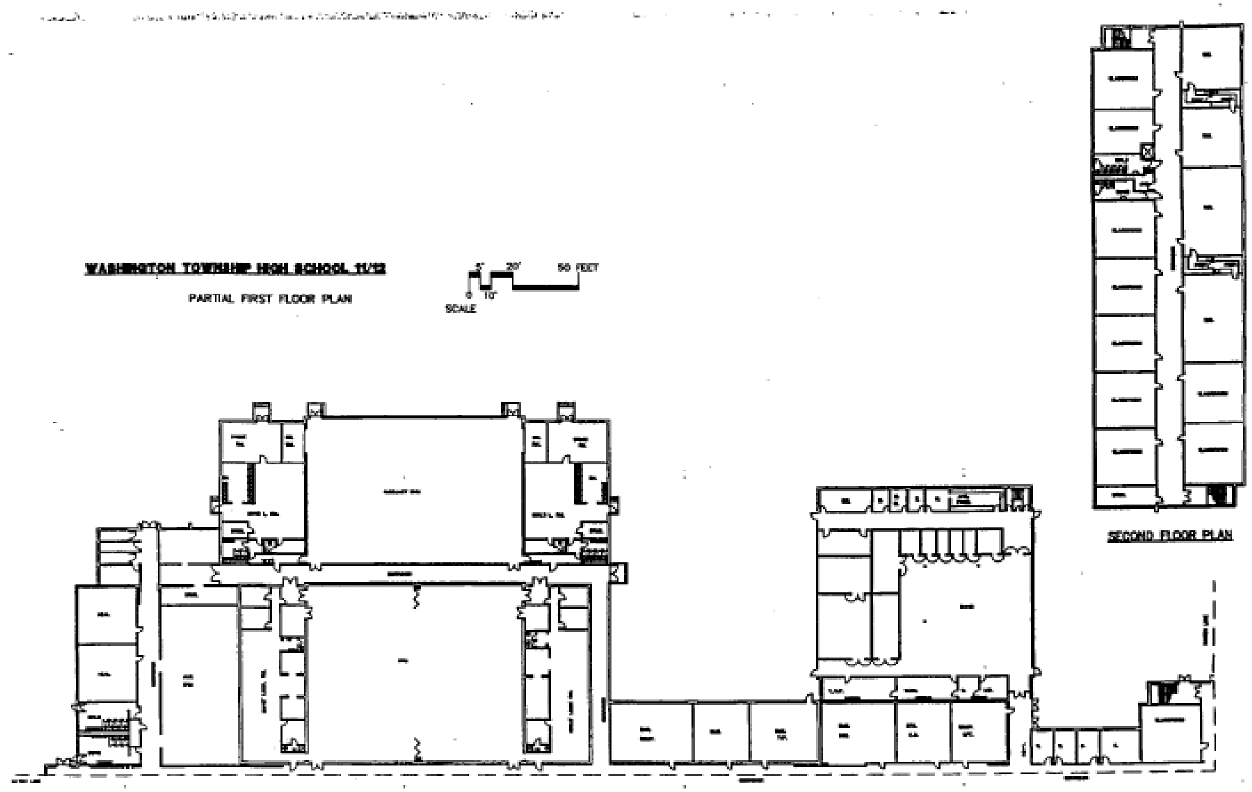
FIRST FLOOR PLAN

1st Floor

9/10 High School


WASHINGTON TOWNSHIP HIGH SCHOOL 11/12
FIRST FLOOR PLAN
0
10'
20'
50 FEET
SCALE

11-12



Appendix C: Lighting Study

Location			Existing Fixture Information												Retrofit Information													Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
1	1	Classroom (K102)	Recessed Parabolic	E	4'T8	8	4	32	Sw	8	241	20	1,184	2,283	C	Recessed Parabolic	4'T8	E	OS	8	4	32	6	241	20	1184	1712	0	571	571
2	1	Classroom (K103)	Recessed Parabolic	E	4'T8	17	4	32	Sw	8	241	20	2,516	4,851	C	Recessed Parabolic	4'T8	E	OS	17	4	32	6	241	20	2516	3638	0	1213	1213
3	1	Storage Closet (K104)	Recessed Parabolic	E	4'T8	1	2	32	Sw	2	241	10	74	36	N/A	Recessed Parabolic	4'T8	E	Sw	1	2	32	2	241	10	74	36	0	0	0
4	1	Classroom (K105)	Recessed Parabolic	E	4'T8	28	2	32	Sw	8	241	10	2,072	3,995	C	Recessed Parabolic	4'T8	E	OS	28	2	32	6	241	10	2072	2996	0	999	999
5	1	Classroom (K106)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
6	1	Classroom (K109)	Recessed Parabolic	E	4'T8	10	4	32	Sw	8	241	20	1,480	2,853	C	Recessed Parabolic	4'T8	E	OS	10	4	32	6	241	20	1480	2140	0	713	713
7	1	Classroom (K110)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
8	1	Classroom (K111)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
9	1	Classroom (K112)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
10	1	Bathroom Men	Recessed Parabolic	E	4'T8	2	4	32	Sw	8	241	20	296	571	C	Recessed Parabolic	4'T8	E	OS	2	4	32	6	241	20	296	428	0	143	143
11	1	Bathroom Women	Recessed Parabolic	E	4'T8	2	4	32	Sw	8	241	20	296	571	C	Recessed Parabolic	4'T8	E	OS	2	4	32	6	241	20	296	428	0	143	143
12	1	Staircase	Parabolic Ceiling Mounted	E	4'T8	3	2	32	Sw	16	241	10	222	856	T8-BL	Parabolic Ceiling Mounted	4'T8	E	BL	3	2	32	10	241	10	222	495	0	361	361
13	1	Hallway	Recessed Parabolic	E	4'T8	24	4	32	Sw	16	241	20	3,552	13,697	N/A	Recessed Parabolic	4'T8	E	Sw	24	4	32	16	241	20	3552	13697	0	0	0
14	1	Office	Recessed Parabolic	E	4'T8	10	3	32	Sw	8	241	15	1,110	2,140	C	Recessed Parabolic	4'T8	E	OS	10	3	32	6	241	15	1110	1605	0	535	535
15	1	Classroom (I102)	Recessed Parabolic	E	4'T8	8	4	32	Sw	8	241	20	1,184	2,283	C	Recessed Parabolic	4'T8	E	OS	8	4	32	6	241	20	1184	1712	0	571	571
16	1	Classroom (I103)	Recessed Parabolic	E	4'T8	17	4	32	Sw	8	241	20	2,516	4,851	C	Recessed Parabolic	4'T8	E	OS	17	4	32	6	241	20	2516	3638	0	1213	1213
17	1	Storage Closet (I104)	Recessed Parabolic	E	4'T8	1	2	32	Sw	2	241	10	74	36	N/A	Recessed Parabolic	4'T8	E	Sw	1	2	32	2	241	10	74	36	0	0	0
18	1	Classroom (I105)	Recessed Parabolic	E	4'T8	28	2	32	Sw	8	241	10	2,072	3,995	C	Recessed Parabolic	4'T8	E	OS	28	2	32	6	241	10	2072	2996	0	999	999
19	1	Classroom (I106)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
20	1	Classroom (I109)	Recessed Parabolic	E	4'T8	10	4	32	Sw	8	241	20	1,480	2,853	C	Recessed Parabolic	4'T8	E	OS	10	4	32	6	241	20	1480	2140	0	713	713
21	1	Classroom (I110)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
22	1	Classroom (I111)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
23	1	Classroom (I112)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
24	1	Bathroom Men	Recessed Parabolic	E	4'T8	2	4	32	Sw	8	241	20	296	571	C	Recessed Parabolic	4'T8	E	OS	2	4	32	6	241	20	296	428	0	143	143
25	1	Bathroom Women	Recessed Parabolic	E	4'T8	2	4	32	Sw	8	241	20	296	571	C	Recessed Parabolic	4'T8	E	OS	2	4	32	6	241	20	296	428	0	143	143
26	1	Staircase	Parabolic Ceiling Mounted	E	4'T8	3	2	32	Sw	16	241	10	222	856	T8-BL	Parabolic Ceiling Mounted	4'T8	E	BL	3	2	32	10	241	10	222	495	0	361	361
27	1	Hallway	Recessed Parabolic	E	4'T8	24	4	32	Sw	16	241	20	3,552	13,697	N/A	Recessed Parabolic	4'T8	E	Sw	24	4	32	16	241	20	3552	13697	0	0	0
28	1	Office	Recessed Parabolic	E	4'T8	10	3	32	Sw	8	241	15	1,110	2,140	C	Recessed Parabolic	4'T8	E	OS	10	3	32	6	241	15	1110	1605	0	535	535
29	1	Classroom (L102)	Recessed Parabolic	E	4'T8	8	4	32	Sw	8	241	20	1,184	2,283	C	Recessed Parabolic	4'T8	E	OS	8	4	32	6	241	20	1184	1712	0	571	571
30	1	Classroom (L103)	Recessed Parabolic	E	4'T8	17	4	32	Sw	8	241	20	2,516	4,851	C	Recessed Parabolic	4'T8	E	OS	17	4	32	6	241	20	2516	3638	0	1213	1213
31	1	Storage Closet (L104)	Recessed Parabolic	E	4'T8	1	2	32	Sw	2	241	10	74	36	N/A	Recessed Parabolic	4'T8	E	Sw	1	2	32	2	241	10	74	36	0	0	0
32	1	Classroom (L105)	Recessed Parabolic	E	4'T8	28	2	32	Sw	8	241	10	2,072	3,995	C	Recessed Parabolic	4'T8	E	OS	28	2	32	6	241	10	2072	2996	0	999	999
33	1	Classroom (L106)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
34	1	Classroom (L109)	Recessed Parabolic	E	4'T8	10	4	32	Sw	8	241	20	1,480	2,853	C	Recessed Parabolic	4'T8	E	OS	10	4	32	6	241	20	1480	2140	0	713	713
35	1	Classroom (L110)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
36	1	Classroom (L111)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
37	1	Classroom (L112)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
38	1	Bathroom Men	Recessed Parabolic	E	4'T8	2	4	32	Sw	8	241	20	296	571	C	Recessed Parabolic	4'T8	E	OS	2	4	32	6	241	20	296	428	0	143	143
39	1	Bathroom Women	Recessed Parabolic	E	4'T8	2	4	32	Sw	8	241	20	296	571	C	Recessed Parabolic	4'T8	E	OS	2	4	32	6	241	20	296	428	0	143	143
40	1	Staircase	Parabolic Ceiling Mounted	E	4'T8	3	2	32	Sw	16	241	10	222	856	T8-BL	Parabolic Ceiling Mounted	4'T8	E	BL	3	2	32	10	241	10	222	495	0	361	361
41	1	Hallway	Recessed Parabolic	E	4'T8	24	4	32	Sw	16	241	20	3,552	13,697	N/A	Recessed Parabolic	4'T8	E	Sw	24	4	32	16	241	20	3552	13697	0	0	0
42	1	Office	Recessed Parabolic	E	4'T8	10	3	32	Sw	8	241	15	1,110	2,140	C	Recessed Parabolic	4'T8	E	OS	10	3	32	6	241	15	1110	1605	0	535	535
43	2	Classroom (K201)	Recessed Parabolic	E	4'T8	28	2	32	Sw	8	241	10	2,072	3,995	C	Recessed Parabolic	4'T8	E	OS	28	2	32	6	241	10	2072	2996	0	999	999
44	2	Classroom (K202)	Recessed Parabolic	E	4'T8	8	4	32	Sw	8	241	20	1,184	2,283	C	Recessed Parabolic	4'T8	E	OS	8	4	32	6	241	20	1184	1712	0	571	571
45	2	Classroom (K203)	Recessed Parabolic	E	4'T8	17	4	32	Sw	8	241	20	2,516	4,851	C	Recessed Parabolic	4'T8	E	OS	17	4	32	6	241	20	2516	3638	0	1213	1213
46	2	Storage Closet (K204)	Recessed Parabolic	E	4'T8	1	2	32	Sw	2	241	10	74	36	N/A	Recessed Parabolic	4'T8	E	Sw	1	2	32	2	241	10	74	36	0	0	0
47	2	Classroom (K205)	Recessed Parabolic	E	4'T8	28	2	32	Sw	8	241	10	2,072	3,995	C	Recessed Parabolic	4'T8	E	OS	28	2	32	6	241	10	2072	2996	0	999	999
48	2	Classroom (K206)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
49	2	Classroom (K209)	Recessed Parabolic	E	4'T8	10	4	32	Sw	8	241	20	1,480	2,853	C	Recessed Parabolic	4'T8	E	OS	10	4	32	6	241	20	1480	2140	0	713	713
50	2	Classroom (K210)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
51	2	Classroom (K211)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
52	2	Classroom (K212)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
53	2	Bathroom Men	Recessed Parabolic	E	4'T8	2	4	32	Sw	8	241	20	296	571	C	Recessed Parabolic	4'T8	E	OS	2	4	32	6	241	20	296	428	0	143	143
54	2	Bathroom Women	Recessed Parabolic	E	4'T8	2	4	32	Sw	8	241	20	296	571	C	Recessed Parabolic	4'T8	E	OS	2	4	32	6	241	20	296	428	0	143	143
55	2	Staircase	Recessed Parabolic	E	4'T8	24	4	32	Sw	16	241	20	3,552	13,697	T8-BL	Recessed Parabolic	4'T8	E	BL	24	4	32	10	241	20	3552	7922	0	5775	5775
56	2	Classroom (I201)	Recessed Parabolic	E	4'T8	28	2	32	Sw	8	241	10	2,072	3,995	C	Recessed Parabolic	4'T8	E	OS	28	2	32	6	241	10	2072	2996	0	999	999
57	2	Classroom (I202)	Recessed Parabolic	E	4'T8	8	4	32	Sw	8	241	20	1,184	2,283	C	Recessed Parabolic	4'T8	E	OS	8	4	32	6	241	20	1184	1712	0	571	571
58	2	Classroom (I203)	Recessed Parabolic	E	4'T8	17	4	32	Sw	8	241	20	2,516	4,851	C	Recessed Parabolic	4'T8	E	OS	17	4	32	6	241	20	2516	3638	0	1213	1213
59	2	Storage Closet (I204)	Recessed Parabolic	E	4'T8	1	2	32	Sw	2	241	10	74	36	N/A	Recessed Parabolic	4'T8	E	Sw	1	2	32	2	241	10	74	36	0	0	0
60	2	Classroom (I205)	Recessed Parabolic	E	4'T8	28	2	32	Sw	8	241	10	2,072	3,995	C	Recessed Parabolic	4'T8	E	OS	28	2	32	6	241	10	2072	2996	0	999	999
61	2	Classroom (I206)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
62	2	Classroom (I209)	Recessed Parabolic	E	4'T8	10	4	32	Sw	8	241	20	1,480	2,853	C	Recessed Parabolic	4'T8	E	OS	10	4	32	6	241	20	1480	2140	0	713	713
63	2	Classroom (I210)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
64	2	Classroom (I211)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
65	2	Classroom (I212)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
66	2	Bathroom Men	Recessed Parabolic	E	4'T8	2	4	32	Sw	8	241	20	296	571	C	Recessed Parabolic	4'T8	E	OS	2	4	32	6	241	20	296	428	0	143	143
67	2	Bathroom Men	Recessed Parabolic	E	4'T8	2	4	32	Sw	8	241	20	296	571	N/A	Recessed Parabolic	4'T8	E	Sw	2	4	32	8	241	20	296	571	0	0	0
68	2	Bathroom Women	Recessed Parabolic	E	4'T8	24	4	32	Sw	16	241	20	3,552	13,697	C	Recessed Parabolic	4'T8	E	OS	24	4	32	12	241	20	3552	10272	0	3424	3424
69	2	Classroom (L201)	Recessed Parabolic	E	4'T8	28	2	32	Sw	8	241	10	2,072	3,995	C	Recessed Parabolic	4'T8	E	OS	28	2	32	6	241	10	2072	2996	0	999	999
70	2	Classroom (L202)	Recessed Parabolic	E	4'T8	8	4	32	Sw	8	241	20	1,184	2,283	C	Recessed Parabolic	4'T8	E	OS	8	4	32	6	241	20	1184	1712	0	571	571

Location			Existing Fixture Information												Retrofit Information													Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
71	2	Classroom (L203)	Recessed Parabolic	E	4'T8	17	4	32	Sw	8	241	20	2,516	4,851	C	Recessed Parabolic	4'T8	E	OS	17	4	32	6	241	20	2516	3638	0	1213	1213
72	2	Storage Closet (L204)	Recessed Parabolic	E	4'T8	1	2	32	Sw	2	241	10	74	36	N/A	Recessed Parabolic	4'T8	E	Sw	1	2	32	2	241	10	74	36	0	0	0
73	2	Classroom (L205)	Recessed Parabolic	E	4'T8	28	2	32	Sw	8	241	10	2,072	3,995	C	Recessed Parabolic	4'T8	E	OS	28	2	32	6	241	10	2072	2996	0	999	999
74	2	Classroom (L206)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
75	2	Classroom (L209)	Recessed Parabolic	E	4'T8	10	4	32	Sw	8	241	20	1,480	2,853	C	Recessed Parabolic	4'T8	E	OS	10	4	32	6	241	20	1480	2140	0	713	713
76	2	Classroom (L210)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
77	2	Classroom (L211)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
78	2	Classroom (L212)	Recessed Parabolic	E	4'T8	11	4	32	Sw	8	241	20	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	11	4	32	6	241	20	1628	2354	0	785	785
79	2	Bathroom Men	Recessed Parabolic	E	4'T8	2	4	32	Sw	8	241	20	296	571	C	Recessed Parabolic	4'T8	E	OS	2	4	32	6	241	20	296	428	0	143	143
80	2	Bathroom Women	Recessed Parabolic	E	4'T8	2	4	32	Sw	8	241	20	296	571	C	Recessed Parabolic	4'T8	E	OS	2	4	32	6	241	20	296	428	0	143	143
81	2	Staircase	Recessed Parabolic	E	4'T8	24	4	32	Sw	16	241	20	3,552	13,697	T8-BL	Recessed Parabolic	4'T8	E	BL	24	4	32	10	241	20	3552	7922	0	5775	5775
82	1	Gymnasium (H106)	High Bay	S	PSMH	35	1	320	Sw	8	241	64	13,440	25,912	T5	High Bay	4'T5	E	Sw	35	6	55	8	241	47	13198	25446	466	0	466
83	1	Gymnasium (H106)	Recessed Parabolic	E	4'T8	28	4	32	Sw	8	241	20	4,144	7,990	N/A	Recessed Parabolic	4'T8	E	Sw	28	4	32	8	241	20	4144	7990	0	0	0
84	1	Classroom (H110)	Recessed Parabolic	E	4'T8	8	4	32	Sw	8	241	20	1,184	2,283	C	Recessed Parabolic	4'T8	E	OS	8	4	32	6	241	20	1184	1712	0	571	571
85	1	Classroom (H110)	Recessed Parabolic	E	4'T8	22	2	32	Sw	8	241	10	1,628	3,139	C	Recessed Parabolic	4'T8	E	OS	22	2	32	6	241	10	1628	2354	0	785	785
86	1	Classroom (H111)	Recessed Parabolic	E	4'T8	24	2	32	Sw	8	241	10	1,776	3,424	C	Recessed Parabolic	4'T8	E	OS	24	2	32	6	241	10	1776	2568	0	856	856
87	1	Hallway	Recessed Parabolic	E	4'T8	11	4	32	Sw	16	241	20	1,628	6,278	N/A	Recessed Parabolic	4'T8	E	Sw	11	4	32	16	241	20	1628	6278	0	0	0
88	1	Classroom (H112)	Recessed Parabolic	E	4'T8	15	2	32	Sw	8	241	10	1,110	2,140	C	Recessed Parabolic	4'T8	E	OS	15	2	32	6	241	10	1110	1605	0	535	535
89	1	Classroom (H107)	Recessed Parabolic	E	4'T8	8	3	32	Sw	8	241	15	888	1,712	C	Recessed Parabolic	4'T8	E	OS	8	3	32	6	241	15	888	1284	0	428	428
90	1	Mechanical Rm (H113)	Parabolic Ceiling Suspended	E	4'T8	16	2	32	Sw	2	241	10	1,184	571	N/A	Parabolic Ceiling Suspended	4'T8	E	Sw	16	2	32	2	241	10	1184	571	0	0	0
91	1	Storage Closet (H114)	Parabolic Ceiling Suspended	E	4'T8	6	2	32	Sw	2	241	10	444	214	N/A	Parabolic Ceiling Suspended	4'T8	E	Sw	6	2	32	2	241	10	444	214	0	0	0
92	1	Boys Locker Room ( )	Recessed Parabolic	E	4'T8	19	4	32	Sw	8	241	20	2,812	5,422	C	Recessed Parabolic	4'T8	E	OS	19	4	32	6	241	20	2812	4066	0	1355	1355
93	1	Boys Locker Room ( )	Recessed Parabolic	S	Inc	3	1	60	Sw	8	241	0	180	347	CFL	Recessed Parabolic	CFL	S	OS	3	1	20	6	241	0	60	87	231	29	260
94	1	Girls Locker Room ( )	Recessed Parabolic	E	4'T8	19	4	32	Sw	8	241	20	2,812	5,422	C	Recessed Parabolic	4'T8	E	OS	19	4	32	6	241	20	2812	4066	0	1355	1355
95	1	Girls Locker Room ( )	Recessed Parabolic	S	Inc	3	1	60	Sw	8	241	0	180	347	CFL	Recessed Parabolic	CFL	S	OS	3	1	20	6	241	0	60	87	231	29	260
96	1	Gym Office ( )	Recessed Parabolic	E	4'T8	2	3	32	Sw	8	241	15	222	428	C	Recessed Parabolic	4'T8	E	OS	2	3	32	6	241	15	222	321	0	107	107
97	1	Main Office ( )	Recessed Parabolic	E	4'T8	14	3	32	Sw	8	241	15	1,554	2,996	C	Recessed Parabolic	4'T8	E	OS	14	3	32	6	241	15	1554	2247	0	749	749
98	1	Student Council Office ( )	Recessed Parabolic	E	4'T8	3	3	32	Sw	8	241	15	333	642	C	Recessed Parabolic	4'T8	E	OS	3	3	32	6	241	15	333	482	0	161	161
99	1	Bathroom Men	Recessed Parabolic	E	4'T8	2	4	32	Sw	8	241	20	296	571	C	Recessed Parabolic	4'T8	E	OS	2	4	32	6	241	20	296	428	0	143	143
100	1	Bathroom Women	Recessed Parabolic	E	4'T8	2	4	32	Sw	8	241	20	296	571	C	Recessed Parabolic	4'T8	E	OS	2	4	32	6	241	20	296	428	0	143	143
101	1	Classroom (J106)	Recessed Parabolic	E	4'T8	16	4	32	Sw	8	241	20	2,368	4,566	C	Recessed Parabolic	4'T8	E	OS	16	4	32	6	241	20	2368	3424	0	1141	1141
102	1	Storage Closet (J106)	Recessed Parabolic	E	4'T8	4	2	32	Sw	2	241	10	296	143	N/A	Recessed Parabolic	4'T8	E	Sw	4	2	32	2	241	10	296	143	0	0	0
103	1	Classroom (J107)	Recessed Parabolic	E	4'T8	38	4	32	Sw	8	241	20	5,624	10,843	C	Recessed Parabolic	4'T8	E	OS	38	4	32	6	241	20	5624	8132	0	2711	2711
104	1	Office (J110)	Recessed Parabolic	E	4'T8	2	4	32	Sw	8	241	20	296	571	C	Recessed Parabolic	4'T8	E	OS	2	4	32	6	241	20	296	428	0	143	143
105	1	Office (J111)	Recessed Parabolic	E	4'T8	2	4	32	Sw	8	241	20	296	571	C	Recessed Parabolic	4'T8	E	OS	2	4	32	6	241	20	296	428	0	143	143
106	1	Office (J112)	Recessed Parabolic	E	4'T8	4	4	32	Sw	8	241	20	592	1,141	C	Recessed Parabolic	4'T8	E	OS	4	4	32	6	241	20	592	856	0	285	285
107	1	Office (J113)	Recessed Parabolic	E	4'T8	4	2	32	Sw	8	241	10	296	571	C	Recessed Parabolic	4'T8	E	OS	4	2	32	6	241	10	296	428	0	143	143
108	1	Office (J114)	Recessed Parabolic	E	4'T8	2	2	32	Sw	8	241	10	148	285	C	Recessed Parabolic	4'T8	E	OS	2	2	32	6	241	10	148	214	0	71	71
109	1	Nurse's Station	Recessed Parabolic	E	4'T8	7	4	32	Sw	8	241	20	1,036	1,997	N/A	Recessed Parabolic	4'T8	E	Sw	7	4	32	8	241	20	1036	1997	0	0	0
110	2	Storage Closet (J201)	Recessed Parabolic	S	Inc	2	1	60	Sw	2	241	0	120	58	CFL	Recessed Parabolic	CFL	S	Sw	2	1	20	2	241	0	40	19	39	0	39
111	2	Faculty Room	Parabolic Wall Mounted	E	4'T8	18	1	32	Sw	8	241	5	666	1,284	C	Parabolic Wall Mounted	4'T8	E	OS	18	1	32	6	241	5	666	963	0	321	321
112	2	Faculty Room	Recessed Parabolic	E	4'T8	17	4	32	Sw	8	241	20	2,516	4,851	C	Recessed Parabolic	4'T8	E	OS	17	4	32	6	241	20	2516	3638	0	1213	1213
113	2	Bathroom Men	Recessed Parabolic	E	4'T8	2	4	32	Sw	8	241	20	296	571	C	Recessed Parabolic	4'T8	E	OS	2	4	32	6	241	20	296	428	0	143	143
114	2	Bathroom Men ( )	Recessed Parabolic	E	4'T8	1	2	32	Sw	8	241	10	74	143	N/A	Recessed Parabolic	4'T8	E	Sw	1	2	32	8	241	10	74	143	0	0	0
115	2	Bathroom Women	Recessed Parabolic	E	4'T8	2	4	32	Sw	8	241	20	296	571	C	Recessed Parabolic	4'T8	E	OS	2	4	32	6	241	20	296	428	0	143	143
116	2	Bathroom Women	Recessed Parabolic	E	4'T8	1	2	32	Sw	8	241	10	74	143	N/A	Recessed Parabolic	4'T8	E	Sw	1	2	32	8	241	10	74	143	0	0	0
117	1	Staircase	Parabolic Ceiling Mounted	E	4'T8	5	2	32	Sw	16	241	10	370	1,427	T8-BL	Parabolic Ceiling Mounted	4'T8	E	BL	5	2	32	10	241	10	370	825	0	602	602
118	1	Boys Locker Room	Recessed Parabolic	E	4'T8	19	4	32	Sw	8	241	20	2,812	5,422	C	Recessed Parabolic	4'T8	E	OS	19	4	32	6	241	20	2812	4066	0	1355	1355
119	2	Girls Locker Room	Recessed Parabolic	E	4'T8	19	4	32	Sw	8	241	20	2,812	5,422	C	Recessed Parabolic	4'T8	E	OS	19	4	32	6	241	20	2812	4066	0	1355	1355
120	2	Classroom (J207)	Recessed Parabolic	E	4'T8	14	4	32	Sw	8	241	20	2,072	3,995	C	Recessed Parabolic	4'T8	E	OS	14	4	32	6	241	20	2072	2996	0	999	999
121	2	Classroom (J209)	Recessed Parabolic	E	4'T8	15	4	32	Sw	8	241	20	2,220	4,280	C	Recessed Parabolic	4'T8	E	OS	15	4	32	6	241	20	2220	3210	0	1070	1070
122	2	Classroom (J210)	Recessed Parabolic	E	4'T8	18	4	32	Sw	8	241	20	2,664	5,136	C	Recessed Parabolic	4'T8	E	OS	18	4	32	6	241	20	2664	3852	0	1284	1284
123	2	Classroom (J211)	Recessed Parabolic	E	4'T8	17	4	32	Sw	8	241	20	2,516	4,851	C	Recessed Parabolic	4'T8	E	OS	17	4	32	6	241	20	2516	3638	0	1213	1213
124	2	Classroom (J212)	Recessed Parabolic	E	4'T8	14	4	32	Sw	8	241	20	2,072	3,995	C	Recessed Parabolic	4'T8	E	OS	14	4	32	6	241	20	2072	2996	0	999	999
125	2	Classroom (J213)	Recessed Parabolic	E	4'T8	14	4	32	Sw	8	241	20	2,072	3,995	C	Recessed Parabolic	4'T8	E	OS	14	4	32	6	241	20	2072	2996	0	999	999
126	2	Classroom (H201)	Recessed Parabolic	E	4'T8	4	4	32	Sw	8	241	20	592	1,141	C	Recessed Parabolic	4'T8	E	OS	4	4	32	6	241	20	592	856	0	285	285
127	2	Classroom (H202)	Recessed Parabolic	E	4'T8	8	4	32	Sw	8	241	20	1,184	2,283	C	Recessed Parabolic	4'T8	E	OS	8	4	32	6	241	20	1184	1712	0	571	571
128	2	Classroom (H205)	Recessed Parabolic	E	4'T8	18	4	32	Sw	8	241	20	2,664	5,136	C	Recessed Parabolic	4'T8	E	OS	18	4	32	6	241	20	2664	3852	0	1284	1284
128	2	Classroom (H205)	Recessed Parabolic	E	4'T8	18	4	32	Sw	8	241	20	2,664	5,136	C	Recessed Parabolic	4'T8	E	OS	18	4	32	6	241	20	2664	3852	0	1284	1284
129	2	Classroom (H206)	Recessed Parabolic	E	4'T8	18	4	32	Sw	8	241	20	2,664	5,136	C	Recessed Parabolic	4'T8	E	OS	18	4	32	6	241	20	2664	3852	0	1284	1284
130	2	Office (H207)	Recessed Parabolic	E	4'T8	3	4	32	Sw	8	241	20	444	856	C	Recessed Parabolic	4'T8	E	OS	3	4	32	6	241	20	444	642	0	214	214
131	1	Exterior	Wallpack	E	HPS	10	1	250	T	12	241	50	3,000	8,676	LED	Wallpack	LED	E	T	10	1	78	12	241	8	858	2481	6195	0	6195
132	1	Exterior	Wallpack	E	HPS	14	1	250	PC	12	241	50	4,200	12,146	LED	Wallpack	LED	E	PC	14	1	78	12	241	8	1201	3474	8673	0	8673
Totals:						1,529	446	5,064				2,364	206,231	447,182						1,529	451	4,335			2,263	200,528	340,817	15,835	90,531	106,365

Rows Highlighed Yellow Indicate an Energy Conservation Measure is recommended for that space

Location			Existing Fixture Information												Retrofit Information													Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
1	1	Kitchen	Recessed	S	CFL	12	1	13	Sw	24	365	0	156	1,367	N/A	Recessed	CFL	S	Sw	12	1	13	24	365	0	156	1367	0	0	0
2	1	Storage Room	Ceiling Mounted	S	CFL	3	1	13	Sw	2	365	0	39	28	N/A	Ceiling Mounted	CFL	S	Sw	3	1	13	2	365	0	39	28	0	0	0
3	1	Cafeteria	Ceiling Mounted	E	4'T8	4	2	32	Sw	8	365	10	296	864	N/A	Ceiling Mounted	4'T8	E	Sw	4	2	32	8	365	10	296	864	0	0	0
4	1	Teachers Lounge	Ceiling Suspended	E	4'T8	8	2	32	Sw	8	365	10	592	1,729	C	Ceiling Suspended	4'T8	E	OS	8	2	32	6	365	10	592	1296	0	432	432
5	1	Bathroom	Recessed	S	Inc	1	1	60	Sw	9	365	0	60	197	CFL	Recessed	CFL	S	Sw	1	1	20	9	365	0	20	66	131	0	131
6	1	Bathroom	Recessed	S	Inc	1	1	60	Sw	9	365	0	60	197	CFL	Recessed	CFL	S	Sw	1	1	20	9	365	0	20	66	131	0	131
7	1	Vestibule	Recessed	E	2'T8	1	2	17	Sw	16	365	4	38	222	N/A	Recessed	2'T8	E	Sw	1	2	17	16	365	4	38	222	0	0	0
8	1	Vestibule	Recessed	E	2'T8	1	2	17	Sw	16	365	4	38	222	N/A	Recessed	2'T8	E	Sw	1	2	17	16	365	4	38	222	0	0	0
9	1	Lobby showcase	Recessed	M	8'T8	1	1	59	Sw	8	365	7	66	193	N/A	Recessed	8'T8	M	Sw	1	1	59	8	365	7	66	193	0	0	0
10	1	Lobby showcase	Recessed	S	CFL	1	1	13	Sw	8	365	0	13	38	N/A	Recessed	CFL	S	Sw	1	1	13	8	365	0	13	38	0	0	0
11	1	Cafeteria	Recessed Parabolic	E	4'T8	44	4	32	Sw	12	241	20	6,512	18,833	N/A	Recessed Parabolic	4'T8	E	Sw	44	4	32	12	241	20	6512	18833	0	0	0
12	1	Cafeteria	Exit Sign	S	LED	3	1	5	N	24	365	1	17	145	N/A	Exit Sign	LED	S	N	3	1	5	24	365	1	17	145	0	0	0
13	1	Cafeteria	Recessed	S	CFL	6	1	13	Sw	24	241	0	78	451	N/A	Recessed	CFL	S	Sw	6	1	13	24	241	0	78	451	0	0	0
14	1	Cafeteria	Track	S	Inc	2	3	60	Sw	12	241	0	360	1,041	CFL	Track	CFL	S	Sw	2	3	20	12	241	0	120	347	694	0	694
15	1	Storage Room	Ceiling Mounted	S	Inc	1	1	60	Sw	2	241	0	60	29	CFL	Ceiling Mounted	CFL	S	Sw	1	1	20	2	241	0	20	10	19	0	19
16	1	Kitchen	Recessed	S	CFL	16	1	13	Sw	8	241	0	208	401	N/A	Recessed	CFL	S	Sw	16	1	13	8	241	0	208	401	0	0	0
17	1	Storage Room	Recessed	E	4'T8	1	4	32	Sw	2	241	20	148	71	N/A	Recessed	4'T8	E	Sw	1	4	32	2	241	20	148	71	0	0	0
18	1	Storage Room	Ceiling Mounted	S	CFL	3	1	13	Sw	2	241	0	39	19	N/A	Ceiling Mounted	CFL	S	Sw	3	1	13	2	241	0	39	19	0	0	0
19	1	Storage Room	Ceiling Mounted	S	Inc	1	1	60	Sw	2	241	0	60	29	CFL	Ceiling Mounted	CFL	S	Sw	1	1	20	2	241	0	20	10	19	0	19
20	1	Kitchen	Ceiling Mounted	E	4'T8	11	2	32	Sw	8	241	10	814	1,569	N/A	Ceiling Mounted	4'T8	E	Sw	11	2	32	8	241	10	814	1569	0	0	0
21	1	Locker Room	Ceiling Mounted	E	4'T8	1	2	32	Sw	8	241	10	74	143	N/A	Ceiling Mounted	4'T8	E	Sw	1	2	32	8	241	10	74	143	0	0	0
22	1	Kitchen	Ceiling Mounted	E	4'T8	6	2	32	Sw	8	241	10	444	856	C	Ceiling Mounted	4'T8	E	OS	6	2	32	6	241	10	444	642	0	214	214
23	1	Boiler Room	Ceiling Mounted	E	4'T8	10	2	32	Sw	2	241	10	740	357	N/A	Ceiling Mounted	4'T8	E	Sw	10	2	32	2	241	10	740	357	0	0	0
24	1	Boiler Room	Exit Sign	S	LED	2	1	5	N	24	365	1	11	96	N/A	Exit Sign	LED	S	N	2	1	5	24	365	1	11	96	0	0	0
25	1	Storage Room	Ceiling Mounted	E	4'T8	1	2	32	Sw	24	241	10	74	428	N/A	Ceiling Mounted	4'T8	E	Sw	1	2	32	24	241	10	74	428	0	0	0
26	1	Lobby	Recessed	E	4'T8	6	8	32	Sw	8	241	40	1,776	3,424	N/A	Recessed	4'T8	E	Sw	6	8	32	8	241	40	1776	3424	0	0	0
27	1	Lobby	Exit Sign	S	LED	3	1	5	N	24	365	1	17	145	N/A	Exit Sign	LED	S	N	3	1	5	24	365	1	17	145	0	0	0
28	1	Office Area-Attendance	Ceiling Mounted	E	4'T8	2	2	32	Sw	24	241	10	148	856	C	Ceiling Mounted	4'T8	E	OS	2	2	32	18	241	10	148	642	0	214	214
29	1	Nurse's Station	Ceiling Suspended	E	4'T8	10	2	32	Sw	8	241	10	740	1,427	N/A	Ceiling Suspended	4'T8	E	Sw	10	2	32	8	241	10	740	1427	0	0	0
30	1	Bathroom	Recessed	S	CFL	1	1	13	Sw	8	241	0	13	25	N/A	Recessed	CFL	S	Sw	1	1	13	8	241	0	13	25	0	0	0
31	1	Copy Room	Recessed	E	4'T8	2	2	32	Sw	2	241	10	148	71	N/A	Recessed	4'T8	E	Sw	2	2	32	2	241	10	148	71	0	0	0
32	1	Classroom-Guidance	Recessed	E	4'T8	6	4	32	Sw	8	241	20	888	1,712	N/A	Recessed	4'T8	E	Sw	6	4	32	8	241	20	888	1712	0	0	0
33	1	Office	Recessed	E	4'T8	17	2	32	Sw	8	241	10	1,258	2,425	N/A	Recessed	4'T8	E	Sw	17	2	32	8	241	10	1258	2425	0	0	0
34	1	Office	Recessed	E	4'T8 U-Shaped	1	2	32	Sw	8	241	10	74	143	N/A	Recessed	4'T8 U-Shaped	E	Sw	1	2	32	8	241	10	74	143	0	0	0
35	1	Storage Room	Ceiling Mounted	E	4'T8	1	2	32	Sw	2	241	10	74	36	N/A	Ceiling Mounted	4'T8	E	Sw	1	2	32	2	241	10	74	36	0	0	0
36	1	Principal Office	Recessed	E	4'T8	5	2	32	Sw	8	241	10	370	713	N/A	Recessed	4'T8	E	Sw	5	2	32	8	241	10	370	713	0	0	0
37	1	Principal Office	Track	S	CFL	1	3	13	Sw	8	241	0	39	75	N/A	Track	CFL	S	Sw	1	3	13	8	241	0	39	75	0	0	0
38	1	Principal Office	Recessed	S	CFL	1	1	13	Sw	8	241	0	13	25	N/A	Recessed	CFL	S	Sw	1	1	13	8	241	0	13	25	0	0	0
39	1	Principals Office Bathroom	Recessed	S	CFL	1	1	13	Sw	4	241	0	13	13	N/A	Recessed	CFL	S	Sw	1	1	13	4	241	0	13	13	0	0	0
40	1	Principals Office Bathroom	Wall Mounted	E	2'T8	1	1	17	Sw	4	241	2	19	18	N/A	Wall Mounted	2'T8	E	Sw	1	1	17	4	241	2	19	18	0	0	0
41	1	Office Area	Ceiling Suspended	E	4'T8	2	2	32	Sw	8	241	10	148	285	N/A	Ceiling Suspended	4'T8	E	Sw	2	2	32	8	241	10	148	285	0	0	0
42	1	Bathroom Men	Recessed	E	4'T8	1	2	32	Sw	8	241	10	74	143	N/A	Recessed	4'T8	E	Sw	1	2	32	8	241	10	74	143	0	0	0
43	1	Bathroom Women	Recessed	E	4'T8	1	2	32	Sw	8	241	10	74	143	N/A	Recessed	4'T8	E	Sw	1	2	32	8	241	10	74	143	0	0	0
44	1	Bathroom Women	Recessed	S	CFL	2	1	13	Sw	8	241	0	26	50	N/A	Recessed	CFL	S	Sw	2	1	13	8	241	0	26	50	0	0	0
45	1	Bathroom Men	Recessed	S	CFL	2	1	13	Sw	8	241	0	26	50	N/A	Recessed	CFL	S	Sw	2	1	13	8	241	0	26	50	0	0	0
46	1	Classroom	Ceiling Suspended	E	4'T8	21	2	32	Sw	8	241	10	1,554	2,996	N/A	Ceiling Suspended	4'T8	E	Sw	21	2	32	8	241	10	1554	2996	0	0	0
47	1	Bathroom	Recessed	S	CFL	1	1	13	Sw	4	241	0	13	13	N/A	Recessed	CFL	S	Sw	1	1	13	4	241	0	13	13	0	0	0
48	1	Storage Room	Recessed	E	2'T8	1	2	17	Sw	2	241	4	38	18	N/A	Recessed	2'T8	E	Sw	1	2	17	2	241	4	38	18	0	0	0
49	1	Storage Room	Recessed	S	CFL	1	1	13	Sw	2	241	0	13	6	N/A	Recessed	CFL	S	Sw	1	1	13	2	241	0	13	6	0	0	0
50	1	Classroom	Recessed	S	CFL	1	1	13	Sw	8	241	0	13	25	N/A	Recessed	CFL	S	Sw	1	1	13	8	241	0	13	25	0	0	0
51	1	Backstage Area	Ceiling Suspended	S	CFL	7	1	13	Sw	4	241	0	91	88	N/A	Ceiling Suspended	CFL	S	Sw	7	1	13	4	241	0	91	88	0	0	0
52	1	Backstage Area	Ceiling Suspended	S	Inc	1	1	60	Sw	4	241	0	60	58	CFL	Ceiling Suspended	CFL	S	Sw	1	1	20	4	241	0	20	19	39	0	39
53	1	Backstage Area	Ceiling Suspended	E	4'T8	10	4	32	Sw	4	241	20	1,480	1,427	C	Ceiling Suspended	4'T8	E	OS	10	4	32	3	241	20	1480	1070	0	357	357
54	1	Backstage Area	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
55	1	Backstage Area	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
56	1	Classroom	Ceiling Suspended	E	4'T8	21	2	32	Sw	8	241	10	1,554	2,996	N/A	Ceiling Suspended	4'T8	E	Sw	21	2	32	8	241	10	1554	2996	0	0	0
57	1	Bathroom	Recessed	S	CFL	1	1	13	Sw	4	241	0	13	13	N/A	Recessed	CFL	S	Sw	1	1	13	4	241	0	13	13	0	0	0
58	1	Classroom	Recessed	S	CFL	1	1	13	Sw	8	241	0	13	25	N/A	Recessed	CFL	S	Sw	1	1	13	8	241	0	13	25	0	0	0
59	1	Classroom	Ceiling Suspended	E	4'T8	15	2	32	Sw	8	241	10	1,110	2,140	N/A	Ceiling Suspended	4'T8	E	Sw	15	2	32	8	241	10	1110	2140	0	0	0
60	1	Bathroom	Recessed	S	CFL	1	1	13	Sw	4	241	0	13	13	N/A	Recessed	CFL	S	Sw	1	1	13	4	241	0	13	13	0	0	0
61	1	Storage Room	Recessed	E	2'T8	1	2	17	Sw	2	241	4	38	18	N/A	Recessed	2'T8	E	Sw	1	2	17	2	241	4	38	18	0	0	0
62	1	Storage Room	Recessed	S	CFL	1	1	13	Sw	2	241	0	13	6	N/A	Recessed	CFL	S	Sw	1	1	13	2	241	0	13	6	0	0	0
63	1	Classroom	Recessed	S	CFL	1	1	13	Sw	8	241	0	13	25	N/A	Recessed	CFL	S	Sw	1	1	13	8	241	0	13	25	0	0	0
64	1	Classroom	Ceiling Suspended	E	4'T8	15	2	32	Sw	8	241	10	1,110	2,140	N/A	Ceiling Suspended	4'T8	E	Sw	15	2	32	8	241	10	1110	2140	0	0	0
65	1	Bathroom	Recessed	S	CFL	1	1	13	Sw	4	241	0	13	13	N/A	Recessed	CFL	S	Sw	1	1	13	4	241	0	13	13	0	0	0
66	1	Classroom	Recessed	S	CFL	1	1	13	Sw	8	241	0	13	25	N/A	Recessed	CFL	S	Sw	1	1	13	8	241	0	13	25	0	0	0
67	1	Receiving Room	Ceiling Suspended	E	4'T8	5	2	32	Sw	2	241	10	370	178	N/A	Ceiling Suspended	4'T8	E	Sw	5	2	32	2	241	10	370	178	0	0	0
68	1	Copy room	Recessed	E	4'T8 U-Shaped	2	2	32	Sw	8	241	10	148	285	N/A	Recessed	4'T8 U-Shaped	E	Sw	2	2	32	8	241	10	148	285	0	0	0
69	1	Gymnasium	High Bay	S	MH	15	1	150	Sw	12	241	42	2,880	8,329	T5	High Bay	4'T5	E	Sw	15	4	28	12	241	16	1920	5552	2777	0	2777
70	1	Gymnasium	Exit Sign	S	LED	2	1	5	N	24	365	1	11	96	N/A	Exit Sign	LED	S	N	2	1	5	24	365	1	11	96	0	0	0
71	1	Bathroom Men	Recessed	E	4'T8	4	2	32	Sw	8	241	10	296	571	C	Recessed	4'T8	E	OS	4	2	32	6	241	10	296	428	0	143	143
72	1	Bathroom Men	Recessed	E	4'T8 U-Shaped	1	2	32	Sw	8	241	10	74	143	C	Recessed	4'T8 U-Shaped	E	OS	1	2	32	6	241	10	74	107	0	36	36
73	1	Bathroom Women	Recessed	E	4'T8 U-Shaped	1	2	32	Sw	8	241	10	74	143	C	Recessed	4'T8 U-Shaped	E	OS	1	2	32	6	241	10	74	107	0	36	36
74	1	Bathroom Women	Recessed	E	4'T8	4	2	32	Sw	8	241	10	296	571	C	Recessed	4'T8	E	OS	4	2	32	6	241	10	296	428	0	143	143
75	1	Janitor's Closet	Ceiling Suspended	E	4'T8	1	2	32	Sw	2	241	10	74	36	N/A	Ceiling Suspended	4'T8	E	Sw	1	2	32	2	241	10	74	36	0	0	0
76	1	Storage Room	Recessed	E	4'T8	4	4	32	Sw	2	241	20	592	285	N/A	Recessed	4'T8	E	Sw	4	4	32	2	241	20	592	285	0	0	0
77	1	Office	Recessed	E	4'T8	2	4	32	Sw	8	241	20	296	571	N/A	Recessed	4'T8	E	Sw	2	4	32	8	241	20	296	571	0	0	0
78	1	Computer Lab	Recessed	E	4'T8	15	4	32	Sw	8	241	20	2,220	4,280	N/A	Recessed	4'T8	E	Sw	15	4	32	8	241	20	2220	4280	0	0	0
79	1	Office	Recessed	E	4'T8	2	4	32	Sw	8	241	20	296	571	N/A	Recessed	4'T8	E	Sw	2	4	32	8	241	20	296	571	0	0	0
80	1	Classroom	Recessed	E	4'T8	3	4	32	Sw	8	241	20	444	856	N/A	Recessed	4'T8	E	Sw	3	4	32	8	241	20	444	856	0	0	0

Location			Existing Fixture Information												Retrofit Information													Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
80	1	Classroom	Recessed	E	4'T8	3	4	32	Sw	8	241	20	444	856	N/A	Recessed	4'T8	E	Sw	3	4	32	8	241	20	444	856	0	0	0
81	1	Classroom	Recessed	E	4'T8	6	4	32	Sw	8	241	20	888	1,712	N/A	Recessed	4'T8	E	Sw	6	4	32	8	241	20	888	1712	0	0	0
82	1	Classroom	Recessed	E	4'T8	6	4	32	Sw	8	241	20	888	1,712	N/A	Recessed	4'T8	E	Sw	6	4	32	8	241	20	888	1712	0	0	0
83	1	Classroom	Recessed	E	4'T8 U-Shaped	1	2	32	Sw	8	241	10	74	143	N/A	Recessed	4'T8 U-Shaped	E	Sw	1	2	32	8	241	10	74	143	0	0	0
84	1	Classroom	Recessed	E	4'T8	5	4	32	Sw	8	241	20	740	1,427	N/A	Recessed	4'T8	E	Sw	5	4	32	8	241	20	740	1427	0	0	0
85	1	Janitor's Closet	Ceiling Suspended	E	4'T8	1	2	32	Sw	2	241	10	74	36	N/A	Ceiling Suspended	4'T8	E	Sw	1	2	32	2	241	10	74	36	0	0	0
86	1	Bathroom Men	Recessed	E	4'T8 U-Shaped	1	2	32	Sw	4	241	10	74	71	N/A	Recessed	4'T8 U-Shaped	E	Sw	1	2	32	4	241	10	74	71	0	0	0
87	1	Bathroom Women	Recessed	E	4'T8 U-Shaped	1	2	32	Sw	4	241	10	74	71	N/A	Recessed	4'T8 U-Shaped	E	Sw	1	2	32	4	241	10	74	71	0	0	0
88	1	Bathroom Boy	Recessed	E	4'T8 U-Shaped	1	2	32	Sw	8	241	10	74	143	C	Recessed	4'T8 U-Shaped	E	OS	1	2	32	6	241	10	74	107	0	36	36
89	1	Bathroom Girl	Recessed	E	4'T8 U-Shaped	1	2	32	Sw	8	241	10	74	143	C	Recessed	4'T8 U-Shaped	E	OS	1	2	32	6	241	10	74	107	0	36	36
90	1	Bathroom Girl	Recessed	E	4'T8	3	4	32	Sw	8	241	20	444	856	C	Recessed	4'T8	E	OS	3	4	32	6	241	20	444	642	0	214	214
91	1	Bathroom Boy	Recessed	E	4'T8	3	4	32	Sw	8	241	20	444	856	C	Recessed	4'T8	E	OS	3	4	32	6	241	20	444	642	0	214	214
92	1	Classroom	Recessed	E	4'T8	12	4	32	Sw	8	241	20	1,776	3,424	N/A	Recessed	4'T8	E	Sw	12	4	32	8	241	20	1776	3424	0	0	0
93	1	Classroom	Recessed	E	4'T8	12	4	32	Sw	8	241	20	1,776	3,424	N/A	Recessed	4'T8	E	Sw	12	4	32	8	241	20	1776	3424	0	0	0
94	1	Classroom	Recessed	E	4'T8	16	4	32	Sw	8	241	20	2,368	4,566	N/A	Recessed	4'T8	E	Sw	16	4	32	8	241	20	2368	4566	0	0	0
95	1	Classroom	Recessed	E	4'T8 U-Shaped	4	2	32	Sw	8	241	10	296	571	N/A	Recessed	4'T8 U-Shaped	E	Sw	4	2	32	8	241	10	296	571	0	0	0
96	1	Storage Room	Recessed	E	4'T8	4	4	32	Sw	2	241	20	592	285	N/A	Recessed	4'T8	E	Sw	4	4	32	2	241	20	592	285	0	0	0
97	1	Classroom	Recessed	E	4'T8	12	4	32	Sw	8	241	20	1,776	3,424	N/A	Recessed	4'T8	E	Sw	12	4	32	8	241	20	1776	3424	0	0	0
98	1	Classroom	Recessed	E	4'T8	12	4	32	Sw	8	241	20	1,776	3,424	N/A	Recessed	4'T8	E	Sw	12	4	32	8	241	20	1776	3424	0	0	0
99	1	Classroom	Recessed	E	4'T8	12	4	32	Sw	8	241	20	1,776	3,424	N/A	Recessed	4'T8	E	Sw	12	4	32	8	241	20	1776	3424	0	0	0
100	1	Classroom	Recessed	E	4'T8	12	4	32	Sw	8	241	20	1,776	3,424	N/A	Recessed	4'T8	E	Sw	12	4	32	8	241	20	1776	3424	0	0	0
101	1	Classroom	Recessed	E	4'T8	12	4	32	Sw	8	241	20	1,776	3,424	N/A	Recessed	4'T8	E	Sw	12	4	32	8	241	20	1776	3424	0	0	0
102	1	Classroom	Recessed	E	4'T8	12	4	32	Sw	8	241	20	1,776	3,424	N/A	Recessed	4'T8	E	Sw	12	4	32	8	241	20	1776	3424	0	0	0
103	1	Classroom	Recessed	E	4'T8	12	4	32	Sw	8	241	20	1,776	3,424	N/A	Recessed	4'T8	E	Sw	12	4	32	8	241	20	1776	3424	0	0	0
104	1	Classroom	Ceiling Suspended	E	4'T8	15	1	32	Sw	8	241	5	555	1,070	N/A	Ceiling Suspended	4'T8	E	Sw	15	1	32	8	241	5	555	1070	0	0	0
105	1	Classroom	Ceiling Suspended	E	4'T8	15	1	32	Sw	8	241	5	555	1,070	N/A	Ceiling Suspended	4'T8	E	Sw	15	1	32	8	241	5	555	1070	0	0	0
106	1	Classroom	Ceiling Suspended	E	4'T8	15	1	32	Sw	8	241	5	555	1,070	N/A	Ceiling Suspended	4'T8	E	Sw	15	1	32	8	241	5	555	1070	0	0	0
107	1	Classroom	Ceiling Suspended	E	4'T8	15	1	32	Sw	8	241	5	555	1,070	N/A	Ceiling Suspended	4'T8	E	Sw	15	1	32	8	241	5	555	1070	0	0	0
108	1	Classroom	Ceiling Suspended	E	4'T8	15	1	32	Sw	8	241	5	555	1,070	N/A	Ceiling Suspended	4'T8	E	Sw	15	1	32	8	241	5	555	1070	0	0	0
109	1	Janitor's Closet	Ceiling Suspended	S	CFL	1	1	13	Sw	2	241	0	13	6	N/A	Ceiling Suspended	CFL	S	Sw	1	1	13	2	241	0	13	6	0	0	0
110	1	Bathroom Men	Recessed	E	4'T8	2	4	32	Sw	8	241	20	296	571	N/A	Recessed	4'T8	E	Sw	2	4	32	8	241	20	296	571	0	0	0
111	1	Bathroom Women	Recessed	E	4'T8	2	4	32	Sw	8	241	20	296	571	N/A	Recessed	4'T8	E	Sw	2	4	32	8	241	20	296	571	0	0	0
112	1	Bathroom Women	Recessed	S	CFL	1	1	13	Sw	8	241	0	13	25	N/A	Recessed	CFL	S	Sw	1	1	13	8	241	0	13	25	0	0	0
113	1	Bathroom Men	Recessed	S	CFL	1	1	13	Sw	8	241	0	13	25	N/A	Recessed	CFL	S	Sw	1	1	13	8	241	0	13	25	0	0	0
114	1	Hallway	Recessed	E	2'T8	7	2	17	Sw	12	241	4	266	769	N/A	Recessed	2'T8	E	Sw	7	2	17	12	241	4	266	769	0	0	0
115	1	Hallway	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
116	1	Classroom	Ceiling Suspended	E	4'T8	15	1	32	Sw	8	241	5	555	1,070	N/A	Ceiling Suspended	4'T8	E	Sw	15	1	32	8	241	5	555	1070	0	0	0
117	1	Library	Ceiling Mounted	E	4'T8	48	2	32	Sw	8	241	10	3,552	6,848	N/A	Ceiling Mounted	4'T8	E	Sw	48	2	32	8	241	10	3552	6848	0	0	0
118	1	Library	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
119	1	Office Area	Ceiling Mounted	E	4'T8	4	2	32	Sw	8	241	10	296	571	N/A	Ceiling Mounted	4'T8	E	Sw	4	2	32	8	241	10	296	571	0	0	0
120	1	Storage Room	Ceiling Suspended	S	CFL	2	1	13	Sw	2	241	0	26	13	N/A	Ceiling Suspended	CFL	S	Sw	2	1	13	2	241	0	26	13	0	0	0
121	1	Bathroom	Ceiling Mounted	S	CFL	1	1	13	Sw	4	241	0	13	13	N/A	Ceiling Mounted	CFL	S	Sw	1	1	13	4	241	0	13	13	0	0	0
122	1	Library	Ceiling Mounted	S	CFL	1	1	13	Sw	8	241	0	13	25	N/A	Ceiling Mounted	CFL	S	Sw	1	1	13	8	241	0	13	25	0	0	0
123	1	Classroom	Ceiling Suspended	E	4'T8	15	2	32	Sw	8	241	10	1,110	2,140	N/A	Ceiling Suspended	4'T8	E	Sw	15	2	32	8	241	10	1110	2140	0	0	0
124	1	Classroom	Ceiling Suspended	E	4'T8	15	2	32	Sw	8	241	10	1,110	2,140	N/A	Ceiling Suspended	4'T8	E	Sw	15	2	32	8	241	10	1110	2140	0	0	0
125	1	Bathroom	Recessed	S	CFL	1	1	13	Sw	4	241	0	13	13	N/A	Recessed	CFL	S	Sw	1	1	13	4	241	0	13	13	0	0	0
126	1	Storage Room	Recessed	E	2'T8	1	2	17	Sw	2	241	4	38	18	N/A	Recessed	2'T8	E	Sw	1	2	17	2	241	4	38	18	0	0	0
127	1	Storage Room	Recessed	S	CFL	1	1	13	Sw	2	241	0	13	6	N/A	Recessed	CFL	S	Sw	1	1	13	2	241	0	13	6	0	0	0
128	1	Classroom	Recessed	S	CFL	1	1	13	Sw	8	241	0	13	25	N/A	Recessed	CFL	S	Sw	1	1	13	8	241	0	13	25	0	0	0
129	1	Classroom	Ceiling Suspended	E	4'T8	15	2	32	Sw	8	241	10	1,110	2,140	N/A	Ceiling Suspended	4'T8	E	Sw	15	2	32	8	241	10	1110	2140	0	0	0
130	1	Bathroom	Recessed	S	CFL	1	1	13	Sw	4	241	0	13	13	N/A	Recessed	CFL	S	Sw	1	1	13	4	241	0	13	13	0	0	0
131	1	Storage Room	Recessed	E	2'T8	1	2	17	Sw	2	241	4	38	18	N/A	Recessed	2'T8	E	Sw	1	2	17	2	241	4	38	18	0	0	0
132	1	Storage Room	Recessed	S	CFL	1	1	13	Sw	2	241	0	13	6	N/A	Recessed	CFL	S	Sw	1	1	13	2	241	0	13	6	0	0	0
133	1	Classroom	Recessed	S	CFL	1	1	13	Sw	8	241	0	13	25	N/A	Recessed	CFL	S	Sw	1	1	13	8	241	0	13	25	0	0	0
134	1	Classroom	Ceiling Suspended	E	4'T8	15	2	32	Sw	8	241	10	1,110	2,140	N/A	Ceiling Suspended	4'T8	E	Sw	15	2	32	8	241	10	1110	2140	0	0	0
135	1	Bathroom	Recessed	S	CFL	1	1	13	Sw	4	241	0	13	13	N/A	Recessed	CFL	S	Sw	1	1	13	4	241	0	13	13	0	0	0
136	1	Storage Room	Recessed	E	2'T8	1	2	17	Sw	2	241	4	38	18	N/A	Recessed	2'T8	E	Sw	1	2	17	2	241	4	38	18	0	0	0
137	1	Storage Room	Recessed	S	CFL	1	1	13	Sw	2	241	0	13	6	N/A	Recessed	CFL	S	Sw	1	1	13	2	241	0	13	6	0	0	0
138	1	Classroom	Recessed	S	CFL	1	1	13	Sw	8	241	0	13	25	N/A	Recessed	CFL	S	Sw	1	1	13	8	241	0	13	25	0	0	0
139	1	Classroom	Ceiling Suspended	E	4'T8	15	2	32	Sw	8	241	10	1,110	2,140	N/A	Ceiling Suspended	4'T8	E	Sw	15	2	32	8	241	10	1110	2140	0	0	0
140	1	Bathroom	Recessed	S	CFL	1	1	13	Sw	4	241	0	13	13	N/A	Recessed	CFL	S	Sw	1	1	13	4	241	0	13	13	0	0	0
141	1	Storage Room	Recessed	E	2'T8	1	2	17	Sw	2	241	4	38	18	N/A	Recessed	2'T8	E	Sw	1	2	17	2	241	4	38	18	0	0	0
142	1	Storage Room	Recessed	S	CFL	1	1	13	Sw	2	241	0	13	6	N/A	Recessed	CFL	S	Sw	1	1	13	2	241	0	13	6	0	0	0
143	1	Classroom	Recessed	S	CFL	1	1	13	Sw	8	241	0	13	25	N/A	Recessed	CFL	S	Sw	1	1	13	8	241	0	13	25	0	0	0
144	1	Classroom	Ceiling Suspended	E	4'T8	15	2	32	Sw	8	241	10	1,110	2,140	N/A	Ceiling Suspended	4'T8	E	Sw	15	2	32	8	241	10	1110	2140	0	0	0
145	1	Classroom	Ceiling Suspended	E	4'T8	15	2	32	Sw	8	241	10	1,110	2,140	N/A	Ceiling Suspended	4'T8	E	Sw	15	2	32	8	241	10	1110	2140	0	0	0
146	1	Janitor's Closet	Ceiling Suspended	E	4'T8	4	2	32	Sw	2	241	10	296	143	N/A	Ceiling Suspended	4'T8	E	Sw	4	2	32	2	241	10	296	143	0	0	0
147	1	Bathroom	Vanity	E	CFL	1	1	13	Sw	4	241	0	13	13	N/A	Vanity	CFL	E	Sw	1	1	13	4	241	0	13	13	0	0	0
148	1	Bathroom	Vanity	E	CFL	1	1	13	Sw	4	241	0	13	13	N/A	Vanity	CFL	E	Sw	1	1	13	4	241	0	13	13	0	0	0
149	1	Vestibule	Recessed	E	CFL	1	1	13	Sw	12	241	0	13	38	N/A	Recessed	CFL	E	Sw	1	1	13	12	241	0	13	38	0	0	0
150	1	Vestibule	Recessed	E	CFL	1	1	13	Sw	12	241	0	13	38	N/A	Recessed	CFL	E	Sw	1	1	13	12	241	0	13	38	0	0	0
151	1	Classroom	Recessed	E	4'T8	3	4	32	Sw	8	241	20	444	856	N/A	Recessed	4'T8	E	Sw	3	4	32	8	241	20	444	856	0	0	0
152	1	Classroom	Recessed	E	4'T8	3	4	32	Sw	8	241	20	444	856	N/A	Recessed	4'T8	E	Sw	3	4	32	8	241	20	444	856	0	0	0
153	1	Classroom	Recessed	E	4'T8	3	4	32	Sw	8	241	20	444	856	N/A	Recessed	4'T8	E	Sw	3	4	32	8	241	20	444	856	0	0	0
154	1	Office	Ceiling Suspended	E	4'T8	1	2	32	Sw	8	241	10	74	143	N/A	Ceiling Suspended	4'T8	E	Sw	1	2	32	8	241	10	74	143	0	0	0
155	1	Office	Ceiling Suspended	E	4'T8	1	2	32	Sw	8	241	10	74	143	N/A	Ceiling Suspended	4'T8	E	Sw	1	2	32	8	241	10	74	143	0	0	0
156	1	Office	Ceiling Suspended	E	4'T8	1	2	32	Sw	8	241	10	74	143	N/A	Ceiling Suspended	4'T8	E	Sw	1	2	32	8	241	10	74	143	0	0	0
157	1	Office	Ceiling Suspended	E	4'T8	1	2	32	Sw	8	241	10	74	143	N/A	Ceiling Suspended	4'T8	E	Sw	1	2	32	8	241	10	74	143	0	0	0
158	1	Office	Ceiling Suspended	E	4'T8	1	2	32	Sw	8	241	10	74	143	N/A	Ceiling Suspended	4'T8	E	Sw	1	2	32	8	241	10	74	143	0	0	0
159	Ext	Exterior	Wallpack	S	HPS	17	1	250	T	12	365	50	5,100	22,338	PSMH	Wallpack	PSMH	S	T	17	1	150	12	365	30	3060	13403	8935	0	8935
160	Ext	Exterior	Wallpack	S	HPS	10	1	150	T	12	365	30	1,800	7,884	PSMH	Wallpack	PSMH	S	T	10	1	100	12	365	20	1200	5256	2628	0	2628
161	Ext	Exterior	Pole Mounted	S	HPS	7	1	400	PC	12	365	80	3,360	14,717	PSMH	Pole Mounted	PSMH	S	PC	7	1	250	12	365	50	2100	9198	5519	0	5519
Totals:						872	321	4,948				1,421	83,795	193,411						872	324	4,286			1,335	78,495	170,446	20,893	2,073	22,966

Rows Highlighed Yellow Indicate an Energy Conservation Measure is recommended for that space

Location			Existing Fixture Information												Retrofit Information													Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
1	1	Hallway	Recessed Parabolic	E	4'T8	35	4	32	Sw	16	241	20	5,180	19,974	C	Recessed Parabolic	4'T8	E	OS	35	4	32	12	241	20	5180	14981	0	4994	4994
2	1	Staircase	Parabolic Ceiling Mounted	E	4'T8	6	4	32	Sw	16	241	20	888	3,424	T8-BL	Parabolic Ceiling Mounted	4'T8	E	BL	6	4	32	10	241	20	888	1980	0	1444	1444
3	1	Classroom (G102)	Recessed Parabolic	E	4'T8	12	4	32	Sw	8	241	20	1,776	3,424	C	Recessed Parabolic	4'T8	E	OS	12	4	32	6	241	20	1776	2568	0	856	856
4	1	Classroom (G104)	Recessed Parabolic	E	4'T8	20	4	32	Sw	8	241	20	2,960	5,707	C	Recessed Parabolic	4'T8	E	OS	20	4	32	6	241	20	2960	4280	0	1427	1427
5	1	Classroom (G106)	Recessed Parabolic	E	4'T8	18	4	32	Sw	8	241	20	2,664	5,136	C	Recessed Parabolic	4'T8	E	OS	18	4	32	6	241	20	2664	3852	0	1284	1284
6	1	Library	Recessed Parabolic	E	4'T8	68	6	32	Sw	8	241	30	15,096	29,105	N/A	Recessed Parabolic	4'T8	E	Sw	68	6	32	8	241	30	15096	29105	0	0	0
7	1	Library	Recessed Parabolic	E	4'T8	15	2	32	Sw	8	241	10	1,110	2,140	N/A	Recessed Parabolic	4'T8	E	Sw	15	2	32	8	241	10	1110	2140	0	0	0
8	1	Library Office	Recessed Parabolic	E	4'T8	12	4	32	Sw	8	241	20	1,776	3,424	C	Recessed Parabolic	4'T8	E	OS	12	4	32	6	241	20	1776	2568	0	856	856
9	1	Library Classroom	Recessed Parabolic	E	4'T8	16	4	32	Sw	8	241	20	2,368	4,566	C	Recessed Parabolic	4'T8	E	OS	16	4	32	6	241	20	2368	3424	0	1141	1141
10	1	Library Storage Closet	Parabolic Ceiling Mounted	E	4'T8	12	4	32	Sw	2	241	20	1,776	856	N/A	Parabolic Ceiling Mounted	4'T8	E	Sw	12	4	32	2	241	20	1776	856	0	0	0
11	1	Library Bathroom Men	Parabolic Ceiling Mounted	E	4'T8 U-Shaped	2	2	32	Sw	8	241	10	148	285	C	Parabolic Ceiling Mounted	4'T8 U-Shaped	E	OS	2	2	32	6	241	10	148	214	0	71	71
12	1	Library Bathroom Women	Parabolic Ceiling Mounted	E	4'T8 U-Shaped	2	2	32	Sw	8	241	10	148	285	C	Parabolic Ceiling Mounted	4'T8 U-Shaped	E	OS	2	2	32	6	241	10	148	214	0	71	71
13	1	Storage Closet (G106)	Recessed Parabolic	E	4'T8	1	4	32	Sw	2	241	20	148	71	N/A	Recessed Parabolic	4'T8	E	Sw	1	4	32	2	241	20	148	71	0	0	0
14	1	Classroom (G108)	Recessed Parabolic	E	4'T8	15	4	32	Sw	8	241	20	2,220	4,280	C	Recessed Parabolic	4'T8	E	OS	15	4	32	6	241	20	2220	3210	0	1070	1070
15	1	Bathroom Men	Recessed Parabolic	E	4'T8	6	4	32	Sw	8	241	20	888	1,712	C	Recessed Parabolic	4'T8	E	OS	6	4	32	6	241	20	888	1284	0	428	428
16	1	Bathroom Women	Recessed Parabolic	E	4'T8	6	4	32	Sw	8	241	20	888	1,712	C	Recessed Parabolic	4'T8	E	OS	6	4	32	6	241	20	888	1284	0	428	428
17	1	Auditorium - Hallway	Recessed Parabolic	E	4'T8 U-Shaped	38	2	32	Sw	16	241	10	2,812	10,843	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	38	2	32	16	241	10	2812	10843	0	0	0
18	1	Auditorium - Hallway	Recessed	E	Quartz Halogen	85	1	150	D	16	241	30	15,300	58,997	N/A	Recessed	Quartz Halogen	E	D	85	1	150	16	241	30	15300	58997	0	0	0
19	1	Auditorium - Hallway	Recessed	E	Quartz Halogen	38	1	250	D	16	241	50	11,400	43,958	N/A	Recessed	Quartz Halogen	E	D	38	1	250	16	241	50	11400	43958	0	0	0
20	1	Auditorium - Hallway	Recessed	E	Quartz Halogen	25	1	500	D	16	241	100	15,000	57,840	N/A	Recessed	Quartz Halogen	E	D	25	1	500	16	241	100	15000	57840	0	0	0
21	1	Backstage Area	Wall Mounted	E	Quartz Halogen	4	1	300	Sw	8	241	60	1,440	2,776	N/A	Wall Mounted	Quartz Halogen	E	Sw	4	1	300	8	241	60	1440	2776	0	0	0
22	1	Backstage Area	Wall Mounted	E	Hal	20	1	90	D	8	241	20	2,196	4,234	CFL	Wall Mounted	CFL	E	D	20	1	30	8	241	0	600	1157	3077	0	3077
23	1	Staircase	Ceiling Mounted	S	CFL	7	1	13	Sw	2	241	0	91	44	N/A	Ceiling Mounted	CFL	S	Sw	7	1	13	2	241	0	91	44	0	0	0
24	1	Boys Locker Room	Recessed Parabolic	E	4'T8	8	2	32	Sw	8	241	10	592	1,141	C	Recessed Parabolic	4'T8	E	OS	8	2	32	6	241	10	592	856	0	285	285
25	1	Boys Locker Room	Vanity	S	Inc	60	1	60	D	8	241	0	3,600	6,941	CFL	Vanity	CFL	S	D	60	1	20	8	241	0	1200	2314	4627	0	4627
26	1	Girls Locker Room	Recessed Parabolic	E	4'T8	8	2	32	Sw	8	241	10	592	1,141	C	Recessed Parabolic	4'T8	E	OS	8	2	32	6	241	10	592	856	0	285	285
27	1	Girls Locker Room	Vanity	S	Inc	60	1	60	D	8	241	0	3,600	6,941	CFL	Vanity	CFL	S	D	60	1	20	8	241	0	1200	2314	4627	0	4627
28	1	Staircase	Parabolic Ceiling Mounted	E	4'T8	6	2	32	Sw	16	241	10	444	1,712	T8-BL	Parabolic Ceiling Mounted	4'T8	E	BL	6	2	32	10	241	10	444	990	0	722	722
29	1	Storage Closet	Parabolic Ceiling Mounted	E	4'T8	1	2	32	Sw	2	241	10	74	36	N/A	Parabolic Ceiling Mounted	4'T8	E	Sw	1	2	32	2	241	10	74	36	0	0	0
30	1	Mechanical Rm	Ceiling Suspended	E	4'T8	20	1	32	Sw	2	241	5	740	357	N/A	Ceiling Suspended	4'T8	E	Sw	20	1	32	2	241	5	740	357	0	0	0
31	1	Office (G110)	Recessed Parabolic	E	4'T8	20	4	32	Sw	8	241	20	2,960	5,707	C	Recessed Parabolic	4'T8	E	OS	20	4	32	6	241	20	2960	4280	0	1427	1427
32	1	Office (G110)	Recessed Parabolic	E	4'T8 U-Shaped	14	2	32	Sw	8	241	10	1,036	1,997	C	Recessed Parabolic	4'T8 U-Shaped	E	OS	14	2	32	6	241	10	1036	1498	0	499	499
33	1	Office (G110)	Recessed Parabolic	S	CFL	14	1	13	Sw	8	241	0	182	351	C	Recessed Parabolic	CFL	S	OS	14	1	13	6	241	0	182	263	0	88	88
34	1	Lobby	Recessed Parabolic	E	4'T8 U-Shaped	16	2	32	Sw	8	241	10	1,184	2,283	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	16	2	32	8	241	10	1184	2283	0	0	0
35	1	Lobby	Recessed	S	CFL	22	2	13	Sw	8	241	0	572	1,103	N/A	Recessed	CFL	S	Sw	22	2	13	8	241	0	572	1103	0	0	0
36	1	Lobby	Wall Mounted	E	4'T8	70	1	32	Sw	24	241	5	2,590	14,981	N/A	Wall Mounted	4'T8	E	Sw	70	1	32	24	241	5	2590	14981	0	0	0
37	1	Office Area (G114)	Recessed Parabolic	E	4'T8	17	4	32	Sw	8	241	20	2,516	4,851	N/A	Recessed Parabolic	4'T8	E	Sw	17	4	32	8	241	20	2516	4851	0	0	0
38	1	Office (G114)	Recessed Parabolic	E	4'T8	30	4	32	Sw	8	241	20	4,440	8,560	C	Recessed Parabolic	4'T8	E	OS	30	4	32	6	241	20	4440	6420	0	2140	2140
39	1	Classroom (G115)	Recessed Parabolic	E	4'T8	15	4	32	Sw	8	241	20	2,220	4,280	C	Recessed Parabolic	4'T8	E	OS	15	4	32	6	241	20	2220	3210	0	1070	1070
40	1	Cafeteria	Recessed Parabolic	E	4'T8	68	4	32	Sw	8	241	20	10,064	19,403	N/A	Recessed Parabolic	4'T8	E	Sw	68	4	32	8	241	20	10064	19403	0	0	0
41	1	Kitchen	Recessed Parabolic	E	4'T8	50	4	32	Sw	8	241	20	7,400	14,267	N/A	Recessed Parabolic	4'T8	E	Sw	50	4	32	8	241	20	7400	14267	0	0	0
42	1	Storage Closet	Recessed Parabolic	E	4'T8	3	4	32	Sw	2	241	20	444	214	N/A	Recessed Parabolic	4'T8	E	Sw	3	4	32	2	241	20	444	214	0	0	0
43	1	Bathroom Men	Parabolic Ceiling Mounted	E	4'T8	4	4	32	Sw	8	241	20	592	1,141	C	Parabolic Ceiling Mounted	4'T8	E	OS	4	4	32	6	241	20	592	856	0	285	285
44	1	Bathroom Women	Parabolic Ceiling Mounted	E	4'T8	4	4	32	Sw	8	241	20	592	1,141	C	Parabolic Ceiling Mounted	4'T8	E	OS	4	4	32	6	241	20	592	856	0	285	285
45	1	Staircase	Parabolic Ceiling Mounted	E	4'T8 U-Shaped	8	2	32	Sw	16	241	10	592	2,283	T8-BL	Parabolic Ceiling Mounted	4'T8 U-Shaped	E	BL	8	2	32	10	241	10	592	1320	0	962	962
46	2	Hallway	Recessed Parabolic	E	4'T8	38	4	32	Sw	16	241	20	5,624	21,686	N/A	Recessed Parabolic	4'T8	E	Sw	38	4	32	16	241	20	5624	21686	0	0	0
47	2	Classroom (G201)	Recessed Parabolic	E	4'T8	12	4	32	Sw	8	241	20	1,776	3,424	C	Recessed Parabolic	4'T8	E	OS	12	4	32	6	241	20	1776	2568	0	856	856
48	2	Classroom (G202)	Recessed Parabolic	E	4'T8	22	4	32	Sw	8	241	20	3,256	6,278	C	Recessed Parabolic	4'T8	E	OS	22	4	32	6	241	20	3256	4708	0	1569	1569
49	2	Classroom (G202)	Recessed Parabolic	E	4'T8 U-Shaped	2	2	32	Sw	8	241	10	148	285	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	2	2	32	8	241	10	148	285	0	0	0
50	2	Classroom (G204)	Recessed Parabolic	E	4'T8	2	4	32	Sw	8	241	20	296	571	C	Recessed Parabolic	4'T8	E	OS	2	4	32	6	241	20	296	428	0	143	143

Location			Existing Fixture Information												Retrofit Information													Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
51	2	Classroom (G205)	Recessed Parabolic	E	4'T8	15	4	32	Sw	8	241	20	2,220	4,280	C	Recessed Parabolic	4'T8	E	OS	15	4	32	6	241	20	2220	3210	0	1070	1070
52	2	Classroom (G206)	Recessed Parabolic	E	4'T8	2	4	32	Sw	8	241	20	296	571	C	Recessed Parabolic	4'T8	E	OS	2	4	32	6	241	20	296	428	0	143	143
53	2	Classroom (G207)	Recessed Parabolic	E	4'T8	18	4	32	Sw	8	241	20	2,664	5,136	C	Recessed Parabolic	4'T8	E	OS	18	4	32	6	241	20	2664	3852	0	1284	1284
54	2	Classroom (G208)	Recessed Parabolic	E	4'T8	18	4	32	Sw	8	241	20	2,664	5,136	C	Recessed Parabolic	4'T8	E	OS	18	4	32	6	241	20	2664	3852	0	1284	1284
55	2	Classroom (G212)	Recessed Parabolic	E	4'T8	23	4	32	Sw	8	241	20	3,404	6,563	C	Recessed Parabolic	4'T8	E	OS	23	4	32	6	241	20	3404	4922	0	1641	1641
56	2	Office (G210)	Recessed Parabolic	E	4'T8	3	4	32	Sw	8	241	20	444	856	C	Recessed Parabolic	4'T8	E	OS	3	4	32	6	241	20	444	642	0	214	214
57	2	Bathroom Men	Parabolic Ceiling Mounted	E	4'T8	4	2	32	Sw	8	241	10	296	571	C	Parabolic Ceiling Mounted	4'T8	E	OS	4	2	32	6	241	10	296	428	0	143	143
58	2	Bathroom Women	Parabolic Ceiling Mounted	E	4'T8	4	2	32	Sw	8	241	10	296	571	C	Parabolic Ceiling Mounted	4'T8	E	OS	4	2	32	6	241	10	296	428	0	143	143
59	2	Bathroom Men	Parabolic Ceiling Mounted	E	4'T8	4	1	32	Sw	8	241	5	148	285	C	Parabolic Ceiling Mounted	4'T8	E	OS	4	1	32	6	241	5	148	214	0	71	71
60	2	Bathroom Women	Parabolic Ceiling Mounted	E	4'T8	4	1	32	Sw	8	241	5	148	285	C	Parabolic Ceiling Mounted	4'T8	E	OS	4	1	32	6	241	5	148	214	0	71	71
61	2	Classroom (G216)	Recessed Parabolic	E	4'T8	4	4	32	Sw	8	241	20	592	1,141	C	Recessed Parabolic	4'T8	E	OS	4	4	32	6	241	20	592	856	0	285	285
62	2	Classroom (G216)	Recessed Parabolic	E	4'T8	18	2	32	Sw	8	241	10	1,332	2,568	C	Recessed Parabolic	4'T8	E	OS	18	2	32	6	241	10	1332	1926	0	642	642
63	2	Storage Closet (G221)	Recessed Parabolic	E	4'T8	10	2	32	Sw	2	241	10	740	357	N/A	Recessed Parabolic	4'T8	E	Sw	10	2	32	2	241	10	740	357	0	0	0
64	2	Storage Closet (G219)	Recessed Parabolic	E	4'T8	6	4	32	Sw	2	241	20	888	428	N/A	Recessed Parabolic	4'T8	E	Sw	6	4	32	2	241	20	888	428	0	0	0
65	2	Storage Closet (G217)	Recessed Parabolic	E	4'T8	12	2	32	Sw	2	241	10	888	428	N/A	Recessed Parabolic	4'T8	E	Sw	12	2	32	2	241	10	888	428	0	0	0
66	2	Office (G223)	Recessed Parabolic	E	4'T8	6	4	32	Sw	8	241	20	888	1,712	C	Recessed Parabolic	4'T8	E	OS	6	4	32	6	241	20	888	1284	0	428	428
67	2	Classroom (G218)	Recessed Parabolic	E	4'T8	18	4	32	Sw	8	241	20	2,664	5,136	C	Recessed Parabolic	4'T8	E	OS	18	4	32	6	241	20	2664	3852	0	1284	1284
68	2	Classroom (G225)	Recessed Parabolic	E	4'T8	18	4	32	Sw	8	241	20	2,664	5,136	C	Recessed Parabolic	4'T8	E	OS	18	4	32	6	241	20	2664	3852	0	1284	1284
69	2	Classroom (G229)	Recessed Parabolic	E	4'T8	19	4	32	Sw	8	241	20	2,812	5,422	C	Recessed Parabolic	4'T8	E	OS	19	4	32	6	241	20	2812	4066	0	1355	1355
70	2	Storage Closet (G220)	Recessed Parabolic	E	4'T8	8	4	32	Sw	2	241	20	1,184	571	N/A	Recessed Parabolic	4'T8	E	Sw	8	4	32	2	241	20	1184	571	0	0	0
71	2	Classroom (G222)	Recessed Parabolic	E	4'T8	15	4	32	Sw	8	241	20	2,220	4,280	C	Recessed Parabolic	4'T8	E	OS	15	4	32	6	241	20	2220	3210	0	1070	1070
72	2	Classroom (G224)	Recessed Parabolic	E	4'T8	18	4	32	Sw	8	241	20	2,664	5,136	C	Recessed Parabolic	4'T8	E	OS	18	4	32	6	241	20	2664	3852	0	1284	1284
73	2	Classroom (G231)	Recessed Parabolic	E	4'T8	18	4	32	Sw	8	241	20	2,664	5,136	C	Recessed Parabolic	4'T8	E	OS	18	4	32	6	241	20	2664	3852	0	1284	1284
74	2	Classroom (G235)	Recessed Parabolic	E	4'T8	18	4	32	Sw	8	241	20	2,664	5,136	C	Recessed Parabolic	4'T8	E	OS	18	4	32	6	241	20	2664	3852	0	1284	1284
75	2	Office (G226)	Recessed Parabolic	E	4'T8	3	4	32	Sw	8	241	20	444	856	C	Recessed Parabolic	4'T8	E	OS	3	4	32	6	241	20	444	642	0	214	214
76	1	Exterior	Wallpack	E	HPS	6	1	250	T	12	241	50	1,800	5,206	LED	Wallpack	LED	E	T	6	1	78	12	241	0	468	1353	3852	0	3852
77	1	Exterior	Wallpack	E	HPS	2	1	250	PC	12	241	50	600	1,735	LED	Wallpack	LED	E	PC	2	1	78	12	241	0	156	451	1284	0	1284
78	1	Hallway	Exit Sign	S	LED	30	1	25	N	24	365	3	825	7,227	LEDex	Exit Sign	LED	S	N	30	1	5	24	365	0	150	1314	5913	0	5913
Totals:						1,351	229	4,029				1,440	186,687	472,509						1,351	229	3,545			1,320	178,515	413,875	17,468	41,166	58,634

Rows Highlighed Yellow Indicate an Energy Conservation Measure is recommended for that space

Legend								
Fixture Type		**Lamp Type**			**Control Type**	**Ballast Type**	**Retrofit Category**
Ceiling Suspended	Recessed	CFL	3'T12	8'T5	Autom. Timer (T)	S (Self)	N/A (None)
Exit Sign	Sconce	Inc	3'T12 U-Shaped	8'T5 U-Shaped	Bi-Level (BL)	E (Electronic)	T8 (Install new T8)
High Bay	Spotlight	LED	3'T5	8'T8	Contact (Ct)	M (Magnetic)	T5 (Install new T5)
Parabolic Ceiling Mounted	Track	HPS	3'T5 U-Shaped	8'T8 U-Shaped	Daylight & Motion (M)		CFL (Install new CFL)
Parabolic Ceiling Suspended	Vanity	MH	3'T8	Circline - T5	Daylight & Switch (DLSw)		LEDex (Install new LED Exit)
Pendant	Wall Mounted	MV	3'T8 U-Shaped	Circline - T8	Daylight Sensor (DL)		LED (Install new LED)
Recessed Parabolic	Wall Suspended	1'T12	4'T5	Circline - T12	Delay Switch (DSw)		D (Delamping)
Ceiling Mounted	Wallpack	1'T12 U-Shaped	4'T5 U-Shaped	Fl.	Dimmer (D)		C (Controls Only)
Chandelier		1'T5	6'T12	Hal	Motion Sensor (MS)		PSMH (Install new Pulse-Start Metal Halide)
Equipment / Fume Hood		1'T5 U-Shaped	6'T12 U-Shaped	Induction	Motion& Switch (MSw)		
Flood		1'T8	6'T5	Infrared	None (N)		
Landscape		1'T8 U-Shaped	6'T5 U-Shaped	LPS	Occupancy Sensor (OS)		
Low Bay		2'T12 U-Shaped	6'T8	Mixed Vapor	Occupancy Sensor - CM (OSCM)		
Parabolic Wall Mounted		2'T5	6'T8 U-Shaped	Neon	Photocell (PC)		
Pole Mounted		2'T5 U-Shaped	8'T12	Quartz Halogen	Switch (Sw)		
Pole Mounted Off Building		2'T8 U-Shaped	8'T12 U-Shaped				

APPENDIX D: SOLAR PV SHADING ANALYSIS

Site Report

Report Name	Washington Township High School
Report Date	2/28/2012 7:37:27 PM
Declination	0d 00m
Location	SEWELL, NJ 08080
Lat/Long	39.755 / -75.202
Weather Station	Philadelphia Intl AP, PA, Elevation: 7 Feet, (39.867/-75.233)
Site distance	8 Miles
Report Type	PV
Array Type	Fixed
Tilt Angle	39.76 deg
Ideal Tilt Angle	39.76 deg
Azimuth	180.00 deg
Ideal Azimuth	180.00 deg
Electric Cost	0.155 ($/KWH)
Panel Make	Sharp
Panel Model	ND-230UC1
Panel Count	425
DC Rate (per panel)	230.0 W
Total System Size	97,750.0 W
Inverter Make	Sharp
Inverter Model	JH-3500U
Inverter Count	3
Derate Method	Using Components
Derate Factor	0.761
Layout Configuration	SinglePicture
Layout Point Count	1

Notes: [None]

Report generated by SolarPathfinder Assistant Version 4.1.27.0. http://www.solarpathfinder.com

System Picture Layout

Layout Type Single Picture
Layout Point Count 1

Report generated by SolarPathfinder Assistant Version 4.1.27.0. http://www.solarpathfinder.com
Page: 2/4

Solar Site Analysis Report

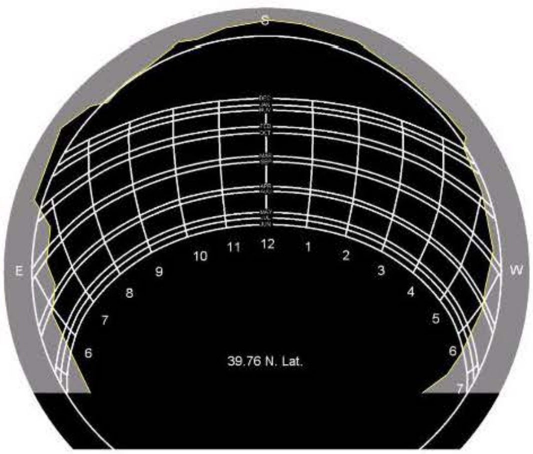
(1)

Image File IMG_6135.jpg

Solar Obstruction Data

Month	Unshaded % of Ideal Site Azimuth=180 Tilt=39.76	Actual Solar Rad w/ Shading Azimuth=180.0 Tilt=39.76 KWH/m^2 /day	Actual AC Energy (KWH) w/ shading Azimuth=180.00 Tilt=39.76	Actual AC Energy (KWH) w/o shading Azimuth=180.0 Tilt=39.76	Ideal AC Energy (KWH) w/o shading Azimuth=180.0 Tilt=39.76	Solar Cost Savings 0.155 ($/KWH)	PVWatts Unshaded % Actual Site Azimuth=180.0 Tilt=39.76	Actual Site Efficiency % Azimuth=180.0 Tilt=39.76	Ideal Site Efficiency % Azimuth=180.0 Tilt=39.76
January	100.00%	3.51	8,415.00	8,415.00	8,415.00	$1,304.33	99.93 %	99.93 %	99.93 %
February	100.00%	4.04	8,430.00	8,431.00	8,431.00	$1,306.65	99.93 %	99.69 %	99.69 %
March	99.93%	4.72	10,566.70	10,567.00	10,567.00	$1,637.84	99.97 %	99.97 %	99.97 %
April	99.37%	5.06	10,686.34	10,693.00	10,693.00	$1,656.38	99.44 %	99.44 %	99.44 %
May	99.24%	5.38	11,389.72	11,392.00	11,392.00	$1,765.41	99.33 %	99.33 %	99.33 %
June	99.10%	5.60	11,249.96	11,253.00	11,253.00	$1,743.74	99.18 %	99.00 %	99.00 %
July	99.02%	5.23	10,704.23	10,707.00	10,707.00	$1,659.16	99.12 %	98.93 %	98.93 %
August	99.19%	5.72	11,796.00	11,797.00	11,797.00	$1,828.38	99.44 %	99.44 %	99.44 %
September	99.35%	5.10	10,292.31	10,300.00	10,300.00	$1,595.31	99.40 %	99.20 %	99.20 %
October	100.00%	4.56	10,130.00	10,133.00	10,133.00	$1,570.15	99.92 %	99.05 %	99.05 %
November	100.00%	3.58	7,962.00	7,962.00	7,962.00	$1,234.11	100.00 %	99.73 %	99.73 %
December	100.00%	3.17	7,298.00	7,298.00	7,298.00	$1,131.19	99.88 %	99.88 %	99.88 %
Totals	**99.60%**	**55.67**	**118,920.26**	**118,948.00**	**118,948.00**	**$18,432.64**	**99.63 %**	**99.47 %**	**99.47 %**
	Unweighted Yearly Avg	**Effect: 99.41% Sun Hrs: 4.64**					**Unweighted Yearly Avg**	**Unweighted Yearly Avg**	**Unweighted Yearly Avg**

Notes: [None]



Report generated by SolarPathfinder Assistant Version 4.1.27.0. http://www.solarpathfinder.com
Page: 3/4

Summary Report

Solar Obstruction Data

Month	Unshaded % of Ideal Site Azimuth=180 Tilt=39.76	Actual Solar Rad w/ Shading Azimuth=180.0 Tilt=39.76 $KWH/m^2/day$	Actual AC Energy (KWH) w/ shading Azimuth=180.00 Tilt=39.76	Actual AC Energy (KWH) w/o shading Azimuth=180.0 Tilt=39.76	Ideal AC Energy (KWH) w/o shading Azimuth=180.0 Tilt=39.76	Solar Cost Savings 0.155 ($/KWH)	PVWatts Unshaded % Actual Site Azimuth=180.0 Tilt=39.76	Actual Site Efficiency % Azimuth=180.0 Tilt=39.76	Ideal Site Efficiency % Azimuth=180.0 Tilt=39.76
January	100.00%	3.51	8,415.00	8,415.00	8,415.00	$1,304.33	99.93 %	99.93 %	99.93 %
February	100.00%	4.04	8,430.00	8,431.00	8,431.00	$1,306.65	99.93 %	99.69 %	99.69 %
March	99.93%	4.72	10,566.70	10,567.00	10,567.00	$1,637.84	99.97 %	99.97 %	99.97 %
April	99.37%	5.06	10,686.34	10,693.00	10,693.00	$1,656.38	99.44 %	99.44 %	99.44 %
May	99.24%	5.38	11,389.72	11,392.00	11,392.00	$1,765.41	99.33 %	99.33 %	99.33 %
June	99.10%	5.60	11,249.96	11,253.00	11,253.00	$1,743.74	99.18 %	99.00 %	99.00 %
July	99.02%	5.23	10,704.23	10,707.00	10,707.00	$1,659.16	99.12 %	98.93 %	98.93 %
August	99.19%	5.72	11,796.00	11,797.00	11,797.00	$1,828.38	99.44 %	99.44 %	99.44 %
September	99.35%	5.10	10,292.31	10,300.00	10,300.00	$1,595.31	99.40 %	99.20 %	99.20 %
October	100.00%	4.56	10,130.00	10,133.00	10,133.00	$1,570.15	99.92 %	99.05 %	99.05 %
November	100.00%	3.58	7,962.00	7,962.00	7,962.00	$1,234.11	100.00 %	99.73 %	99.73 %
December	100.00%	3.17	7,298.00	7,298.00	7,298.00	$1,131.19	99.88 %	99.88 %	99.88 %
Totals	**99.60%**	**55.67**	**118,920.26**	**118,948.00**	**118,948.00**	**$18,432.64**	**99.63 %**	**99.47 %**	**99.47 %**
	Unweighted	**Effect: 99.41%**					**Unweighted**	**Unweighted**	**Unweighted**
	Yearly Avg	**Sun Hrs: 4.64**					**Yearly Avg**	**Yearly Avg**	**Yearly Avg**

Notes: [None]

Report generated by SolarPathfinder Assistant Version 4.1.27.0. http://www.solarpathfinder.com

Page: 4/4

APPENDIX F: COST WORKS COST ESTIMATES

Washington Township BOE,
509 Hurfville Crosskeys Road,
Sewell,
NJ , 08080
Year 2011 Quarter 4

Unit Detail Report

Cost Estimate Report
CostWorks
RSMeans

Prepared By:
Dan Carmichael
Steven Winter Associates Inc

Date: 15-May-12

9-10 Building

Line Number			Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
Division 02 Existing Conditions							
024210200740			Deconstruction of building doors and windows, deconstruciton of door & wrap, interior or exterior, double, solid core, up to 2 stories, excludes handling, packaging or disposal costs, no closers	145	Ea.	$196.55	$28,499.75
Division 02 Existing Conditions Subtotal							$28,499.75
Division 07 Thermal and Moisture Protection							
070150101600			Roof Coatings, reflective, white, elastomeric, 50 sf/gallon	1100.04	Gal.	$17.89	$19,679.72
075113202200			Built-up roofing systems, asphalt flood coat, smooth surface, asphalt base sheet & 3 plies #15 asphalt felt, mopped	550.02	Sq.	$288.96	$158,933.78
Division 07 Thermal and Moisture Protection Subtotal							$178,613.50
Division 08 Openings							
085113202000			Windows, aluminum, commercial grade, stock units, awning, with screen, 4'-5" x 5'-3" opening, incl. frame and glazing	4	Ea.	$693.21	$2,772.84
085113203800			Windows, aluminum, commercial grade, stock units, single hung, enameled, insulating glass, 3'-4" x 5'-0" opening, incl. frame and glazing	141	Ea.	$590.51	$83,261.91
088713102050			Reflective Glass, solar film on glass, excl. glass, maximum	145	S.F.	$22.91	$3,321.95
Division 08 Openings Subtotal							$89,356.70
Division 22 Plumbing							
221223132180			Water heater storage tank, galvanized steel, 125 psi, 500 gallon, 36" diameter, 126" L.O.A., ASME	2	Ea.	$17,723.86	$35,447.72
Division 22 Plumbing Subtotal							$35,447.72
Division 23 Heating, Ventilating, and Air Conditioning (HVAC)							
230505102850			Heat pump, air source, single package, up thru 12 ton, selective demolition	59	Ea.	$1,579.20	$93,172.80

235213102200			Boiler, electric, hot water, 165 kW, 563 MBH, ASME, includes standard controls and trim	1	Ea.	$12,863.00	$12,863.00
236213100100			Condensing unit, air cooled, compressor, 2 ton, includes standard controls	2	Ea.	$2,220.74	$4,441.48
236213100300			Condensing unit, air cooled, compressor, 3 ton, includes standard controls	1	Ea.	$2,751.75	$2,751.75
236213100400			Condensing unit, air cooled, compressor, 4 ton, includes standard controls	2	Ea.	$3,770.33	$7,540.66
236213100600			Condensing unit, air cooled, compressor, 10 ton, includes standard controls	1	Ea.	$8,573.28	$8,573.28
236513102520			Cooling tower, packaged unit, galvanized steel, blow through, centrifugal type, 75 ton, includes standard controls, excludes pumps and piping	1	Ea.	$17,024.60	$17,024.60
237433101100			Rooftop air conditioner, single zone, electric cool, gas heat, 3 ton cooling, 60 MBH heating, includes, standard controls, curb and economizer	1	Ea.	$6,166.60	$6,166.60
Division 23 Heating, Ventilating, and Air Conditioning (HVAC) Subtotal							**$152,534.17**
Division 26 Electrical							
260150813200			Lighting fixture, maintenance, remove and replace (reinstall), incl. remove, disconnect wire terminations, store, reinstall and reconnect wire terminations	24	Ea.	$222.76	$5,346.24
265619209250			Roadway area luminaire, LED fixture, high power, replaces high pressure sodium 250 watt, incl lamp	24	Ea.	$2,303.90	$55,293.60
Division 26 Electrical Subtotal							**$60,639.84**

Washington Township BOE
529 Hurfville Crosskeys Road
Sewell,
NJ, 08080
Year 2011 Quarter 4

Date: 28-Feb-12

Unit Detail Report

11-12 Building

Cost Estimate Report
CostWorks
RSMeans

Prepared By:
Dan Carmichael
Steven Winter Associates Inc

LineNumber	Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
Division 07 Thermal and Moisture Protection					
070150101600	Roof Coatings, reflective, white, elastomeric, 50 sf/gallon	1,978.75	Gal.	$17.89	$35,399.84
075323204800	Ethylene-propylene-diene-monomer roofing, (EPDM), 0.40 P.S.F., fully adhered with adhesive, 60 mils	989.38	Sq.	$243.98	$241,387.71
Division 07 Subtotal					**$276,787.55**
Division 08 Openings					
085113203800	Windows, aluminum, commercial grade, stock units, single hung, enameled, insulating glass, 3'-4" x 5'-0" opening, incl. frame and glazing	279.00	Ea.	$590.51	$164,752.29
085123100300	Windows, steel sash, custom units, casement, fixed, excl. glazing and trim	2,340.00	S.F.	$41.46	$97,016.40
085123201500	Windows, steel, custom units, double hung, commercial projected, 3'-9" x 5'-5" opening, incl. frame, trim and insulated glass	59.00	Ea.	$1,560.10	$92,045.90
088125104000	Glass, super efficient glazing, triple glazed with low-e glass, gas filled, minimum	2,340.00	S.F.	$37.86	$88,592.40
088713102050	Reflective Glass, solar film on glass, excl. glass, maximum	4,185.00	S.F.	$22.91	$95,878.35
Division 08 Subtotal					**$538,285.34**
Division 23 Heating, Ventilating, and Air Conditioning (HVAC)					
235223202280	Boiler, gas fired, natural or propane, cast iron, steam, gross output, 1275 MBH, includes standard controls and insulated jacket, packaged	2.00	Ea.	$28,184.30	$56,368.60
236213100050	Condensing unit, air cooled, compressor, 1.5 ton, includes standard controls	11.00	Ea.	$1,849.80	$20,347.80
236213100100	Condensing unit, air cooled, compressor, 2 ton, includes standard controls	1.00	Ea.	$2,220.74	$2,220.74
236213100200	Condensing unit, air cooled, compressor, 2.5 ton, includes standard controls	1.00	Ea.	$2,420.09	$2,420.09
236213100300	Condensing unit, air cooled, compressor, 3 ton, includes standard controls	32.00	Ea.	$2,751.75	$88,056.00
236213100350	Condensing unit, air cooled, compressor, 3.5 ton, includes standard controls	46.00	Ea.	$3,209.85	$147,653.10
237433101122	Rooftop air conditioner, single zone, electric cool, gas heat SEER 13, 4 ton cooling, 95 MBH heating, 4 ton cooling, 95 MBH heating SHEER 13, includes, standard controls, curb and economizer	1.00	Ea.	$9,863.71	$9,863.71
237433101142	Rooftop air conditioner, single zone, electric cool, gas heat SEER 13, 5 ton cooling, 112 MBH heating, includes, standard controls, curb and economizer	5.00	Ea.	$11,115.91	$55,579.55

LineNumber			Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
237433101150			Rooftop air conditioner, single zone, electric cool, gas heat, 7.5 ton cooling, 170 MBH heating, includes, standard controls, curb and economizer	9.00	Ea.	$11,584.78	$104,263.02
237433101160			Rooftop air conditioner, single zone, electric cool, gas heat, 10 ton cooling, 200 MBH heating, includes, standard controls, curb and economizer	6.00	Ea.	$15,232.30	$91,393.80
237433101170			Rooftop air conditioner, single zone, electric cool, gas heat, 12.5 ton cooling, 230 MBH heating, includes, standard controls, curb and economizer	1.00	Ea.	$18,570.08	$18,570.08
237433101222			Rooftop air conditioner, single zone, electric cool, gas heat SEER 13, 30 ton cooling, 540 MBH heating, includes, standard controls, curb and economizer	4.00	Ea.	$49,282.45	$197,129.80
Division 23 Subtotal							**$793,866.29**
Division 26 Electrical							
260150813200			Lighting fixture, maintenance, remove and replace (reinstall), incl. remove, disconnect wire terminations, store, reinstall and reconnect wire terminations	28.00	Ea.	$222.76	$6,237.28
265619209250			Roadway area luminaire, LED fixture, high power, replaces high pressure sodium 250 watt, incl lamp	28.00	Ea.	$2,303.90	$64,509.20
Division 26 Subtotal							**$70,746.48**

Washington Township BOE
519 Hurffville Cross Keys Road
Sewell,
NJ, 08080
Year 2011 Quarter 4

Date: 28-Feb-12

Unit Detail Report

Cost Estimate Report
CostWorks
RSMeans

High School Core

Prepared By:
Dan Carmichael
Steven Winter Associates Inc

LineNumber			Description	Quantity	Unit	Total Incl. O&P	Ext. Total Incl. O&P
Division 07 Thermal and Moisture Protection							
070150101600			Roof Coatings, reflective, white, elastomeric, 50 sf/gallon	1,660.00	Gal.	$17.89	$29,697.40
075323204800			Ethylene-propylene-diene-monomer roofing, (EPDM), 0.40 P.S.F., fully adhered with adhesive, 60 mils	830.00	Sq.	$243.98	$202,503.40
Division 07 Subtotal							**$232,200.80**
Division 23 Heating, Ventilating, and Air Conditioning (HVAC)							
235226702208			Boiler, packaged water tube, gas fired, steam or hot water, gross output, 275 MBH	1.00	Ea.	$9,381.30	$9,381.30
237433101170			Rooftop air conditioner, single zone, electric cool, gas heat, 12.5 ton cooling, 230 MBH heating, includes, standard controls, curb and economizer	1.00	Ea.	$18,570.08	$18,570.08
Division 23 Subtotal							**$27,951.38**
Division 26 Electrical							
260150813200			Lighting fixture, maintenance, remove and replace (reinstall), incl. remove, disconnect wire terminations, store, reinstall and reconnect wire terminations	8.00	Ea.	$222.76	$1,782.08
265619209250			Roadway area luminaire, LED fixture, high power, replaces high pressure sodium 250 watt, incl lamp	8.00	Ea.	$2,303.90	$18,431.20
Division 26 Subtotal							**$20,213.28**

APPENDIX G: UPCOMING EQUIPMENT PHASEOUTS

LIGHTING:

- As of **July 1, 2010** magnetic ballasts most commonly used for the operation of T12 lamps will no longer be produced for commercial and industrial applications.

- As of **January 1, 2012** 100 watt incandescent bulbs will be phased out in accordance with the Energy Independence and Security Act of 2007.

- Starting **July 2012** many non energy saver model T12 lamps will be phased out of production.

- As of **January 1, 2013** 75 watt incandescent bulbs will be phased out in accordance with the Energy Independence and Security Act of 2007.

- As of **January 1, 2014** 60 and 40 watt incandescent bulbs will be phased out in accordance with the Energy Independence and Security Act of 2007.

- Energy Independence and Security Act of 2007 incandescent lamp phase-out exclusions:
  1. Appliance lamp (e.g. refrigerator or oven light)
  2. Black light lamp
  3. Bug lamp
  4. Colored lamp
  5. Infrared lamp
  6. Left-hand thread lamp
  7. Marine lamp
  8. Marine signal service lamp
  9. Mine service lamp
  10. Plant light lamp
  11. Reflector lamp
  12. Rough service lamp
  13. Shatter-resistant lamp (including a shatter-proof lamp and a shatter-protected lamp)
  14. Sign service lamp
  15. Silver bowl lamp
  16. Showcase lamp
  17. 3-way incandescent lamp
  18. Traffic signal lamp
  19. Vibration service lamp
  20. Globe shaped “G” lamp (as defined in ANSI C78.20-2003 and C79.1-2002 with a diameter of 5 inches or more
  21. T shape lamp (as defined in ANSI C78.20-2003 and C79.1-2002) and that uses not more than 40 watts or has a length of more than 10 inches
  22. A B, BA, CA, F, G16-1/2, G-25, G30, S, or M-14 lamp (as defined in ANSI C79.1-2002 and ANSI C78.20-2003) of 40 watts or less
  23. Candelabra incandescent and other lights not having a medium Edison screw base.

- When installing compact fluorescent lamps (CFLs), be advised that they contain a very small amount of mercury sealed within the glass tubing and EPA guidelines concerning cleanup and safe disposal of compact fluorescent light bulbs should be followed. Additionally, all lamps to be disposed should be recycled in accordance with EPA guidelines through state or local government collection or exchange programs instead.

HCFC (Hydrochlorofluorocarbons):

- As of **January 1, 2010,** no production and no importing of R-142b and R-22, except for use in equipment manufactured before January 1, 2010, in accordance with adherence to the Montreal Protocol.

- As of **January 1, 2015,** No production and no importing of any HCFCs, except for use as refrigerants in equipment manufactured before January 1, 2010.

- As of **January 1, 2020** No production and no importing of R-142b and R-22.

APPENDIX H: THIRD PARTY ENERGY SUPPLIERS

http://www.state.nj.us/bpu/commercial/shopping.html

Third Party Electric Suppliers for Atlantic City Electric Service Territory	Telephone & Web Site
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
American Powernet Management, LP 437 North Grove St. Berlin, NJ 08009	(877) 977-2636 www.americanpowernet.com
BOC Energy Services, Inc. 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 www.boc.com
Commerce Energy, Inc. 4400 Route 9 South, Suite 100 Freehold, NJ 07728	(800) 556-8457 www.commerceenergy.com
ConEdison Solutions 535 State Highway 38 Cherry Hill, NJ 08002	(888) 665-0955 www.conedsolutions.com
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 www.newenergy.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
FirstEnergy Solutions 300 Madison Avenue Morristown, NJ 07926	(800) 977-0500 www.fes.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.com
Integrys Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 www.integrysenergy.com
Liberty Power Delaware, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(866) 769-3799 www.libertypowercorp.com
Liberty Power Holdings, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(800) 363-7499 www.libertypowercorp.com
Pepco Energy Services, Inc. 112 Main St. Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com

Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Strategic Energy, LLC 55 Madison Avenue, Suite 400 Morristown, NJ 07960	(888) 925-9115 www.sel.com
Suez Energy Resources NA, Inc. 333 Thornall Street, 6th Floor Edison, NJ 08837	(888) 644-1014 www.suezenergyresources.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com

Third Party Gas Suppliers for South Jersey Gas Service Territory	Telephone & Web Site
Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109	(800) 628-9427 www.cooperativenet.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 www.gesc.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com
Great Eastern Energy 116 Village Riva, Suite 200 Princeton, NJ 08540	(888) 651-4121 www.greateastern.com
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
Intelligent Energy 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	(800) 724-1880 www.intelligentenergy.org
Metromedia Energy, Inc. 6 Industrial Way Eatontown, NJ 07724	(877) 750-7046 www.metromediaenergy.com
MxEnergy, Inc. 510 Thornall Street, Suite 270	(800) 375-1277 www.mxenergy.com

Edison, NJ 08837	
NATGASCO (Mitchell Supreme) 532 Freeman Street Orange, NJ 07050	(800) 840-4427 www.natgasco.com
Pepco Energy Services, Inc. 112 Main Street Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Woodruff Energy 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 www.woodruffenergy.com

APPENDIX I: GLOSSARY AND METHOD OF CALCULATIONS

Net ECM Cost: The net ECM cost is the cost experienced by the customer, which is typically the total cost (materials + labor) of installing the measure minus any available incentives. Both the total cost and the incentive amounts are expressed in the summary for each ECM.

Annual Energy Cost Savings (AECS): This value is determined by the audit firm based on the calculated energy savings (kWh or Therm) of each ECM and the calculated energy costs of the building.

Lifetime Energy Cost Savings (LECS): This measure estimates the energy cost savings over the lifetime of the ECM. It can be a simple estimation based on fixed energy costs. If desired, this value can factor in an annual increase in energy costs as long as the source is provided.

Simple Payback: This is a simple measure that displays how long the ECM will take to break-even based on the annual energy and maintenance savings of the measure.

ECM Lifetime: This is included with each ECM so that the owner can see how long the ECM will be in place and whether or not it will exceed the simple payback period. Additional guidance for calculating ECM lifetimes can be found below. This value can come from manufacturer's rated lifetime or warranty, the ASHRAE rated lifetime, or any other valid source.

Operating Cost Savings (OCS): This calculation is an annual operating savings for the ECM. It is the difference in the operating, maintenance, and / or equipment replacement costs of the existing case versus the ECM. In the case where an ECM lifetime will be longer than the existing measures (such as LED lighting versus fluorescent) the operating savings will factor in the cost of replacing the units to match the lifetime of the ECM. In this case or in one where one-time repairs are made, the total replacement / repair sum is averaged over the lifetime of the ECM.

Return on Investment (ROI): The ROI is expresses the percentage return of the investment based on the lifetime cost savings of the ECM. This value can be included as an annual or lifetime value, or both.

Net Present Value (NPV): The NPV calculates the present value of an investment's future cash flows based on the time value of money, which is accounted for by a discount rate (assumes bond rate of 3.2%).

Internal Rate of Return (IRR): The IRR expresses an annual rate that results in a break-even point for the investment. If the owner is currently experiencing a lower return on their capital than the IRR, the project is financially advantageous. This measure also allows the owner to compare ECMs against each other to determine the most appealing choices.

Gas Rate and Electric Rate ($/therm and $/kWh): The gas rate and electric rate used in the financial analysis is the total annual energy cost divided by the total annual energy usage for the 12 month billing period studied. The graphs of the monthly gas and electric rates reflect the total monthly energy costs divided by the monthly usage, and display how the average rate fluctuates throughout the year. The average annual rate is the only rate used in energy savings calculations.

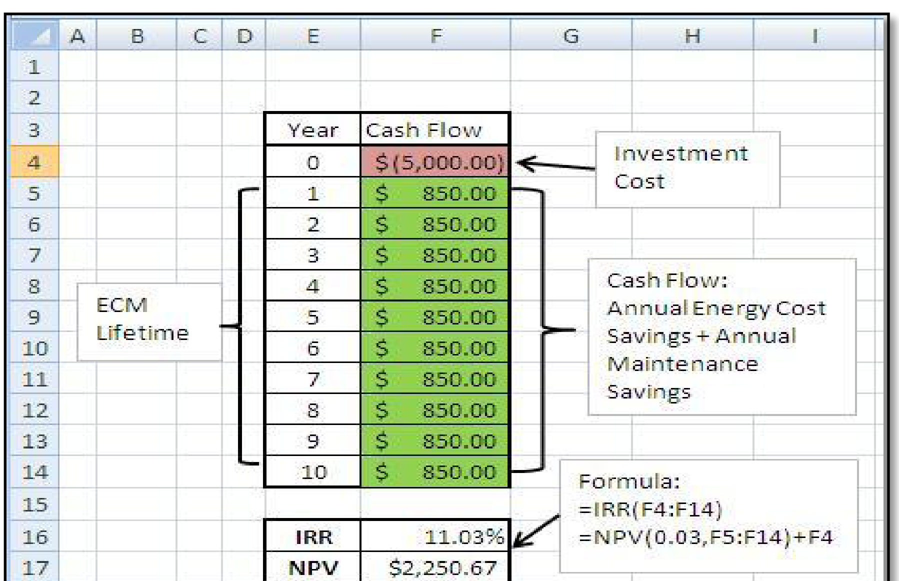
Calculation References

Term	Definition
ECM	Energy Conservation Measure
AOCS	Annual Operating Cost Savings
AECS	Annual Energy Cost Savings
LOCS*	Lifetime Operating Cost Savings
LECS	Lifetime Energy Cost Savings
LCS	Lifetime Cost Savings
NPV	Net Present Value
IRR	Internal Rate of Return
DR	Discount Rate
Net ECM Cost	Total ECM Cost – Incentive
LECS	AECS X ECM Lifetime
AOCS	LOCS / ECM Lifetime
LCS	LOCS+LECS
Simple Payback	Net ECM Cost / (AECS + AOCS)
Lifetime ROI	(LECS + LOCS – Net ECM Cost) / Net ECM Cost
Annual ROI	(Lifetime ROI / Lifetime) = [(AECS + OCS) / Net ECM Cost – (1 / Lifetime)]

* The lifetime operating cost savings are all avoided operating, maintenance, and/or component replacement costs over the lifetime of the ECM. This can be the sum of any annual operating savings, recurring or bulk (i.e. one-time repairs) maintenance savings, or the savings that comes from avoiding equipment replacement needed for the existing measure to meet the lifetime of the ECM (e.g. lighting change outs).

Excel NPV and IRR Calculation

In Excel, function =IRR (values) and =NPV (rate, values) are used to quickly calculate the IRR and NPV of a series of annual cash flows. The investment cost will typically be a negative cash flow at year 0 (total cost - incentive) with years 1 through the lifetime receiving a positive cash flow from the annual energy cost savings and annual maintenance savings. The calculations in the example below are for an ECM that saves $850 annually in energy and maintenance costs (over a 10 year lifetime) and takes $5,000 to purchase and install after incentives:



Solar PV ECM Calculation

There are several components to the calculation:

Costs:	Material of PV system including panels, mounting and net-metering + Labor
Energy Savings:	Reduction of kWh electric cost for life of panel, 25 years Solar Renewable Energy Credits (SRECs) – Market-rate incentive. Calculations assume $608/Megawatt hour consumed per year for a maximum of 15 years; added to annual energy cost savings for a period of 15 years. (Megawatt hour used is rounded to nearest 1,000 kWh)
Assumptions:	A Solar Pathfinder device is used to analyze site shading for the building and determine maximum amount of full load operation based on available sunlight. When the Solar Pathfinder device is not implemented, amount of full load operation based on available sunlight is assumed to be 1,180 hours in New Jersey.

Total lifetime PV energy cost savings =
kWh produced by panel * [$/kWh cost * 25 years + $608/Megawatt hour /1000 * 15 years]

ECM and Equipment Lifetimes

Determining a lifetime for equipment and ECM's can sometimes be difficult. The following table contains a list of lifetimes that the NJCEP uses in its commercial and industrial programs. Other valid sources are also used to determine lifetimes, such as the DOE, ASHRAE, or the manufacturer's warranty.

Lighting is typically the most difficult lifetime to calculate because the fixture, ballast, and bulb can all have different lifetimes. Essentially the ECM analysis will have different operating cost savings (avoided equipment replacement) depending on which lifetime is used.

When the bulb lifetime is used (rated burn hours / annual burn hours), the operating cost savings is just reflecting the theoretical cost of replacing the existing case bulb and ballast over the life of the recommended bulb. Dividing by the bulb lifetime will give an annual operating cost savings.

When a fixture lifetime is used (e.g. 15 years) the operating cost savings reflects the avoided bulb and ballast replacement cost of the existing case over 15 years minus the projected bulb and ballast replacement cost of the proposed case over 15 years. This will give the difference of the equipment replacement costs between the proposed and existing cases and when divided by 15 years will give the annual operating cost savings.

New Jersey Clean Energy Program Commercial Equipment Life Span

Measure	Life Span
Commercial Lighting — New	15
Commercial Lighting — Remodel/Replacement	15
Commercial Custom — New	18
Commercial Chiller Optimization	18
Commercial Unitary HVAC — New - Tier 1	15
Commercial Unitary HVAC — Replacement - Tier 1	15
Commercial Unitary HVAC — New - Tier 2	15
Commercial Unitary HVAC — Replacement Tier 2	15
Commercial Chillers — New	25
Commercial Chillers — Replacement	25
Commercial Small Motors (1-10 HP) — New or Replacement	20
Commercial Medium Motors (11-75 HP) — New or Replacement	20
Commercial Large Motors (76-200 HP) — New or Replacement	20
Commercial VSDs — New	15
Commercial VSDs — Retrofit	15
Commercial Comprehensive New Construction Design	18
Commercial Custom — Replacement	18
Industrial Lighting — New	15
Industrial Lighting — Remodel/Replacement	15
Industrial Unitary HVAC — New - Tier 1	15
Industrial Unitary HVAC — Replacement - Tier 1	15
Industrial Unitary HVAC — New - Tier 2	15
Industrial Unitary HVAC — Replacement Tier 2	15
Industrial Chillers — New	25
Industrial Chillers — Replacement	25
Industrial Small Motors (1-10 HP) — New or Replacement	20
Industrial Medium Motors (11-75 HP) — New or Replacement	20
Industrial Large Motors (76-200 HP) — New or Replacement	20
Industrial VSDs — New	15
Industrial VSDs — Retrofit	15
Industrial Custom — Non-Process	18
Industrial Custom — Process	10
Small Commercial Gas Furnace — New or Replacement	20
Small Commercial Gas Boiler — New or Replacement	20
Small Commercial Gas DHW — New or Replacement	10
C&I Gas Absorption Chiller — New or Replacement	25
C&I Gas Custom — New or Replacement (Engine Driven Chiller)	25
C&I Gas Custom — New or Replacement (Gas Efficiency Measures)	18
O&M savings	3
Compressed Air (GWh participant)	8

APPENDIX J: STATEMENT OF ENERGY PERFORMANCE FROM ENERGY STAR®

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Washington Township High School

Building ID: 2844664
For 12-month Period Ending: August 31, 2011[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: February 28, 2012

Facility
Washington Township High School
509 Hurffville Crosskeys Road
Sewell, NJ 08080

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1962
Gross Floor Area (ft²): 412,000

Energy Performance Rating[2] (1-100) 41

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	20,609,875
Natural Gas (kBtu)[4]	15,089,128
Total Energy (kBtu)	35,699,003

Energy Intensity[4]	
Site (kBtu/ft²/yr)	87
Source (kBtu/ft²/yr)	205

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	3,721

Electric Distribution Utility
Atlantic City Electric Co [Pepco Holdings Inc]

National Median Comparison	
National Median Site EUI	81
National Median Source EUI	191
% Difference from National Median Source EUI	8%
Building Type	K-12 School

Stamp of Certifying Professional

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

Meets Industry Standards[5] for Indoor Environmental Conditions:	
Ventilation for Acceptable Indoor Air Quality	**N/A**
Acceptable Thermal Environmental Conditions	**N/A**
Adequate Illumination	**N/A**

Certifying Professional
N/A

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

The government estimates the average time needed to fill out this form is 6 hours (includes the time for entering energy data, Licensed Professional facility inspection, and notarizing the SEP) and welcomes suggestions for reducing this level of effort. Send comments (referencing OMB control number) to the Director, Collection Strategies Division, U.S., EPA (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460.

EPA Form 5900-16

APPENDIX K: INCENTIVE PROGRAMS

New Jersey Clean Energy Pay for Performance

The NJ Clean Energy Pay for Performance (P4P) Program relies on a network of Partners who provide technical services to clients. LGEA participating clients who are not receiving Direct Energy Efficiency and Conservation Block Grants are eligible for P4P. SWA is an eligible Partner and can develop an Energy Reduction Plan for each project with a whole-building traditional energy audit, a financial plan for funding the energy measures and an installation construction schedule.

The Energy Reduction Plan must define a comprehensive package of measures capable of reducing a building's energy consumption by 15+%. P4P incentives are awarded upon the satisfactory completion of three program milestones: submittal of an Energy Reduction Plan prepared by an approved Program Partner, installation of the recommended measures, and completion of a Post-Construction Benchmarking Report. The incentives for electricity and natural gas savings will be paid based on actual savings, provided that the minimum 15% performance threshold savings has been achieved.

Energy Provider Incentives

- **South Jersey Gas** - Offers financing up to $100,000 on the customer's portion of project cost through private lender. In addition to available financing, it provides matching incentive on gas P4P incentives #2 and #3 up to $100,000 (not to exceed total project cost).

For further information, please see: http://www.njcleanenergy.com/commercial-industrial/programs/pay-performance/existing-buildings .

Direct Install 2011 Program*

Direct Install is a division of the New Jersey Clean Energy Programs' Smart Start Buildings. It is a turn-key program for small to mid-sized facilities to aid in upgrading equipment to more efficient types. It is designed to cut overall energy costs by upgrading lighting, HVAC, and other equipment with energy efficient alternatives. The program pays **up to 70%** of the retrofit costs, including equipment cost and installation costs. Each project is limited to $75,000 in incentives.

Eligibility:

- Existing small and mid-sized commercial and industrial facilities with peak electrical demand **below 150 kW** within 12 months of applying (the 150 kW peak demand threshold has been waived for local government entities who receive and utilize their Energy Efficiency and Conservation Block Grant in conjunction with Direct Install)
- Must be located in New Jersey
- Must be served by one of the state's public, regulated or natural gas companies

Energy Provider Incentives

- **South Jersey Gas** – Program offers financing up to $25,000 on customer's 40% portion of the project and combines financing rate based on portion of the project devoted to gas and electric measures. All gas measures financed at 0%, all electric measures financed at normal rate. Does not offer financing on projects that only include electric measures.

- **Atlantic City Electric –** Provides a free audit, and additional incentives up to 20% of the current incentive up to a maximum of $5,000 per customer.

For the most up to date information on contractors in New Jersey who participate in this program, go to: http://www.njcleanenergy.com/commercial-industrial/programs/direct-install or visit the utility web sites.

Smart Start

New Jersey's SmartStart Building Program is administered by New Jersey's Office of Clean Energy. The program also offers design support for larger projects and technical assistance for smaller projects. If your project specifications do not fit into anything defined by the program, there are even incentives available for custom projects.

There are a number of improvement options for commercial, industrial, institutional, government, and agricultural projects throughout New Jersey. Alternatives are designed to enhance quality while building in energy efficiency to save money. Project categories included in this program are New Construction and Additions, Renovations, Remodeling and Equipment Replacement.

Energy Provider Incentives

- **South Jersey Gas –** Program to finance projects up to $25,000 not covered by incentive
- **New Jersey Natural Gas** – Will match SSB incentives on gas equipment
  PSE&G - Provides funding for site-specific uses of emerging technology. The incentives are determined on a case by case basis.

For the most up to date information on how to participate in this program, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings.

Renewable Energy Incentive Program*

The Renewable Energy Incentive Program (REIP) provides incentives that reduce the upfront cost of installing renewable energy systems, including solar, wind, and sustainable biomass. Incentives vary depending upon technology, system size, and building type. Current incentive levels, participation information, and application forms can be found at the website listed below.

Solar Renewable Energy Credits (SRECs) represent all the clean energy benefits of electricity generated from a solar energy system. SRECs can be sold or traded separately from the power, providing owners a source of revenue to help offset the cost of installation. All solar project owners in New Jersey with electric distribution grid-connected systems are eligible to generate SRECs. Each time a system generates 1,000 kWh of electricity an SREC is earned and placed in the customer's account on the web-based SREC tracking system.

For the most up to date information on how to participate in this program, go to: http://www.njcleanenergy.com/renewable-energy/home/home.

Combined Heat and Power (CHP)

Energy Provider Incentives

- South Jersey Gas - Provides additional incentive of $1.00/watt up to $1,000,000 on top of NJCEP incentive.

Utility Sponsored Programs

Check with your local utility companies for further opportunities that may be available.

Energy Efficiency and Conservation Block Grant Rebate Program

The Energy Efficiency and Conservation Block Grant (EECBG) Rebate Program provides supplemental funding up to $20,000 for eligible New Jersey local government entities to lower the cost of installing energy conservation measures. Funding for the EECBG Rebate Program is provided through the American Recovery and Reinvestment Act (ARRA).

For the most up to date information on how to participate in this program, go to: http://njcleanenergy.com/EECBG.

Other Federal and State Sponsored Programs

Other federal and state sponsored funding opportunities may be available, including BLOCK and R&D grant funding. For more information, please check http://www.dsireusa.org/.

*Subject to availability. Incentive program timelines might not be sufficient to meet the 25% in 12 months spending requirement outlined in the LGEA program.

APPENDIX L: ENERGY CONSERVATION MEASURES

#	ECM Description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
ECM 1	Replace 8 incandescent lamps with CFLs (9/10 Building)	$72	$0	$72	501	0.0	0	0.0	$0	$78	5	$389	0.9	440%	88%	105%	$24	897
ECM 2	Replace 100 incandescent lamps with CFLs (11/12 Building)	$900	$0	$900	6,479	0.0	0	0.1	$0	$1,005	5	$5,027	0.9	459%	92%	109%	$314	11,601
ECM 3	Replace 140 incandescent lamps with CFLs (Core building)	$1,290	$0	$1,290	12,331	0.0	0	0.1	$0	$1,913	5	$9,567	0.7	642%	128%	147%	$597	22,079
ECM 4	Replace 35 high bay metal halide fixtures with T5s (9/10 Building)	$9,220	$560	$8,660	10,430	2.0	0	0.1	$875	$2,493	10	$24,934	3.5	188%	19%	14%	$779	18,675
ECM 5	Replace 92 high bay metal halide fixtures with T5s (11/12 Building)	$15,815	$1,472	$14,343	27,416	3.0	0	0.2	$2,300	$6,554	10	$65,542	2.2	357%	36%	36%	$2,047	49,088
ECM 6	Install 127 new occupancy sensors (9/10 Building)	$27,940	$2,540	$25,400	77,297	0.0	0	0.6	$0	$11,994	10	$119,943	2.1	372%	37%	38%	$3,745	########
ECM 7	Install 62 new bi-level fixtures in stairwells (9/10 Building)	$10,950	$1,550	$9,400	13,234	0.0	0	0.1	$0	$2,054	15	$30,803	4.6	228%	15%	3%	$641	23,695
ECM 8	Replace 45 old LED exit signs with newer LED exit signs (11/12 Building)	$6,773	$900	$5,873	8,475	1.0	0	0.1	$126	$1,441	15	$21,616	4.1	268%	18%	7%	$450	15,174
ECM 9	Install 100 new occupancy sensors (11/12 Building)	$22,000	$2,000	$20,000	57,908	0.0	0	0.5	$0	$8,986	10	$89,857	2.2	349%	35%	35%	$2,806	########
ECM 10	Install 20 new bi-level fixtures in stairwells (Core Building)	$3,390	$500	$2,890	3,128	0.0	0	0.0	$0	$485	15	$7,281	6.0	152%	10%	-6%	$152	5,601
ECM 11	Replace 30 old LED exit signs with newer LED exit signs (Core Building)	$4,515	$600	$3,915	5,913	0.8	0	0.0	$84	$1,002	15	$15,023	3.9	284%	19%	9%	$313	10,587
ECM 12	Install 49 new occupancy sensors (Core Building)	$10,780	$980	$9,800	38,038	0.0	0	0.3	$0	$5,902	10	$59,024	1.7	502%	50%	53%	$1,843	68,107
CI 1	Install 97.75 kW Solar Photovoltaic System (Core and 9/10 Building)	$586,500	$0	$586,500	118,920	78.2	0	1.0	-$500	$34,358	25	$694,699	17.1	18%	2%	2%	($87,802)	########
CI 2	Replace existing roof (9/10 Building)	$305,960	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CI 3	Replace existing exterior light fixtures (9/10 Building)	$60,640	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CI 4	Replace existing windows with Energy Star certified windows (9/10 Building)	$117,856	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CI 5	Replace existing roof (11/12 Building)	$553,575	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CI 6	Replace existing exterior light fixtures (11/12 Building)	$70,747	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CI 7	Replace existing windows with Energy Star certified windows (11/12 Building)	$538,285	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CI 8	Replace existing roof (Core Building)	$232,200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CI 9	Replace existing exterior light fixtures (Core Building)	$20,213	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CI 10	Replace End-of-Life RTUs and Condensing Units (9/10 Building)	$28,928	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C 11	Replace End-of-Life RTUs and Condensing Units (11/12 Building)	$737,499	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C 12	Replace End-of-Life AHU (Core Building)	$18,570	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C 13	Replace two End-of-Life 10,400 cast iron boilers (11/12 Building)	$56,369	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C 14	Install BMS system (9/10 Building)	$75,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CI 15	Optimize chilled water and ice storage plant (Core Building)	$7,500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CI 16	Replace 59 EDPAC heat pumps and glycol system	$93,173	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CI 17	Replace 250 MBH Bradford-White domestic hot water heater (Core building)	$9,381	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CI 18	Replace domestic hot water heater and tank (9/10 Building)	$48,311	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CI 19	Replace BAC cooling tower (9/10 Building)	$17,025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Totals:		**$3,691,377**	**######**	**$3,680,276**	**380,070**	**86.0**	**0**	**3.1**	**$2,885**	**$78,266**	-	**$1,143,706**	**49.7**	-	-	-	-	**######**

Assumptions: Discount Rate: 3.2%; Energy Price Escalation Rate: 0%
Note: A 0.0 electrical demand reduction/month indicates that it is very low/negligible

APPENDIX M: METHOD OF ANALYSIS

Assumptions and tools

Cost estimates:	RS Means 2009 (Facilities Maintenance & Repair Cost Data) RS Means 2009 (Building Construction Cost Data) RS Means 2009 (Mechanical Cost Data) Published and established specialized equipment material and labor costs Cost estimates also based on utility bill analysis and prior experience with similar projects

Disclaimer

This engineering audit was prepared using the most current and accurate fuel consumption data available for the site. The estimates that it projects are intended to help guide the owner toward best energy choices. The costs and savings are subject to fluctuations in weather, variations in quality of maintenance, changes in prices of fuel, materials, and labor, and other factors. Although we cannot guarantee savings or costs, we suggest that you use this report for economic analysis of the building and as a means to estimate future cash flow.

THE RECOMMENDATIONS PRESENTED IN THIS REPORT ARE BASED ON THE RESULTS OF ANALYSIS, INSPECTION, AND PERFORMANCE TESTING OF A SAMPLE OF COMPONENTS OF THE BUILDING SITE. ALTHOUGH CODE-RELATED ISSUES MAY BE NOTED, SWA STAFF HAVE NOT COMPLETED A COMPREHENSIVE EVALUATION FOR CODE-COMPLIANCE OR HEALTH AND SAFETY ISSUES. THE OWNER(S) AND MANAGER(S) OF THE BUILDING(S) CONTAINED IN THIS REPORT ARE REMINDED THAT ANY IMPROVEMENTS SUGGESTED IN THIS SCOPE OF WORK MUST BE PERFORMED IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL LAWS AND REGULATIONS THAT APPLY TO SAID WORK. PARTICULAR ATTENTION MUST BE PAID TO ANY WORK WHICH INVOLVES HEATING AND AIR MOVEMENT SYSTEMS, AND ANY WORK WHICH WILL INVOLVE THE DISTURBANCE OF PRODUCTS CONTAINING MOLD, ASBESTOS, OR LEAD.