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**Local Government Energy Program
Final Energy Audit Report**

For

**Wall Township
Town Hall, Library and Police Buildings
2700 Allaire Road
Wall, New Jersey 07719**

Project Number: LGEA33



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INTRODUCTION

On October 22, 2009, Steven Winter Associates, Inc. (SWA) and PMK Group, Inc., a business unit of Birdsall Services Group (BSG-PMK), performed an energy audit and assessment of the Town Hall, Library, and Police buildings located in Wall, New Jersey. Current conditions and energy-related information were collected in order to analyze and facilitate the implementation of energy conservation measures for the buildings.

The Town Hall is a 19,732 square-foot, 2-story building built in 1990. It serves as office space for about 60 Township employees under various departments and is in operation for approximately 60 hours per week.

The Library Building is a 17,986 square-foot, single-story building built in 1990. It serves as a public library and has a staff of approximately 15 persons. It is in operation for approximately 60 hours per week.

The Police Building is a 24,000-square foot, 2-story building built in 1975. It serves as the Wall Township Police Department with approximately 84 employees under various departments and is in constant operation.

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 and BSG-PMK estimated the energy and cost savings associated with the installation of each of the recommended energy conservation measures. The findings for the building are summarized in this report.

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 buildings.

Launched in 2008, the 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 75% of the cost of the audit. If the net cost of the installed measures recommended by the audit, after applying eligible NJ SmartStart Buildings incentives, exceeds the remaining cost of the audit, then the additional 25% will also be paid by the program. The Board of Public Utilities (BPU) Office of Clean Energy has assigned TRC Energy Services to administer the Program.

EXECUTIVE SUMMARY

This document contains the energy audit report for the Town Hall, Library, and Police buildings located at 2700 Allaire Road, Wall, New Jersey 07719.

Based on the field visit performed by Steven Winter Associates (SWA) and BSG-PMK staff on October 22, 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.

Current conditions

The Town Hall building shares a common electrical account with the Police Station and a common natural gas account with the Library. In the most recent full year of data collected, October, 2008 through September, 2009, the Town Hall and the Police buildings consumed a combined 865,280 kWh of electricity for a total cost of \$151,690. The Library had consumed 213,840 kWh of electricity for a total cost of \$34,792. The Town Hall building and Library had consumed 47,417 therms of natural gas for a total cost of \$55,161. The Police building had consumed 11,075 therms of natural gas for a total cost of \$13,774. Using an average cost of \$0.15/kWh a third party supplier could save the Township \$21,898/year on the Town Hall and the Police buildings' account and \$2,716/year at the Library's account. Unfortunately a third party supplier would not reduce the Townships cost of natural gas at the Town Hall, Library, or Police buildings because the Township now pays a rate lower than the average rate of \$1.55/therm.

With electricity and fossil fuel combined, the building consumed 9,532 MMBtus of energy at a total cost of \$225,417.

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 the buildings is 125 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 the year 2009 baseline to track the changes in energy consumption associated with the energy improvements.

BSG-PMK has entered energy information about the Library and Town Hall buildings in the US Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* energy benchmarking system. The building performance rating could not be determined because this is a mixed-use facility, comprised by non-eligible space types categorized as "Other".

Buildings achieving an Energy Star rating of 75 are eligible to apply for the Energy Star award and receive the Energy Star plaque to convey superior performance. These ratings also greatly help when applying for Leadership in Energy and Environmental Design (LEED) building certification through the United States Green Building Council (USGBC). BSG-PMK encourages the Township of Wall to continue entering utility data in *Energy Star Portfolio Manager* in order to track whether normalized source energy use over time.

(Refer to Section 1.3 for Energy Star Rating)

Recommendations

Category I Recommendations: Capital Improvements

- 1) The composite slate shingles on the roofs of the Town Hall building and Library are in poor condition and should be replaced. Many shingles were cracked, broken, or missing. This will lead to water infiltration and possible interior and structural damage.
- 2) Low-flow plumbing fixtures or no-flow for urinals.
- 3) All equipment listed in Section 3 of this report as having a remaining useful life of 10% or less should be considered for replacement on an as fail basis, if it's not already recommended in the ECM section of this report

Category II Recommendations: Operations & Maintenance

Based on the results of BSG-PMK's survey, no operations and maintenance measures are recommended.

Category III Recommendations: Energy Conservation Measures (ECMs)

- 1) At this time, SWA/BSG-PMK highly recommends a total of **6** Energy Conservation Measures (ECMs) for the Town Hall, Police, and Library buildings that are summarized in the following table. The total investment cost for these ECMs, with incentives, is **\$216,069**. SWA/BSG-PMK estimates a first year savings of **\$95,440** with a simple payback of **2.3 years**. SWA/BSG-PMK estimates that implementing the highly recommended ECMs will reduce the carbon footprint of the buildings by **804,723 lbs of CO₂/yr**, which is equivalent to removing approximately 69 cars from the roads each year.
- 2) There are various incentives that the Township of Wall could apply for that could also help lower the cost of installing the ECMs. SWA/BSG-PMK recommends that the Township apply 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. A new NJ Clean Power program, Direct Install, could also assist to cover up to 80% of the capital investment. In order to qualify, the facility being upgraded must not have had a peak demand that exceeded 200 kW in any of the preceding 12 months; the highest peak demand for the Library in the previous year was 45.9 kW; no demand data for the Town Hall and Police buildings were available..

SCOPE OF WORK – SUMMARY TABLE

Table 1 - Highly Recommended 0-5 Year Payback ECMs																			
ECM #	ECM description	Source	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 Energy Cost Savings, \$	Simple Payback, Yrs	Lifetime Return on Investment, %	Annual Return on Investment, %	Internal Rate of Return, %	Net Present Value, \$	CO2 Reduced, lbs/yr
1	Repair VFD Software	Similar Projects	\$10,000	\$0	\$10,000	87,751	0.0	0	6.85	\$0.00	\$15,383	15	\$181,011	0.65	1710%	114%	154%	\$173,639	120,219
2	(39) 7-Day Programmable Thermostats	RS Means CostWorks 2009	\$18,880	\$0	\$18,880	75,101	0.0	9,068	18.84	\$0.00	\$22,836	10	\$192,823	0.83	921%	92%	121%	\$175,917	208,982
3	Hot Water Outdoor Air Reset Control	Similar Projects	\$5,000	\$0	\$5,000	0	0.0	3,793	10.06	\$0.00	\$4,413	15	\$51,927	1.13	939%	63%	88%	\$47,681	44,382
4	Lighting Upgrades	Similar Projects	\$119,304	\$15,403	\$103,901	180,794	13.0	0.0	10.00	\$0.00	\$30,893	15	\$363,517	3.36	250%	17%	29%	\$264,895	247,688
	Occupancy Sensors		\$8,480	\$920	\$7,560	14,726	0.4	0.0	0.81	\$0.00	\$2,554	10	\$21,564	2.96	185%	19%	32%	\$14,224.60	20,175
5	Replace 2 Chillers and Cooling Tower	RS Means CostWorks 2009	\$310,000	\$248,000	\$62,000	113,162	0.0	0	10.24	\$0.00	\$18,306	24	\$303,454	3.39	389%	16%	29%	\$248,029	155,032
TOTAL			\$471,664	\$264,323	\$207,341	471,535	13.5	12,861	56.79	\$0.00	\$94,385	-	\$1,114,296	2.20	-	-	-	\$924,385	796,478

Table 2 - Recommended 5-10 Year Payback ECMs																			
ECM #	ECM description	Source	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 Energy Cost Savings, \$	Simple Payback, Yrs	Lifetime Return on Investment, %	Annual Return on Investment, %	Internal Rate of Return, %	Net Present Value, \$	CO2 Reduced, lbs/yr
6	Replace 8 Circulation Pumps	RS Means CostWorks 2009	\$43,638	\$34,911	\$8,728	6,018	0.0	0	0.54	\$0.00	\$1,055	20	\$15,409	8.27	77%	4%	10%	\$6,968	8,245
TOTAL			\$43,638	\$34,911	\$8,728	6,018	0.0	0	0.54	\$0.00	\$1,055	-	\$15,409	8.27	-	-	-	\$6,968	8,245

ROI: Return on Investment (%)																			
Assumptions:																			
Discount rate:					3.2% per DOE FEMP guidelines					Electricity rate					\$0.17 \$/kWh (Library - Entire Year)				
Energy price escalation rate:					0% per DOE FEMP guidelines										\$0.16 \$/kWh (All Buildings - Cooling Season Only)				
															\$0.17 \$/kWh (Municipal/Police - Cooling Season Only)				
															\$0.18 \$/kWh (Municipal/Police - Entire Year)				
Area of Building (SF)					19,732 (Municipal Building)					Gas rate					\$1.16 \$/therm (Municipal/Library)				
					24,000 (Police Dept.)										\$1.24 \$/therm (Police Department)				
					17,986 (Library)										\$1.18 \$/therm (All buildings combined)				

NOTE: Demand data only provided for the library; demand reduction only calculated for the library.

1. HISTORIC ENERGY CONSUMPTION

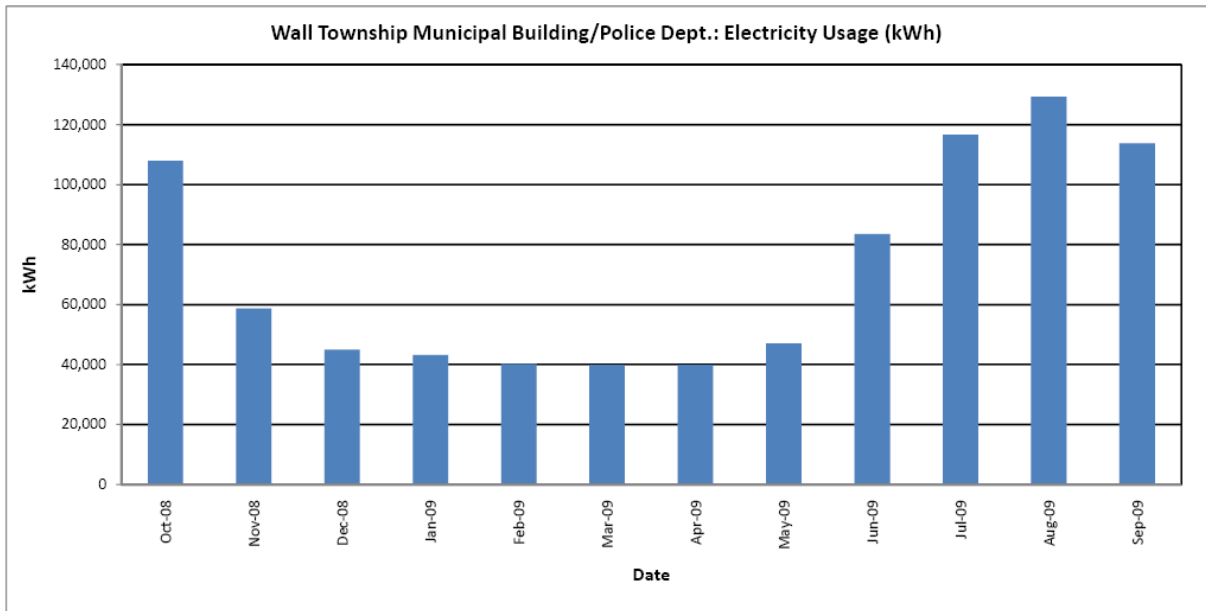
1.1. Energy usage and cost analysis

SWA analyzed utility bills from October, 2008 through September, 2009 that were received from the utility companies supplying the Town Hall building with electric and natural gas.

Town Hall:

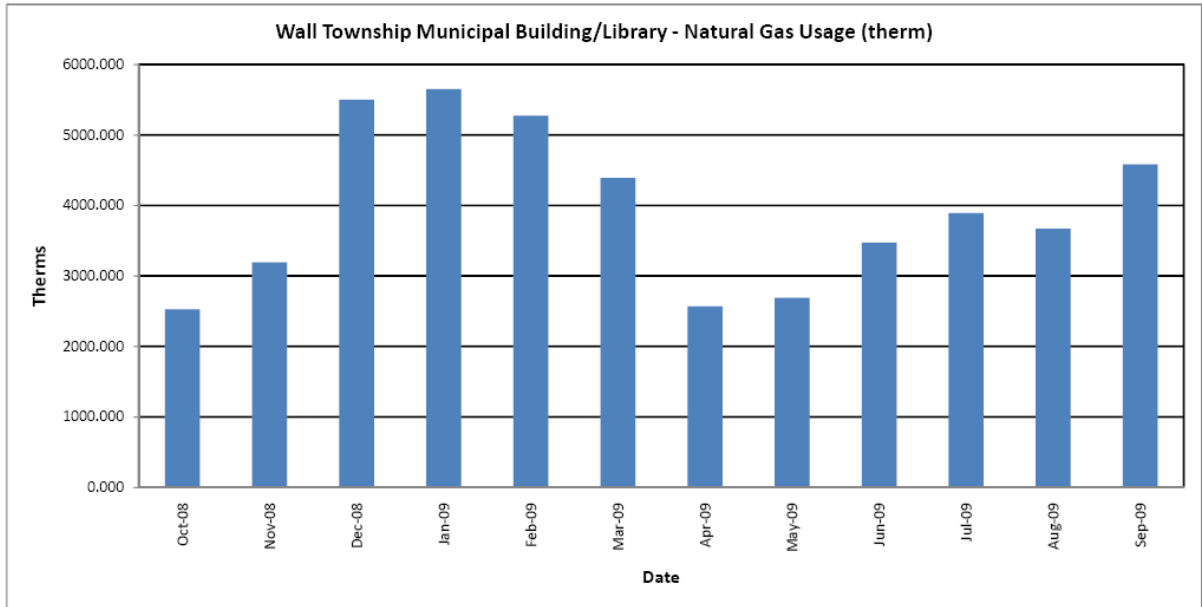
Electricity - The Town Hall building is currently served by one electric meter but shares an account with a separate meter for the Police building. The Town Hall building currently buys electricity from Jersey Central Power & Light at **an average rate of \$0.18/kWh** based on 12 months of utility bills from October 2008 to September 2009. The Town Hall building purchased **approximately 865,280 kWh or \$151,690 worth of electricity** in the previous year.

The following chart shows electricity usage for the building based on utility bills from October, 2008 through September, 2009:



Natural gas - The Town Hall building is currently served by one meter for natural gas which also services the Library. The Town Hall building currently buys natural gas from New Jersey Natural Gas at **an average aggregated rate of \$1.16/therm** based on 12 months of utility bills for October 2008 to September 2009. The Town Hall building purchased **approximately 8,364.32 therms or \$13,430 worth of natural gas** in the previous year.

The following chart shows natural gas usage for the building based on utility bills from October, 2008 through September, 2009:

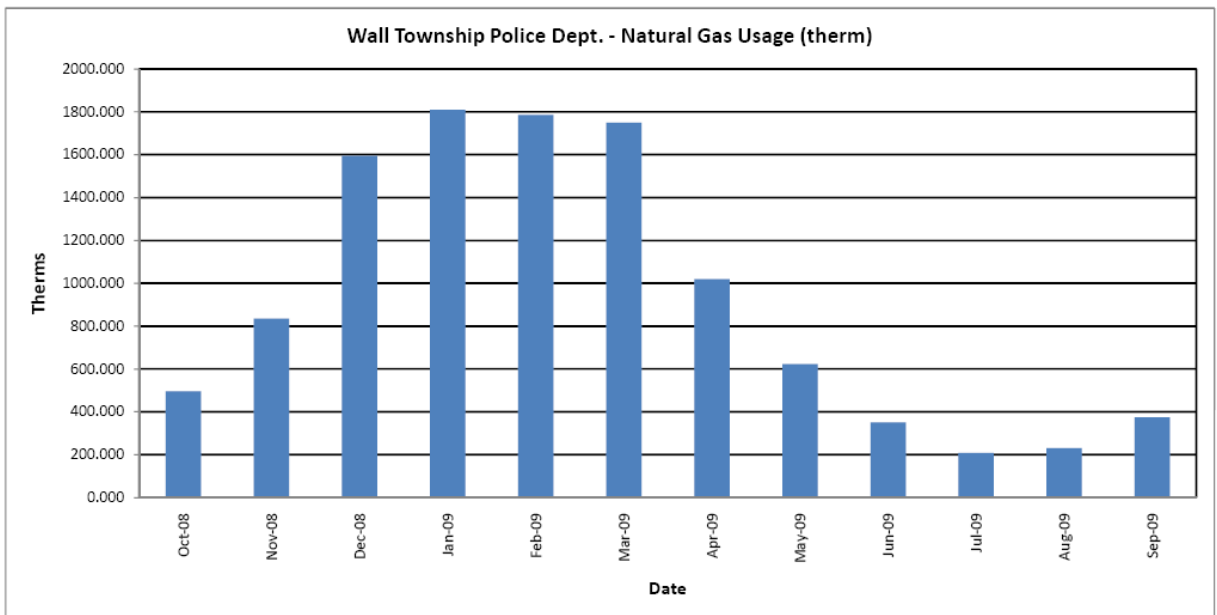


Police:

Electricity – The Police building shares an electric account with the Town Hall building.

Natural gas - The Police building is currently served by one meter for natural gas. It currently buys natural gas from New Jersey Natural Gas at **an average aggregated rate of \$1.24/therm** based on 12 months of utility bills for October, 2008 through September, 2009. The Police building purchased **approximately 11,075 therms or \$13,774 worth of natural gas** in the previous year.

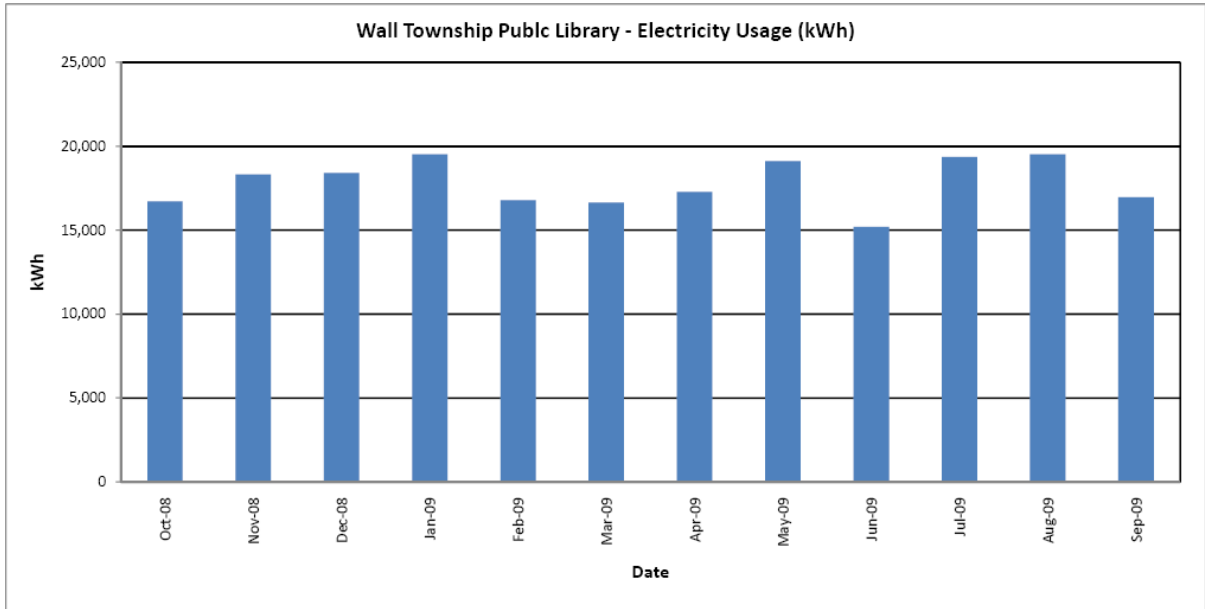
The following chart shows the natural gas usage for the building based on utility bills from October, 2008 through September, 2009:



Library:

Electricity - The Library building is currently served by one electric meter. It currently buys electricity from Jersey Central Power & Light at an average rate of **\$0.17/kWh** based on 12 months of utility bills from October, 2008 through September, 2009. The Library building purchased **approximately 213,840 kWh or \$34,792 worth of electricity** in the previous year. The average monthly demand was 43.8 kW.

The following chart shows electricity usage for the building based on utility bills from October, 2008 through September, 2009:



Natural gas – The Library shares a natural gas account with the Town Hall building.

1.2. Utility rate

The Town Hall and Police buildings currently purchase electricity from Jersey Central Power & Light at an average rate of \$0.18/kWh based on 12 months of utility bills from October, 2008 through September, 2009.

The Town Hall and Library buildings currently purchase natural gas supply from New Jersey Natural Gas at an average aggregated rate of \$1.16/therm based on 12 months of utility bills from October, 2008 through September, 2009.

The Library currently purchases electricity from Jersey Central Power & Light at an average rate of \$0.17/kWh based on 12 months of utility bills from October, 2008 through September, 2009.

The Police building currently purchases natural gas supply from New Jersey Natural Gas at an average aggregated rate of \$1.24/therm based on 12 months of utility bills from October, 2008 through September, 2009.

Some of the minor unusual utility fluctuations that showed up for a couple of months on the utility bills may be due to adjustments between estimated and actual meter readings.

1.3. Energy benchmarking

The building information and utility data were entered into the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. SWA/BSG-PMK recommends that the Town maintain the Portfolio Manager account at the link below and the account has been shared with TRC. As the account is maintained, SWA/BSG-PMK can share with the Town and allow future data to be added and tracked using the benchmarking tool.

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

Username: WallTownship
Password: walltownship

Buildings achieving an Energy Star rating of 75 are eligible to apply for the Energy Star award and receive the Energy Star plaque to convey superior performance. These ratings also greatly help when applying for Leadership in Energy and Environmental Design (LEED) building certification through the United States Green Building Council (USGBC). SWA/BSG-PMK encourages the Township of Wall to continue entering utility data in Energy Star Portfolio Manager in order to track whether normalized source energy use over time.

The Site Energy Use Intensity is 154 kBtu/ft²yr compared to the national average of 90 kBtu/ft²yr for commercial buildings classified by the Energy Star Portfolio Manager as "Other". Implementing this report's recommendations will reduce use by approximately 57.3 kBtu/ft²yr, which when implemented would lower the buildings energy consumption.



STATEMENT OF ENERGY PERFORMANCE Municipal Complex

Building ID: 1962793
For 12-month Period Ending: September 30, 2009¹
Date SEP becomes ineligible: N/A

Date SEP Generated: April 06, 2010

Facility
Municipal Complex
2700 Allaire Road
Wall, NJ 07719

Facility Owner
Wall Township
2700 Allaire Road
Wall, NJ 07719

Primary Contact for this Facility
Kate Kohri
2700 Allaire Road
Wall, NJ 07719

Year Built: 1990
Gross Floor Area (ft²): 61,718

Energy Performance Rating² (1-100) N/A

Site Energy Use Summary³

Electricity - Grid Purchase(kBtu)	3,681,957
Natural Gas (kBtu) ⁴	5,849,149
Total Energy (kBtu)	9,531,106

Energy Intensity⁵

Site (kBtu/ft ² /yr)	154
Source (kBtu/ft ² /yr)	298

Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO ₂ e/year)	872
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Electric Distribution Utility

FirstEnergy - Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	90
National Average Source EUI	189
% Difference from National Average Source EUI	58%
Building Type	Other

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 Standards⁶ 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.

The government estimates the average time needed to fill out this form is 6 hours (includes the time for entering energy data, PE 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

2. FACILITY AND SYSTEMS DESCRIPTION

2.1. Building Characteristics

The Town Hall building is a 19,732 square foot, one-story building with a basement, built in 1990. It serves as office space for 60 township employees under various departments and is in operation for 60 hours per week.

The Library is a 17,986 square foot, one-story building with a basement, built in 1990. There are 15 employees, and the building is in operation for 60 hours per week.

The Police building is a 24,000 square foot, one-story building with a basement, built in 1975. The facility houses the Township of Wall's Police Department, with office space, a dispatch room, and a firing range, among other areas. There are approximately 84 employees, and the building has continuous operation.

2.2. Building occupancy profiles

The peak occupancy for the Town Hall building is approximately 60 permanent Township employees at any given time during weekdays. The building also occupies several senior citizens and daycare children. During the summer there may be a small number of part time, seasonal employees. Evening public meetings occur periodically afterhours and weekend. Office hours are from about 8 AM – 4 PM.

The peak occupancy for the Police building is approximately 84 permanent Township employees at any given time. The building also contains temporary jail cells, and has continuous operation.

The peak occupancy for the Library is approximately 15 permanent Township employees. Hours of operation are Monday, 10 AM – 9 PM; Tuesday through Thursday, 9 AM – 9 PM; Friday, 1 PM – 5 PM; and Saturday, 9 AM – 5 PM.

2.3. Building envelope

2.3.1. Exterior walls

The exterior walls of the three buildings consist of 3 ½" brick and mortar with CMU back-up block, metal studs, with insulation and dry wall. The total thickness of the outside walls is approximately 16". Exterior and interior finishes of the envelope were found to be in good condition and there are no recommendations to upgrade the building exterior.

2.3.2. Roof

The roofs of the Town Hall and Library buildings are pitched with composite slate shingle roofing. The roofs were found to be in poor condition with broken or missing shingles, with some indications of water penetration.

Category I Capital Improvements: The composite slate shingles on the roofs of the Town Hall building and Library are in poor condition and should be replaced. Many shingles were cracked, broken, or missing. This will lead to water infiltration and possible interior and structural damage.

The police building roof is a newer asphalt shingle pitched roof, with one area having a flat EPDM. The addition also has newer asphalt shingles with one small area of built-up roofing with white stone ballasts.

2.3.3.Base

The buildings' bases are a 4" concrete slab-on sub grade with a perimeter footing. No water seepage through the slab or other issues related to thermal performance was detected.

2.3.4.Windows

The buildings have the double-pane windows originally installed. They have thermal breaks and no upgrades are recommended.

2.3.5.Exterior doors

There are two entry vestibules at the Town Hall building and the Library, which prevent heat loss by almost always having at least one set of doors closed. The exterior doors were aluminum and, at the time of inspection, were observed to be in good condition.

The Police Station also had two sets of double doors at the main entrances, as well as garage doors, which were also in good condition.

2.3.6.Building air tightness

The building was inspected and it was determined that the building air tightness was in good condition. There were no complaints of drafts or cold spots, or indications of occupant discomfort. There were no personal fans to supplement for loss of conditioned air.

2.4. HVAC systems

2.4.1.Heating

Town Hall & Library:

The heating system is comprised of forced hot air with hot water reheat, and perimeter radiant heating. Heating hot water is provided by two Cleaver Brooks boilers, model # CB200-40 NB155 and model # CB200-40 NB156. Both units were installed in 1990. The gas input for both units is 1,675 MBH. The units heat the Town Hall Building as well as the adjacent library, and are in good condition. On each boiler is a Marathon Electric pump, with model # UVJ182TTDR8501AN1 and rated at 2 HP and 3,520 RPM. There is one Trane space heater in the boiler room.



(2) Cleaver Brooks boilers

There are 3 hot water supply pumps:

Manufacturer and Model		RPM	HP	Purpose
Pump	Motor			
Bell & Gossett # P42263	Marathon Electric # UVK 184TTDR702 6DFI	1,740	5	Hot Water Supply
Bell & Gossett # P42263	Marathon Electric # UVK 184TTDR702 6DFL	1,740	5	Hot Water Supply
Bell & Gossett # P42263	Marathon Electric # UVK 184TTDR702 6DFL	1,740	5	Hot Water Supply



Circulating pumps

Police:

The heating system is comprised of forced hot air and perimeter radiant heating. This system was upgraded in 2007. There is a Trane unit heater in the garage; specifications could not be found. There are two Power VT condensing hot water boilers in the mechanical room, model # 8WB250A-PV. The units are gas-fired, have input capacities of 1,000 MBH, and are 93% efficient. Each boiler has an American Fan Company blower, with model # AF-9-R10527-5 and ratings of ¾ HP and 4,175 HP. One boiler had a Franklin Electric motor, with model # 4103007417 and ratings of 1/3 HP and 3,475 RPM, and the other had a Baldor motor, with model # VL1306A and rated at ¾ HP and 3,450 RPM. There are two Bell & Gossett hot water pumps, with model # P42268. They each had Baldor motors, with model # M3218T and rated at 5 HP and 1,750 RPM.

2.4.2.Cooling

Town Hall:

Cooling is provided by two indoor Trane chillers, model # CGWCC806RDNJJ623BDHRTFP and model # CGWCC806RDNJJ623BDFHRPT. Tonnages and SEERs could not be located, but the units were in good condition. A Baltimore Air Coil cooling tower is located behind the library, with model # VXT1650R. The unit has a capacity of 188 tons, and is in good condition. Two Trane Climate Changer air handlers were in the mechanical room. One of these units had model # CCDB31B30G and was rated at 15 HP, and the other has model # CCDB4CN3H and was rated at 7.5 HP.

Category III Recommendation: ECM #5: Recommends replacing the chillers and cooling tower.



Trane chillers



Cooling tower

There are three chilled water pumps, and two condenser water pumps:

Manufacturer and Model		RPM	HP	Purpose
Pump	Motor			
Bell & Gossett	Electrim # Esg	1,750	8	Chilled Water
Bell & Gossett	Marathon Electric # UVJ 213TTDR702	1,750	7	Chilled Water
Bell & Gossett	Marathon Electric # UVJ 213TTDR702	1,750	7	Chilled Water
Bell & Gossett # P43361	AO Smith #E301M	1,745	10	Cond. Water
Bell & Gossett # P43361	Marathon Electric # UVN 215TTDR702	1,745	10	Cond. Water

Library:

The building shares the Town Hall Building's cooling system. There is a Trane Climate Changer in the basement, with model # CCDB31830G and rated at 15 HP.

Police:

The cooling system, which was upgraded in 2007, is comprised of several units:

Manufacturer & Model	Quantity	Cooling			Heating	
		Tons	SEER	Refrig.	Gas Input	Efficiency
Carrier Weathermaster # 48HJR012HM- 571RY	1	10	13	R-22	224 MBH	82%
Carrier Weathermaster # 48HJR004HM- 541RY	1	3	13	R-22	72 MBH	82.8%
EMI Condensing Unit # S1CA9000	2	0.75	13	R-22	n/a	n/a
Carrier Gemini Split-System # 38AH-028	1	25	11.66	R-22	n/a	n/a

The two EMI units each have a corresponding indoor evaporator unit; there is an EMI wall air-handler in the server room, and an EMI cassette air-handler on the ceiling of the dispatch room. Air is circulated by a Carrier Semi-Custom Central Station Air-Handler, with model # 39MN-17B00SERV12XGS, rated at 8,500 CFM.



Carrier Weathermaster

2.4.3. Ventilation

Town Hall:

There is also a Trane centrifugal fan, with model # CAFB33B12CC1HK3A01000R0. The specifications of this unit could not be found. Air is circulated by a VAV system, with VAV boxes as the terminal units. Ventilation is also provided by ceiling vents, doors and windows.

Library:

The building shares the Town Hall Building’s HVAC systems. Ventilation is also provided by ceiling vents, doors and windows.

Police:

Ventilation is provided through a Trane Climate Changer, outside air intake, and an economizer. Ventilation is also provided by ceiling vents, doors and windows.

2.4.4. Domestic Hot Water

Town Hall:

Water is heated by an AO Smith Energy Saver gas-fired water heater, with model # FSGT50 244. The volume is 48 gallons, the input capacity is 60 MBH, and it has a recovery of 64.6 gallons/hour.



Town Hall building’s water heater

Library:

Water is heated by a State Industries electric water heater, with model # PV20 10M54 X. The volume is 19.9 gallons and the input capacity is 2.5 kW (8,538 BTUH).

Police:

Water is heated by a PVI Maxim gas-fired water boiler, with model # 27P250A-MX. It has a volume of 250 gallons, an input capacity of 270 MBH, and a recovery of 340 gallons/hour.



Police Department Water Heater

2.5. Electrical systems

2.5.1. Lighting

Category III Recommendation: ECM #4:

Recommend upgrading all T-12 lighting fixtures with magnetic ballasts to T-8 fixtures with electronic ballasts, as well as various other lighting upgrades outlined in Appendix A. Also recommend installing lighting sensors to certain areas where lights typically remain lit when unoccupied for long periods of time.

Town Hall:

The facility's lighting consists primarily of T-12 lamps with magnetic ballasts. There are also incandescent, compact fluorescents, and mercury vapor lamps of various wattages. All exit signs are lighted by light-emitting diodes (LEDs). No lighting sensors are installed in the building.

Library:

The facility's lighting consists primarily of T-12 lamps with magnetic ballasts. There are also mercury vapor lamps incandescent lamps, of various wattages. All exit signs are lighted by light-emitting diodes (LEDs). No lighting sensors are installed in the building.

Police:

The facility's lighting consists primarily of T-12 lamps with magnetic ballasts. There are also compact fluorescent lamps incandescent lamps, of various wattages. All exit signs are lighted by light-emitting diodes (LEDs). No lighting sensors are installed in the building.

See the attached lighting schedule in Appendix A for a complete inventory of lighting throughout the building and estimated power consumption.

2.5.2. Appliances and process

There were refrigerators, microwaves, and other kitchen appliances in the break rooms in all buildings, as well as vending machines. There were many computers, which could not be counted due to the fact that many offices were locked.

2.5.3. Elevators

There is one elevator each at the Police Station and the Town Hall building, each in good condition. The elevators only transport between the ground floors and the basements.

There is no elevator at the library, as the basement is only accessible from a stairwell located outside the building.

2.5.4. Other electrical systems

There are no other major electrical systems in any of the three buildings.

3. EQUIPMENT LIST

Town Hall Building & Library

Building System	Description	Location	Model #	Fuel	Space Served	Year Installed	Estimated Remaining Useful Life %
Heating	Hot water boiler, 1,675 MBH input, 85.5% efficient (in 1998)	Municipal building, basement, boiler room	Cleaver Brooks M# CB200-40 NB-155	Natural gas	Municipal building, library	1990	24%
Heating	Hot water boiler, 1,675 MBH input, 85.5% efficient (in 1998)	Municipal building, basement, boiler room	Cleaver Brooks M# CB200-40 NB-156	Natural gas	Municipal building, library	1990	24%
Heating	Two 2 HP, 3,520 RPM pumps, 85.8% efficient (when installed)	Municipal building, basement, boiler room (one attached to each boiler)	Marathon Electric M# UVJ182TTDR8501A N1	Electric	Municipal building, library	1990	5%
Heating	Small cabinet heater	Municipal building, basement, boiler room	Trane (nameplate not accessible)	Natural gas	Boiler room	1990	5%
Heating	Hot water supply pump, 1,740 RPM, 5 HP, 1.15 SF	Municipal building, basement, boiler room	Pump: Bell & Gossett M# P42263; motor: Marathon Electric M# UVK 184TTDR7026DFI	Electric	Municipal building, library	1990	5%
Heating	Hot water supply pump, 1,740 RPM, 5 HP, 1.15 SF	Municipal building, basement, boiler room	Pump: Bell & Gossett M# P42263; motor: Marathon Electric M# UVK 184TTDR7026DFL	Electric	Municipal building, library	1990	5%
Heating	Hot water supply pump, 1,740 RPM, 5 HP, 1.15 SF	Municipal building, basement, boiler room	Pump: Bell & Gossett M# P42263; motor: Marathon Electric M# UVK 184TTDR7026DFL	Electric	Municipal building, library	1990	5%
Cooling	Cond. water pump, 1,745 RPM, 10 HP, 1.15 SF	Municipal building, basement, boiler room	Pump: Bell & Gossett M# P43361; motor: AO Smith M# E301M	Electric	Municipal building, library	1990	5%
Cooling	Cond. water pump, 1,745 RPM, 10 HP, 1.15 SF	Municipal building, basement, boiler room	Pump: Bell & Gossett M# P43361; motor: Marathon Electric M# UVN 215TTDR7026HTL	Electric	Municipal building, library	1990	5%
Cooling	Indoor chiller (specifications not found)	Municipal building, basement, boiler room	Trane M# CGWCC806RDNIJ6 23BDHRTFP	Electric	Municipal building, library	1990	21%
Cooling	Indoor chiller (specifications not found)	Municipal building, basement, boiler room	Trane M# CGWCC806RDNIJ6 23BDHRPT	Electric	Municipal building, library	1990	21%
Cooling	Cooling tower (specifications not found)	About 24 yards north of library	Baltimore Air Coil M# VXT1650R	Electric	Municipal building, library	1990	21%

Cooling	15 HP air-handler	Municipal building, basement, boiler room	Trane Climate Changer M# CCDB31B30G	Electric	Municipal building	1990	5%
Cooling	7.5 HP air-handler	Municipal building, basement, boiler room	Trane Climate Changer M# CCDB4CN3H	Electric	Municipal building	1990	5%
Cooling	8 HP, 1,750 RPM chilled-water pump	Municipal building, basement, boiler room	Pump: Bell & Gossett, motor: Electrim # Esg	Electric	Municipal building, library	1990	5%
Cooling	7 HP, 1,750 RPM chilled-water pump	Municipal building, basement, boiler room	Pump: Bell & Gossett, motor: Marathon Electric # UVJ 213TTDR7026GPL	Electric	Municipal building, library	1990	5%
Cooling	7 HP, 1,750 RPM chilled-water pump	Municipal building, basement, boiler room	Pump: Bell & Gossett, motor: Marathon Electric # UVJ 213TTDR7026GPL	Electric	Municipal building, library	1990	5%
Ventilation	Centrifugal air coil fan (specifications not found)	Municipal building, basement, boiler room	Trane M# CAFB33B12CC1HK 3A01000R0	Electric	Municipal building, library	1990	0%
Ventilation	VAV system w/ VAV boxes as terminal units	Municipal building, basement, boiler room (VAV boxes throughout facility)	Nameplate not accessible	Electric	Municipal building	1990	5%
Domestic Hot Water	60 MBH water heater with 48 gallon tank and 64.6 gallons/hour recovery	Municipal building, basement, boiler room	AO Smith Energy Saver M# FSGT50 244	Natural gas	Municipal building	2007	85%
Controls	26 non-setback thermostats	Throughout Municipal building	Trane	Electric	Municipal building	1990	0%
Controls	Building automation system	Municipal building, basement, boiler room	Nameplate not accessible	Electric	Municipal building	2007	80%
Controls	Setback thermostat	First-floor hallway	Honeywell	Electric	First-floor hallway	2007	80%
Controls	4 variable frequency drives	Municipal building, basement, boiler room	Nameplate not accessible	Electric	Two air handlers and two return fans	2007	87%
Cooling	15 HP air-handler	Library, basement	Trane Climate Changer M# CCDB31830G	Electric	Library	1990	5%
Domestic Hot Water	2.5 kW (8.54 MBH) water heater with 19.9 gallon tank	Municipal building, basement, boiler room	State Industries M# PV20 10M54 X	Electric	Library	2007	85%
Controls	14 non-setback thermostats	Throughout library	Trane	Electric	Library	1990	0%

Police

Building System	Description	Location	Model #	Fuel	Space Served	Year Installed	Remaining Useful Life %
Heating	Cabinet heater	Garage	Trane (nameplate not accessible)	Natural gas	Garage	2007	90%
Heating	2 condensing hot water boilers, 1,000 MBH input, 93% efficient	Mechanical room	Power VT M# 8WB250A-PV	Natural gas	Entire facility	2007	92%
Heating	2 blowers, 3/4 HP, 4,175 RPM	Mechanical room (one on each boiler)	American Fan Company M# AF-9-R10527-5	Electric	Entire facility	2007	90%
Heating	1/3 HP, 3,475 RPM motor	Mechanical room (on one boiler)	Franklin Electric M# 4103007417	Electric	Entire facility	2007	90%
Heating	3/4 HP, 3,450 RPM motor	Mechanical room (on other boiler)	Baldor M# VL1306A	Electric	Entire facility	2007	90%
Heating	2 hot water pumps	Mechanical room	Bell & Gossett M# P42268	Electric	Entire facility	2007	90%
Heating	2 motors; 5 HP, 1,750 RPM	Mechanical room (one on each hot water pump)	Baldor M# M3218T	Electric	Entire facility	2007	90%
Cooling	10 ton, 13 SEER rooftop unit, with 224 MBH gas heat at 82% efficiency	Roof	Carrier Weathermaster M# 48HJR012HM-571RY	Electric, natural gas	Not found	2007	87%
Cooling	3 ton, 13 SEER rooftop unit, with 72 MBH gas heat at 82.8% efficiency	Roof	Carrier Weathermaster M# 48HJR004HM-541RY	Electric, natural gas	Not found	2007	87%
Cooling	Two 3/4 ton, 13-SEER condensing units with corresponding indoor air-handlers	Roof	EMI M# S1CA9000	Electric	Server room (wall air-handler), dispatch room (ceiling cassette air-handler)	2007	87%
Cooling	25-ton split-system with 10.2 EER	Roof	Carrier Gemini M# 38AH-028	Electric	Not found	2007	87%
Cooling	8,500 CFM air-handler	Roof	Carrier Semi-Custom Central Station M# 39MN-17B00SERV12XGS	Electric	Not found	2007	90%
Ventilation	VAV system w/ VAV boxes as terminal units	VAV boxes throughout facility	Nameplate not accessible	Electric	Entire facility	2007	90%
Controls	Approx. 19 non-setback thermostats	Throughout facility	Combination of Carrier and Barber Colman	Electric	Entire facility	2007	80%
Domestic Hot Water	270 MBH water heater with 250 gallon tank and 340 gallons/hour recovery	Municipal building, basement, boiler room	PVI Maxim M# 27P250A-MX	Natural gas	Municipal building	2007	85%

Note: The remaining useful life of a system (in %) is the relationship between the system manufactured and / or installed date and the standard life expectancy of similar equipment based on ASHRAE (2003), ASHRAE Handbook: HVAC Applications, Chapter 36.

* All equipment listed with a remaining useful life of 10% or less should be considered for replacement on an as fail basis, if it's not already recommended in the ECM section of this report

4. ENERGY CONSERVATION MEASURES

Based on the assessment of this building, SWA and BSG-PMK have 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

The slate shingles on the roofs of the Town Hall building and Library are in poor condition and should be replaced. Many shingles were cracked, broken, or missing.

Category II Recommendations: Operations and Maintenance

Based on the results of BSG-PMK's survey, no operations and maintenance measures are recommended.

Category III Recommendations: Energy Conservation Measures

Summary table

ECM#	Description
1	Repair VFD Software
2	59 Programmable Thermostats
3	Hot Water Outdoor Air Reset Control
4	Lighting Upgrades and Occupancy Sensors
5	Replace 2 Chillers and Cooling Tower
6	Replace 8 Circulation Pumps

ECM #1: Repair VFD Software at the Town Hall Building

Description:

There are four variable frequency drives (VFDs) that control the frequency at which electrical power is supplied to the motors on Air-Handler #1, Air-Handler #2, Return Fan #1, and Return Fan #2, with the purpose of adjusting the rotational speed of the motor. However, in three separate visits to the boiler room over a period of two months, these drives were operating at 100% frequency, or 60 Hz, indicating that these VFDs are not saving any energy or money. These drives must be serviced in order to save the energy they were intended to. After these repairs, the frequency at which the VFDs operate will vary, depending on system demand, and will yield a large amount of energy savings.

Installation cost:

Estimated implementation cost: It should take the controls contractor two weeks to repair the software, and at an estimated rate of \$125/hour, should cost no \$10,000.

Source of cost estimate: Similar projects

Economics:

ECM #	ECM description	Source	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 Energy 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	Repair VFD Software	Similar Projects	\$10,000	\$0	\$10,000	87,751	0.0	0	6.85	\$0.00	\$15,383	15	\$181,011	0.65	1710%	114%	154%	\$173,639	120,219

Assumptions:

There was no indication, based on the information collected in BSG-PMK's survey of the building that the HVAC system was shut off at night; therefore, it was estimated that the motors were operating at all hours of every week. Horsepower ratings on the motor nameplates were 15, 7.5, 5, and 2.5 HP for AHU-1, AHU-2, RF-1, and RF-2, respectively; however, readings from the VFDs indicated that these motors were actually running at 7.5, 2.5, 6.15, and 2.5 HP, and these values were used in the calculations. The unit cost for electricity, taken from twelve months of billing data, was \$0.18/kWh. Savings were calculated using Honeywell's VFD Quick Savings Estimator, an Excel spreadsheet, which calculated the energy savings for each motor in five steps:

- 1) Convert the motor horsepower to kilowatts by multiplying the horsepower by a factor of 0.746.
- 2) Multiply the VFD power ratio, 0.28, by the kilowatts found in Step 1. This yields the kilowatts the motor requires with the VFD installed.

- 3) Multiply the power ratio of the presently employed control by the kilowatts from Step 1. This yields the kilowatts the motor currently requires. Due to the fact that the controllers are constantly running at 100% frequency, the power factor is 1.
- 4) Subtract the kilowatts in Step 2 from the kilowatts in Step 3 to yield the kilowatts saved by the control.
- 5) Multiply the savings in Step 4 by the annual hours the system operates to find the kilowatt-hours saved. Multiply this by the unit cost of electricity to find the money saved by the VFDs.

Rebates/financial incentives:

There are no rebates for this ECM, as the systems have already been installed and paid for.

ECM #2: 59 Programmable Thermostats

Description:

Heating and cooling at the Library, Police Station, and Town Hall buildings by approximately 59 non-setback thermostats. As many as 7 thermostats at the Police Station may not be operable. Non-setback thermostats need to be adjusted manually, so the heating and cooling would not be lowered automatically when the building is not in use. Setback thermostats do adjust the temperature automatically when the facility is not in use, and save energy by not causing excess heating and cooling to be used when the building is unoccupied.

Installation cost:

Estimated installed cost: \$320 each, \$18,880 total
 Source of cost estimate: RS Means CostWorks 2009

Economics:

ECM #	ECM description	Source	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 Energy 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	(59) 7-Day Programmable Thermostats	RS Means CostWorks 2009	\$18,880	\$0	\$18,880	75,101	0.0	9,068	18.84	\$0.00	\$22,836	10	\$192,823	0.83	921%	92%	121%	\$175,917	208,982

Assumptions:

The average fuel costs, for all buildings combined, were \$0.162/kWh for electricity and \$1.18/therm for natural gas. For the heating season, the occupied and unoccupied temperatures were assumed to be 70°F and 60°F, respectively. For the cooling season, these temperatures were assumed to be 76°F and 86°F, respectively. Using heating and electrical bills, the total heating and cooling consumptions were calculated to be 60,391 therms of natural gas and 341,826 kWh of electricity, respectively. The annual heating consumptions were assumed to be the 100% of the natural gas consumptions for both buildings combined. The cooling consumption for the Police Department and Town Hall buildings, due to the fact that the electric consumptions from June through October were much higher than those in the rest of the year, was assumed to be the difference between the average consumption from June through October, and the average electric consumption for the rest of the year. For the Library, there was no such increase, and therefore, an alternate method had to be used to estimate the cooling consumption. The Department of Energy indicates that the average commercial building uses 7% of its annual electric consumption for cooling; therefore, the cooling consumption for the Library was assumed to be 7% of the annual electric bill. The average hours of setback for the three buildings were estimated to be 10 hours every night

and 8 hours during the day on weekends. The Police Station, due to the fact that it is always operating, was assumed to have fewer unoccupied hours than the other two buildings, as only private offices and rooms not always in use would require setback controls. The savings were calculated using Honeywell's Commercial Programmable Thermostat Energy Savings Calculator, an Excel spreadsheet, which assumes 3% savings per degree of setback for the heating season, and 6% for the cooling season.

Rebates/financial incentives:

No rebates or incentives for programmable thermostats could be found.

ECM#3: Hot Water Outdoor Air Reset Control

Description:

Heating is provided to the Library and Town Hall buildings by two hot water boilers, located in the basement of the Town Hall building. These boilers are in good condition, and their operation can be made even more efficient by installing outside air reset control. Boilers are designed to provide water to radiators or hot water coils at a constant temperature, usually 180°F. This can cause the system to provide too high a temperature to the space it was designed to heat, which wastes energy and increases energy bills. Outside air reset controllers reduce the maximum boiler water temperature depending on the outside air temperature; for instance, if the outside air temperature is 0°F, the boiler temperature will be 180°F, but if the outside air temperature is 40°F, the boiler temperature will only need to be 130°F. At the time of BSG-PMK's inspection of the Town Hall building's boilers, in-line temperature gauges at the pumps indicated a supply water temperature of 206°F and 210°F and a return water temperature of 196°F.

Installation cost:

Estimated installed cost: \$5,000

Source of cost estimate: Similar projects

Economics:

ECM #	ECM description	Source	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 Energy 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	Hot Water Outdoor Air Reset Control	Similar Projects	\$5,000	\$0	\$5,000	0	0.0	3,793	10.06	\$0.00	\$4,413	15	\$51,927	1.13	939%	63%	88%	\$47,681	44,382

Assumptions:

Outside air reset controllers typically save between 8% and 15% of the annual heating consumption; to be conservative, the lower end of this range, 8%, will be used. From October 1, 2008 through September 30, 2009, the Library and the Town Hall buildings consumed 47,416.45 therms at a rate of \$1.16 per therm.

Rebates/financial incentives:

No rebates for outside air reset control are available.

ECM#4: Lighting Upgrades and Occupancy Sensors

Description:

Lighting at the Library and the Town Hall buildings consist primarily of T-12 fluorescent bulbs with magnetic ballasts. Standard 40-watt T-12s, for example, require 48 watts of power; by comparison, equivalent 32-watt, T-8 fluorescent bulbs with electronic ballasts require 30 watts and have a near equal lighting output, reducing the energy required by 37.5%. It is recommended that all T-12 fixtures with magnetic ballasts be replaced with T-8 fixtures with electronic ballasts. Lighting replacement generally yields a very good payback, due to the fact that most lighting in commercial buildings is used thousands of hours per year and the installation is fairly inexpensive. A few fixtures at have already been upgraded to T-8's at these two facilities, and most of the fixtures at the Police Station have already been upgraded.

Also in the buildings are incandescent lamps, of various wattages. It is recommended that these be replaced with compact fluorescents. Only a 26-watt compact fluorescent is needed to produce quantities of light equivalent to that of a 100-watt incandescent, for a 74% reduction in required energy. Other types of lighting fixtures in these buildings, some of which will not need upgrades, include compact fluorescents and mercury vapor lamps.

Lighting sensors are another way to save energy in commercial buildings, in rooms where lights typically stay on while the space is unoccupied. These sensors turn the lights on when the room is occupied, and off when it is not. This can lead to a reduction in energy use by 50% or more. Recommended lighting upgrades are detailed in Appendix A.

Installation cost:

Estimated installed cost: Lighting: \$119,304; sensors: \$8,480; total: \$127,784
 Rebates/incentives: Lighting: \$15,403; sensors: \$920; total: \$16,322
 Net cost, with incentives: Lighting: \$103,901; sensors: \$7,560; total: \$111,461
 Source of cost estimate: Similar projects

Economics:

ECM #	ECM description	Source	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 Energy 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
4	Lighting Upgrades	Similar Projects	\$119,304	\$15,403	\$103,901	180,794	13.0	0	10.00	\$0.00	\$30,893	15	\$363,517	3.36	250%	17%	29%	\$264,895	247,688
	Occupancy Sensors		\$8,480	\$920	\$7,560	14,726	0.4495	0	0.81415	\$0.00	\$2,554	10	\$21,564	2.96	185%	19%	32%	\$14,225	20,175

Assumptions:

The electric costs used in this ECM were \$0.18/kWh for the Town Hall building and Police Departments, and \$0.16/kWh for the library, which were their average rates for the 12-month period ranging from October 1st, 2008 through September 30th, 2009. The replacements for each lighting fixture, the costs to replace or retrofit each one, and the rebates and wattages for each fixture are located in Appendix A.

Rebates/financial incentives:

The New Jersey SmartStart rebate for upgrading lighting fixtures to LED exit signs and T-8 bulbs ranges from \$10 to \$20 per bulb. The total rebate this ECM qualifies for is \$16,322.

ECM#5: Replace 2 Chillers and Cooling Tower

Description:

Cooling is provided to the Municipal building and the Library by two 80-ton Trane chillers, located in the basement of the Municipal building, and by a 188-ton Baltimore Air Coil cooling tower, located behind the Library. They are approaching the end of their useful lives, but because they are still in good condition and because the investment is quite costly, they should be replaced on an as-fail basis. Newer units use either R-134A or R-410A refrigerant, which are more energy-efficient refrigerants than the refrigerant of the current units, R-22, and therefore yield higher Energy Efficiency Ratios (EERs). The Trane chillers, at the time of installation, had EERs of 13.2; once the end of their useful life is reached, it can be assumed that their EER values are 80% of what they were initially, or 10.6. The cooling tower initially had an EER of approximately 10, and therefore would have an EER of 8 once it reaches the end of its useful life. The recommended upgrades for the indoor chillers, two 80-ton Trane RTWD Series R chillers, have an EER of 16.9. The recommended replacement for the cooling tower, a Baltimore Air Coil Series V model with equivalent tonnage, will have an EER of approximately 12.

Installation cost:

Cooling tower: \$120,000 (equipment); \$30,000 (labor); \$150,000 (total)
 Trane chillers: \$60,000 each (equipment); \$20,000 (labor); \$160,000 (total)
 Total cost: \$310,000
 (Source: RS Means CostWorks 2009)

Economics:

ECM #	ECM description	Source	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 Energy 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	Replace 2 Chillers and Cooling Tower	RS Means CostWorks 2009	\$310,000	\$248,000	\$62,000	113,162	0.0	0	10.24	\$0.00	\$18,306	24	\$303,454	3.39	389%	16%	29%	\$248,029	155,032

Assumptions:

Due to the fact that the Municipal and Police buildings share an electricity account, the electric data of those two buildings and the Library had to be taken into consideration. From October, 2008 through September, 2009, 865,280 kWh were consumed by the Municipal and Police buildings, and 213,840 kWh were consumed by the Library. The Municipal and Police buildings had a consistently lower electric consumption in the

months where the cooling system was not in use, November through May, than it had the rest of the year. In the non-cooling months, the average consumption for these two buildings was 44,869 kWh; by contrast, from June through October, the average electric consumption was 110,240 kWh. The average from November through May can be assumed to be the average electric consumption for the each month that is not used for cooling; in total, 538,423 kWh were not used for cooling, and therefore, 326,857 kWh were. For the Library, there was no such increase in consumption during the summer months, so another method of estimating the cooling consumption was needed. A pie chart from the US Department of Energy, shown in Appendix C, shows that cooling constitutes for 8% of all energy consumption in commercial buildings, and 14% of all energy consumption that is not used for heating, and therefore 14% of the 213,840 kWh the Library consumed on electricity was used for cooling, or 30,549 kWh. The three buildings combined for 357,406 kWh of cooling; in addition, the three buildings purchased electricity at a rate of \$0.16/kWh during the summer months.

In addition to the three cooling units being replaced, there are also five cooling units in the Police Station, with a cumulative tonnage of 39.5. The eight units in the three buildings combined for 387.5 tons, with the cooling tower consisting of 49% of this tonnage, and each 80-ton chiller consisting for 21%. It can therefore be assumed that the cooling tower consumed 49% of the electricity the three buildings used for cooling in this twelve-month period, and each of the Trane chillers, 21%. Together, these three units account for 90% of the three buildings' annual cooling consumption.

The energy savings for each unit can now be calculated:

Trane chillers:

$$\begin{aligned} \text{Annual energy purchase, current:} & \quad (21\% \times 2) \times 357,406 \text{ kWh} = 147,574 \text{ kWh (electric input)} \\ & \quad 147,574 \text{ kWh} \times 10.6 \text{ EER} = 1,558,381 \text{ BTU (cooling output)} \\ \text{Annual energy purchase, proposed:} & \quad \frac{1,558,381 \text{ BTU}}{16.9 \text{ EER}} = 92,212 \text{ kWh (electric input)} \\ \text{Annual savings:} & \quad 147,574 \text{ kWh} - 92,212 \text{ kWh} = 55,362 \text{ kWh} \\ & \quad 55,362 \text{ kWh} \times \frac{\$0.16}{\text{kWh}} = \$8,956 \end{aligned}$$

Cooling tower:

$$\begin{aligned} \text{Annual energy purchase, current:} & \quad 49\% \times 357,406 \text{ kWh} = 173,399 \text{ kWh (electric input)} \\ & \quad 173,399 \text{ kWh} \times 8 \text{ EER} = 1,387,195 \text{ BTU (cooling output)} \\ \text{Annual energy purchase, proposed:} & \quad \frac{1,387,195 \text{ BTU}}{12 \text{ EER}} = 115,600 \text{ kWh (electric input)} \\ \text{Annual savings:} & \quad 173,399 \text{ kWh} - 115,600 \text{ kWh} = 57,800 \text{ kWh} \\ & \quad 57,800 \text{ kWh} \times \frac{\$0.16}{\text{kWh}} = \$9,857 \end{aligned}$$

$$\begin{aligned} \text{Total savings:} & \quad 55,362 \text{ kWh} + 57,800 \text{ kWh} = 113,162 \text{ kWh} \\ & \quad 113,162 \text{ kWh} \times \frac{\$0.16}{\text{kWh}} = \$18,306 \end{aligned}$$

Rebates/financial incentives:

This ECM is eligible for New Jersey's Direct Install rebate, which covers up to 80% of the installation cost, or \$248,000 for this ECM. Existing small to mid-sized commercial and industrial facilities with a peak electric demand that did not exceed 200 kW in any of the preceding 12 months are eligible to participate in Direct Install. Buildings must be located in New Jersey and served by one of the state's public, regulated electric or natural gas utility companies. If the Township is interested in applying for this rebate, please refer to the New Jersey Office of Clean Energy website, <http://www.njcleanenergy.com/commercial-industrial/programs/direct-install>.

ECM#6: Replace 8 Circulation Pumps

Description:

In the boiler room of the Municipal building, there are three hot water supply pumps, three chilled water pumps, and two condenser water pumps. These eight pumps, which have nominal efficiencies between 85% and 90%, have reached the end of their useful lives. Due to the fact that they are still in good working condition and have a long payback period, they should be replaced with premium-efficiency, three-phase pumps with 95%-efficient motors on an as-fail basis.

Installation cost:

Pump	Qty.	HP	RPM	Cost	Pump	Qty.	HP	RPM	Cost	Pump	Qty.	HP	RPM	Cost	Pump	Qty.	HP	RPM	Cost	Total
Hot Water Supply	3	5	1,740	\$5,275	Chilled Water	1	8	1,750	\$5,275	Chilled Water	2	7	1,750	\$5,063	Cond. Water	2	10	1,745	\$5,950	\$37,179

Source of cost estimate: RS Means CostWorks 2009

Economics:

ECM #	ECM description	Source	Est. Installed Cost, \$	Est. Incentives, \$	Net Est. ECM Cost with Incentives, \$	kWh, 1st Yr Savings	kW Demand Reduction/Mo	Therms, 1st Yr Savings	kBtu/sqft, 1st Yr Savings	Est. Operating Cost, 1st Yr Savings, \$	Total 1st Yr Savings, \$	Life of Measure, Yrs	Est. Lifetime Energy 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
6	Replace 8 Circulation Pumps	RS Means CostWorks 2009	\$43,638	\$34,911	\$8,728	6,018	0.0	0	0.54	\$0.00	\$1,055	20	\$15,409	8.27	77%	4%	10%	\$6,968	8,245

Assumptions:

The average electric cost for the 12-month period from October, 2008 through September, 2009 was \$0.18/kWh. The current efficiencies of the pumps, which were approximately 85% at the time of their installations, can be assumed to have dropped 20% over time, to about 68%. The horsepower of the pumps, shown in the chart above, were converted to kW, using a factor of 0.7457. The annual electric consumptions of the existing pumps are calculated simply by multiplying the full-capacity kW just found, by the total annual operating hours. The operating hours can be estimated by calculating the equivalent full-load hours the heating and cooling systems operate. The total cooling consumptions for the Municipal, Police, and Library buildings, as stated in the previous ECM, was 357,406 kWh; of this, the three units that serve the Library and

Municipal buildings, the Trane chillers and the cooling tower, account for 90%, or 321,973 kWh. The three units combine for 348 tons of cooling, equivalent to 1,223 kW. The number of full-load hours for the pumps used for cooling, the chilled water and condenser water pumps, is as follows:

$$\frac{357,406 \text{ kW}\times\text{hr}}{1,223 \text{ kW}}=262 \text{ full-load hours}$$

Similarly, during the 12-month period from October, 2008 through September, 2009, the Library and Municipal buildings, which share a common heating system, consumed 47,417 therms of natural gas. The pie chart in Appendix C shows that, on average, 36% of all energy consumption by commercial buildings was for space heating, and 8% was used for water heating; this accounts for 100% of natural gas usage. Based on these percentages, 82% of all natural gas usage is used for space heating, or 38,796 therms. This converts to 3,879,572,045 BTUs, generated by two 1,675 MBH boilers. The equivalent full-load heating hours is as follows:

$$\frac{3,879,572,045 \text{ BTU}}{1,675,000 \frac{\text{BTU}}{\text{hr}}\times 2}=1,158 \text{ full-load hours}$$

The current and proposed electric consumptions for the pumps used for heating and cooling can now be calculated:

Current electric consumption, hot water supply pumps:

$$3 \text{ pumps}\times 5 \text{ HP}\times 0.7457 \frac{\text{kW}}{\text{HP}}\times 1,158 \text{ hrs}=12,954 \text{ kWh}$$

Current electric output, hot water supply pumps:

$$12,954 \text{ kWh}\times 68\% \text{ efficiency}=8,809 \text{ kWh}$$

Proposed electric consumption, hot water supply pumps:

$$\frac{8,809 \text{ kWh}}{95\% \text{ efficiency}}=9,272 \text{ kWh}$$

Current electric consumption, chilled water and condenser water pumps:

$$(1 \text{ pump}\times 8 \text{ HP}+2 \text{ pumps}\times 7 \text{ HP}+2 \text{ pumps}\times 10 \text{ HP})\times \left(0.7457 \frac{\text{kW}}{\text{HP}}\times 262 \text{ hrs}\right)=8,221 \text{ kWh}$$

Current electric output, chilled water and condenser water pumps:

$$8,221 \text{ kWh}\times 68\% \text{ efficiency}=5,590 \text{ kWh}$$

Proposed electric consumption, chilled water and condenser water pumps:

$$\frac{8,221 \text{ kWh}}{95\% \text{ efficiency}}=5,885 \text{ kWh}$$

Total electric savings:

$$(12,954 \text{ kWh} - 9,272 \text{ kWh}) + (8,221 \text{ kWh} - 5,885 \text{ kWh}) = 6,018 \text{ kWh}$$

Total annual cost savings:

$$\frac{\$0.18}{\text{kWh}} \times 6,018 \text{ kWh} = \$1,055$$

Rebates/financial incentives:

This ECM is eligible for New Jersey's Direct Install rebate, which covers up to 80% of the installation cost, or \$34,911 for this ECM.

5. RENEWABLE AND DISTRIBUTED 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 a high cost of installation and small area of viable space available.

5.3. Solar Thermal Collectors

Solar thermal collectors are not cost effective for this project and are not 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.

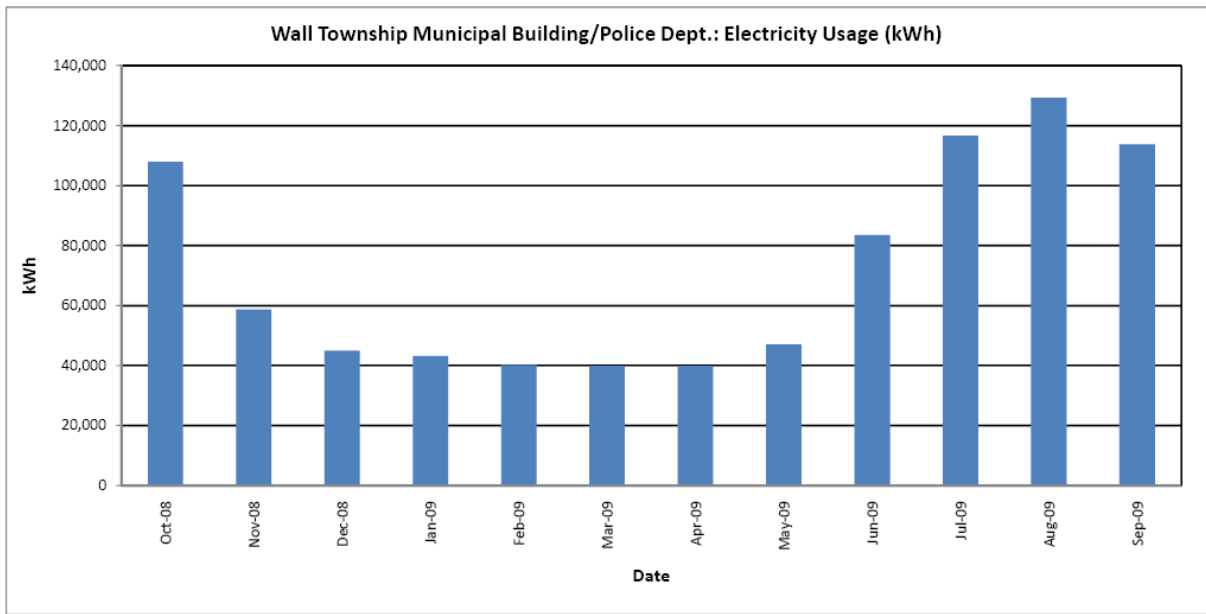
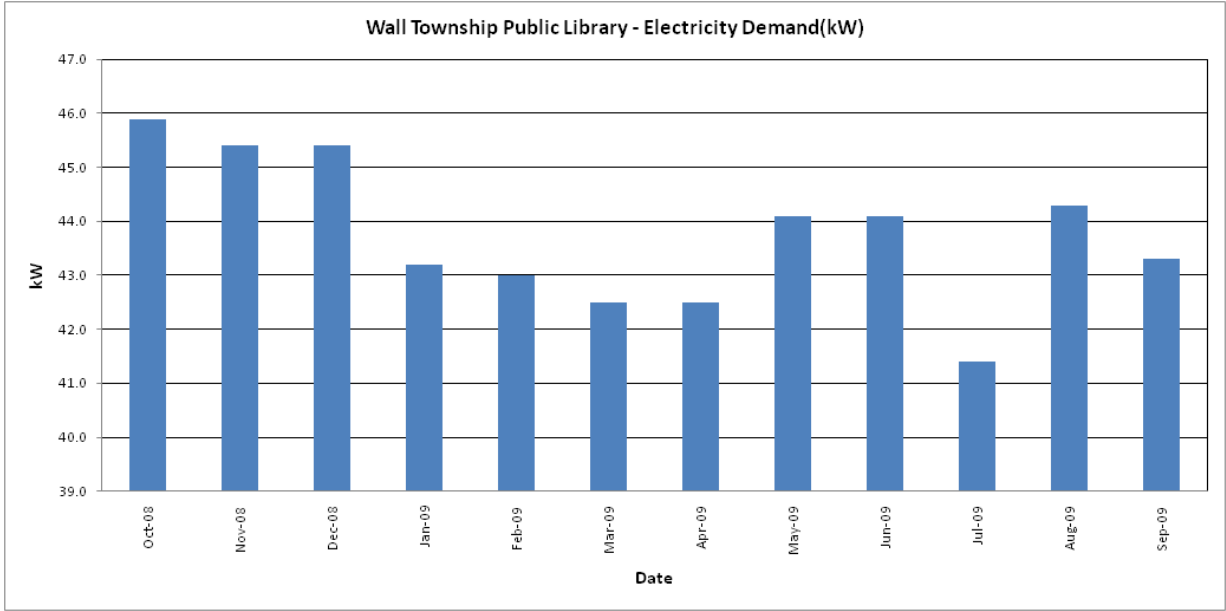
5.6. Wind

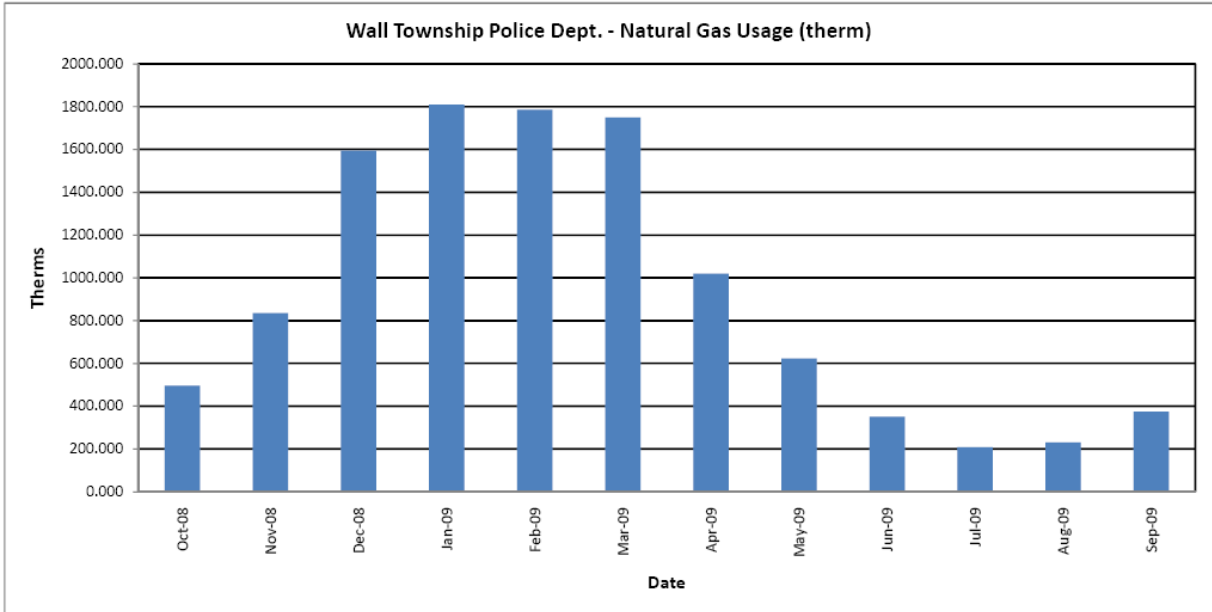
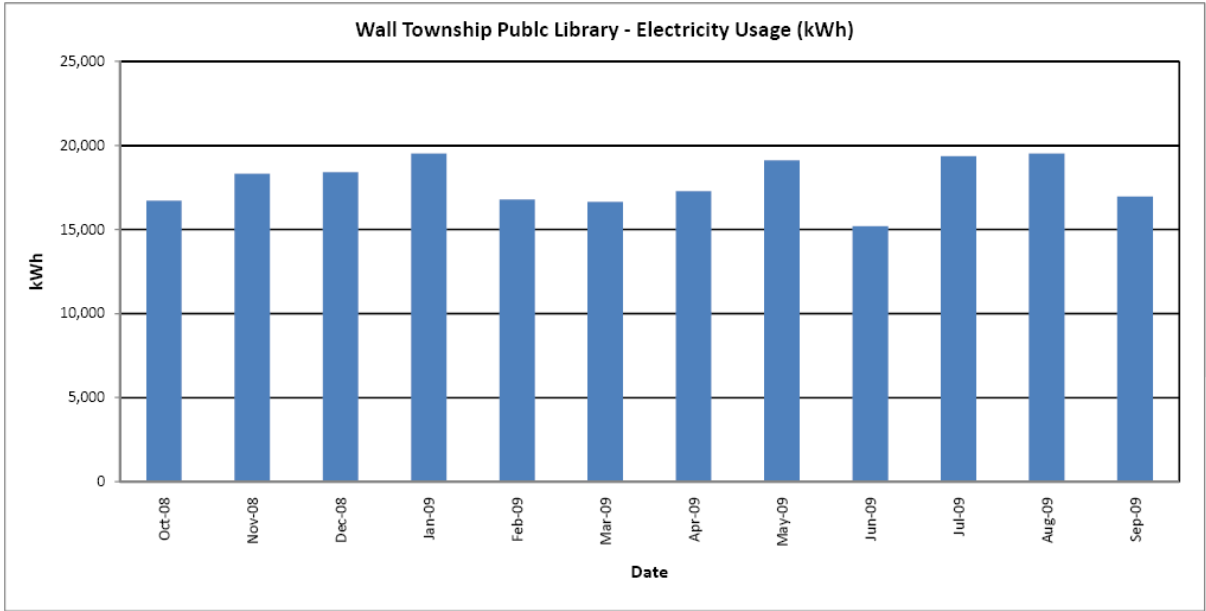
Wind power production is not appropriate for this location because required land is not available for the wind turbine. Also, the available wind energy resource is very low.

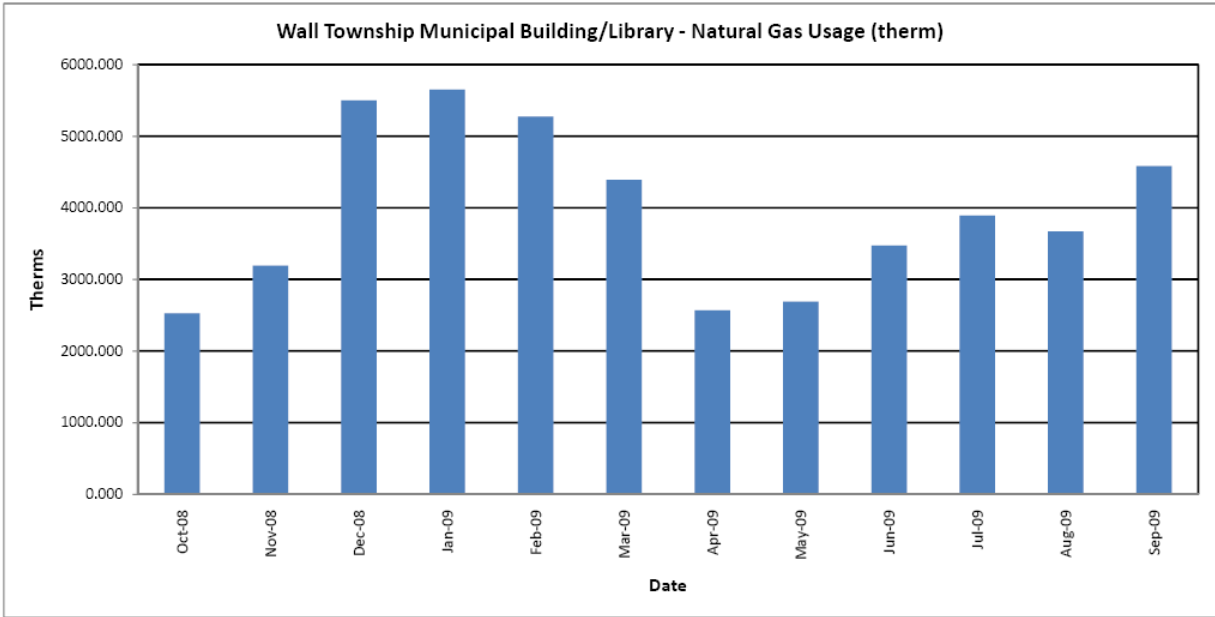
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

6.1. Load profiles

The average electrical peak demand for the Library during previous year was 43.8 kW and the maximum peak demand was 45.9 kW. Demand data for the Town Hall and Police buildings was not available. 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 for the Library, demand data was not available for the Town Hall and Police electric account, and the other charts show electric and gas usage (in kWh), respectively.



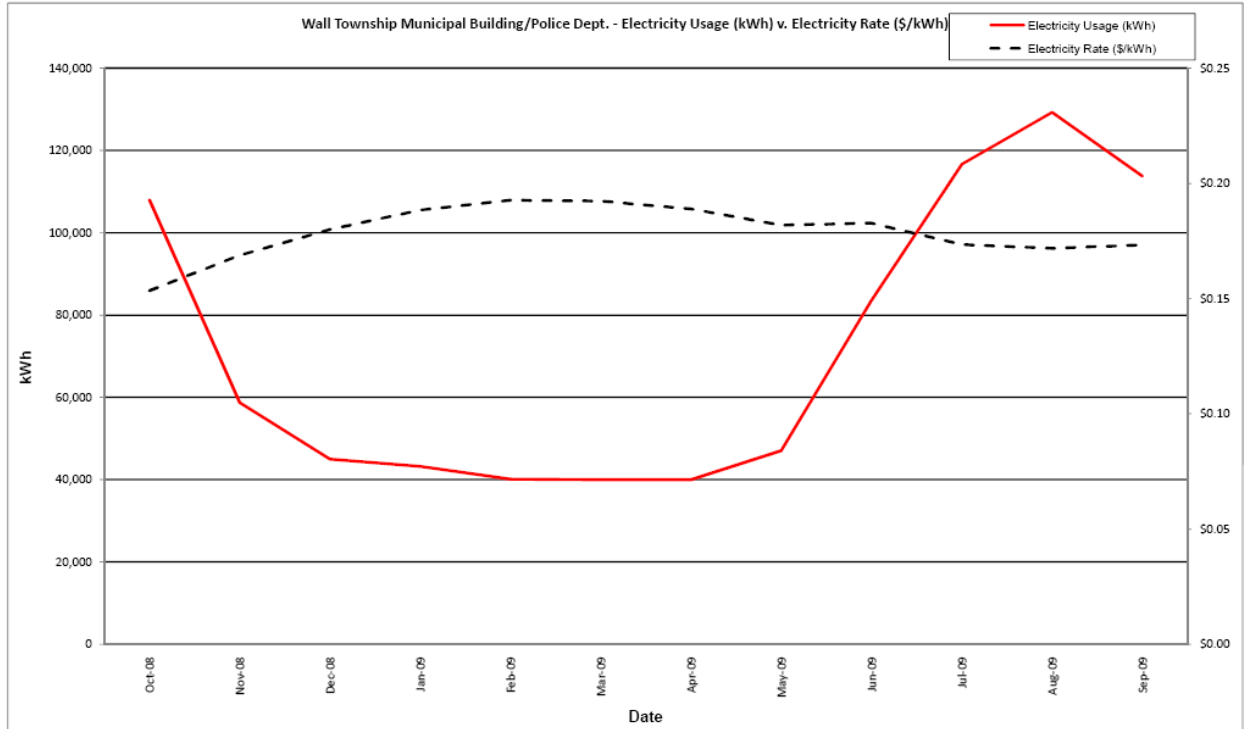




6.2. Energy Procurement strategies

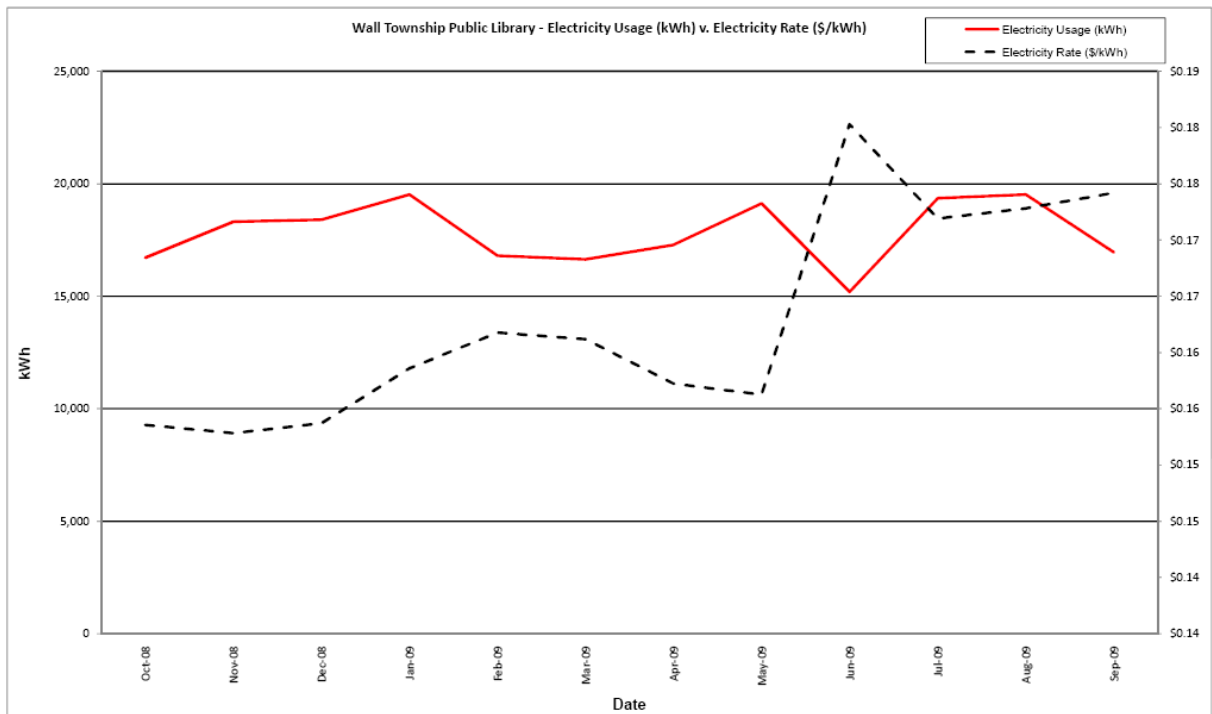
Billing analysis shows price fluctuations of over 20% over the course of the year for the building electrical and natural gas accounts. Customers that have a large variation in monthly billing rates can often reduce the costs associated with energy procurement by selecting a third party energy supplier. 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 Township. Using an average cost of \$0.15/kWh a third party supplier could save the Township \$21,898/year on the Town Hall and the Police buildings’ account and \$2,716/year at the Library’s account. Unfortunately a third party supplier would not reduce the Townships cost of natural gas at the Town Hall, Library, or Police buildings because the Township now pays a rate lower than the average rate of \$1.55/therm. Appendix B contains a complete list of third party energy suppliers.

Town Hall & Police



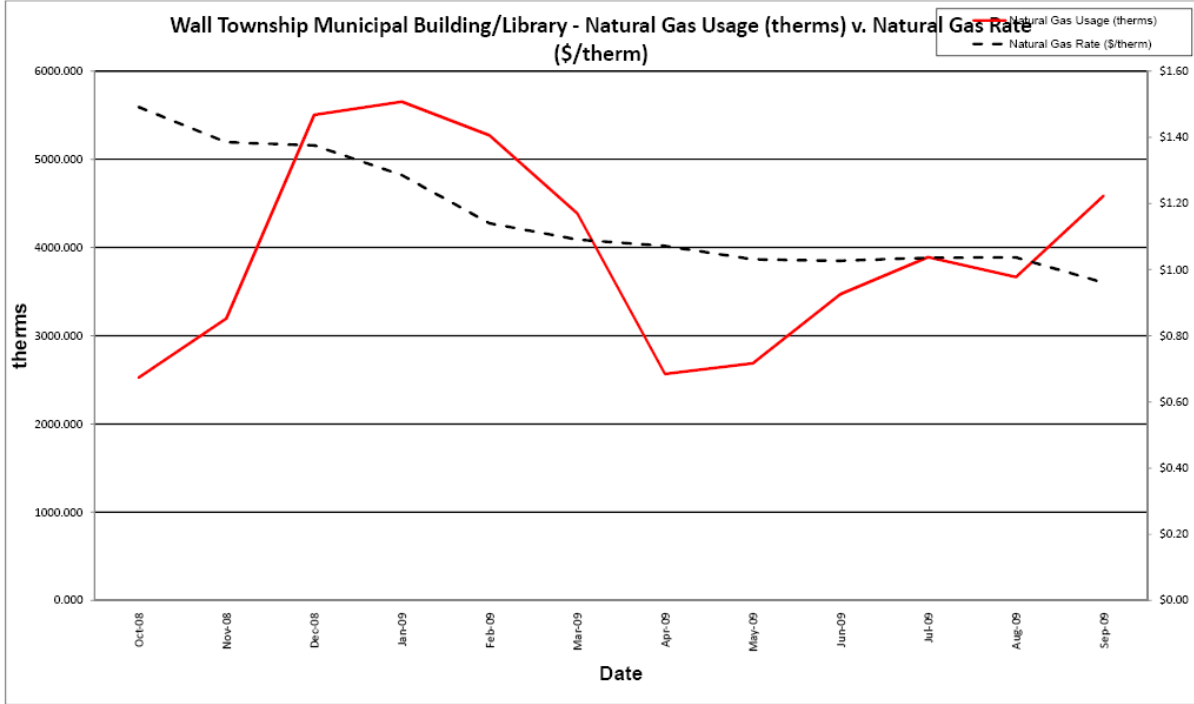
Electricity prices reflect electricity usage

Library



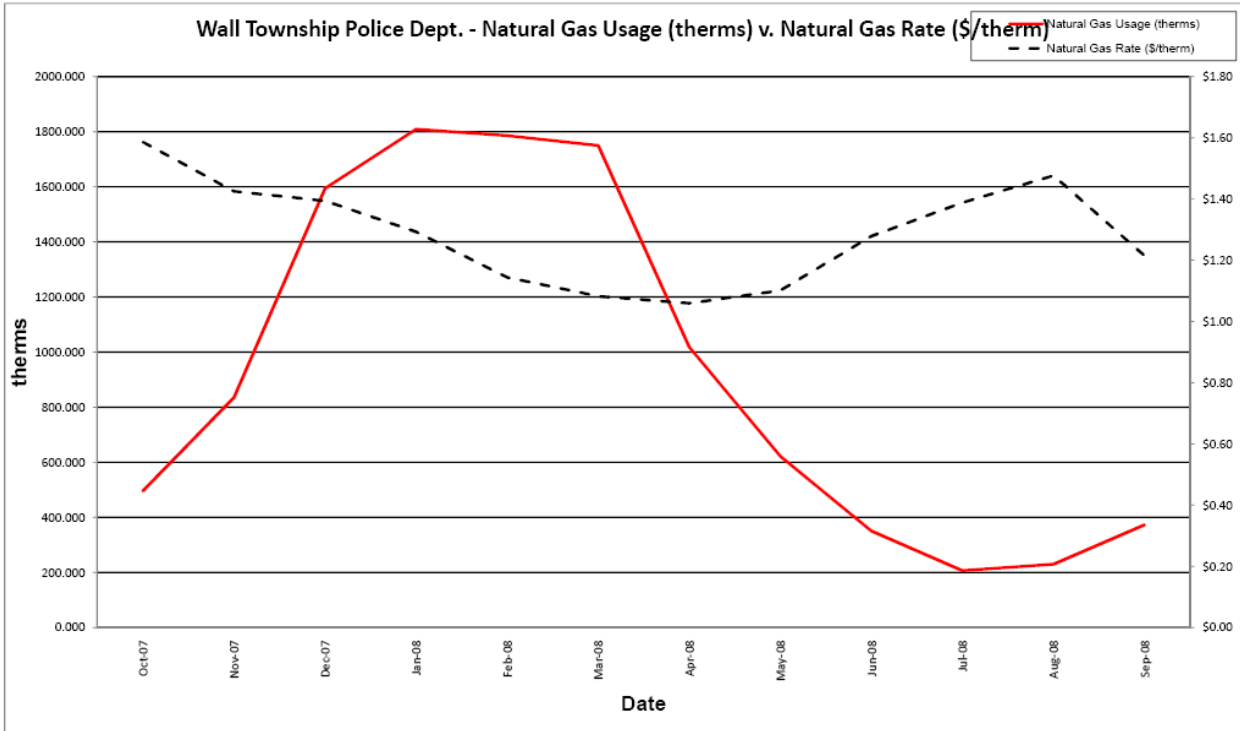
Electricity prices reflect electricity usage

Town Hall



Natural gas prices fluctuate as expected with usage

Police



Natural gas prices fluctuate as expected with usage

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

 BIRDSALL SERVICES GROUP ENGINEERS & CONSULTANTS										Township of Wall Wall Municipal Building 2700 Allaire Road, Wall, NJ					Lighting Upgrades Estimated Cost: \$81,500.00 Estimated Savings: \$16,721.04 Estimated Payback: 3.81186682					Sensor Upgrades (Pre-Lighting Upgrade) Estimated Cost: \$8,090.00 Estimated Savings: \$2,081.55 Estimated Payback: 2.988174524					Lighting & Sensor Upgrades Estimated Cost: \$87,690.00 Estimated Savings: \$18,808.78 Estimated Payback: 3.974740472				
Average Cost/KW: \$0.18										Lighting					Occupancy Sensors (ONLY)					Lighting & Occupancy Sensors									
Room/Area	Type	Existing Fixtures			Upgrade	Recommended Fixtures			Fixture Use	Recommended	Post-Sensor	Cost (\$)	SmartStart	Payback	Cost (\$)	SmartStart	Payback	Cost (\$)	SmartStart	Payback									
		Ballast	Wattage	Qty.	Type	Type	Ballast	Wattage	Qty.	(hr/yr)	Controls	Use (hr/yr)	Rebate (\$)	(yrs)	Rebate (\$)	(yrs)	Rebate (\$)	(yrs)	Rebate (\$)	(yrs)									
Exit Signs	Exit LED	-	2	11	None	Exit LED	-	2	11	8760	-	8760	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00								
Administration	2F40T12U	Magnetic	92	4	Retrofit	2F32T8U	Electronic	59	4	3000	-	3000	\$320.00	\$40.00	\$69.42	4.03	\$0.00	\$0.00	\$0.00	\$0.00	\$320.00								
Assistant Admin.	2F40T12	Magnetic	46	18	Retrofit	F32T8	Electronic	30	18	3000	-	3000	\$1,080.00	\$180.00	\$151.46	5.94	\$0.00	\$0.00	\$0.00	\$0.00	\$1,080.00								
Conference	2F40T12U	Magnetic	92	4	Retrofit	2F32T8U	Electronic	59	4	2000	OSW	1800	\$420.00	\$60.00	\$90.88	3.96	\$200.00	\$20.00	\$60.59	3.0	\$620.00								
Rest Room	Inc150	-	150	2	Replace	CFL46	-	46	2	2000	OSW	1600	\$62.00	\$0.00	\$72.92	0.71	\$0.00	\$0.00	\$26.30	0.0	\$62.00								
Administration	2F40T12	Magnetic	46	6	Retrofit	F32T8	Electronic	30	6	2000	OSW	1600	\$360.00	\$60.00	\$33.66	6.91	\$0.00	\$0.00	\$24.19	0.0	\$360.00								
Board of Health	2F40T12U	Magnetic	92	6	Retrofit	2F32T8U	Electronic	59	6	2400	OSW	1800	\$480.00	\$80.00	\$83.30	5.34	\$0.00	\$0.00	\$58.06	0.0	\$480.00								
Township Clerk	2F40T12U	Magnetic	92	4	Retrofit	2F32T8U	Electronic	59	4	2400	OSW	1800	\$480.00	\$60.00	\$83.30	5.34	\$200.00	\$20.00	\$58.06	3.1	\$680.00								
Office (currently vacant)	2F40T12U	Magnetic	92	18	Retrofit	2F32T8U	Electronic	59	18	3000	OSW	1800	\$320.00	\$40.00	\$66.54	5.04	\$200.00	\$20.00	\$38.71	4.7	\$520.00								
Storage	2F40T12	Magnetic	92	4	Retrofit	2F32T8U	Electronic	59	4	2400	OSW	1800	\$320.00	\$40.00	\$66.54	5.04	\$200.00	\$20.00	\$38.71	4.7	\$520.00								
Main Hall (Front)	2F40T12	Magnetic	96	1	Retrofit	F32T8	Electronic	30	1	2800	OSW	1400	\$70.00	\$10.00	\$17.67	3.40	\$200.00	\$20.00	\$23.56	7.8	\$270.00								
Women's Room	Inc100	-	100	7	Replace	CFL26	-	26	7	3000	-	3000	\$181.00	\$0.00	\$272.42	0.59	\$0.00	\$0.00	\$0.00	0.0	\$181.00								
Men's Room	2F40T12	Magnetic	96	1	Retrofit	F32T8	Electronic	30	1	3200	OSW	1600	\$220.00	\$40.00	\$89.75	2.91	\$260.00	\$35.00	\$114.44	2.0	\$480.00								
Meeting Room	2F40T12	Magnetic	96	76	Retrofit	F32T8	Electronic	60	76	2000	-	2000	\$5,320.00	\$760.00	\$969.24	4.75	\$0.00	\$0.00	\$0.00	\$0.00	\$5,320.00								
Back Room #1	Inc60	-	60	8	Replace	CFL14	-	14	8	2000	-	2000	\$55.00	\$0.00	\$129.02	0.43	\$0.00	\$0.00	\$0.00	0.0	\$55.00								
Back Room #2	2F30T12	Magnetic	36	2	Retrofit	F32T8	Electronic	31	2	2400	-	2400	\$140.00	\$20.00	\$21.04	6.70	\$0.00	\$0.00	\$0.00	0.0	\$140.00								
Joining Room	Inc150	-	150	2	Replace	CFL46	-	46	2	2400	-	2400	\$62.00	\$0.00	\$87.51	0.59	\$0.00	\$0.00	\$0.00	0.0	\$62.00								
Recreation	2F40T12	Magnetic	96	15	Retrofit	F32T8	Electronic	60	15	3000	-	3000	\$1,120.00	\$160.00	\$302.92	3.17	\$0.00	\$0.00	\$0.00	0.0	\$1,120.00								
Tax Main	Inc150	-	150	2	Replace	CFL46	-	46	2	3000	-	3000	\$62.00	\$0.00	\$109.39	0.48	\$0.00	\$0.00	\$0.00	0.0	\$62.00								
Court Admin.	2F40T12U	Magnetic	92	24	Retrofit	2F32T8U	Electronic	59	24	3000	-	3000	\$1,320.00	\$240.00	\$416.51	4.03	\$0.00	\$0.00	\$0.00	0.0	\$1,320.00								
Judges' Chambers	2F40T12U	Magnetic	92	2	Retrofit	2F32T8U	Electronic	59	2	3000	OSW	2400	\$180.00	\$20.00	\$34.71	4.03	\$200.00	\$20.00	\$19.36	9.3	\$380.00								
Rest Room	2F40T12	Magnetic	46	6	Retrofit	F32T8	Electronic	30	6	3000	OSW	2400	\$360.00	\$60.00	\$60.49	5.94	\$0.00	\$0.00	\$29.03	0.0	\$360.00								
Break Room	2F40T12U	Magnetic	92	1	Retrofit	2F32T8U	Electronic	59	1	2800	OSW	1400	\$80.00	\$10.00	\$16.20	4.32	\$200.00	\$20.00	\$22.89	8.0	\$280.00								
Mech. Room	2F40T12U	Magnetic	92	4	Retrofit	2F32T8U	Electronic	59	4	2400	OSW	1800	\$320.00	\$40.00	\$66.54	5.04	\$200.00	\$20.00	\$38.71	4.7	\$520.00								
Storage	2F40T12U	Magnetic	92	4	Retrofit	2F32T8U	Electronic	59	4	2400	OSW	1800	\$320.00	\$40.00	\$66.54	5.04	\$200.00	\$20.00	\$38.71	4.7	\$520.00								
Women's Room	2F40T12U	Magnetic	96	6	Retrofit	F32T8U	Electronic	30	6	2400	OSW	1800	\$87.80	\$12.50	\$40.39	1.86	\$0.00	\$0.00	\$29.03	0.0	\$87.80								
Men's Room	2F40T12U	Magnetic	96	1	Retrofit	F32T8U	Electronic	30	1	1600	OSW	800	\$80.00	\$10.00	\$9.26	7.56	\$260.00	\$35.00	\$12.90	17.4	\$340.00								
Storage	2F40T12U	Magnetic	92	4	Retrofit	F32T8U	Electronic	59	4	3000	-	3000	\$240.00	\$40.00	\$33.66	5.94	\$0.00	\$0.00	\$0.00	0.0	\$240.00								
Judges' Chambers	2F40T12U	Magnetic	92	10	Retrofit	2F32T8U	Electronic	59	10	3000	-	3000	\$900.00	\$100.00	\$173.55	4.03	\$0.00	\$0.00	\$0.00	0.0	\$900.00								
Storage	2F40T12U	Magnetic	92	4	Retrofit	2F32T8U	Electronic	59	4	200	-	200	\$320.00	\$40.00	\$46.63	60.60	\$0.00	\$0.00	\$0.00	0.0	\$320.00								
Women's Room	Inc60	-	60	1	Replace	CFL14	-	14	1	200	-	200	\$7.00	\$0.00	\$1.61	4.34	\$0.00	\$0.00	\$0.00	0.0	\$7.00								
Men's Room	2F40T12	Magnetic	96	1	Retrofit	F32T8	Electronic	30	1	3200	-	3200	\$70.00	\$10.00	\$20.19	2.97	\$0.00	\$0.00	\$0.00	0.0	\$70.00								
Storage	2F40T12U	Magnetic	96	1	Retrofit	F32T8U	Electronic	60	1	3200	-	3200	\$70.00	\$10.00	\$20.19	2.97	\$0.00	\$0.00	\$0.00	0.0	\$70.00								
Planning	2F40T12U	Magnetic	92	33	Retrofit	2F32T8U	Electronic	59	33	3000	-	3000	\$2,640.00	\$330.00	\$572.71	4.03	\$0.00	\$0.00	\$0.00	0.0	\$2,640.00								
Zaborsky	Inc100	-	100	4	Replace	CFL26	-	26	4	3000	-	3000	\$82.00	\$0.00	\$166.67	0.59	\$0.00	\$0.00	\$0.00	0.0	\$82.00								
	2F40T12U	Magnetic	92	6	Retrofit	2F32T8U	Electronic	59	6	2400	OSW	1800	\$480.00	\$60.00	\$83.30	5.34	\$200.00	\$20.00	\$58.06	3.1	\$680.00								
	2F40T12	Magnetic	46	6	Retrofit	F32T8	Electronic	30	6	2400	OSW	1800	\$360.00	\$60.00	\$40.39	7.43	\$0.00	\$0.00	\$29.03	0.0	\$360.00								

Heiflich	2F40T12	Magnetic	98	4	Retrofit	2F32T8	Electronic	60	4	2400	OSW	1800	\$280.00	\$40.00	\$60.58	3.96	\$200.00	\$20.00	\$40.39	4.8	\$480.00	\$60.00	\$95.83	4.89
Const. Official	2F40T12U	Magnetic	92	6	Retrofit	2F32T8U	Electronic	59	6	2400	OSW	1800	\$480.00	\$60.00	\$83.30	5.04	\$200.00	\$20.00	\$58.06	3.1	\$680.00	\$80.00	\$120.84	4.98
Town Planner	2F40T12U	Magnetic	92	6	Retrofit	2F32T8U	Electronic	59	6	2400	OSW	1800	\$480.00	\$60.00	\$83.30	5.04	\$200.00	\$20.00	\$58.06	3.1	\$680.00	\$80.00	\$120.84	4.98
Fire Prevention Official	2F40T12U	Magnetic	92	6	Retrofit	2F32T8U	Electronic	59	6	2400	OSW	1800	\$480.00	\$60.00	\$83.30	5.04	\$200.00	\$20.00	\$58.06	3.1	\$680.00	\$80.00	\$120.84	4.98
Layne	2F40T12U	Magnetic	92	4	Retrofit	2F32T8U	Electronic	59	4	2400	OSW	1800	\$320.00	\$40.00	\$55.54	5.04	\$200.00	\$20.00	\$38.71	4.7	\$520.00	\$60.00	\$80.36	5.72
File Room	2F40T12U	Magnetic	92	6	Retrofit	2F32T8U	Electronic	59	6	2400	OSW	1800	\$480.00	\$60.00	\$104.13	4.03	\$200.00	\$20.00	\$145.15	1.2	\$680.00	\$80.00	\$197.21	3.04
Planning Coordinator	2F40T12U	Magnetic	92	6	Retrofit	2F32T8U	Electronic	59	6	2400	OSW	1800	\$480.00	\$60.00	\$83.30	5.04	\$200.00	\$20.00	\$58.06	3.1	\$680.00	\$80.00	\$120.84	4.98
	F40T12	Magnetic	48	60	Retrofit	F32T8	Electronic	30	60	3000	-	3000	\$3,600.00	\$600.00	\$504.86	5.94	\$0.00	\$0.00	\$0.00	0.0	\$3,600.00	\$600.00	\$504.86	5.94
	F30T12	Magnetic	20	6	Retrofit	F17T8	Electronic	17	6	3000	-	3000	\$300.00	\$60.00	\$9.47	25.35	\$0.00	\$0.00	\$0.00	0.0	\$300.00	\$60.00	\$9.47	25.35
	2F40T12	Magnetic	95	24	Retrofit	2F32T8	Electronic	60	24	3000	-	3000	\$1,680.00	\$240.00	\$454.38	3.17	\$0.00	\$0.00	\$0.00	0.0	\$1,680.00	\$240.00	\$454.38	3.17
	Inc100	-	100	1	Replace	CFL36	-	36	1	3000	-	3000	\$33.00	\$0.00	\$38.92	0.59	\$0.00	\$0.00	\$0.00	0.0	\$33.00	\$0.00	\$38.92	0.59
	2F20T12	Magnetic	96	4	Retrofit	2F17T8	Electronic	21	4	3000	-	3000	\$280.00	\$40.00	\$52.59	4.55	\$0.00	\$0.00	\$0.00	0.0	\$280.00	\$40.00	\$52.59	4.55
Police Lobby	2F40T12U	Magnetic	92	3	Retrofit	2F32T8U	Electronic	59	3	3000	-	3000	\$240.00	\$30.00	\$52.05	4.03	\$0.00	\$0.00	\$0.00	0.0	\$240.00	\$30.00	\$52.05	4.03
	2F40T12U	Magnetic	92	35	Retrofit	2F32T8U	Electronic	59	35	3000	-	3000	\$2,800.00	\$350.00	\$607.41	4.03	\$0.00	\$0.00	\$0.00	0.0	\$2,800.00	\$350.00	\$607.41	4.03
Water/Tax	4F40T12	Magnetic	192	2	Retrofit	4F32T8	Electronic	112	2	3000	-	3000	\$320.00	\$40.00	\$84.14	3.14	\$0.00	\$0.00	\$0.00	0.0	\$320.00	\$40.00	\$84.14	3.14
Tax Assessor	2F40T12U	Magnetic	92	6	Retrofit	2F32T8U	Electronic	59	6	2400	OSW	1800	\$480.00	\$60.00	\$83.30	5.04	\$200.00	\$20.00	\$58.06	3.1	\$680.00	\$80.00	\$120.84	4.98
Office #2	2F40T12U	Magnetic	92	6	Retrofit	2F32T8U	Electronic	59	6	2400	OSW	1800	\$480.00	\$60.00	\$83.30	5.04	\$200.00	\$20.00	\$58.06	3.1	\$680.00	\$80.00	\$120.84	4.98
Tax Collector	2F40T12U	Magnetic	92	4	Retrofit	2F32T8U	Electronic	59	4	2400	OSW	1800	\$320.00	\$40.00	\$55.54	5.04	\$200.00	\$20.00	\$38.71	4.7	\$520.00	\$60.00	\$80.36	5.72
	2F40T12U	Magnetic	92	6	Retrofit	2F32T8U	Electronic	59	6	3000	-	3000	\$480.00	\$60.00	\$104.13	4.03	\$0.00	\$0.00	\$0.00	0.0	\$480.00	\$60.00	\$104.13	4.03
Finance	F40T12	Magnetic	48	9	Retrofit	F32T8	Electronic	30	9	3000	-	3000	\$540.00	\$90.00	\$75.73	5.94	\$0.00	\$0.00	\$0.00	0.0	\$540.00	\$90.00	\$75.73	5.94
	2F40T12U	Magnetic	92	4	Retrofit	2F32T8U	Electronic	59	4	2000	-	2000	\$320.00	\$40.00	\$46.28	6.05	\$0.00	\$0.00	\$0.00	0.0	\$320.00	\$40.00	\$46.28	6.05
Conference	Inc100	-	100	2	Replace	CFL26	-	26	2	2000	-	2000	\$46.00	\$0.00	\$51.89	0.89	\$0.00	\$0.00	\$0.00	0.0	\$46.00	\$0.00	\$51.89	0.89
Storage	2F40T12U	Magnetic	92	2	Retrofit	2F32T8U	Electronic	59	2	2800	-	2800	\$160.00	\$20.00	\$32.40	4.32	\$0.00	\$0.00	\$0.00	0.0	\$160.00	\$20.00	\$32.40	4.32
Office	2F40T12U	Magnetic	92	4	Retrofit	2F32T8U	Electronic	59	4	2400	OSW	1800	\$320.00	\$40.00	\$55.54	5.04	\$200.00	\$20.00	\$38.71	4.7	\$520.00	\$60.00	\$80.36	5.72
CPO	2F40T12U	Magnetic	92	4	Retrofit	2F32T8U	Electronic	59	4	2400	OSW	1800	\$320.00	\$40.00	\$55.54	5.04	\$200.00	\$20.00	\$38.71	4.7	\$520.00	\$60.00	\$80.36	5.72
Office	2F40T12U	Magnetic	92	4	Retrofit	2F32T8U	Electronic	59	4	2400	OSW	1800	\$320.00	\$40.00	\$55.54	5.04	\$200.00	\$20.00	\$38.71	4.7	\$520.00	\$60.00	\$80.36	5.72
Lobby (Front)	2F40T12	Magnetic	96	4	Retrofit	2F32T8	Electronic	60	4	3000	-	3000	\$280.00	\$40.00	\$75.73	3.17	\$0.00	\$0.00	\$0.00	0.0	\$280.00	\$40.00	\$75.73	3.17
Stairs	2F40T12	Magnetic	96	3	Retrofit	2F32T8	Electronic	60	3	3000	-	3000	\$210.00	\$30.00	\$56.80	3.17	\$0.00	\$0.00	\$0.00	0.0	\$210.00	\$30.00	\$56.80	3.17
Stairs	2F40T12	Magnetic	96	3	Retrofit	2F32T8	Electronic	60	3	3000	-	3000	\$210.00	\$30.00	\$56.80	3.17	\$0.00	\$0.00	\$0.00	0.0	\$210.00	\$30.00	\$56.80	3.17
Basement	-	-	0	0	None	-	-	0	0	0	-	0	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
	2F40T12U	Magnetic	92	10	Retrofit	2F32T8U	Electronic	59	10	3000	-	3000	\$800.00	\$100.00	\$173.55	4.03	\$0.00	\$0.00	\$0.00	0.0	\$800.00	\$100.00	\$173.55	4.03
Main Hall (Front)	F40T12	Magnetic	48	94	Retrofit	F32T8	Electronic	30	94	3000	-	3000	\$5,640.00	\$940.00	\$790.95	5.94	\$0.00	\$0.00	\$0.00	0.0	\$5,640.00	\$940.00	\$790.95	5.94
	F20T12	Magnetic	20	24	Retrofit	F17T8	Electronic	17	24	3000	-	3000	\$1,200.00	\$240.00	\$37.86	25.35	\$0.00	\$0.00	\$0.00	0.0	\$1,200.00	\$240.00	\$37.86	25.35
	2F40T12	Magnetic	96	2	Retrofit	2F32T8	Electronic	60	2	200	-	200	\$140.00	\$20.00	\$25.63	47.54	\$0.00	\$0.00	\$0.00	0.0	\$140.00	\$20.00	\$25.63	47.54
Boiler Room	2F96T12	Magnetic	207	9	Retrofit	2F96T8	Electronic	109	9	200	-	200	\$2,250.00	\$90.00	\$30.92	69.85	\$0.00	\$0.00	\$0.00	0.0	\$2,250.00	\$90.00	\$30.92	69.85
	2F40T12	Magnetic	96	8	Retrofit	2F32T8	Electronic	60	8	2800	-	2800	\$560.00	\$80.00	\$141.35	3.40	\$0.00	\$0.00	\$0.00	0.0	\$560.00	\$80.00	\$141.35	3.40
Storage	2F32T8	Electronic	60	21	None	2F32T8	Electronic	60	21	2800	-	2800	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
	2F40T12U	Magnetic	92	2	Retrofit	2F32T8U	Electronic	59	2	3000	-	3000	\$160.00	\$20.00	\$34.71	4.03	\$0.00	\$0.00	\$0.00	0.0	\$160.00	\$20.00	\$34.71	4.03
Crafts Room	2F40T12	Magnetic	96	1	Retrofit	2F32T8	Electronic	60	1	3000	-	3000	\$70.00	\$10.00	\$18.93	3.17	\$0.00	\$0.00	\$0.00	0.0	\$70.00	\$10.00	\$18.93	3.17
	4F40T12	Magnetic	192	10	Retrofit	4F32T8	Electronic	112	10	3000	-	3000	\$1,100.00	\$200.00	\$420.72	3.14	\$0.00	\$0.00	\$0.00	0.0	\$1,100.00	\$200.00	\$420.72	3.14
Storage	2F40T12	Magnetic	96	2	Retrofit	2F32T8	Electronic	60	2	2800	-	2800	\$140.00	\$20.00	\$35.34	3.40	\$0.00	\$0.00	\$0.00	0.0	\$140.00	\$20.00	\$35.34	3.40
	F40T12	Magnetic	48	2	Retrofit	F32T8	Electronic	30	2	2800	-	2800	\$120.00	\$20.00	\$15.71	6.37	\$0.00	\$0.00	\$0.00	0.0	\$120.00	\$20.00	\$15.71	6.37
	CFL46	-	46	60	None	CFL46	-	46	60	3000	-	3000	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
	4F40T12	Magnetic	192	32	Retrofit	4F32T8	Electronic	112	32	3000	-	3000	\$3,520.00	\$640.00	\$1,346.30	2.14	\$0.00	\$0.00	\$0.00	0.0	\$3,520.00	\$640.00	\$1,346.30	2.14
Lounge	F40T12	Magnetic	48	18	Retrofit	F32T8	Electronic	30	18	3000	-	3000	\$1,080.00	\$180.00	\$151.46	5.94	\$0.00	\$0.00	\$0.00	0.0	\$1,080.00	\$180.00	\$151.46	5.94
	2F40T12	Magnetic	96	1	Retrofit	2F32T8	Electronic	60	1	3000	-	3000	\$70.00	\$10.00	\$18.93	3.17	\$0.00	\$0.00	\$0.00	0.0	\$70.00	\$10.00	\$18.93	3.17
Kitchen	2F40T12	Magnetic	151	10	Retrofit	2F32T8	Electronic	90	10	3000	-	3000	\$900.00	\$200.00	\$320.80	2.18	\$0.00	\$0.00	\$0.00	0.0	\$900.00	\$200.00	\$320.80	2.18
Electrical Room	2F96T12	Magnetic	207	5	Retrofit	2F96T8	Electronic	109	5	200	-	200	\$1,250.00	\$60.00	\$17.18	69.85	\$0.00	\$0.00	\$0.00	0.0	\$1,250.00	\$60.00	\$17.18	69.85
Men's Room	2F40T12	Magnetic	151	3	Retrofit	2F32T8	Electronic	90	3	3200	OSR	1500	\$270.00	\$60.00	\$102.66	2.05	\$260.00	\$35.00	\$135.00	1.7	\$630.00	\$95.00	\$183.12	2.38
	2F40T12	Magnetic	96	1	Retrofit	2F32T8	Electronic	60	1	3200	OSR	1500	\$70.00	\$10.00	\$20.19	2.97	\$0.00	\$0.00	\$28.61	0.0	\$70.00	\$10.00	\$28.61	1.58
Women's Room	2F40T12	Magnetic	151	3	Retrofit																			



Lighting Upgrades
 Estimated Cost: \$1,628.00
 Estimated Savings: \$4,894.89
 Estimated Payback: 0.31682228

Township of Wall
 Wall Police Department
 2700 Allaire Road, Wall, NJ

Sensor Upgrades (Pre-Lighting Upgrade)
 Estimated Cost: \$720.00
 Estimated Savings: \$164.86
 Estimated Payback: 4.387660748

Lighting & Sensor Upgrades
 Estimated Cost: \$2,248.00
 Estimated Savings: \$4,990.83
 Estimated Payback: 0.45004341

Average Cost/kW: \$0.18

Room/Area	Existing Fixtures				Upgrade Type	Recommended Fixtures				Fixture Use (hr/yr)	Recommended Controls	Post-Sensor Use (hr/yr)	Lighting			Occupancy Sensors (ONLY)			Lighting & Occupancy Sensors					
	Type	Ballast	Wattage	Qty.		Type	Ballast	Wattage	Qty.				Cost (\$)	SmartStart Rebate (\$)	Savings (\$)	Payback (yrs)	Cost (\$)	SmartStart Rebate (\$)	Savings (\$)	Payback (yrs)	Cost (\$)	SmartStart Rebate (\$)	Savings (\$)	Payback (yrs)
Admin. Hall	2F3278U	Electronic	59	15	None	2F3278U	Electronic	59	15	8750	-	8750	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Dispatch	3F40712	Magnetic	151	3	Retrofit	3F3278	Electronic	90	3	8750	-	8750	\$270.00	\$50.00	\$28.02	0.75	\$0.00	\$0.00	\$0.00	0.00	\$270.00	\$50.00	\$28.02	0.75
Office	3F40712	Magnetic	151	3	Retrofit	3F3278	Electronic	90	3	2400	-	2400	\$270.00	\$50.00	\$76.99	2.73	\$0.00	\$0.00	\$0.00	0.00	\$270.00	\$50.00	\$76.99	2.73
Conference Room	Inc40	-	40	12	Replace	CFL14	-	14	12	2000	-	2000	\$84.00	\$0.00	\$109.39	0.77	\$0.00	\$0.00	\$0.00	0.00	\$84.00	\$0.00	\$109.39	0.77
	CFL46	-	46	64	None	CFL46	-	46	64	2000	-	2000	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Office	3F3278	Electronic	90	4	None	3F3278	Electronic	90	4	2400	OGW	1800	\$0.00	\$0.00	\$0.00	0.00	\$200.00	\$20.00	\$37.86	4.8	\$200.00	\$20.00	\$37.86	4.75
Office	3F3278	Electronic	90	4	None	3F3278	Electronic	90	4	2400	OGW	1800	\$0.00	\$0.00	\$0.00	0.00	\$200.00	\$20.00	\$37.86	4.8	\$200.00	\$20.00	\$37.86	4.75
Men's Room	3F3278	Electronic	90	1	None	3F3278	Electronic	90	1	4380	OGW	2000	\$0.00	\$0.00	\$0.00	0.00	\$200.00	\$20.00	\$37.55	4.8	\$200.00	\$20.00	\$37.55	4.79
Women's Room	3F3278	Electronic	90	1	None	3F3278	Electronic	90	1	4380	OGW	2000	\$0.00	\$0.00	\$0.00	0.00	\$200.00	\$20.00	\$37.55	4.8	\$200.00	\$20.00	\$37.55	4.79
Employee Entrance	CFL46	-	46	8	None	CFL46	-	46	8	8750	-	8750	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Jail Cell Area	3F3278	Electronic	90	10	None	3F3278	Electronic	90	10	8750	-	8750	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Room #1	3F3278	Electronic	90	2	None	3F3278	Electronic	90	2	8750	-	8750	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Room #2	3F3278	Electronic	90	2	None	3F3278	Electronic	90	2	8750	-	8750	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Rest Room	Inc40	-	40	2	Replace	CFL14	-	14	2	2000	-	1000	\$14.00	\$0.00	\$18.23	0.77	\$0.00	\$0.00	\$14.02	0.00	\$14.00	\$0.00	\$23.14	0.61
Kitchen	3F3278	Electronic	90	2	None	3F3278	Electronic	90	2	8750	-	8750	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Cell Hall	3F3278	Electronic	90	3	None	3F3278	Electronic	90	3	8750	-	8750	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Cell #1	3F3278	Electronic	90	1	None	3F3278	Electronic	90	1	8750	-	8750	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Cell #2	3F3278	Electronic	90	1	None	3F3278	Electronic	90	1	8750	-	8750	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Cell #3	3F3278	Electronic	90	1	None	3F3278	Electronic	90	1	8750	-	8750	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Cell #4	3F3278	Electronic	90	1	None	3F3278	Electronic	90	1	8750	-	8750	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Cell #5	3F3278	Electronic	90	1	None	3F3278	Electronic	90	1	8750	-	8750	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Garage Bay 1	2F3278	Electronic	60	5	None	2F3278	Electronic	60	5	8750	-	8750	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
IT	3F3278	Electronic	90	2	None	3F3278	Electronic	90	2	6000	-	6000	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Server Room	2F3278	Electronic	60	2	None	2F3278	Electronic	60	2	2000	-	2000	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Break Room	2F3278	Electronic	60	2	None	2F3278	Electronic	60	2	8750	-	8750	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Elevator	2F3278	Electronic	60	1	None	2F3278	Electronic	60	1	8750	-	8750	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Hall (continued)	2F3278	Electronic	60	1	None	2F3278	Electronic	60	1	8750	-	8750	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Dispatch	2F1778	Electronic	31	8	None	2F1778	Electronic	31	8	8750	-	8750	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Rest Room	2F3278	Electronic	60	1	None	2F3278	Electronic	60	1	4380	-	4380	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Interview Room #1	2F3278	Electronic	60	2	None	2F3278	Electronic	60	2	2000	-	2000	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Interview Room #2	2F3278	Electronic	60	2	None	2F3278	Electronic	60	2	2000	-	2000	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Interview Hall	2F3278U	Electronic	59	2	None	2F3278U	Electronic	59	2	2000	-	2000	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Counseling	2F3278	Electronic	60	2	None	2F3278	Electronic	60	2	2400	-	2400	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Side Entrance	CFL46	-	46	6	None	CFL46	-	46	6	8750	-	8750	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Records	3F3278	Electronic	90	12	None	3F3278	Electronic	90	12	4380	-	4380	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Storage	2F3278	Electronic	60	2	None	2F3278	Electronic	60	2	2000	-	2000	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Juv. Detective Bureau	2F3278	Electronic	60	20	None	2F3278	Electronic	60	20	2400	-	2400	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Interview Room	2F3278	Electronic	60	2	None	2F3278	Electronic	60	2	2000	-	2000	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Break Room	2F3278	Electronic	60	2	None	2F3278	Electronic	60	2	8750	-	8750	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Conference Office	2F3278	Electronic	60	6	None	2F3278	Electronic	60	6	2000	-	2000	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Office	3F3278	Electronic	90	3	None	3F3278	Electronic	90	3	2400	-	2400	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Office	3F3278	Electronic	90	3	None	3F3278	Electronic	90	3	2400	-	2400	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Interview Room	3F3278	Electronic	90	2	None	3F3278	Electronic	90	2	2000	-	2000	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Evidence Room	2F3278	Electronic	60	4	None	2F3278	Electronic	60	4	3000	-	3000	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
	2F3278	Electronic	60	1	None	2F3278	Electronic	60	1	3000	-	3000	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Garage Bay 3	2F3278	Electronic	60	3	None	2F3278	Electronic	60	3	8750	-	8750	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Hallway	2F3278	Electronic	60	6	None	2F3278	Electronic	60	6	8750	-	8750	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
	CFL46	-	46	4	None	CFL46	-	46	4	8750	-	8750	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Utility	2F3278	Electronic	60	1	None	2F3278	Electronic	60	1	2400	-	2400	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Men's Room	2F3278	Electronic	60	4	None	2F3278	Electronic	60	4	4380	-	4380	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Women's Room	2F3278	Electronic	60	4	None	2F3278	Electronic	60	4	4380	-	4380	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Chief's Office	3F3278	Electronic	90	9	None	3F3278	Electronic	90	9	2400	-	2400	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00
Chief's Office (Rest Room)	2F3278	Electronic	60	1	None	2F3278	Electronic	60	1	600	-	600	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.00

Chief's Office (Closet)	CFL46	-	46	1	None	CFL46	-	46	1	200	-	200	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
Secretary	2F3278	Electronic	60	4	None	2F3278	Electronic	60	4	2400	-	2400	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
File Room	2F3278	Electronic	60	3	None	2F3278	Electronic	60	3	4000	-	4000	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
Office	3F3278	Electronic	90	4	None	3F3278	Electronic	90	4	2400	-	2400	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
2nd Floor	-	-	0	-	-	-	-	0	0	-	-	0	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
Stairway	2F3278	Electronic	60	5	None	2F3278	Electronic	60	5	8760	-	8760	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
Hallway	2F3278	Electronic	60	1	None	2F3278	Electronic	60	1	8760	-	8760	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
	CFL46	-	46	4	None	CFL46	-	46	4	8760	-	8760	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
Storage Area	2F3278	Electronic	60	5	None	2F3278	Electronic	60	5	2000	-	2000	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
	2F3278	Electronic	60	4	None	2F3278	Electronic	60	4	2000	-	2000	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
Mechanical Area	Inc100	-	100	4	Replace	CFL26	-	26	4	2000	-	2000	\$92.00	\$0.00	\$103.78	0.89	\$0.00	\$0.00	\$0.00	0.0	\$92.00	\$0.00	\$103.78	0.89
	3F3278	Electronic	90	3	None	3F3278	Electronic	90	3	8760	-	8760	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
	2F3278	Electronic	60	1	None	2F3278	Electronic	60	1	8760	-	8760	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
EMO	2F3278	Electronic	60	1	None	2F3278	Electronic	60	1	8760	-	8760	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
	Inc150	-	150	2	Replace	CFL46	-	46	2	8760	-	8760	\$52.00	\$0.00	\$319.41	0.16	\$0.00	\$0.00	\$0.00	0.0	\$52.00	\$0.00	\$319.41	0.16
Basement	-	-	0	-	-	-	-	0	0	-	-	0	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
Lounge	2F3278	Electronic	60	8	None	2F3278	Electronic	60	8	8760	-	8760	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
Training	2F3278	Electronic	60	12	None	2F3278	Electronic	60	12	4380	-	4380	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
Office	2F3278	Electronic	60	4	None	2F3278	Electronic	60	4	2400	-	2400	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
Storage	2F3278	Electronic	60	1	None	2F3278	Electronic	60	1	2000	-	2000	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
Hallway	2F3278	Electronic	60	10	None	2F3278	Electronic	60	10	8760	-	8760	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
Gym	2F3278	Electronic	60	22	None	2F3278	Electronic	60	22	8760	-	8760	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
Storage #1	2F3278	Electronic	60	7	None	2F3278	Electronic	60	7	2000	-	2000	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
Storage #2	2F40T12	Magnetic	96	1	Retrofit	2F3278	Electronic	60	1	2000	-	2000	\$70.00	\$10.00	\$12.62	4.75	\$0.00	\$0.00	\$0.00	0.0	\$70.00	\$10.00	\$12.62	4.75
Hall Storage	2F3278	Electronic	60	1	None	2F3278	Electronic	60	1	2000	-	2000	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
Training	2F3278	Electronic	90	10	None	3F3278	Electronic	90	10	4380	-	4380	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
Training Mech.	2F40T12	Magnetic	96	2	Retrofit	2F3278	Electronic	60	2	2000	-	2000	\$140.00	\$20.00	\$25.24	4.75	\$0.00	\$0.00	\$0.00	0.0	\$140.00	\$20.00	\$25.24	4.75
Training Office	2F3278	Electronic	60	2	None	2F3278	Electronic	60	2	2400	-	2400	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
Men's Locker Room	2F3278	Electronic	60	26	None	2F3278	Electronic	60	26	8760	-	8760	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
Men's Locker Room Rest Room	2F3278	Electronic	60	2	None	2F3278	Electronic	60	2	8760	-	8760	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
	CFL46	-	46	6	None	CFL46	-	46	6	8760	-	8760	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
Utility	2F3278	Electronic	60	1	None	2F3278	Electronic	60	1	2400	-	2400	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
	2F3278	Electronic	60	1	None	2F3278	Electronic	60	1	8760	-	8760	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	0.0	\$0.00	\$0.00	\$0.00	0.00
Shooting Range	2F40T12	Magnetic	96	1	Retrofit	2F3278	Electronic	60	1	8760	-	8760	\$70.00	\$10.00	\$55.28	1.09	\$0.00	\$0.00	\$0.00	0.0	\$70.00	\$10.00	\$55.28	1.09
	Inc150	-	150	24	Replace	CFL46	-	46	24	8760	-	8760	\$624.00	\$0.00	\$3,832.93	0.16	\$0.00	\$0.00	\$0.00	0.0	\$624.00	\$0.00	\$3,832.93	0.16



BIRDSALL SERVICES GROUP
ENGINEERS & CONSULTANTS

Township of Wall
Wall Public Library
2700 Allaire Road, Wall, NJ

Lighting Upgrades
Estimated Cost: \$40,876.00
Estimated Savings: \$10,398.82
Estimated Payback: 3.95431124

Sensor Upgrades (Pre-Lighting Upgrade)
Estimated Cost: \$810.00
Estimated Savings: \$367.42
Estimated Payback: 2.208246466

Lighting & Sensor Upgrades
Estimated Cost: \$41,686.00
Estimated Savings: \$10,684.40
Estimated Payback: 3.84679768

Average Cost/kWh: \$0.18

Room/Area	Existing Fixtures				Upgrade Type	Recommended Fixtures				Fixture Use (hr/yr)	Recommended Controls	Post-Sensor Use (hr/yr)	Lighting				Occupancy Sensors (ONLY)				Lighting & Occupancy Sensors			
	Type	Ballast	Wattage	Qty.		Type	Ballast	Wattage	Qty.				Cost (\$)	SmartStart Rebate (\$)	Savings (\$)	Payback (yrs)	Cost (\$)	SmartStart Rebate (\$)	Savings (\$)	Payback (yrs)	Cost (\$)	SmartStart Rebate (\$)	Savings (\$)	Payback (yrs)
Main Area	F40T12	Magnetic	46	171	Retrofit	F32T8	Electronic	30	171	3000	-	3000	\$10,260.00	\$1,710.00	\$1,335.44	6.40	\$0.00	\$0.00	\$0.00	\$0.00	\$1,710.00	\$1,335.44	6.40	
	inc100	-	100	4	Replace	OFL36	-	26	4	3000	-	3000	\$92.00	\$0.00	\$144.48	0.64	\$0.00	\$0.00	\$0.00	\$0.00	\$92.00	\$0.00	0.64	
	2F40T12U	Magnetic	92	28	Retrofit	2F32T8U	Electronic	59	28	3000	-	3000	\$2,340.00	\$280.00	\$461.00	4.36	\$0.00	\$0.00	\$0.00	\$0.00	\$2,340.00	\$280.00	4.36	
	F96T12	Magnetic	96	36	Retrofit	F96T8	Electronic	58	36	3000	-	3000	\$5,400.00	\$360.00	\$667.72	7.55	\$0.00	\$0.00	\$0.00	\$0.00	\$5,400.00	\$360.00	7.55	
	inc60	-	60	15	Replace	OFL14	-	14	15	3000	-	3000	\$105.00	\$0.00	\$336.79	0.31	\$0.00	\$0.00	\$0.00	\$0.00	\$105.00	\$0.00	0.31	
	MV	-	150	48	Replace	OFL46	-	46	48	3000	-	3000	\$1,248.00	\$0.00	\$2,436.60	0.51	\$0.00	\$0.00	\$0.00	\$0.00	\$1,248.00	\$0.00	0.51	
	2F96T12	Magnetic	207	32	Retrofit	2F96T8	Electronic	109	32	3000	-	3000	\$8,000.00	\$320.00	\$1,530.68	5.02	\$0.00	\$0.00	\$0.00	\$0.00	\$8,000.00	\$320.00	5.02	
	2F40T12	Magnetic	96	12	Retrofit	2F32T8	Electronic	60	12	3000	-	3000	\$840.00	\$120.00	\$210.86	3.41	\$0.00	\$0.00	\$0.00	\$0.00	\$840.00	\$120.00	3.41	
	F40T12	Magnetic	46	142	Retrofit	F32T8	Electronic	30	142	3000	-	3000	\$8,520.00	\$1,420.00	\$1,108.96	6.40	\$0.00	\$0.00	\$0.00	\$0.00	\$8,520.00	\$1,420.00	6.40	
	2F40T12U	Magnetic	92	11	Retrofit	2F32T8U	Electronic	59	11	2400	-	2400	\$880.00	\$110.00	\$141.74	5.43	\$0.00	\$0.00	\$0.00	\$0.00	\$880.00	\$110.00	5.43	
Office	2F40T12U	Magnetic	92	6	Retrofit	2F32T8U	Electronic	59	6	2400	OBW	1800	\$480.00	\$60.00	\$77.32	5.43	\$200.00	\$53.89	3.3	\$680.00	\$80.00	\$111.87	5.36	
Back Room #2	2F40T12U	Magnetic	92	14	Retrofit	2F32T8U	Electronic	59	14	2400	-	2400	\$1,120.00	\$140.00	\$190.40	5.43	\$0.00	\$0.00	\$0.00	\$0.00	\$1,120.00	\$140.00	5.43	
Back Room Closet	2F40T12U	Magnetic	92	1	Retrofit	2F32T8U	Electronic	59	1	200	-	200	\$60.00	\$10.00	\$1.07	65.19	\$0.00	\$0.00	\$0.00	\$0.00	\$60.00	\$10.00	65.19	
Lobby	inc150	-	150	13	Replace	OFL46	-	46	13	3000	-	3000	\$336.00	\$0.00	\$659.91	0.51	\$0.00	\$0.00	\$0.00	\$0.00	\$336.00	\$0.00	0.51	
	2F40T12	Magnetic	96	7	Retrofit	2F32T8	Electronic	60	7	3000	-	3000	\$480.00	\$70.00	\$123.00	3.41	\$0.00	\$0.00	\$0.00	\$0.00	\$480.00	\$70.00	3.41	
Men's Room	2F40T12U	Magnetic	92	4	Retrofit	2F32T8U	Electronic	59	4	3200	OGR	1500	\$320.00	\$40.00	\$68.72	4.07	\$260.00	\$35.00	\$101.79	2.2	\$580.00	\$75.00	\$134.00	3.77
	2F40T12	Magnetic	96	1	Retrofit	2F32T8	Electronic	60	1	3200	-	1500	\$70.00	\$10.00	\$18.74	3.20	\$0.00	\$26.55	0.0	\$0.00	\$70.00	\$10.00	\$35.34	1.70
Women's Room	2F40T12	Magnetic	92	4	Retrofit	2F32T8U	Electronic	59	4	3200	OGR	1500	\$320.00	\$40.00	\$68.72	4.07	\$260.00	\$35.00	\$101.79	2.2	\$580.00	\$75.00	\$134.00	3.77
	2F40T12	Magnetic	96	1	Retrofit	2F32T8	Electronic	60	1	3200	-	1500	\$70.00	\$10.00	\$18.74	3.20	\$0.00	\$26.55	0.0	\$0.00	\$70.00	\$10.00	\$35.34	1.70
Meeting Room	inc100	-	100	5	Replace	OFL36	-	26	5	2400	-	2400	\$115.00	\$0.00	\$144.48	0.80	\$0.00	\$0.00	\$0.00	\$0.00	\$115.00	\$0.00	\$144.48	0.80
	2F40T12U	Magnetic	92	20	Retrofit	2F32T8U	Electronic	59	20	2400	-	2400	\$1,600.00	\$200.00	\$257.72	5.43	\$0.00	\$0.00	\$0.00	\$0.00	\$1,600.00	\$200.00	\$257.72	5.43
Break Room	2F40T12	Magnetic	96	2	Retrofit	2F32T8	Electronic	60	2	3000	OBW	1500	\$140.00	\$20.00	\$35.14	3.41	\$200.00	\$46.96	3.8	\$340.00	\$40.00	\$64.43	4.68	
Break Room Closet	inc60	-	60	1	Replace	OFL14	-	14	1	200	-	200	\$7.00	\$0.00	\$1.50	4.68	\$0.00	\$0.00	\$0.00	\$0.00	\$7.00	\$0.00	\$1.50	4.68
Storage	2F40T12	Magnetic	96	3	Retrofit	2F32T8	Electronic	60	3	2800	-	2800	\$210.00	\$30.00	\$49.20	3.66	\$0.00	\$0.00	\$0.00	\$0.00	\$210.00	\$30.00	\$49.20	3.66
Boiler Room	2F96T12	Magnetic	207	12	Retrofit	2F96T8	Electronic	109	12	1400	-	1400	\$3,000.00	\$120.00	\$267.87	10.75	\$0.00	\$0.00	\$0.00	\$0.00	\$3,000.00	\$120.00	\$267.87	10.75



BIRDSALL SERVICES GROUP
ENGINEERS & CONSULTANTS

Township of Wall
Department of Public Works
Tilton Corner Road & Ridgewood Road, Wall, NJ

Lighting Upgrades
Estimated Cost: \$21,298.00
Estimated Savings: \$3,806.87
Estimated Payback: 5.60582732

Sensor Upgrades (Pre-Lighting Upgrade)
Estimated Cost: \$2,070.00
Estimated Savings: \$776.55
Estimated Payback: 2.68806824

Lighting & Sensor Upgrades
Estimated Cost: \$23,368.00
Estimated Savings: \$4,683.88
Estimated Payback: 6.72432438

Average Cost/kWh: \$0.18

Room/Area	Existing Fixtures				Upgrade Type	Recommended Fixtures				Fixture Use (hr/yr)	Recommended Controls	Post-Sensor Use (hr/yr)	Lighting				Occupancy Sensors (ONLY)				Lighting & Occupancy Sensors			
	Type	Ballast	Wattage	Qty.		Type	Ballast	Wattage	Qty.				Cost (\$)	SmartStart Rebate (\$)	Savings (\$)	Payback (yrs)	Cost (\$)	SmartStart Rebate (\$)	Savings (\$)	Payback (yrs)	Cost (\$)	SmartStart Rebate (\$)	Savings (\$)	Payback (yrs)
Garage	2F32T8	Electronic	60	6	None	2F32T8	Electronic	60	6	2080	-	2080	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.00	
Garage	2F96T12	Magnetic	207	69	Retrofit	2F96T8	Electronic	109	69	2080	-	2080	\$17,250.00	\$690.00	\$2,472.62	6.70	\$0.00	\$0.00	\$0.00	\$0.00	\$17,250.00	\$690.00	\$2,472.62	6.70
Garage	Halogen	-	-	1	None	-	-	-	1	2080	-	2080	\$0.00	\$0.00	\$0.00	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.00	
Office	2F40T12	Magnetic	96	10	Retrofit	2F32T8	Electronic	60	10	2080	OBW	2080	\$700.00	\$100.00	\$131.64	4.56	\$200.00	\$0.00	\$131.64	3.90	\$900.00	\$120.00	\$131.64	5.93
Work Room	2F40T12	Magnetic	96	3	Retrofit	2F32T8	Electronic	60	3	2080	OBW	1400	\$210.00	\$30.00	\$39.49	4.56	\$200.00	\$34.43	5.2	\$410.00	\$60.00	\$61.01	5.90	
Electrical Room	2F96T12	Magnetic	207	1	Retrofit	2F96T8	Electronic	109	1	200	-	200	\$260.00	\$10.00	\$2.45	69.65	\$0.00	\$0.00	\$0.00	\$0.00	\$260.00	\$10.00	\$2.45	69.65
Locker Room	4F32T8	Electronic	112	1	None	4F32T8	Electronic	112	1	2080	OGR	1040	\$0.00	\$0.00	\$0.00	0.00	\$250.00	\$35.00	\$20.48	11.9	\$250.00	\$35.00	\$20.48	10.99
Carpentry Shop	2F40T12	Magnetic	96	10	Retrofit	2F32T8	Electronic	60	10	2080	-	1400	\$700.00	\$100.00	\$131.64	4.56	\$200.00	\$0.00	\$131.64	3.90	\$900.00	\$120.00	\$131.64	5.93
Carpentry Shop	2F40T12	Magnetic	151	10	Retrofit	2F32T8	Electronic	60	10	2080	OBW	1400	\$900.00	\$200.00	\$233.06	3.14	\$0.00	\$180.51	0.0	\$900.00	\$200.00	\$233.06	2.12	
Garage	2F40T12	Magnetic	96	2	Retrofit	2F32T8	Electronic	60	2	2080	-	2080	\$140.00	\$20.00	\$26.33	4.56	\$0.00	\$0.00	\$0.00	\$0.00	\$140.00	\$20.00	\$26.33	4.56
Hallway	2F40T12	Magnetic	96	2	Retrofit	2F32T8	Electronic	60	2	2080	-	2080	\$140.00	\$20.00	\$26.33	4.56	\$0.00	\$0.00	\$0.00	\$0.00	\$140.00	\$20.00	\$26.33	4.56
Office	4F40T12	Magnetic	192	2	Retrofit	4F32T8	Electronic	112	2	2080	OBW	1400	\$220.00	\$40.00	\$58.51	3.08	\$200.00	\$45.90	3.9	\$420.00	\$60.00	\$58.29	4.22	
Office	2F40T12U	Magnetic	92	1	Retrofit	2F32T8U	Electronic	59	1	2080	-	1400	\$80.00	\$10.00	\$12.07	5.80	\$0.00	\$11.00	0.0	\$80.00	\$10.00	\$12.07	3.66	
Office	2F40T12	Magnetic	96	2	Retrofit	2F32T8	Electronic	60	2	2080	OBW	1400	\$140.00	\$20.00	\$26.33	4.56	\$200.00	\$22.99	7.8	\$340.00	\$40.00	\$40.67	7.38	
Locker Room	4F40T12	Magnetic	192	2	Retrofit	4F32T8	Electronic	112	2	2080	OBW	1040	\$220.00	\$40.00	\$58.51	3.08	\$260.00	\$35.00	\$70.21	3.2	\$480.00	\$75.00	\$99.46	4.07
Landscaping Storage	2F40T12	Magnetic	96	1	Retrofit	2F32T8	Electronic	60	1	2080	OBW	1400	\$70.00	\$10.00	\$13.16	4.56	\$200.00	\$11.48	15.7	\$270.00	\$30.00	\$20.34	11.80	
Landscaping Storage	2F96T12	Magnetic	207	1	Retrofit	2F96T8	Electronic	109	1	2080	-	1400	\$250.00	\$10.00	\$35.84	6.70	\$0.00	\$24.75	0.0	\$250.00	\$10.00	\$35.87	4.91	
Blars	2F40T12U	Magnetic	92	1	Retrofit	2F32T8U	Electronic	59	1	2080	-	2080	\$90.00	\$10.00	\$12.07	5.80	\$0.00	\$0.00	\$0.00	\$0.00	\$90.00	\$10.00	\$12.07	5.80
Blars	2F20T12	Magnetic	55	1	Retrofit	2F11T8	Electronic	31	1	2080	-	2080	\$70.00	\$10.00	\$9.14	6.56	\$0.00	\$0.00	\$0.00	\$0.00	\$70.00	\$10.00	\$9.14	6.56
Office	2F40T12U	Magnetic	92	4	Retrofit	2F32T8U	Electronic	59	4	2080	-	1400	\$32											

Appendix B: Third Party Energy Suppliers (ESCOs)

Third Party Electric Suppliers for PSEG Service Territory	Telephone & Web Site	Third Party Gas Suppliers for Elizabethtown Gas Co. Service Territory	Telephone & Web Site
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com	Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109	(800) 628-9427 www.cooperativenet.com
American Powernet Management, LP 437 North Grove St. Berlin, NJ 08009	(877) 977-2636 www.americanpowernet.com	Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
BOC Energy Services, Inc. 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 www.boc.com	Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 www.gesc.com
Commerce Energy, Inc. 4400 Route 9 South, Suite 100 Freehold, NJ 07728	(800) 556-8457 www.commerceenergy.com	UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com
ConEdison Solutions 535 State Highway 38 Cherry Hill, NJ 08002	(888) 665-0955 www.conedsolutions.com	Great Eastern Energy 116 Village Riva, Suite 200 Princeton, NJ 08540	(888) 651-4121 www.greateastern.com
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 www.newenergy.com	Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.com
Credit Suisse, (USA) Inc. 700 College Road East Princeton, NJ 08450	(212) 538-3124 www.creditsuisse.com	Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com	Intelligent Energy 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	(800) 724-1880 www.intelligentenergy.org
FirstEnergy Solutions 300 Madison Avenue Morristown, NJ 07926	(800) 977-0500 www.fes.com	Metromedia Energy, Inc. 6 Industrial Way Eatontown, NJ 07724	(877) 750-7046 www.metromediaenergy.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.com	MxEnergy, Inc. 510 Thornall Street, Suite 270 Edison, NJ 08837	(800) 375-1277 www.mxenergy.com
Metro Energy Group, LLC 14 Washington Place Hackensack, NJ 07601	(888) 536-3876 www.metroenergy.com	NATGASCO (Mitchell Supreme) 532 Freeman Street Orange, NJ 07050	(800) 840-4427 www.natgasco.com
Integrus Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 www.integrusenergy.com	Pepco Energy Services, Inc. 112 Main Street Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
Liberty Power Delaware, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(866) 769-3799 www.libertypowercorp.com	PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
Liberty Power Holdings, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(800) 363-7499 www.libertypowercorp.com	South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Pepco Energy Services, Inc. 112 Main St. Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com	Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com	Woodruff Energy 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 www.woodruffenergy.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		