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Local Government Energy Program
Energy audit report

For

Hamilton Board of Education
Yardville Elementary School
Hamilton, NJ 08620

Project Number: LGEA01

TABLE OF CONTENTS

INTRODUCTION

On April 13th, 14th, 15th and 16th, 2009, Steven Winter Associates, Inc. (SWA) performed energy audits and assessments of 12 elementary schools within the Hamilton School District located in Hamilton, NJ. Current conditions and energy-related information were collected in order to analyze and facilitate the implementation of energy conservation measures for the building.

The following twelve elementary schools were evaluated under this energy audit: Greenwood, Klockner, Kuser, Lalor, Langtree, Mercerville, Morgan, Robinson, Sayen, Sunnybrae, Yardville, and Yardville Heights. The original construction date, type, and building area of each school vary, since the buildings were constructed to accommodate school district expansion over the years. Construction of the original 12 buildings was undertaken between 1908 and 1966, with additions or modular classroom units added between 1922 and 1995. Floor area ranges from 27,750 square feet up to 51,813 square feet. Typical occupancy includes 300 Kindergarten through fifth grade students and 30 teachers and staff.

Energy data and building information collected in the field were analyzed to determine the baseline energy performance of each building. Using spreadsheet-based calculation methods, SWA estimated the energy and cost savings associated with the installation of each of the recommended energy conservation measures. The findings for each building are summarized in the respective report.

The present report is for Yardville Elementary School only.

Yardville Elementary School was built in 1938 with additions built in 1957 and two modular classrooms added in 1989 and 1993. The school consists of 35,370 square feet of conditioned space. There are approximately 300 students in grades Kindergarten through fifth grade and about 55 staff people. The building is operated on weekday schedule from 6:30 am to 5:30 pm, about 55 hours a week.

The goal of this energy audit is to provide sufficient information to make decisions regarding the implementation of the most appropriate and most cost effective energy conservation measures for the building.

EXECUTIVE SUMMARY

This document contains the energy audit report for Yardville Elementary School located at 450 Yardville Allentown Rd, Hamilton, NJ 08620. Yardville Elementary is a two story building. Based on the field visit performed by Steven Winter Associates (SWA) staff on April 15th, 2009 and the results of a comprehensive energy analysis, this report describes the site's current conditions and recommendations for improvements. Suggestions for measures related to energy conservation and improved comfort are provided in the scope of work. Energy and resource savings are estimated for each measure that results in a reduction of heating, cooling, and electric usage.

In the most recent full year of data collected (September 2007 through September 2008), Yardville Elementary School building consumed approximately 176,780 kwh or $28,635.07 worth of electricity and 27,337 therms or $42,373 worth of natural gas. For purposes of this report, an average gas cost of $1.55/therm was assumed. This unit price represents typical local costs for both consumption and transportation of natural gas. With electricity and gas combined, the building consumed 3,337 MMBtu of energy that cost a total of $71,008.

SWA benchmarked Yardville Elementary School using the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. The Portfolio Manager generated a benchmark score of 38 for the building when compared to a national average. The benchmark rating is based on the facility's source energy use, level of business activity, and geographical location. The Portfolio Manager is also capable of generating a site energy use intensity number using 2008 as a baseline year.

In order to compare commercial buildings equitably, the *Portfolio Manager* ratings convey the consumption of each type of energy in a single common unit. The EPA uses source energy to represent the total amount of raw fuel required to operate the building. The site energy use intensity for Yardville Elementary School building is 84 kBtu/sq.ft/year. After energy efficiency improvements are made, future utility bills can be added to the Portfolio Manager and the site energy use intensity for a different time period can be compared to September 2007 through September 2008 baseline to track the changes in energy consumption associated with the energy improvements.

SWA recommends a total of 2 Energy Conservation Measures (ECMs) for Yardville Elementary School. The total investment cost for these ECMs is $105,176. SWA estimates a first year savings of $2,947 with a simple payback of 35.7 years. SWA also estimates that Yardville Elementary School will be able to reduce their carbon footprint by **21,017 lbs of CO2 annually.**

There are various incentives that Yardville Elementary School could apply for that could also help lower the cost of installing the ECMs. SWA recommends that Yardville Elementary School applies for the NJ SmartStart program through the New Jersey Office of Clean Energy. This incentive can help provide technical assistance for the building in the implementation phase of any energy conservation project.

When pursuing incentives through the SmartStart program, SWA encourages building managers to contact the program provider to obtain more detailed information on the program guidelines and request pre-approval for all planned upgrades. At the time of this report, high-efficiency, gas-fired boilers with a capacity between 1500 – 4000 MBH may be eligible for an incentive of $1.00 per MBH. Larger equipment may qualify for a custom incentive package. When replacing gas-fired water heaters, consider upgrading to high-efficiency equipment. Water heaters that are 50 gallons and larger may be eligible for an incentive of $1.00-$2.00 per MBH. Incentives are also available for the installation of occupancy sensors and dimming controls. Incentives for lighting controls vary and are based on the quantity and type of controls installed.

For further information on both custom and prescriptive incentives, please visit:

http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/equipment-incentives/equi

The New Jersey Clean Energy website also provides information on incentives for renewable energy. Visit the website to download a copy of the Renewable Energy Incentive Program (REIP) Guidebook. Incentives include up to $1.00 per watt for eligible photovoltaic projects.

Hamilton Board of Education should become familiar with New Jersey Clean Energy programs aimed specifically at schools if they are considering building new facilities or doing major renovations. For further information about specific program information, please visit:
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/school-construction/about

The following table summarizes the proposed Energy Conservation Measures (ECM) and their economical relevance.

SCOPE OF WORK – SUMMARY TABLE

ECM Table without Incentives

ECM#	ECM description	Installed Cost		1st year energy savings							SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO2)
		Estimated $	Source	Electric Savings (kWh)	Unit	Natural Gas Savings (therms)	Unit	Demand	Unit	$ Savings/year			Cost Savings		
1	Steam boiler replacement	$ 105,161	RSMeans	0	kWh	1,893	therms	0.0	kW	$ 2,934	35.8	30	$ 56,052	-1.6%	20,867
2	Upgrade existing lighting	$ 15	RSMeans	84	kWh	-	therms	0.0	kW	$ 13	1.2	20	$ 260	81.8%	150
Total	**Total Scope of Work**	**$ 105,176**	**-**	**84**	**-**	**1,893**		**0.0**	**-**	**$ 2,947**	**35.7**		**$ 56,312**		**21,017**

Definitions:

SPP: Simple Payback (years)
LoM: Life of Measure (years)
ROI: Return on Investment (%)

Assumptions:

Discount rate:	3.2%	per DOE FEMP guidelines	Average Electric Rate =	0.155	$/kWh	Carbon Dioxide per unit Electriciy =	1.7905	lbs of CO2/kWh
Energy price escalation rate:	0%	per DOE FEMP guidelines	Average Natural Gas Rate =	1.55	$/therm	Carbon Dioxide per unit Nat.l Gas =	11.023	lbs of CO2/therm

1. HISTORIC ENERGY CONSUMPTION

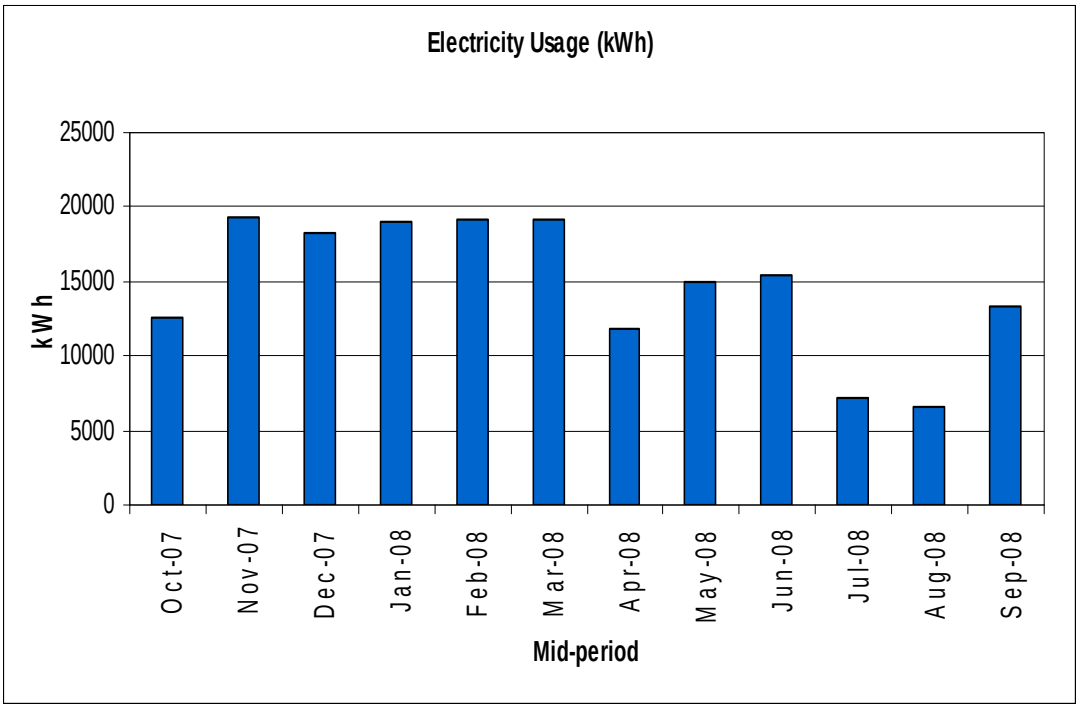
1.1. Energy usage and cost analysis

SWA received and analyzed utility bills from September 2006 through September 2008 that were received from the Hamilton Board of Education.

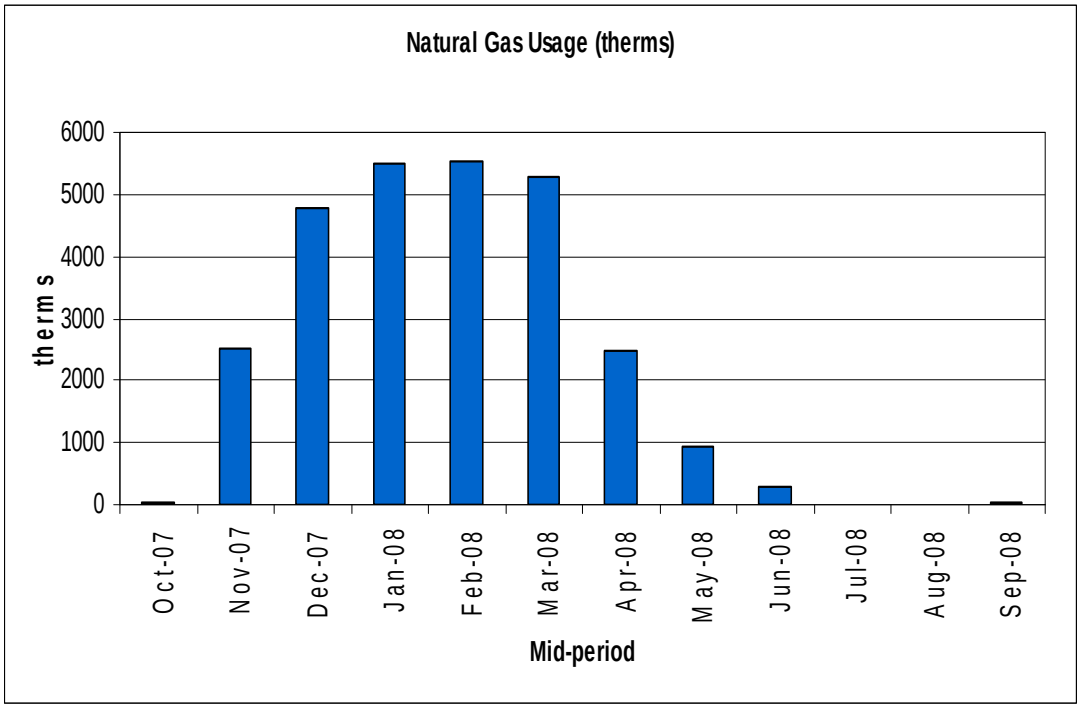
Electricity – Yardville Elementary School has one electric meter for incoming electricity supply. The building purchases electricity from PSE&G at **an average aggregated rate of $.173/kWh** based on September 2007 through September 2008 electric bills. The building purchased **approximately 176,780 kWh or $28,635.07 worth of electricity based on the specified 12 months of utility bills.** Based on the same time period, the building also has **an average monthly demand of 57.9 kW and monthly peak demand of 64.8 kW.**

Natural Gas – Yardville Elementary School has one gas meter for incoming natural gas from PSE&G. Between September 2007 and September 2008, the building purchased **approximately 27,338 therms or $42,373 worth of natural gas.** To account for the additional costs associated with transportation and delivery fees, an average total gas rate of **$1.55 per therm** was assumed in this report.

The following chart shows electricity usage for the Yardville Elementary School based on utility bills for the year 2008.



The following chart shows the natural gas usage for Yardville Elementary School base on utility bills for the year September 2007 to September 2008.



In the above chart, the natural gas usage follows a heating trend as expected. During the summer it is clear that the natural gas usage is very minimal which reflects that heat is not being used and the DHW load is minimal.

1.2. Utility rate

Yardville Elementary School currently buys electricity and gas from PSE&G at the FTLV general service rate (or MD rate). The FTLV general service is s typical rate where customers pay for natural gas based on usage and electricity based on usage with the addition of an electrical charge demand. Yardville Elementary School uses account # 13 62 569 250 68, at the service address of 450 Yardville Allentown Rd, Hamilton, NJ 08620 for the building electric and gas. Electricity for the building was billed at an average rate of **$0.174/kWh.** As previously noted, a typical regional average gas unit price of **$1.55/therm** was assumed in this report to address both the consumption and transportation costs of the fuel.

1.3. Energy benchmarking

Yardville Elementary School information and utility data were entered into the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* energy benchmarking system. The

performance score generated for the building is 38. SWA recommends that the Yardville Elementary School Board of Education maintain the Portfolio Manager account at the link below. As the account is maintained, SWA can share the Yardville Elementary School facility and allow future data to be added and tracked using the benchmarking tool.

http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Yardville Elementary

Building ID: 1762498
For 12-month Period Ending: July 31, 2008[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: June 26, 2009

Facility
Yardville Elementary
450 Yardville Allentown Rd
Trenton, NJ 08620

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1938
Gross Floor Area (ft²): 35,370

Energy Performance Rating[2] (1-100) 38

Site Energy Use Summary[3]

Natural Gas (kBtu)[4]	2,387,553
Electricity (kBtu)	599,814
Total Energy (kBtu)	2,987,367

Energy Intensity[5]

Site (kBtu/ft²/yr)	84
Source (kBtu/ft²/yr)	127

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	218

Electric Distribution Utility
PSE&G - Public Service Elec & Gas Co

National Average Comparison

National Average Site EUI	77
National Average Source EUI	115
% Difference from National Average Source EUI	10%
Building Type	K-12 School

Stamp of Certifying Professional

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

Meets Industry Standards[6] **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

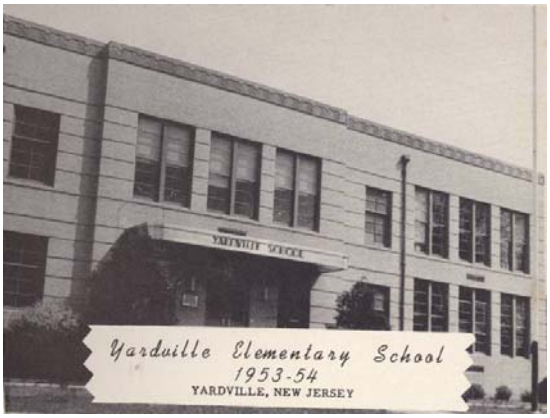
Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Natural Gas values in units of volume (e.g. cubic feet) are converted to kBtu with adjustments made for elevation based on Facility zip code.
5. Values represent energy intensity, annualized to a 12-month period.
6. 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.

EPA Form 5900-16

2. FACILITY AND SYSTEMS DESCRIPTION

2.1. Building Characteristics

The Yardville Elementary School, located at 450 Yardville-Allentown Road in Hamilton, New Jersey was built in 1938 and was originally approximately 28,354 square feet consisting of two above ground stories and a daylight basement. An additional 4,500 square feet were added in 1957 and two detached modular classrooms of 1,508 square feet in 1989 and 1008 square feet in 1993. The building today is comprised of 35,370 square feet of conditioned space that includes approximately 22 classrooms, (including art/music, special education, resource rooms and basic skills, etc.), three offices, a faculty break room, a library, an auditorium / theater, a cafeteria with adjacent kitchen, a boiler room and various storage areas and rest rooms. The building is built of concrete masonry units and brick. The exterior is a light tan brick that is attractive, well pointed and generally well maintained.



Original Yardville Elementary School

2.2. Building occupancy profiles

Yardville is one of seventeen elementary schools in the Hamilton Township School District. It provides kindergarten through fifth grade education. There is a student enrollment of approximately 350, with a staff of approximately 45 including full and part time faculty, administrative, maintenance, educational assistants and lunchroom/playground assistants. According to maintenance staff the building is occupied for approximately 10 hours each weekday from September through June.

2.3. Building envelope

2.3.1. Exterior walls

The exterior walls of the building consist of concrete masonry unit structure with a light tan face brick exterior facade. There is no evidence of any insulation in the exterior walls and maintenance staff could not recall ever seeing any wall insulation. The small detached modular classrooms that were added in 1995 would have been required by the state building code to have a very minimum level of insulation in exterior surfaces.

The detached modular buildings, added in 1995, appear to be a framed and have Texture 111 plywood siding.

Adding insulation to masonry wall construction is difficult and not cost effective. If any portion of the building is renovated or improved as part of a capital improvement plan, it may be possible to installation on the interior side of the walls during construction.

Brick exterior on back of school

2.3.2. Roof

The roof of Yardville School is flat / very low slope throughout. It is covered with hot process asphaltic membrane, tar and gravel. This roof was installed in 2003 or 2004 and probably has rigid foam insulation. Once again, the modular units built in 1995 would have been required to have some insulation in the roof/ceiling.

The modular units have a gable-end type, low pitch roof covered with asphalt composition shingles.

Installing insulation in a flat roof of this type of construction (main building) necessitates removing or covering and replacing the existing roof membrane and, as a stand alone measure, is prohibitively expensive. When it is time to replace the roof, however, at least two inches of polyisocyanurate, or similar rigid foam board insulation should be installed.

2.3.3. Base

The Yardville School's base is a five-inch concrete slab-on-grade. There were no reported problems with water penetration or moisture. There is no evidence of any perimeter insulation around the slab or under the slab. Excavation to install additional slab insulation is expensive and would not be cost-effective as a single measure. However, if the perimeter of the building is ever excavated to repair or replace drainage protections, installing two inches of a rigid foam board insulation should be considered.

2.3.4. Windows

The windows at the Yardville School are an atypical application. Rather than a standard window/storm window installation, there are two completely separate single-hung, single glazed windows, each in its own aluminum frame within the same window opening. The two windows are separated by approximately 2.5 inches of space. It was unclear to SWA whether the additional glazing units had been installed to improve comfort, security, aesthetics, or energy-efficiency. Overall, the windows appear to be in very good condition.

In a standard dual glazed window, the air trapped between the panes of glass provides much of the insulating value. In this system, with two completely separate window installations separated by several inches of space, it is difficult to assess the energy performance of the assembly as a whole. Temperature measurements taken in the field did show, however, that the interior surfaces of the windows were between 18 and 21 degrees colder than the ambient temperature of the classroom.

SWA recommends that both of the window installations be carefully inspected and any loose or deteriorated weather-stripping be replaced. The perimeter of both window frames should be completely caulked and sealed. Given the configuration, it may be necessary to seal the interior side of the interior unit and the exterior side of the exterior unit, taking care not to seal the weep holes. Although SWA is not aware of the decision-making rationale behind the selection of this installation, it may not provide anticipated energy savings but will likely require additional maintenance to prevent air leakage and condensation problems.

Windows at Main Building

The modular buildings have a standard double pane, aluminum frame sliding window.

Detached Modular Classrooms

2.3.5. Exterior doors

The exterior doors of the building are in satisfactory condition. They are metal clad, insulated doors and it is understood that security and safety are the primary considerations. Exterior doors can be a major source of heat loss in general and SWA recommends checking the weather-stripping of each door on a regular basis and replacing any broken seals immediately. Tight seals around the door will help ensure that the building is kept sealed and insulated over time. This will help ensure that the building stays tight and will prevent unconditioned air from infiltrating the interior. An optimum solution would be to install an airlock entry in which the exterior door opens into a vestibule containing another door to the inside. This prevents infiltration directly from the outside whenever a door is opened.

2.3.6. Building air tightness

Based upon a visual inspection, the building appears to be relatively well-sealed considering its' age and the general condition of the windows. SWA recommends that all exterior doors and windows be carefully inspected on a regular basis and all missing or deteriorated weather-stripping be repaired or replaced. Any caulking at the perimeter of windows and doors should also be inspected and cracked or missing caulking should be cleaned and re-caulked.

Any holes or penetrations in the building exterior should be sealed to prevent the loss of conditioned air. All plumbing, wiring, HVAC or ductwork penetrations should be sealed with foam or caulk. All other building penetrations, including fans, air conditioners, pipe, wire, or HVAC penetrations throughout the building should be sealed. Any asbestos-like-material should be properly abated before energy-efficient upgrades, such as air sealing or adding insulation, are conducted.

2.4. HVAC systems

2.4.1. Heating

The school is served by two steam boilers. These boilers supply steam to floor mounted unit ventilators in each classroom. The heating capacity of each unit ventilators ranges from 60-100 Mbtu. Each unit ventilator has unit-mounted controls that provide adjustment of both the steam valve and the fan. The building is served by pneumatic controls. Boiler On/Off operation can be controlled remotely by an Automated Logic panel located in the mechanical room. See the Equipment Inventory Table for further details.

Asbestos was observed on the piping and equipment in the mechanical room. Although this assessment focuses on energy-efficiency, the health and safety concerns associated with asbestos should be noted. Asbestos abatement is primarily a safety issue and is not directly associated with a cost payback. However, the existence of asbestos very often impacts the ability of building operators to perform routine maintenance procedures without undertaking appropriate safety measures and incurring associated costs.

As a result of asbestos, the efficiency of building systems often suffers from lack of routine maintenance. During the course of this assessment, appropriate safety precautions were taken with regards to the presence of asbestos. In some cases, this prevented SWA from completing a more thorough investigation of the existing systems and equipment. To protect the welfare of students and staff, SWA recommends that asbestos abatement be addressed prior to undertaking any other significant investments in capital improvements.

2.4.2. Cooling

There are also numerous window air conditioning units serving spaces throughout the buiding. SWA recommends replacing older model units with Energy Star window air conditioners, sized proportionally for the room, with an EER of 12 or better. All window air conditioners should have a gasketed cover. SWA recommends a gasketed air conditioner cover called Chill Stop-R if it is not possible to remove fans or air conditioners when not in use during heating months.

2.4.3. Ventilation

The floor-mounted unit ventilators in each classroom have an outdoor air duct through the exterior wall that delivers air to the rear of the unit. Exterior louvers allow air to be drawn into the unit ventilator and heated within the space. When the unit ventilator fan is operating, the fresh air is distributed to the room. In addition, the classrooms have operable windows to provide ventilation during the summer months.

Dedicated exhaust is provided for the kitchen and baths to remove odors.

2.4.4. Domestic Hot Water

Domestic Hot Water for the building is provided by an A.O. Smith natural gas-fired hot water storage tank. The storage tank has a capacity of 60 gallons of storage and an intput of 120 MBtuh. This standard efficiency equipment has an efficiency rating of approximately 78%.

It is not cost-effective to replace the existing water heating equipment with higher efficiency equipment. However, higher efficiency water heating equipment will save energy and should be strongly considered upon replacement of the equipment. Energy saving appliances bearing the ENERGY STAR label should be selected to ensure efficiency performance. Incentives may be available to offset any added costs for the installed equipment.

More efficient water-consuming fixtures and appliances save both energy and money through reduced energy consumption for water heating, as well decreased water and sewer bills. SWA recommends adding controlled on/off timers on all lavatory faucets to reduce domestic hot water demand and save water. Building staff can also easily install faucet aerators and/or low-flow fixtures to reduce hot water consumption. In addition, routine maintenance practices that identify and quickly address water leaks are a low-cost way to save water and energy.

2.5. Electrical systems

2.5.1. Lighting

Interior Lighting – Yardville Elementary School has efficient lighting installed throughout the building. SWA's lighting inventory included efficient T8 bulbs, compact fluorescents, and electronic ballasts throughout the school (see Appendix A for details). As such, there is little opportunity for improvement. There are a few areas noted that use incandescent bulbs which should be replaced with compact fluorescents. SWA recommends taking advantage of lighting on different switches and use only lighting needed in classrooms.

SWA recommends taking advantage of lighting on different switches and use only lighting needed in classrooms.

Although natural day lighting has been shown to improve occupant health, solar heat gain and glare from older glazing often negatively impact activities and comfort within the space. During the time of our visit (spring break week) shades were half drawn throughout the school. To understand the comfort concerns and identify those classrooms with the most significant problems, building staff can conduct an occupant survey. For problem areas, it may be beneficial to install tinted glazing or a window film to reduce the glare and solar heat gains. This recommendation will not provide energy savings but may improve occupant comfort.

2.5.2. Appliances and process

Appliances, such as refrigerators, that are over 10 years of age should be replaced with newer efficient models with the Energy Star label. For example, Energy Star refrigerators use as little as 315kwh/hr. When compared to the average electrical consumption of older equipment, Energy Star equipment results in a large savings. Look for the Energy Star label when replacing appliances and equipment, including: window air conditioners, refrigerators, printers, computers, copy machines, etc. More information can be found in the "Products" section of the Energy Star website at: http://www.energystar.gov

Computers left on in classrooms consume a lot of energy. A typical desk top computer uses 65 to 250 watts and uses the same amount of energy when the screen saver is left on. Televisions in classrooms use approximately 3-5 watts of electricity when turned off. SWA recommends all computers and all classrooms appliances (i.e. fridges, coffee makers, televisions, etc) be plugged in to power strips and turned off each evening just as the lights are turned off.

Educating both students and staff is a great way for schools to save energy while raising awareness about the importance of energy-efficiency. Prizes and challenges can be used to get classes involved in finding creative ways to reduce and monitor energy usage throughout the school. There are many free resources available to help Students, Parents, and School Administrators incorporate energy into school curricula and every day activities.

2.5.3. Elevators

There are no elevators at Yardville Elementary School.

2.5.4. Other electrical systems

There are currently no other electrical systems in the building.

3. EQUIPMENT LIST

Building System	Description	Make/ Model	Fuel	Space served	Estimated Remaining useful life %
Heating	(2) Steam Boilers, 214 HP each	HB Smith	Natural Gas	Building	0%
Distribution System	Floor mounted Unit ventilators/radiators with unit-mounted adjustable valve and fan controls	Nesbitt	Steam	Each Classroom	Varies
Cooling	No Central Cooling				
Ventilation	Outdoor Intake in Unit Ventilators, Exhaust for kitchens and baths.				
Domestic Hot Water	Tank-type Water Heater, 60 gallon, 120 Mbtuh	A.O. Smith	Natural Gas	Building	10%
Lighting	See details appendix A	-	-	-	-

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.

4. ENERGY CONSERVATION MEASURES

Based on the assessment of this building, SWA has separated the investment opportunities into three categories of recommendations:

1. Capital Improvements – Upgrades not directly associated with energy savings
2. Operations and Maintenance – Low Cost/No Cost Measures
3. Energy Conservation Measures – Higher cost upgrades with associated energy savings

Category I Recommendations: Capital Improvements

- Asbestos Abatement – As noted previously, asbestos was observed in the buildings and is considered a health and safety hazard. In addition, the existence of asbestos impacts the ability of the building operations staff to conduct routine maintenance without incurring additional costs associated with proper safety measures. Regardless of the recommendations adopted to upgrade the energy-efficiency of the facility, SWA recommends abatement by licensed asbestos contractors as the first priority.

Category II Recommendations: Operations and Maintenance

- Pipe Insulation – The energy efficiency of the heating plant and distribution system can be improved by repairing and/or replacing damaged pipe insulation. This recommendation can easily be undertaken by maintenance personal for minimal cost. However, the existence of asbestos impacts the cost associated with this recommendation. For this reason, asbestos abatement has been identified as a high priority investment.
- Steam Traps – Similarly, the energy efficiency of the heating plant and distribution system can be improved by repairing and/or replacing damaged steam traps. SWA recommends that building personnel conduct a steam trap inventory to determine the scope of the project. Project costs will vary, depending on the number of traps and the type of upgrade required. Again, the existence of asbestos impacts the cost associated with this recommendation. For this reason, asbestos abatement has been identified as a high priority investment.
- Controls Optimization – Is is SWA's understanding that the existing Automated Logic Control panel is used to remotely control on/off boiler operation for all buildings by the District Facility Manager. This panel can be optimized and/or expanded to either shut down or reset the boilers based on outdoor temperature. This may require additional sensors and programming by a Controls professional. However, utilization of the existing equipment makes this a relatively simple and cost-effective recommendation.
- Weather Stripping/Air Sealing - SWA observed that exterior door weather-stripping was beginning to deteriorate. Doors and vestibules should be observed annually for deficient weather-stripping and replaced as needed. The perimeter of all window frames should also be regularly inspected and any missing or deteriorated caulking should be re-caulked to provide an unbroken seal around the window frame. Any other accessible gaps or penetrations in the thermal envelope penetrations should also be sealed with caulk or spray foam.
- Water Efficient Fixtures & Controls - Adding controlled on/off timers on all lavatory faucets is a cost-effect 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-consuming fixtures and appliances will save both energy and money through reduced energy consumption for water heating, while also decreasing water and sewer bills.

- Create an educational program that teaches both students and their teachers how to minimize their energy use in the classroom. The US Department of Energy offers free information for hosting energy efficiency educational programs and K-12 lesson plans, for more information please visit: http://www1.eere.energy.gov/education/

Category III Recommendations: Energy Conservation Measures

Summary table

ECM#	Description
1	**Replace Existing Steam Boilers: Upgrade the existing steam boilers with new, higher efficiency steam boilers. This recommendation includes optimization of existing remote boiler controls, new local boiler controls, repair/replacement of failed steam traps, and increased pipe insulation. Implementation of this recommendation will require professional design assistance and asbestos abatement.**
2	**Lighting Upgrade; See appendix A for entire lighting retrofit schedule.**

ECM#1: *Replace Existing Steam Boilers*

Description:

The existing steam boilers have been reasonably well-maintained but they are inefficient relative to newer technology and they have reached the end of their useful life. The recommendation provided here cannot be cost justified by energy savings alone. However, the age and condition of the equipment warrant attention and this recommendation is intended to provide guidance to help the building management staff prioritize upgrades within the facility.

The existing equipment is approximately 75% efficient. To improve heating plant energy performance, SWA recommends replacement of the existing boilers with new boilers that have an efficiency of 82% or better. Boiler capacity should be properly sized. Insulation and steam traps on all boiler piping within the mechanical room and any accessible distribution piping should be replaced during this retrofit. As part of this upgrade, a local boiler control should be installed to provide on/off control based on outdoor temperature and boiler sequencing. The existing Automated Logic Control panel should be optimized to provide improved control during remote operation. This may require the installation of local temperature sensors and updated programming by a controls contractor.

Before proceeding with implementation of this recommendation, it will be necessary to abate the asbestos in the mechanical room. Asbestos abatement is outside the scope of this assessment and the cost estimates provided do not include pricing associated with abatement. This recommendation will also require professional design assistance to determine the appropriate equipment and configuration. Costs associated with design have not been included in the estimate provided in this report.

Pneumatic controls are used to regulate the heating system throughout the building, which primarily includes floor-mounted unit ventilators that are quite old. Although there is an opportunity to improve comfort and energy performance by upgrading the building controls and the distribution system, the impact on the building operations negates the cost-effectiveness of this recommendation.

Installation cost:

Estimated installed cost: $105,161
Source of cost estimate: RS *Means*

Economics:

1st year energy savings					SPP	LoM	lifetime		Annual Carbon Reduction (lbs of CO2)
usage	unit	demand	unit	$ savings			cost savings	ROI	
1,893	therm	0.0	-	$ 2,934	35.8	30	$ 56,052	-1.6%	20,867

Assumptions: SWA calculated the savings for this measure using information collected during the field visit and analysis of historical utility consumption information. SWA estimated the natural gas usage associated with heating only and assumed that this measure will save 7% of the heating usage. Pricing is based on removal of all existing boilers and replacement with an equal number of boilers.

Rebates/financial incentives:

This measure may qualify for an incentive of $1.00 per MBH of boiler capacity. Required boiler capacity will be determined by the design professional.

Options for funding ECM:
Additional information may be found on the NJ Clean Energy website.

ECM#2: *Lighting Upgrade*

Description:

Yardville Elementary School has efficient lighting installed throughout the building. SWA's lighting inventory included efficient T8 bulbs, compact fluorescents, and electronic ballasts throughout the school (see Appendix A for details). As such, there is little opportunity for improvement. There are a few areas noted that use incandescent bulbs which should be replaced with compact fluorescents. SWA recommends taking advantage of lighting on different switches and use only lighting needed in classrooms. For a complete existing and retrofit lighting schedule, please see Appendix A.

Installation cost:

Estimated installed cost: $15
Source of cost estimate: RS *Means*

Economics:

1st year energy savings					SPP	LoM	lifetime		Annual Carbon Reduction (lbs of CO2)
usage	unit	demand	unit	$ savings			cost savings	ROI	
84	kWh	0.0	kW	$ 13	1.2	20	$ 260	81.8%	150

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the field visit, and billing analysis.

Rebates/financial incentives:

NJ Clean Energy – Prescriptive Lighting Incentive, Incentive based on installing T5 or T8 lamps with electronic ballasts in existing facilities ($10-$30 per fixture, depending on quantity of lamps).

Options for funding ECM:

This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES

5.1. Existing systems

There are currently no existing renewable energy systems.

5.2. Solar Photovoltaic

Photovoltaic (PV) technology would not be cost beneficial to this project since there is such little electric demand. Also, the school is not in session during the summer when photovoltaic panels would be most beneficial.

5.3. Solar Thermal Collectors

Solar thermal collectors are not cost effective for this project and are not be recommended due to the low amount of domestic hot water use throughout the building.

5.4. Combined Heat and Power

CHP is not applicable to this project because of the HVAC system type and limited domestic hot water usage.

5.5. Geothermal

Geothermal is not applicable to this project because it would require modifications to the existing heat distribution system, which would not be cost effective.

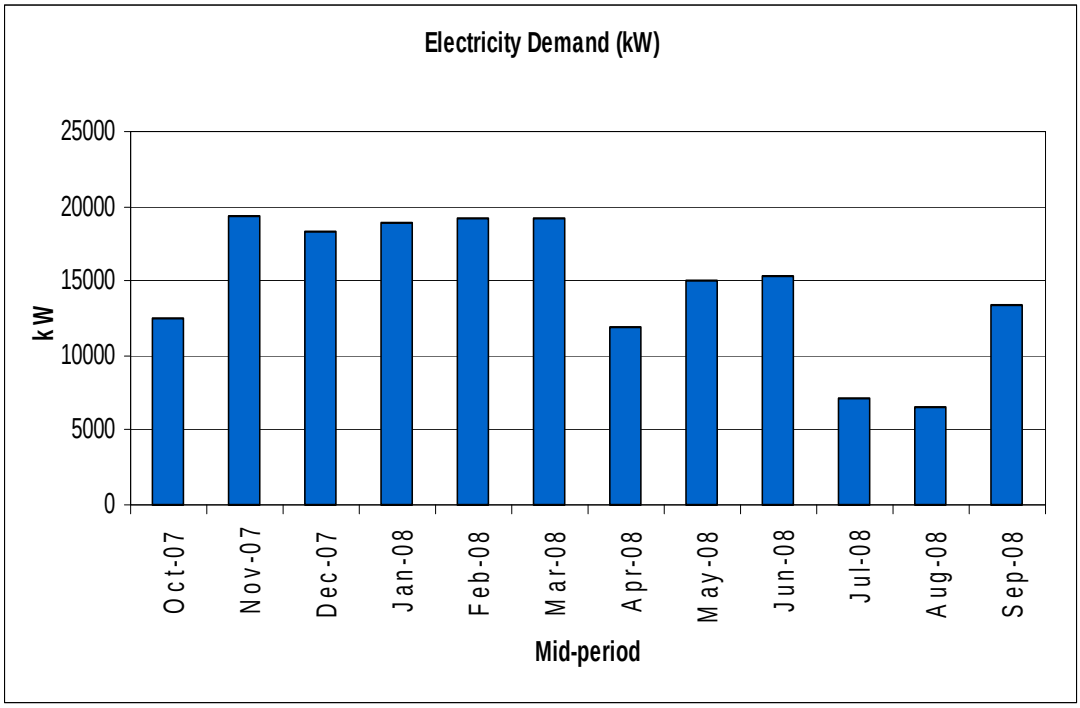
5.6. Wind

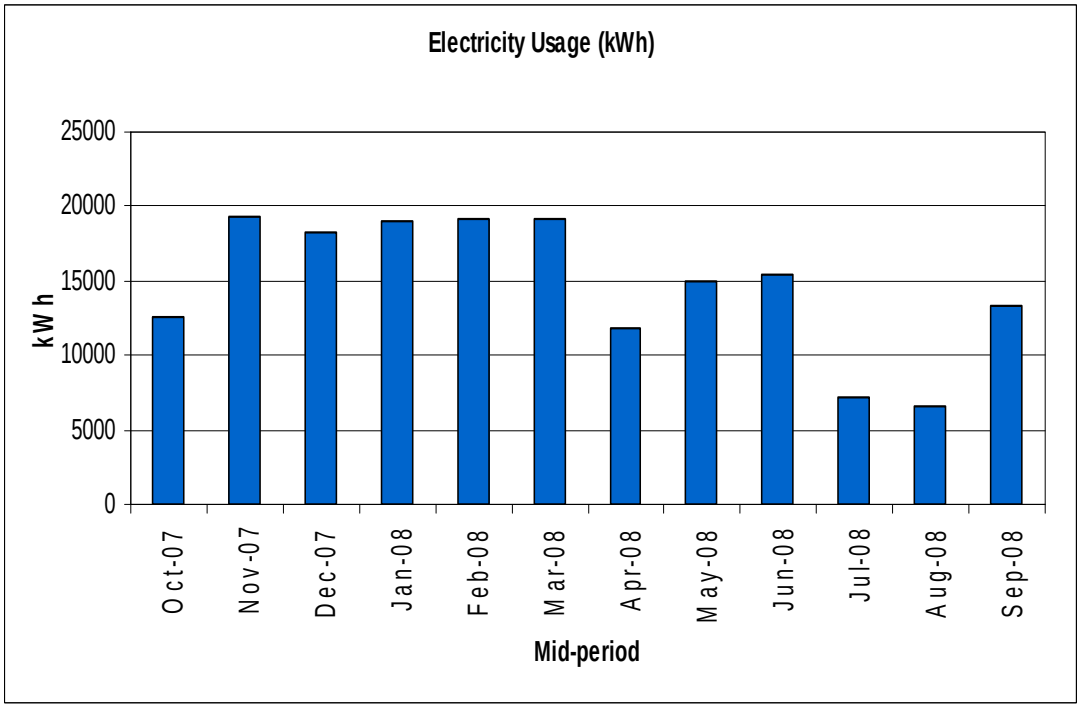
Wind power production is not appropriate for this location because required land is not available for the wind turbine. Also, the available wind energy resource is very low.

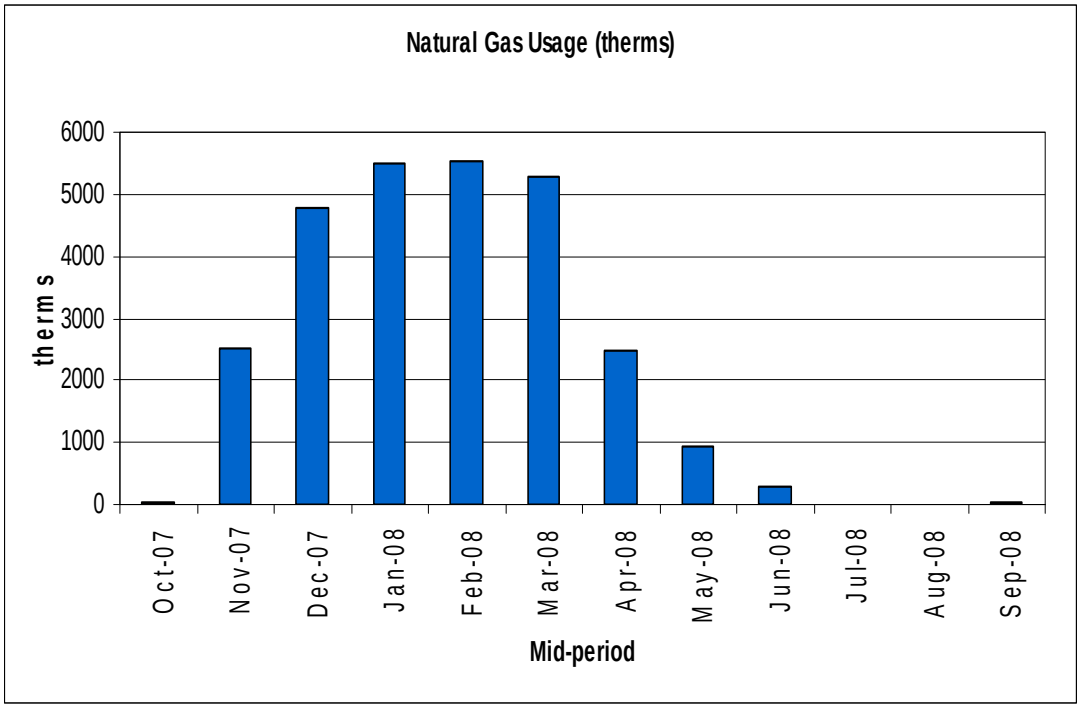
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

6.1. Load profiles

The average electrical peak demand for the previous year was 58.2 kW and the maximum peak demand was 64.8 kW. The electric and gas load profiles for this project are presented in the following charts. The first chart shows electric demand (in kW) for the previous 12 months and the other two charts show electric and gas usage (in kWh), respectively.


Electricity Demand (kW)
25000
20000
15000
10000
5000
0
kW
Oct-07
Nov-07
Dec-07
Jan-08
Feb-08
Mar-08
Apr-08
May-08
Jun-08
Jul-08
Aug-08
Sep-08
Mid-period


Electricity Usage (kWh)
25000
20000
15000
10000
5000
0
kWh
Oct-07
Nov-07
Dec-07
Jan-08
Feb-08
Mar-08
Apr-08
May-08
Jun-08
Jul-08
Aug-08
Sep-08
Mid-period



6.2. Tariff analysis

The school currently buys electricity and gas from PSE&G at the FTLV rate. FTLV is a typical rate structure where customers pay for natural gas based on usage and electricity based on usage with the addition of an electrical demand charge. The FTLV rate is appropriate for this building. No information on gas transportation charges was provided for this analysis.

6.3. Energy Procurement strategies

Billing analysis shows price fluctuations of over 20% over the course of the year for the building electrical and natural gas accounts. Customers that have a large variation in monthly billing rates can often reduce the costs associated with energy procurement by selecting a third party energy supplier. Contact the NJ Energy Choice Program for further information on Energy Services Companies (ESCOs) that can act as third party energy suppliers. Purchasing electricity from an ESCO can reduce electric rate fluctuation and ultimately reduce the annual cost of energy for the school. Appendix C contains a complete list of third party energy suppliers.

The building would not be eligible for enrollment in a Demand Response Program because the minimum electric demand each month does not greatly exceed 50 kW, which is the typical threshold for considering this option.

7. METHOD OF ANALYSIS

7.1. Assumptions and methods

Energy modeling method:	Spreadsheet-based calculation methods
Cost estimates:	RS Means 2009 (Facilities Maintenance & Repair Cost Data) RS Means 2009 (Building Construction Cost Data) RS Means 2009 (Mechanical Cost Data) Note: Cost estimates also based on utility bill analysis and prior experience with similar projects.

7.2. 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.

Appendix A: Lighting study

Existing Lighting Conditions																	Proposed Lighting Improvements								
#	School	Building	Level/Floor	Location in Building	Measured Lighting Level in Footcandles	Fixture Type	Ballast Type	No. of Fixtures	No. of Lamps	Type of Lamp	Watts/Lamp	Hrs/Day	Energy Use (Watt hours/day)	Controls	Daylighting possible?	Total Power (Watts)	Fixture Type	Ballast Type	No. of Fixtures	No. of Lamps	Type of Lamp	Watts/Lamp	Hrs/Day	Energy Use (Watt hours/day)	Total Power (W)
1	Yardville	1938 Building	Basement	Boiler Room		4' linear T8	electronic	3	4	Fluorescent	32	2	768	Switch	No	256	4' linear T8	electronic	3	4	Fluorescent	32	2	768	384
2	Yardville	1938 Building	Basement	Custodian Storage		4' linear T8	electronic	1	4	Fluorescent	32	2	256	Switch	No	256	4' linear T8	electronic	1	4	Fluorescent	32	2	256	128
3	Yardville	1938 Building	Basement	Art/Music		4' linear T8	electronic	12	4	Fluorescent	32	8	12288	Switch	No	1024	4' linear T8	electronic	12	4	Fluorescent	32	8	12288	1536
4	Yardville	1938 Building	Basement	Storage		4' linear T8	electronic	2	4	Fluorescent	32	2	512	Switch	No	256	4' linear T8	electronic	2	4	Fluorescent	32	2	512	256
5	Yardville	1938 Building	Basement	Kitchen		4' linear T8	electronic	4	4	Fluorescent	32	8	4096	Switch	No	1024	4' linear T8	electronic	4	4	Fluorescent	32	8	4096	512
6	Yardville	1938 Building	Basement	Cafeteria		4' linear T8	electronic	24	4	Fluorescent	32	8	24576	Switch	No	1024	4' linear T8	electronic	24	4	Fluorescent	32	8	24576	3072
7	Yardville	1938 Building	First Floor	Kindergarten #1	80	4' linear T8	electronic	14	4	Fluorescent	32	8	14336	Switch	No	1024	4' linear T8	electronic	14	4	Fluorescent	32	8	14336	1792
8	Yardville	1938 Building	First Floor	Kindergarten #1		4' linear T8	electronic	14	2	Fluorescent	32	8	7168	Switch	No	512	4' linear T8	electronic	14	2	Fluorescent	32	8	7168	896
9	Yardville	1938 Building	First Floor	Kindergarten #1 Toilet		4' linear T8	electronic	1	2	Fluorescent	13	2	52	Switch	No	52	4' linear T8	electronic	1	2	Fluorescent	13	2	52	26
10	Yardville	1938 Building	First Floor	Special Ed #2	76	4' linear T8	electronic	13	4	Fluorescent	32	8	13312	Switch	No	1024	4' linear T8	electronic	13	4	Fluorescent	32	8	13312	1664
11	Yardville	1938 Building	First Floor	Guidance Office	57	4' linear T8	electronic	2	4	Fluorescent	32	8	2048	Switch	No	1024	4' linear T8	electronic	2	4	Fluorescent	32	8	2048	256
12	Yardville	1938 Building	First Floor	Classroom #4	60	4' linear T8	electronic	12	2	Fluorescent	32	8	6144	Switch	No	512	4' linear T8	electronic	12	2	Fluorescent	32	8	6144	768
13	Yardville	1938 Building	First Floor	Auditorium	3	Halogen	electronic	12	1	Fluorescent	500	8	48000	Switch	No	4000	Halogen	electronic	12	1	Fluorescent	500	8	48000	6000
14	Yardville	1938 Building	First Floor	Stage		4' linear T8	electronic	2	2	Fluorescent	32	2	256	Switch	No	128	4' linear T8	electronic	2	2	Fluorescent	32	2	256	128
15	Yardville	1938 Building	First Floor	Stage Office	45	4' linear T8	electronic	1	2	Fluorescent	32	2	128	Switch	Yes	128	4' linear T8	electronic	1	2	Fluorescent	32	2	128	64
16	Yardville	1938 Building	First Floor	Classroom #6	58	4' linear T8	electronic	12	2	Fluorescent	32	8	6144	Switch	No	512	4' linear T8	electronic	12	2	Fluorescent	32	8	6144	768
17	Yardville	1938 Building	First Floor	Classroom #8	56	4' linear T8	electronic	8	4	Fluorescent	32	8	8192	Switch	No	1024	4' linear T8	electronic	8	4	Fluorescent	32	8	8192	1024
18	Yardville	1938 Building	First Floor	Classroom #8 Toilet		4' linear T8	electronic	1	2	Fluorescent	32	2	128	Switch	No	128	4' linear T8	electronic	1	2	Fluorescent	32	2	128	64
19	Yardville	1938 Building	First Floor	Classroom #7	65	4' linear T8	electronic	12	4	Fluorescent	32	8	12288	Switch	No	1024	4' linear T8	electronic	12	4	Fluorescent	32	8	12288	1536
20	Yardville	1938 Building	First Floor	Classroom #7 Toilet		4' linear T8	electronic	1	2	Fluorescent	32	2	128	Switch	No	128	4' linear T8	electronic	1	2	Fluorescent	32	2	128	64
21	Yardville	1938 Building	First Floor	Classroom #8 Storage		4' linear T8	electronic	3	2	Fluorescent	32	2	384	Switch	No	128	4' linear T8	electronic	3	2	Fluorescent	32	2	384	192
22	Yardville	1938 Building	First Floor	Classroom #5	63	4' linear T8	electronic	12	2	Fluorescent	32	8	6144	Switch	No	512	4' linear T8	electronic	12	2	Fluorescent	32	8	6144	768
23	Yardville	1938 Building	First Floor	Boys Restroom		4' linear T8	electronic	2	4	Fluorescent	32	8	2048	Switch	No	1024	4' linear T8	electronic	2	4	Fluorescent	32	8	2048	256
24	Yardville	1938 Building	First Floor	Nurse Office	80	4' linear T8	electronic	4	2	Fluorescent	32	8	2048	Switch	No	512	4' linear T8	electronic	4	2	Fluorescent	32	8	2048	256
25	Yardville	1938 Building	First Floor	Nurse Office Toilet		4' linear T8	electronic	1	2	Fluorescent	32	2	128	Switch	No	128	4' linear T8	electronic	1	2	Fluorescent	32	2	128	64
26	Yardville	1938 Building	First Floor	Faculty Room	46	4' linear T8	electronic	3	4	Fluorescent	32	8	3072	Switch	No	1024	4' linear T8	electronic	3	4	Fluorescent	32	8	3072	384
27	Yardville	1938 Building	First Floor	Girls Restroom		4' linear T8	electronic	2	4	Fluorescent	32	8	2048	Switch	No	1024	4' linear T8	electronic	2	4	Fluorescent	32	8	2048	256
28	Yardville	1938 Building	First Floor	Main Office	75-56	4' linear T8	electronic	8	4	Fluorescent	32	8	8192	Switch	Yes	1024	4' linear T8	electronic	8	4	Fluorescent	32	8	8192	1024
29	Yardville	1938 Building	First Floor	Principal	75	4' linear T8	electronic	2	4	Fluorescent	32	8	2048	Switch	Yes	1024	4' linear T8	electronic	2	4	Fluorescent	32	8	2048	256
30	Yardville	1938 Building	First Floor	First Floor Hallway		4' linear T8	electronic	12	4	Fluorescent	32	11	16896	Switch	No	1408	4' linear T8	electronic	12	4	Fluorescent	32	11	16896	1536
31	Yardville	1938 Building	First Floor	Custodian Closet		1 Inc 100	-	1	1	Incandescent	100	4	400	Switch	No	400	20W CFL	-	1	1	Incandescent	20	4	80	20
32	Yardville	1957 Building	Second Floor	Library		4' linear T8	electronic	12	4	Fluorescent	32	8	12288	Switch	No	1024	4' linear T8	electronic	12	4	Fluorescent	32	8	12288	1536
33	Yardville	1938 Building	Second Floor	Speech		4' linear T8	electronic	2	4	Fluorescent	31	8	1984	Switch	No	992	4' linear T8	electronic	2	4	Fluorescent	31	8	1984	248
34	Yardville	1938 Building	Second Floor	Speech Toilet		4' linear T8	electronic	1	2	Fluorescent	32	2	128	Switch	No	128	4' linear T8	electronic	1	2	Fluorescent	32	2	128	64
35	Yardville	1957 Building	Second Floor	Classroom #21		4' linear T8	electronic	12	4	Fluorescent	32	8	12288	Switch	No	1024	4' linear T8	electronic	12	4	Fluorescent	32	8	12288	1536
36	Yardville	1938 Building	Second Floor	Classroom #23		4' linear T8	electronic	12	2	Fluorescent	32	8	6144	Switch	No	512	4' linear T8	electronic	12	2	Fluorescent	32	8	6144	768
37	Yardville	1938 Building	Second Floor	Resource Room /Basic Skills		4' linear T8	electronic	12	2	Fluorescent	32	8	6144	Switch	No	512	4' linear T8	electronic	12	2	Fluorescent	32	8	6144	768
38	Yardville	1957 Building	Second Floor	Classroom #28		4' linear T8	electronic	8	4	Fluorescent	32	8	8192	Switch	No	1024	4' linear T8	electronic	8	4	Fluorescent	32	8	8192	1024
39	Yardville	1957 Building	Second Floor	Classroom #27		4' linear T8	electronic	12	4	Fluorescent	32	8	12288	Switch	No	1024	4' linear T8	electronic	12	4	Fluorescent	32	8	12288	1536
40	Yardville	1938 Building	Second Floor	Classroom #25		4' linear T8	electronic	12	4	Fluorescent	32	8	12288	Switch	No	1024	4' linear T8	electronic	12	4	Fluorescent	32	8	12288	1536
41	Yardville	1938 Building	Second Floor	Boys Restoom		4' linear T8	electronic	2	4	Fluorescent	32	8	2048	Switch	No	1024	4' linear T8	electronic	2	4	Fluorescent	32	8	2048	256
42	Yardville	1938 Building	Second Floor	Classroom #24		4' linear T8	electronic	12	4	Fluorescent	32	8	12288	Switch	No	1024	4' linear T8	electronic	12	4	Fluorescent	32	8	12288	1536
43	Yardville	1938 Building	Second Floor	Girls Restroom		4' linear T8	electronic	2	4	Fluorescent	32	8	2048	Switch	No	1024	4' linear T8	electronic	2	4	Fluorescent	32	8	2048	256
44	Yardville	1938 Building	Second Floor	Classroom #22		4' linear T8	electronic	12	4	Fluorescent	32	8	12288	Switch	No	1024	4' linear T8	electronic	12	4	Fluorescent	32	8	12288	1536
45	Yardville	1989 Building	Modular Classrooms	Classroom #31		4' linear T8	electronic	12	4	Fluorescent	32	8	12288	Switch	No	1024	4' linear T8	electronic	12	4	Fluorescent	32	8	12288	1536
46	Yardville	1989 Building	Modular Classrooms	Classroom #31 Toilet		4' linear T8	electronic	1	4	Fluorescent	32	2	256	Switch	No	256	4' linear T8	electronic	1	4	Fluorescent	32	2	256	128
47	Yardville	1989 Building	Modular Classrooms	Classroom #32		4' linear T8	electronic	12	4	Fluorescent	32	8	12288	Switch	No	1024	4' linear T8	electronic	12	4	Fluorescent	32	8	12288	1536
48	Yardville	1989 Building	Modular Classrooms	Classroom #32 Toilet		4' linear T8	electronic	1	3	Fluorescent	32	2	192	Switch	No	192	4' linear T8	electronic	1	3	Fluorescent	32	2	192	96
49	Yardville	1993 Building	Modular Classrooms	Classroom #33		4' linear T8	electronic	12	2	Fluorescent	32	8	6144	Switch	No	512	4' linear T8	electronic	12	2	Fluorescent	32	8	6144	768
50	Yardville	1993 Building	Modular Classrooms	Classroom #33 Toilet		4' linear T8	electronic	1	3	Fluorescent	32	2	192	Switch	No	192	4' linear T8	electronic	1	3	Fluorescent	32	2	192	96

Totals					
			Existing Lighting Total Power (Watts)	2116	Watts
Existing Usage (kWh/year)		87,697	Existing Lighting Power Density (W/sqft)	0.52	W/sqft
Proposed Usage (kWh/year)		87,614			
Existing Est. Cost ($/year)	$	14,382.32	Proposed Lighting Total Power (Watts)	2036	Watts
Proposed Est. Cost ($/year)	$	14,368.62	Proposed Lighting Power Density (W/sqft)	0.05	W/sqft
Total kWh Savings		84			
Total $ Savings	$	13.70			

Appendix B: Third Party Energy Suppliers (ESCOs)

Third Party Electric Suppliers for PSEG 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) 665-8457 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
Credit Suisse, (USA) Inc. 700 College Road East East Princeton, NJ 08450	(212) 547-2722 www.creditsuisses.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
FirstEnergy Solutions 300 Madison Avenue Morriston, NJ 07962	(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	(866) 769-3799 www.libertypowercorp.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
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
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.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 PSEG 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
Dominion Retail, Inc. 395 Highway 170, Suite 125 Lakewood, NJ 08701	(866) 275-4240 www.retail.dom.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
Hudson Energy Services, LLC 545 Route 17 South Ridgewood, NJ 07450	(877) 483-7669 www.hudsonenergyservices.com
Intelligent Energy 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	(800) 724-1880 www.intelligentenergy.org
Keil & Sons 1 Bergen Blvd. Fairview, NJ 07002	(877) 797-8786 www.systrumenergy.com
Metro Energy Group, LLC 14 Washington Place Hackensack, NJ 07601	(888) 536-3876 www.metroenergy.com
MxEnergy, Inc. 510 Thornall Street, Suite 270 Edison, NJ 08837	(800) 375-1277 www.mxenergy.com
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
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
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
Stuyvesant Energy LLC 10 West Ivy Lane, Suite 4 Englewood, NJ 07631	(800) 646-6457 www.stuyfuel.com
Woodruff Energy 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 www.woodruffenergy.com