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**Local Government Energy Program  
Energy audit report  
Final; 2/1/2010**

*For*

***Somerset Hall  
Raritan Valley Community College  
North Branch, NJ 08876***

***Project Number: LGEA05***



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## **INTRODUCTION**

On April 21<sup>st</sup>, 22<sup>nd</sup>, 23<sup>rd</sup> & 24<sup>th</sup>, 2009; Steven Winter Associates, Inc. (SWA) performed an energy audit and assessment of the Raritan Valley Community College (RVCC) buildings located in North Branch, NJ. Current conditions and energy-related information was collected in order to analyze and facilitate the implementation of energy conservation measures for the building.

Energy data collected in the field was imported into the eQUEST energy conservation software to generate a baseline model of the building. SWA simulated the installation of energy improvement measures on the baseline model of the building. Energy saving calculations and projected economics are automated and served as the basis for our conclusions.

There are eleven separate buildings that were evaluated for this energy audit; Somerset Hall, Hunterdon Hall, East Building/Planetarium, College Center, Physical Education Building, Library/Theater, Conference Center (ATCC), Science Building, West Building, Arts Building and also the Child Care Center (CCC) buildings. The buildings were built at different times as the college expanded. Each building is unique in area and also building construction.

Only CCC and Arts building have their individual electric meters; other buildings are connected to the main campus electric meter. Science building has its own gas meter; other buildings that use gas are connected to the main campus gas meter. The campus has a district cooling and heating plant that serves chilled water and hot water to various buildings connected to the campus loop; ATCC, Science building, Arts building, and CCC are not connected to this loop. The gas to the boiler providing hot water to the loop is metered separately. The central plant is also equipped with a cogenerator, the gas for which is metered separately. Hence, there are three main gas meters in the campus that are directly or indirectly connected to the eleven buildings: Main campus gas meter, Boiler plant gas meter, and Cogen gas meter.

The present report is for Somerset Hall only.

Somerset Hall houses RVCC administrative offices, classrooms and a learning center. The four-story building consists of 70,200 square feet and is fully conditioned. The building is operated from 7am to 10pm on weekdays and occasionally on weekends for classes.

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

## EXECUTIVE SUMMARY

The energy audit performed by SWA encompasses eleven buildings of various ages and constructions. A report has been generated for each building in order to fully document the existing conditions and recommended Energy Conservation Measures (ECMs). Based on the field visits performed by Steven Winter Associates (SWA) staff on April 21<sup>st</sup>, 22<sup>nd</sup>, 23<sup>rd</sup> and 24<sup>th</sup>, 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 and 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.

Somerset Hall is currently not metered separately and receives both electricity and gas from main campus meters. In the most recent year (March 2008-February 2009), the RVCC main electric meter recorded approximately 7,807,991 kWh or \$1,224,758.25 worth of electricity. The total amount of gas recorded by the three main gas meters in the campus was 392,183 therms or \$534,089.63 worth of natural gas. Since the Somerset Hall building is not metered separately for gas, SWA estimated the amount of gas consumed by this building alone, directly or indirectly, on a pro-rata basis by its square footage. The Somerset Hall building consumed 76,472 therms of gas during this period at a total cost of \$104,160.44

SWA benchmarked Somerset Hall as part of the RVCC campus using the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. The Portfolio Manager is not currently capable of generating a benchmark score for the building to compare on a national average since the building is part of a campus. The Portfolio Manager is capable of generating a site energy use intensity number using the 12 months prior to February 2009 as a baseline year. The site energy use intensity for the RVCC campus is 184 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 of a different time period can be compared to the current year baseline to show changes in energy consumption over time.

SWA recommends a total of 4 Energy Conservation Measures (ECMs) for Somerset Hall. The total investment cost for these ECMs is **\$172,162**. The total investment cost for these ECMs if maximum incentives are achieved is **\$160,892**. SWA estimates a first year savings of **\$29,675** with a simple payback of **5.8 years**. SWA estimates that implementing the recommended ECMs will reduce the carbon footprint of Somerset Hall by **225,467 lbs of CO<sub>2</sub> annually**.

There are various incentives that Somerset Hall could apply for that could also help lower the cost of installing the ECMs. SWA recommends that Somerset Hall applies for the NJ SmartStart program through the New Jersey Office of Clean Energy. This incentive can help provide technical assistance for the building in the implementation phase of any energy conservation project. RVCC should consider applying to the New Jersey Clean Energy Pay-for-Performance Program. Additional details are available in the SWA document "Energy Audit Report Summary" for all buildings. There are also prescriptive measure incentives that would pay RVCC up to \$1,050 for lighting, up to \$2,220 for upgrading lighting controls, and \$400 for replacing the electric DHW heater. The total amount of incentives available for Somerset Hall is **\$3,270** and the total investment cost if all the incentives are paid to their maximum amount is **\$160,892**.

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

ECM Table without Incentives															
ECM#	ECM description	Installed Cost		1st year energy savings							SPP	LoM	Lifetime		Annual Carbon Reduction (lbs of CO2)
		Estimated \$	Source	Electric Savings (kWh)	Unit	Natural Gas Savings (therms)	Unit	Demand	Unit	\$ Savings/year			Cost Savings	ROI	
1a	Upgrade existing lighting	\$ 6,920	RSMeans	9,238	kWh	-	therms	1.1	kW	\$ 1,432	4.8	20	\$ 20,914	10.1%	16,541
1b	Upgrade existing lighting controls	\$ 24,420	RSMeans	39,033	kWh	-	therms	0.0	kW	\$ 6,050	4.0	12	\$ 59,510	12.0%	69,888
2	Weather-strip exterior doors	\$ 422	RSMeans	-	kWh	76	therms	0.0	kW	\$ 123	3.4	10	\$ 1,040	14.6%	838
4	Replace pneumatic controls	\$ 140,400	Similar project	25,120	kWh	8,652	therms	0.0	kW	\$ 22,070	6.4	10	\$ 186,354	3.3%	138,201
<b>Total</b>	<b>Total Scope of Work</b>	<b>\$ 172,162</b>	<b>-</b>	<b>73,391</b>	<b>-</b>	<b>8,728</b>		<b>1.1</b>	<b>-</b>	<b>\$ 29,675</b>	<b>5.8</b>		<b>\$ 267,817</b>		<b>225,467</b>

ECM Table including Incentives															
ECM#	ECM description	Installed Cost		1st year energy savings							SPP	LoM	Lifetime		Annual Carbon Reduction (lbs of CO2)
		Estimated \$	Source	Electric Savings (kWh)	Unit	Natural Gas Savings (therms)	Unit	Demand	Unit	\$ Savings/year			Cost Savings	ROI	
1a	Upgrade existing lighting	\$ 5,870	RSMeans	9,238	kWh	-	therms	1.1	kW	\$ 1,432	4.1	20	\$ 20,914	12.8%	16,541
1b	Upgrade existing lighting controls	\$ 22,200	RSMeans	39,033	kWh	-	therms	0.0	kW	\$ 6,050	3.7	12	\$ 59,510	14.0%	69,888
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<b>Total</b>	<b>Total Scope of Work</b>	<b>\$ 168,892</b>	<b>-</b>	<b>73,391</b>	<b>-</b>	<b>8,728</b>		<b>1.1</b>	<b>-</b>	<b>\$ 29,675</b>	<b>5.7</b>		<b>\$ 267,817</b>		<b>225,467</b>

**Definitions:**

SPP: Simple Payback (years)

LoM: Life of Measure (years)

ROI: Return on Investment (%)

**Assumptions:**

Discount rate:

3.2% per DOE FEMP guidelines

Energy price escalation rate:

0% per DOE FEMP guidelines

# 1. HISTORIC ENERGY CONSUMPTION

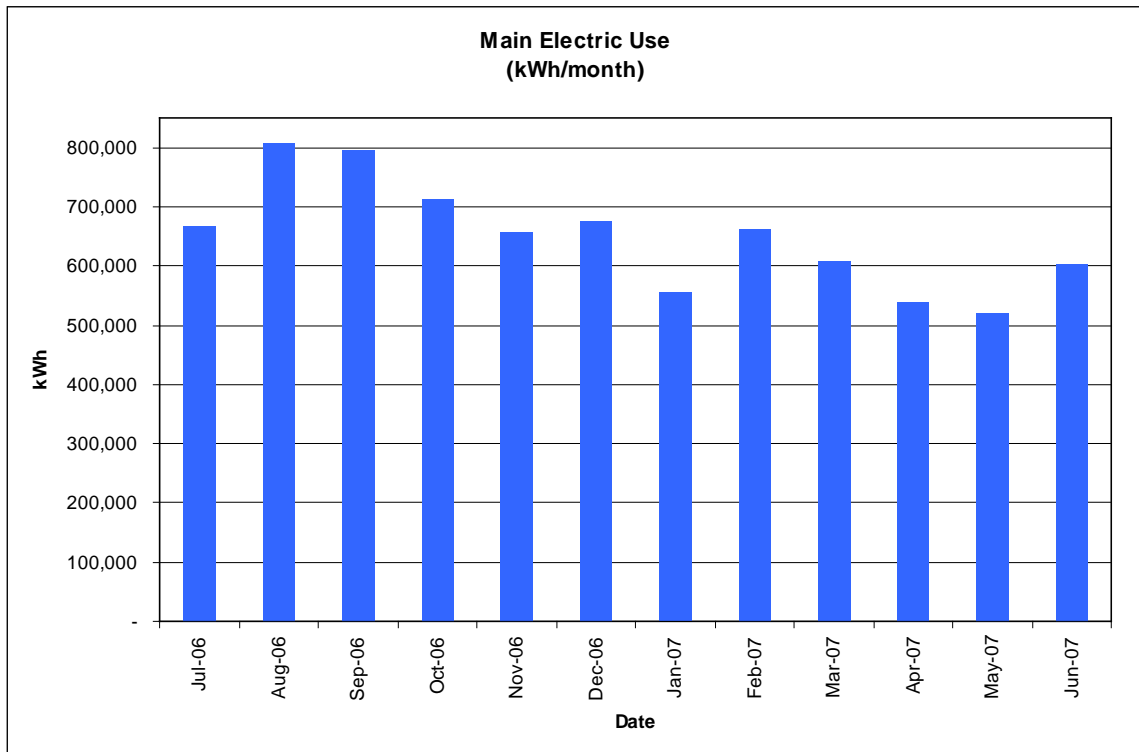
## 1.1. Energy usage and cost analysis

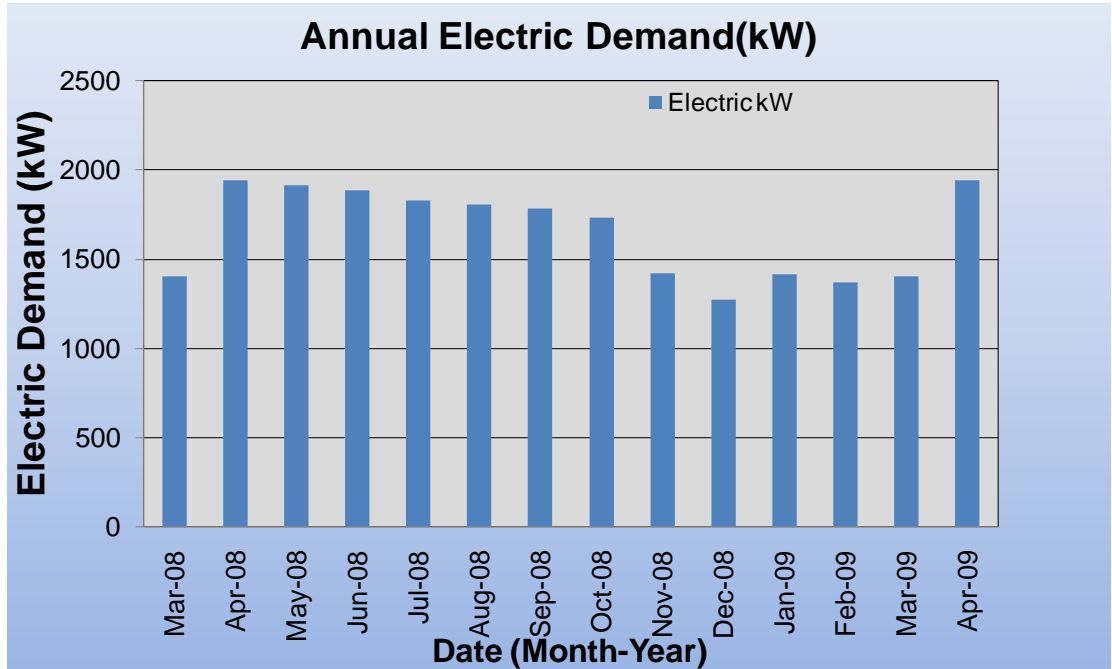
SWA analyzed utility bills from March 2008 through February 2009 that were received from Raritan Valley Community College.

Electricity – Somerset Hall is currently not metered separately for electricity. The Main Campus electric meter currently buys electricity from JCP&L at **an average rate of \$.155/kWh** based on the previous 12 months worth of utility bills. The Main Campus electric meter purchased **approximately 7,807,991 kWh or \$1,224,758.25 worth of electricity** in the previous year. The data also reflected that demand peaked at 1945 kW in April.

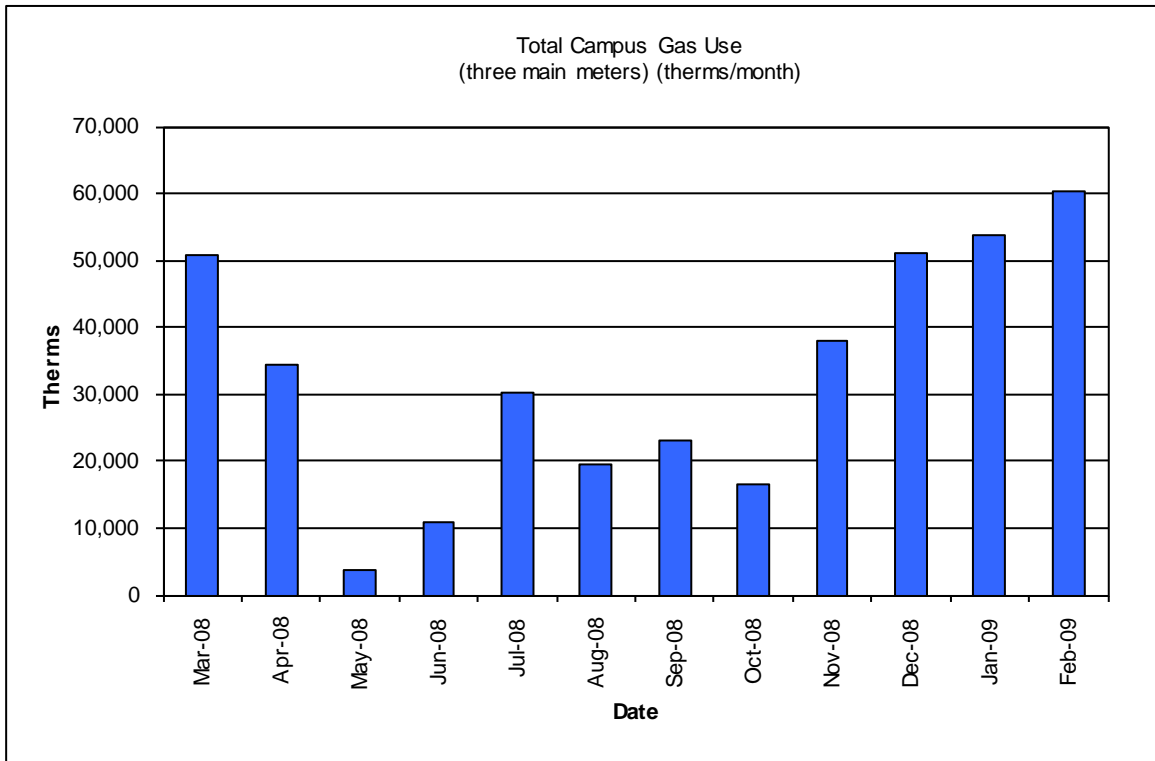
Natural Gas – Somerset Hall is currently not metered separately for natural gas. The Campus buys natural gas for its three main meters mentioned above from a third-party Energy Service Company (ESCO) via PSE&G at **an average aggregated rate of \$1.36/therm** based on the previous 12 months worth of utility bills. The three gas meters purchased **approximately 392,183 therms or \$534,361.90 worth of natural gas** in the previous year. Since the building is not metered separately for gas, SWA estimated the amount of gas consumed by the Somerset Hall building alone on pro-rata basis of its square footage. This building consumed **76,472 therms of gas** during this period at a total cost of **\$104,160.44**.

The following charts show electricity usage (kWh) and electricity demand (kW for the Main Campus electric meter based on utility bills for the 12 month period of March 2008 – February 2009. Please note that March '08 and April '09 demand in kW was estimated the same as March '09 and April '09 demand in kW.

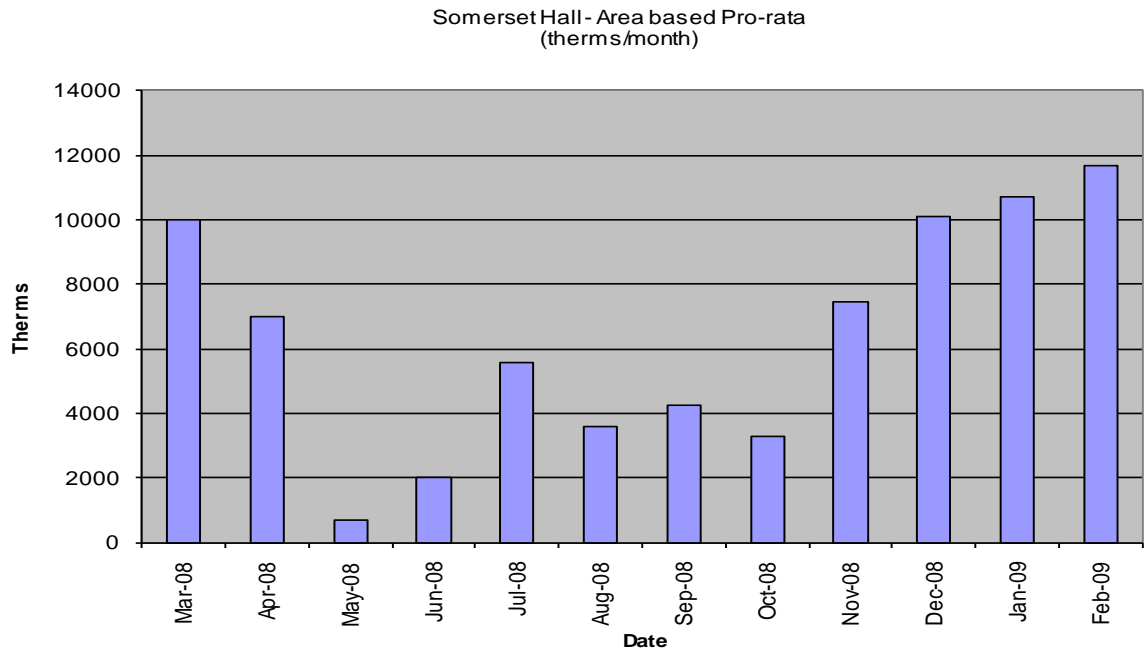




The following chart shows natural gas usage for the Main Campus meter based on utility bills for the 12 month period of March 2008 – February 2009.



Since the Somerset Hall building is not metered separately for gas, SWA estimated the amount of gas consumed by the building alone on pro-rata basis by square footage of various spaces for the 12 month period of March 2008 – February 2009, as follows:



### 1.2. Utility rate

Electricity is received from the Main Campus electric meter which is purchased from JCP&L at a general service market rate for electricity usage (kWh) with a separate (kW) demand charge. The Main Campus electric meter currently pays an average rate of approximately \$0.155/kWh based on the previous 12 months of utility bills.

Natural gas is received from the Main Campus gas meter which is purchased at a general service market rate for natural gas (therms). The Campus gas meters that provide natural gas service, directly or indirectly, to the Physical Education building currently pay an average aggregated rate of approximately of **\$1.36/therm** based on the previous 12 months of utility bills.

### 1.3. Energy benchmarking

Somerset Hall information and utility data were entered into the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. The building data could be documented; however, a performance score could not be generated since the building shares a meter as part of the campus. The Energy Star Portfolio Manager currently is not capable of generating a benchmark score for certain building types such as college campuses. SWA has created a Portfolio Manager account for RVCC to access the information. This information can be accessed at: <https://www.energystar.gov/istar/pmpam/>

Username: RaritanValleyCC  
 Password: RARITANVCC

SWA is also sharing the Portfolio Manager information with TRC Energy Services.



## STATEMENT OF ENERGY PERFORMANCE

### Raritan VCC

Building ID: 1762814  
 For 12-month Period Ending: February 28, 2009<sup>1</sup>  
 Date SEP becomes ineligible: N/A

Date SEP Generated: June 16, 2009

<b>Facility</b>	<b>Facility Owner</b>	<b>Primary Contact for this Facility</b>
Raritan VCC 118 Lamington Road Branchburg, NJ 08876	N/A	N/A

Year Built: 1960  
 Gross Floor Area (ft<sup>2</sup>): 423,900

Energy Performance Rating<sup>2</sup> (1-100) N/A

#### Site Energy Use Summary<sup>3</sup>

Electricity (kBtu)	29,225,895
Natural Gas (kBtu) <sup>4</sup>	48,850,300
Total Energy (kBtu)	78,076,195

#### Energy Intensity<sup>5</sup>

Site (kBtu/ft <sup>2</sup> /yr)	184
Source (kBtu/ft <sup>2</sup> /yr)	351

#### Emissions (based on site energy use)

Greenhouse Gas Emissions (MTCO <sub>2</sub> e/year)	7,129
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#### Electric Distribution Utility

Jersey Central Power & Lt Co

#### National Average Comparison

National Average Site EUI	76
National Average Source EUI	170
% Difference from National Average Source EUI	106%
Building Type	College/University (Campus-Level)

Stamp of Certifying Professional

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

#### Meets Industry Standards<sup>6</sup> 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 (28221), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460.

EPA Form 5900-16

## **2. FACILITY AND SYSTEMS DESCRIPTION**

### **2.1. Building Characteristics**

The four-story Somerset Hall is over 30 years old, was remodeled in the 1990s and houses mostly classrooms and administrative offices. The building has an area of approximately 70,200 square feet.

### **2.2. Building occupancy profiles**

The peak occupancy for Somerset Hall is approximately 400 persons during weekdays from 7am to 10pm. Occasionally, there are classes held on Saturdays but usually only a part of the building is occupied during those events.

### **2.3. Building envelope**

#### **2.3.1. Exterior walls**

Exterior walls consist of 4" face bricks and stone lintels. There are 6" metal studs spaced 16" on center located on the inside of the exterior wall with 6" of R-19 fiberglass batt insulation between each metal stud.

During the site visit and data collection period, SWA performed an infrared scan of the building. The infrared scan was performed early in the morning when the outdoor temperature was round 50°F. The infrared scan showed that each section was uniform and SWA determined that no problematic areas existed in the building envelope.

SWA evaluated adding additional insulation to the exterior walls of the building in order to reduce thermal losses through the building envelope, but the cost of implementing this measure would be prohibitive. If RVCC decides to do any type of capital improvement to the exterior shell of a building, insulation with a high-effective R-value is always recommended as well as reflective window film on highly glazed areas to reduce the load of the heating and cooling systems.

#### **2.3.2. Roof**

The roof is a flat, light-colored roof constructed of EPDM rubber on tapered rigid insulation over a metal deck. On the day of the site visit, SWA inspected the roof and observed no major deficiencies. SWA recommends that if the roof is ever replaced that a well-insulated roof is installed with a light-colored Energy Star reflective surface to cut down on solar heat gain.

#### **2.3.3. Base**

The building's base is a 4" concrete slab-on grade and perimeter foundation. No insulation was detected. There were no reported problems with water penetration or moisture.

#### **2.3.4. Windows**

The double-paned windows are fixed aluminum-framed units with no insulating properties or films. SWA has determined that there are no cost-effective options for the windows at this point in time.

### **2.3.5. Exterior doors**

The exterior doors of the building are aluminum-framed units with no insulating properties or films. The exterior doors were observed to have the original weather-stripping which is no longer performing as intended. SWA recommends that the exterior doors of the building are weather-stripped in order to decrease the amount of conditioned air that is lost around each door. SWA also recommends checking the weather-stripping of each door on a regular basis and replacing any broken seals immediately. Tight seals around the door will help ensure that the building is kept tight and insulated over time.

### **2.3.6. Building air tightness**

Somerset Hall was observed to be a relatively tight building with the exception of the exterior doors. There were no major observed deficiencies of air tightness within the building besides the exterior doors.

## **2.4. HVAC systems**

### **2.4.1. Heating**

The building is fed from the existing campus Chilled Water (CHW) and Hot Water (HW) loops for summer cooling and winter heating during 5 week days from 7am to 10pm and selectively during after-hour and weekend events when the central CHP engine-generator, chillers and boilers are in operation.

One large rooftop air-handling unit (AHU) with a CHW coil and electric heating coil serve the classrooms on top floors. In classrooms and offices, floor mounted unit ventilators with CHW and HW coils fed from campus water loop provide conditioned air.

### **2.4.2. Cooling**

The building is fed from the existing campus CHW loops and uses the same appliances to cool as it does to heat. There are many split systems for IT and computer rooms. Small air-handling units (AHUs) and fan coil units (FCUs) are in specific rooms and areas where IT and computers are located.

The building consists of many split units which are being converted to the chilled water fan coil units connected to district chilled water loop. The management converts a non-performing split unit to a CHW unit on an ongoing basis. Since there is considerable life left for the split units, SWA did not make any recommendations. The building continues to have a mix of DX and CHW units presently.

### **2.4.3. Ventilation**

The building uses the rooftop units to provide fresh air to the building in combination with natural ventilation in classrooms and offices.

#### **2.4.4. Domestic Hot Water**

Domestic Hot Water is provided by a 36kW electric water heater in mechanical room. SWA considered replacing this with a gas fired unit; however, the room is under grade and exhaust flue path is not straightforward. For this reason, no recommendation is made.

### **2.5. Electrical systems**

#### **2.5.1. Lighting**

*Interior Lighting* – Somerset Hall uses a mix of various efficient and inefficient lighting. Areas such as the administrative offices, classes, bathrooms and stairwells contain older T12 magnetic fixtures that should be replaced with T8 electronic fixtures.

*Exit Lights* – The building contains all 5W LED exit signs.

*Exterior Lighting* – The exterior lighting was surveyed during the building audit. SWA has deemed it not cost effective to replace exterior lighting at this time. All exterior lighting is controlled by a timer located in the boiler room. There is no need for any immediate upgrade of lighting or timer; however, SWA recommends that the building maintenance adjust the timer at least twice per year in order to make sure that the timer stays current with Daylight Savings Time.

#### **2.5.2. Appliances and process**

SWA has surveyed all appliances installed at Somerset Hall and have deemed that it would not be cost effective to replace any appliances at this time. SWA recommends that the most energy efficient options are always chosen whenever any appliances including computers, dispatch radio equipment, refrigerators, etc. are purchased.

#### **2.5.3. Elevators**

Somerset Hall contains a hydraulic elevator. There are currently no energy efficient options that are cost-effective for this type of elevator.

#### **2.5.4. Other electrical systems**

There are currently no other electrical systems installed at this building.

### 3. EQUIPMENT LIST

Building System	Description	Location	Model#	Fuel	Space served	Year Equip Installed	Remaining useful life %
Cooling	S-126, Condensing Unit R22, 208/230 60Hz, 1 Ph, 16MCA	Roof	Mitsubishi Electric, model PU24EK, S/N 77100	Elec.	S-126	2001	50%
Cooling	S-128, Condensing Unit R22, 208/230 60Hz, 1 Ph, 16MCA	Roof	Mitsubishi Electric, model PU24EK, S/N 7YF004	Elec.	S-128	2001	50%
Ventilation	Mushroom exhaust fans, old, 1/2hp estimated, 2 no.	Roof	Nameplate, N/A	Elec.	N/A	1992	15%
Cooling	S-117, Condensing Unit, 10 ton est.	Roof	Larkin, model R6B1451, S/N 8995841A-2	Elec.	N/A	1992	0%
Ventilation	Exhaust fan, EF-13, 115/1/60, 1/4 hp, 5Amps	Roof	Carnes, model VUBK10L1A20SPCX, s/n 480801.001	Elec.	N/A	2002	65%
Cooling	S-120, Condensing Unit R410A, 208/230 60Hz, 1 Ph, 13MCA	Roof	Mitsubishi Electric, model PUY-A12NHA, S/N 35U0048AC	Elec.	S-120	2001	50%
Cooling	S-131, Condensing Unit R22, 208/230 60Hz, 1 Ph, 16MCA	Roof	Mitsubishi Electric, model PU24EK, S/N 15X10009	Elec.	S-131	2001	50%
Cooling	S-130, Condensing Unit R22, 208/230 60Hz, 1 Ph, 16MCA	Roof	Mitsubishi Electric, model PU24EK, S/N n/a	Elec.	S-131	2001	50%
Cooling	S-n/a, Condensing Unit R22, 208/230 60Hz, 1 Ph, 16MCA	Roof	Mitsubishi Electric, model PU24EK, S/N 00003	Elec.	N/A	2001	50%
Ventilation	Mushroom exhaust fans, old, 1/2hp estimated, 2 no.	Roof	Nameplate, N/A	Elec.	N/A	1992	50%
HVAC	Package unit, S353,352; 460/3/60, MCA 150; 100kW elec. Heat; R-22		Aaon, model RK-28-3-EO-104:ZBCEGFEBJOOMDX; S/N 200206-AKEP07541		S352, S353	2002	50%

Building System	Description	Location	Model#	Fuel	Space served	Year Equip Installed	Remaining useful life %
HVAC	S-351: Roof top DX cooling, elec. heating, 10 tons, 460/60/3, 32.9MCA; R-22	High roof	Trane, Model THC120A4RGAOED000A 1000000; S/N 224100997L	Elec.	S-351	2002	50%
HVAC	S-350: Roof top DX cooling, elec. heating, 10 tons, 460/60/3, 32.9MCA; R-22	High roof	Trane, Model THC120A4RGAOED000A 1000000; S/N 224100814L	Elec.	S-350	2002	50%
HVAC	S-349: Roof top DX cooling, elec. heating, 10 tons, 460/60/3, 32.9MCA; R-22	High roof	Trane, Model THC120A4RGAOED000A 1000000; S/N 224101046L	Elec.	S-349	2002	50%
Ventilation	Exhaust fan, EF-12, 208/3/60, 3/4 hp, 3.3Amps	Roof	Carnes, model VUBK18R1G1UA20SPCX, s/n 480801.002	Elec.	N/A	2002	65%
Cooling	Condensing units, 5 nos., approx 3 tons each	Roof	Trane, nameplate N/A	Elec.	S-012,010,018,014&016	1992	0%
Cooling	Condensing units, 3 nos. Liebert; 460/3/60, MCA=4;	Roof	Liebert, Model TCDV205-A, S/N 0842C16315, 0842C16173, & 0841C15965	Elec.	Computer server rooms	2008	95%
HVAC	AH-1: 4 pipe heating/cooling air handler, 208/3/60, 15hp AO Smith fan motor, new, 100%OA,	Mechanical room	Trane, nameplate N/A	Elec.	Whole building	1992	15%
Heating	DHW tank, 119.9 gallons, 480/3/60, 36kW total	Mechanical room	Rheem Vanguard, Model 6E747A, S/N VG 1298E00408	Elec.	Whole building	2004	65%
Controls	Air compressor, 2x1.5hp motors, 460/3/60; tank 135psi @450deg F	Mechanical room, level 1	Curtis Toledo, Compressor Model ES-20	Elec.	HVAC system actuators	1996	35%

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

#### 4. ENERGY CONSERVATION MEASURES

Energy Conservation Measures: Summary table

<b>ECM#</b>	<b>Description</b>
<b>1a</b>	<b>Upgrade existing lighting; upgrade all T12 magnetic fixtures to T8 electronic fixtures.</b>
<b>1b</b>	<b>Upgrade existing lighting controls</b>
<b>2</b>	<b>Weather-strip exterior doors; weather-stripping will decrease the amount of conditioned air that is lost between the exterior door and frame</b>
<b>3</b>	<b>Replace pneumatic controls; replace current control system with DDC controls for more accuracy and greater control over building systems</b>

## ECM#1a: Upgrade existing lighting

**Description:**

On the day of the site visit, SWA completed a lighting inventory of Somerset Hall on the RVCC campus. Much of the existing lighting consists of T12 magnetic fixtures. SWA recommends replacing all T12 magnetic fixtures with T8 electronic fixtures. The building also had at least one fixture that was retrofitted with T8 lamps but still contained magnetic ballasts; these should be upgraded as well. See Appendix A, Sheet 2 for complete lighting retrofit details.

**Installation cost:**

Estimated installed cost: \$6,920  
 Source of cost estimate: *RS Means*

**Economics (without incentives):**

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO <sub>2</sub> )
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
9,238	-	1.1	\$ 1,432	4.8	20	\$ 20,914	10.1%	16,541

**Economics (with incentives):**

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO <sub>2</sub> )
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
9,238	-	1.1	\$ 1,432	4.1	20	\$ 20,914	12.8%	16,541

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

**Rebates/financial incentives:**

*NJ Clean Energy – Prescriptive Lighting Incentive, Incentive based on installing T5 or T8 lamps with electronic ballasts in existing facilities (\$10-\$30 per fixture, depending on quantity of lamps). Maximum incentive amount is \$1,050.*

**Options for funding ECM:**

*This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.*

*<http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings>*

## ECM#1b: Upgrade interior lighting controls

### Description:

Currently, the Somerset Hall Building lighting is mostly controlled by manual switches. In most areas, lights are on from 7 am through 10 pm; in other areas, lights may be switched off by people owning responsibility for these areas, such as janitor owns responsibility for the janitor rooms. SWA performed an evaluation of installing occupancy sensors in large spaces, offices and bathrooms that may be left unoccupied a considerable amount of time throughout the day. Further details on the quantity and areas for the occupancy sensors recommendation be found in Appendix A, Sheet 3. Dual Technology occupancy sensors provide 360° of coverage and use both passive infrared and ultrasonic technologies to sense occupancy.

### Installation cost:

Estimated installed cost: \$24,420  
Source of cost estimate: *RS Means*

### Economics (without incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO <sub>2</sub> )
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
39,033	-	-	\$ 6,050	4.0	12	\$ 59,510	12.0%	69,888

### Economics (with incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO <sub>2</sub> )
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
39,033	-	-	\$ 6,050	3.7	12	\$ 59,510	14.0%	69,888

**Assumptions:** SWA calculated the savings for this measure using reduced hours of operation after the installation of occupancy sensors; please see Appendix A, Sheet 3, for the new hours/day assumed.

### Rebates/financial incentives:

*NJ Clean Energy - Wall Mounted occupancy sensors (\$20 per control)  
Maximum incentive amount is \$2,220.*

### Options for funding ECM:

*This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.*

*<http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings>.*

## ECM#2: Weather-strip exterior doors

### Description:

On the day of the site visit, SWA observed that exterior door weather-stripping was beginning to deteriorate. Doors and vestibules should be observed annually for deficient weather-stripping and replaced as needed. The weather-stripping observed at Somerset Hall was intact but worn out in some areas and no longer performing as expected.

### Installation cost:

Estimated installed cost: \$422

Source of cost estimate: *RS Means*

### Economics (without incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO <sub>2</sub> )
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
-	76	0.0	\$ 123	3.4	10	\$ 1,040	14.6%	838

### Economics (with incentives):

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO <sub>2</sub> )
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
-	76	0.0	\$ 123	3.4	10	\$ 1,040	14.6%	838

**Assumptions:** SWA calculated the savings for this measure using measurements taken the day of the field visit and using the billing analysis. SWA calculated savings using eQUEST and assuming that infiltration would be reduce by 5% on any wall that included an exterior door that needed weather-stripping.

### Rebates/financial incentives:

*There are no incentives available for this measure at this time.*

### Options for funding ECM:

*This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.*

*<http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings>*

### ECM#3: *Replace pneumatic controls*

**Description:**

The proposed measure consists of replacing the existing pneumatic control system that include controllers and pneumatic temperature sensors with Direct Digital Controls (DDC) to operate the heating and cooling valves. A DDC system will replace the local control loop with an electronic temperature sensor and a microprocessor to replace the controller. The output from the microprocessor will be converted to a pressure signal to position the remaining heating and cooling valves.

The benefits of DDC include simplicity of operation because the building operator would have direct control over the environment of the building as well as the ability to control setpoints with much more accuracy than a pneumatic control system. This would provide considerable energy savings because the controlled variables would be precisely maintained.

**Installation cost:**

Estimated installed cost: \$140,400  
 Source of cost estimate: Vendor (Belimo)

**Economics (without incentives):**

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO <sub>2</sub> )
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
25,120	8,652	0.0	\$ 22,070	6.4	10	\$ 186,354	3.3%	138,201

**Economics (with incentives):**

Annual Savings				SPP	LoM	Lifetime	ROI	Annual Carbon Reduction (lbs of CO <sub>2</sub> )
Electric Savings (kWh)	Natural Gas Savings (therms)	Demand (kW)	Dollar Savings/year			Cost Savings		
25,120	8,652	0.0	\$ 22,070	6.4	10	\$ 186,354	3.3%	138,201

**Assumptions:** SWA calculated the savings for this measure using measurements taken the day of the field visit and using the billing analysis. Additionally, pneumatic compressor savings and operation & maintenance savings have been included, estimated based on 1 hour per week savings of an O&M personnel.

**Rebates/financial incentives:**

*There are no incentives available for this measure at this time from New Jersey Clean energy Program (NJCEP).*

**Options for funding ECM:**

*This measure could have been applicable for grant from New Jersey Department of Environmental Protection under “Local Government Greenhouse Gas Reduction Grant Program”. The deadline for sending the preliminary application was September 4, 2009 – it was mandatory to send a preliminary application before this date for access to this grant. SWA recommends to visit the following website in future to check for updates on the opening of a second round of grants in 2010:*

[http://www.state.nj.us/dep/opsc/docs/ghg\\_grant\\_guidance.pdf](http://www.state.nj.us/dep/opsc/docs/ghg_grant_guidance.pdf)

## **5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES**

### **5.1. Existing systems**

*There are currently no existing renewable energy systems.*

### **5.2. Solar Photovoltaic**

*Solar Photovoltaic (PV) technology is not applicable for this project because the campus cannot be net metered due to an existing CHP system. Without net metering, the incentives available are considerably reduced and do not justify the investment.*

### **5.3. Solar Thermal Collectors**

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

### **5.4. Combined Heat and Power**

#### **Description:**

*CHP is not applicable for this building because of existing campus-wide CHP unit already in place.*

### **5.5. Geothermal**

#### **Description:**

*Geothermal is not applicable for this building because it would not be cost effective to change to a geothermal system.*

### **5.6. Wind**

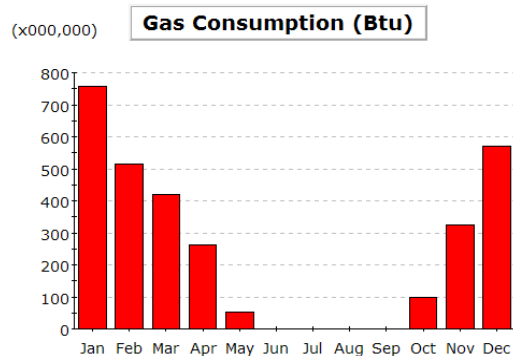
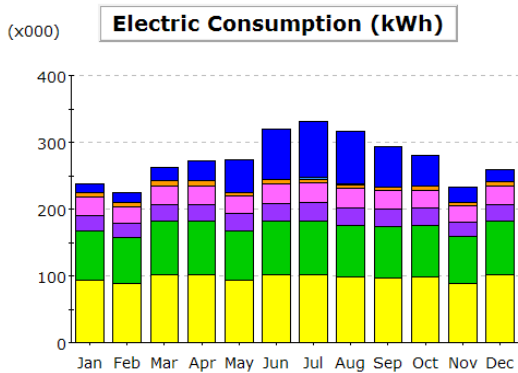
#### **Description:**

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

## **6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES**

### **6.1. Load profiles**

In 2007, a power survey was conducted at the Somerset substation by Trace Electrical Services and Testing. The survey was conducted by installing power recording meters for seven days at various buildings on campus. The Somerset substation was surveyed from September 18<sup>th</sup>, 2007 through September 25<sup>th</sup>, 2007. The results of the test revealed that the Somerset substation had a peak demand of 230.95 kW at 2:33pm on September 19<sup>th</sup>, 2007. Over the seven-day period, there was a cumulative power usage of 24.746 MWh or approximately 3535.143 kWh per day. An accurate load profile could not be determined from utility bills since this building is not metered separately, however a load profile can be estimated from the eQUEST model of the building. Below are the charts from eQUEST that simulate an electric and natural gas profile.



- |  |  |  |  |
|--|--|--|--|
| <span style="color: yellow;">■</span> Area Lighting  | <span style="color: grey;">■</span> Exterior Usage   | <span style="color: orange;">■</span> Water Heating  | <span style="color: cyan;">■</span> Refrigeration  |
| <span style="color: brown;">■</span> Task Lighting   | <span style="color: purple;">■</span> Pumps & Aux.   | <span style="color: darkred;">■</span> Ht Pump Supp. | <span style="color: blue;">■</span> Heat Rejection |
| <span style="color: green;">■</span> Misc. Equipment | <span style="color: pink;">■</span> Ventilation Fans | <span style="color: red;">■</span> Space Heating     | <span style="color: blue;">■</span> Space Cooling  |

## 6.2. Tariff analysis

Currently, natural gas and electricity is provided to Somerset Hall through the Main Campus gas and electric meters. Natural gas is purchased for the main campus meter from an ESCO and is provided through PSE&G at a general service rate. The general service rate for natural gas charges a market-rate price based on usage and the RVCC billing does not breakdown demand costs. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. Typically, the natural gas prices increase during the heating months when natural gas is used by the rooftop air-handling units.

Electricity is purchased for the main campus meter from JCP&L at a general service rate. The general service rate for electricity charges a market-rate price based on usage and the RVCC billing does not breakdown demand costs. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year.

## 6.3. Energy Procurement strategies

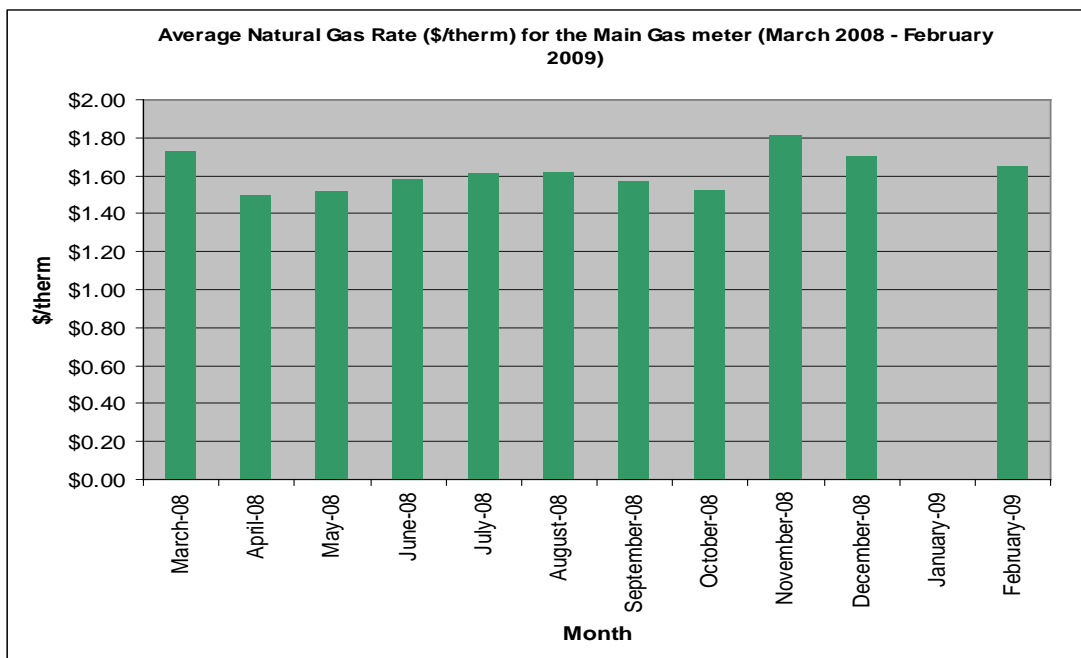
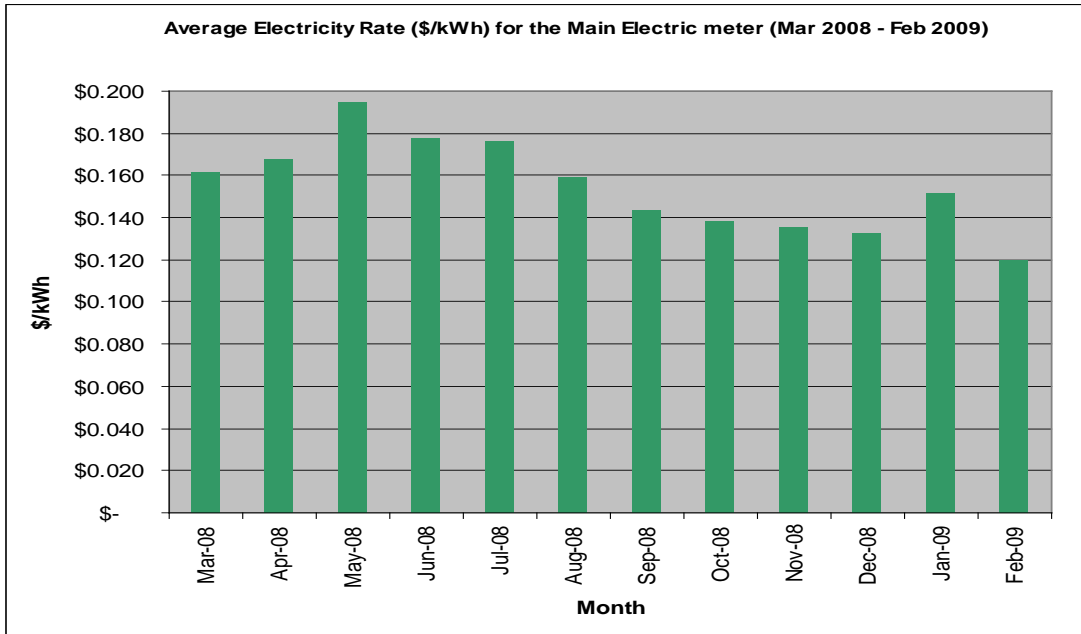
Somerset Hall receives natural gas from the main campus meter which already uses an Energy Services Company (ESCO) that acts as a third party energy supplier. Additionally, it receives part of its electricity generated by CHP, and hence consumes some gas indirectly. Further, it is connected to the campus hot water loop, which is heated by gas metered at the central boiler. Electricity is received from the main campus electric meter directly from JCP&L and no ESCO is used. SWA analyzed the utility rate for electricity over the previous 12 months. Electric bill analysis shows fluctuations of 39% over the most recent 12 month period. Some of these fluctuations may have been caused by adjustments between estimated and actual meter readings; others may be due to unusually high and escalating energy costs in 2008. The average estimated NJ commercial utility rates for electric and gas are \$0.150/kWh and \$1.550/therm respectively. The Somerset Hall building annual utility costs are \$9,425.63 higher for electric when compared to the average estimated NJ commercial utility rates.

SWA recommends that the RVCC further explore opportunities of purchasing both natural gas and electricity from ESCOs in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the campus. Appendix C contains a complete list of third party energy suppliers for the

service area.

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

RVCC is already enrolled in a Demand Response Program and Emergency Programs through a contract agreement with Enernoc. Prior to any curtailment or emergency events, temperature setpoints are decreased by a couple of degrees to “boost” the building thermal loads. This system allows RVCC to receive additional revenues from these energy programs without any disruption in occupants comfort.



## 7. METHOD OF ANALYSIS

### 7.1. Assumptions and tools

Energy modeling tool: eQUEST V3.6  
Cost estimates: RS Means 2009 (Facilities Maintenance & Repair Cost Data)  
RS Means 2009 (Building Construction Cost Data)  
RS Means 2009 (Mechanical Cost Data)  
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 (Sheet 1 – Existing lights)

Existing Lighting Conditions															
#	Building	Level/Floor	Location in Building	Measured Lighting Level in Footcandles	Fixture Type	Ballast Type	No. of Fixtures	No. of Lamps	Type of Lamp	Watts/Lamp	Hrs/Day	Energy Use (Watt hours/day)	Controls	Daylighting possible?	Total Power (Watts)
1	Somerset Hall	Second Level	Human Resource Offices	42	4' linear T8	electronic	19	4	Fluorescent	32	12	29184	Switch	No	2432
2	Somerset Hall	Second Level	Area near elevators	30	2' U-shaped T12	magnetic	16	2	Fluorescent	40	15	19200	Switch	No	1280
3	Somerset Hall	Second Level	Area near elevators	-	LED Exit Signs	-	2	1	LED	5	24	240	None	No	10
4	Somerset Hall	Second Level	Men's Room	28	2' U-shaped T12	magnetic	3	2	Fluorescent	40	15	3600	Switch	No	240
5	Somerset Hall	Second Level	Women's Room	28	2' U-shaped T12	magnetic	3	2	Fluorescent	40	15	3600	Switch	No	240
6	Somerset Hall	Second Level	Room 243	27	4' linear T8	electronic	12	3	Fluorescent	32	12	13824	Switch	Yes	1152
7	Somerset Hall	Second Level	Room 243	27	20W CFL	-	27	2	CFL	20	12	12960	Switch	Yes	1080
8	Somerset Hall	Second Level	Room 244	28	4' linear T8	electronic	12	3	Fluorescent	32	12	13824	Switch	Yes	1152
9	Somerset Hall	Second Level	Room 244	28	20W CFL	-	27	2	CFL	20	12	12960	Switch	Yes	1080
10	Somerset Hall	Second Level	Room 245	82	4' linear T8	electronic	12	3	Fluorescent	32	12	13824	Switch	Yes	1152
11	Somerset Hall	Second Level	Room 245	82	20W CFL	-	26	2	CFL	20	12	12480	Switch	Yes	1040
12	Somerset Hall	Second Level	Room 246	80	4' linear T8	electronic	12	3	Fluorescent	32	12	13824	Switch	Yes	1152
13	Somerset Hall	Second Level	Room 246	50	20W CFL	-	26	2	CFL	20	12	12480	Switch	Yes	1040
14	Somerset Hall	Second Level	Room 247	91	4' linear T8	electronic	12	3	Fluorescent	32	12	13824	Switch	Yes	1152
15	Somerset Hall	Second Level	Room 247	91	20W CFL	-	27	2	CFL	20	12	12960	Switch	Yes	1080
16	Somerset Hall	Second Level	Hallway	38	2' U-shaped T8	electronic	22	2	Fluorescent	32	15	21120	Switch	No	1408
17	Somerset Hall	Second Level	Hallway	38	LED Exit Signs	-	2	1	Fluorescent	5	24	240	None	No	10
18	Somerset Hall	Second Level	Custodian's Closet	17	4' linear T12	magnetic	1	2	Fluorescent	40	4	320	Switch	No	80
19	Somerset Hall	Second Level	Room 242	46	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
20	Somerset Hall	Second Level	Room 240 and Reception area	68	4' linear T8	electronic	6	4	Fluorescent	32	12	9216	Switch	No	768
21	Somerset Hall	Second Level	Room 241	68	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
22	Somerset Hall	Second Level	Room 239	68	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
23	Somerset Hall	Second Level	Room 235A	73	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
24	Somerset Hall	Second Level	Room 235	72	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
25	Somerset Hall	Second Level	Break Room	53	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
26	Somerset Hall	Second Level	Room 227	67	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
27	Somerset Hall	Second Level	Room 225	68	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
28	Somerset Hall	Second Level	Room 223B	63	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
29	Somerset Hall	Second Level	Room 223A	59	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
30	Somerset Hall	Second Level	Room 236	71	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
31	Somerset Hall	Second Level	Room 237	70	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
32	Somerset Hall	Second Level	Room 232	65	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
33	Somerset Hall	Second Level	Room 230	60	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
34	Somerset Hall	Second Level	Room 229	74	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
35	Somerset Hall	Second Level	Room 226	71	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
36	Somerset Hall	Second Level	Room 224	69	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
37	Somerset Hall	Second Level	Room 222	65	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
38	Somerset Hall	Second Level	Office Hallway	44	2' U-shaped T8	electronic	11	2	Fluorescent	32	15	10560	Switch	No	704
39	Somerset Hall	Third Level	Area near elevators	34	2' U-shaped T12	magnetic	11	2	Fluorescent	40	15	13200	Switch	No	880
40	Somerset Hall	Third Level	Men's Room	60	2' U-shaped T12	magnetic	3	2	Fluorescent	40	15	3600	Switch	No	240
41	Somerset Hall	Third Level	Women's Room	60	2' U-shaped T12	magnetic	3	2	Fluorescent	40	15	3600	Switch	No	240
42	Somerset Hall	Third Level	Stairwells	60	4' linear T12	magnetic	11	2	Fluorescent	40	15	13200	Switch	Yes	880
43	Somerset Hall	Third Level	Stairwells	60	LED Exit Signs	-	1	1	LED	5	24	120	None	Yes	5
44	Somerset Hall	Third Level	Office Reception Area	68	4' linear T12	magnetic	10	3	Fluorescent	40	12	14400	Switch	No	1200
45	Somerset Hall	Third Level	Office Reception Area	68	LED Exit Signs	-	2	1	LED	5	24	240	None	No	10
46	Somerset Hall	Third Level	Room 305	57	4' linear T12	magnetic	2	3	Fluorescent	40	12	2880	Switch	No	240
47	Somerset Hall	Third Level	Room 303	57	2' U-shaped T12	magnetic	4	2	Fluorescent	40	12	3840	Switch	No	320
48	Somerset Hall	Third Level	Room 305	61	4' linear T12	magnetic	2	3	Fluorescent	40	12	2880	Switch	No	240
49	Somerset Hall	Third Level	Room 307	60	4' linear T12	magnetic	2	3	Fluorescent	40	12	2880	Switch	No	240
50	Somerset Hall	Third Level	Room 309	59	4' linear T12	magnetic	2	3	Fluorescent	40	12	2880	Switch	No	240
51	Somerset Hall	Third Level	Room 308 - Meeting Room	73	4' linear T8	magnetic	4	3	Fluorescent	40	12	5760	Switch	No	480
52	Somerset Hall	Third Level	Room 308 - Meeting Room	73	40W Flood lights	-	4	1	Flood lights	40	4	640	Switch	No	160
53	Somerset Hall	Third Level	Room 306	69	4' linear T12	magnetic	2	3	Fluorescent	40	12	2880	Switch	No	240
54	Somerset Hall	Third Level	Room 304	68	4' linear T12	magnetic	2	3	Fluorescent	40	12	2880	Switch	No	240
55	Somerset Hall	Third Level	Room 302	71	4' linear T12	magnetic	2	3	Fluorescent	40	12	2880	Switch	No	240
56	Somerset Hall	Third Level	Room 310	67	4' linear T12	magnetic	2	3	Fluorescent	40	12	No	Switch	No	240
57	Somerset Hall	Third Level	Room 312	58	4' linear T12	magnetic	2	3	Fluorescent	40	12	2880	Switch	No	240
58	Somerset Hall	Third Level	Room 314	61	4' linear T12	magnetic	2	3	Fluorescent	40	12	2880	Switch	No	240
59	Somerset Hall	Third Level	Room 316	63	4' linear T12	magnetic	2	3	Fluorescent	40	12	2880	Switch	No	240
60	Somerset Hall	Third Level	Storage	59	4' linear T12	magnetic	1	2	Fluorescent	40	2	160	Switch	No	80
61	Somerset Hall	Third Level	Room 319	57	4' linear T12	magnetic	2	3	Fluorescent	40	12	2880	Switch	No	240
62	Somerset Hall	Third Level	Room 317	73	4' linear T12	magnetic	2	3	Fluorescent	40	12	2880	Switch	No	240
63	Somerset Hall	Third Level	Room 315	66	4' linear T12	magnetic	2	3	Fluorescent	40	12	2880	Switch	No	240
64	Somerset Hall	Third Level	Room 313	69	4' linear T12	magnetic	2	3	Fluorescent	40	12	2880	Switch	No	240
65	Somerset Hall	Third Level	Room 311	74	4' linear T12	magnetic	2	3	Fluorescent	40	12	2880	Switch	No	240
66	Somerset Hall	Third Level	Hallway	47	2' U-shaped T8	electronic	22	2	Fluorescent	40	15	26400	Switch	No	1760
67	Somerset Hall	Third Level	Hallway	47	LED Exit Signs	-	3	1	LED	5	24	360	Switch	No	15
68	Somerset Hall	Third Level	Room 349	107	4' linear T8	electronic	12	3	Fluorescent	32	12	13824	Switch	Yes	1152
69	Somerset Hall	Third Level	Room 349	107	20W CFL	-	26	2	CFL	20	12	12480	Switch	Yes	1040
70	Somerset Hall	Third Level	Room 350	59	4' linear T8	electronic	12	3	Fluorescent	32	12	13824	Switch	Yes	1152

71	Somerset Hall	Third Level	Room 350	59	20W CFL	-	25	2	CFL	20	12	12000	Switch	Yes	1000
72	Somerset Hall	Third Level	Room 351	72	4' linear T8	electronic	12	3	Fluorescent	32	12	13824	Switch	Yes	1152
73	Somerset Hall	Third Level	Room 351	72	20W CFL	-	25	2	CFL	20	12	12000	Switch	Yes	1000
74	Somerset Hall	Third Level	Room 352	64	4' linear T8	electronic	12	3	Fluorescent	32	12	13824	Switch	Yes	1152
75	Somerset Hall	Third Level	Room 352	64	20W CFL	-	25	2	CFL	20	12	12000	Switch	Yes	1000
76	Somerset Hall	Third Level	Room 353	97	4' linear T8	electronic	12	3	Fluorescent	32	12	13824	Switch	Yes	1152
77	Somerset Hall	Third Level	Room 353	97	20W CFL	-	25	2	CFL	20	12	12000	Switch	Yes	1000
78	Somerset Hall	Third Level	Custodian's Closet	17	4' linear T12	magnetic	1	2	Fluorescent	40	4	320	Switch	No	80
79	Somerset Hall	Third Level	Room 346 and Reception Area	62	4' linear T8	electronic	6	4	Fluorescent	32	12	9216	Switch	No	768
80	Somerset Hall	Third Level	Room 348	57	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
81	Somerset Hall	Third Level	Room 347	62	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
82	Somerset Hall	Third Level	Room 347A	61	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
83	Somerset Hall	Third Level	Room 345	60	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
84	Somerset Hall	Third Level	Room 341	63	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
85	Somerset Hall	Third Level	Room 339	72	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
86	Somerset Hall	Third Level	Room 333	71	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
87	Somerset Hall	Third Level	Room 333A	65	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
88	Somerset Hall	Third Level	Room 331	62	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
89	Somerset Hall	Third Level	Room 329	69	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
90	Somerset Hall	Third Level	Storage	64	4' linear T8	electronic	1	4	Fluorescent	32	12	1536	Switch	No	128
91	Somerset Hall	Third Level	Room 328	79	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
92	Somerset Hall	Third Level	Room 330	72	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
93	Somerset Hall	Third Level	Room 332	78	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
94	Somerset Hall	Third Level	Room 334	79	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
95	Somerset Hall	Third Level	Room 335	71	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
96	Somerset Hall	Third Level	Room 336	74	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
97	Somerset Hall	Third Level	Room 337	68	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
98	Somerset Hall	Third Level	Room 340	77	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
99	Somerset Hall	Third Level	Room 342	59	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
100	Somerset Hall	Third Level	Room 343	62	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
101	Somerset Hall	Third Level	Room 344	67	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
102	Somerset Hall	Third Level	Office Hallway	58	2' U-shaped T8	electronic	11	2	Fluorescent	32	12	8448	Switch	No	704
103	Somerset Hall	First Level	Tutoring Center	75	4' linear T8	electronic	57	2	Fluorescent	32	12	43776	Switch	No	3648
104	Somerset Hall	First Level	Tutoring Center	75	LED Exit Signs	-	4	1	LED	5	24	480	None	No	20
105	Somerset Hall	First Level	Room S017	58	4' linear T8	electronic	15	2	Fluorescent	32	12	11520	Switch	No	960
106	Somerset Hall	First Level	Room S017	58	LED Exit Signs	-	1	1	LED	5	24	120	None	No	5
107	Somerset Hall	First Level	New Security Office	100	2' U-shaped T8	electronic	11	3	Fluorescent	32	12	12672	Switch	No	1056
108	Somerset Hall	First Level	New Security Office	100	20W CFL	-	6	2	CFL	20	12	2880	Switch	No	240
109	Somerset Hall	First Level	New Security Office	100	LED Exit Signs	-	1	1	LED	5	24	120	None	No	5
110	Somerset Hall	First Level	Room 012	87	4' linear T8	electronic	12	2	Fluorescent	32	12	9216	Switch	No	768
111	Somerset Hall	First Level	Room 012	87	100W Floods	-	8	1	Flood lights	100	4	3200	Switch	No	800
112	Somerset Hall	First Level	Room 012	87	LED Exit Signs	-	2	1	LED	5	24	240	None	No	10
113	Somerset Hall	First Level	Room 014	42	4' linear T8	electronic	12	2	Fluorescent	32	12	9216	Switch	No	768
114	Somerset Hall	First Level	Room 014	42	LED Exit Signs	-	2	1	LED	5	24	240	None	No	10
115	Somerset Hall	First Level	Room 016	41	4' linear T8	electronic	12	2	Fluorescent	32	12	9216	Switch	No	768
116	Somerset Hall	First Level	Room 016	41	100W Floods	-	8	1	Flood lights	100	4	3200	Switch	No	800
117	Somerset Hall	First Level	Room 016	41	LED Exit Signs	-	2	1	LED	5	24	240	None	No	10
118	Somerset Hall	First Level	Room 018 - Media Depot	23	4' linear T8	electronic	14	2	Fluorescent	32	12	10752	Switch	No	896
119	Somerset Hall	First Level	Room 018 - Media Depot	23	LED Exit Signs	-	1	1	LED	5	24	120	None	No	5
120	Somerset Hall	First Level	Storage	26	4' linear T12	magnetic	1	2	Fluorescent	40	4	320	Switch	No	80
121	Somerset Hall	First Level	Janitor's Closet 1	17	4' linear T8	electronic	1	1	Fluorescent	32	4	128	Switch	No	32
122	Somerset Hall	First Level	Janitor's Closet 2	16	4' linear T8	electronic	1	1	Fluorescent	32	4	128	Switch	No	32
123	Somerset Hall	First Level	Elevators	23	4' linear T12	magnetic	2	2	Fluorescent	32	24	3072	None	No	128
124	Somerset Hall	First Level	Hallway	32	2' U-shaped T8	magnetic	20	2	Fluorescent	32	15	19200	Switch	No	1280
125	Somerset Hall	First Level	Hallway	32	LED Exit Signs	-	3	1	LED	5	24	360	None	No	15
126	Somerset Hall	First Level	Room 015	32	4' linear T8	electronic	1	1	Fluorescent	32	12	384	Occ. Sensor	No	32
127	Somerset Hall	First Level	Room 013	32	4' linear T8	electronic	9	2	Fluorescent	32	12	6912	Switch	No	576
128	Somerset Hall	First Level	Hallway in front of coffee shop	28	2' U-shaped T12	magnetic	8	2	Fluorescent	40	15	9600	Switch	No	640
129	Somerset Hall	First Level	Stairwells	25	2' U-shaped T8	electronic	12	2	Fluorescent	32	15	11520	Switch	No	768
130	Somerset Hall	First Level	Hallway towards bookstore	28	2' linear T8	electronic	2	1	Fluorescent	17	15	510	Switch	No	34
131	Somerset Hall	First Level	Coffee Shop	36	4' linear T8	electronic	4	1	Fluorescent	32	12	1536	Switch	No	128
132	Somerset Hall	First Level	Coffee Shop	36	40W Flood lights	-	7	1	Flood lights	40	12	3360	Switch	No	280
133	Somerset Hall	First Level	Hallway near security	46	2' U-shaped T12	magnetic	12	2	Fluorescent	40	15	14400	Switch	No	960
134	Somerset Hall	First Level	Hallway near security	46	LED Exit Signs	-	1	1	LED	5	24	120	None	No	5
135	Somerset Hall	First Level	Hallway near security	46	Fluorescent Exit Signs	-	2	1	Fluorescent	20	24	960	None	No	40
136	Somerset Hall	First Level	Hallway display/bulletins	46	4' linear T12	magnetic	2	2	Fluorescent	40	15	2400	Switch	No	160
137	Somerset Hall	First Level	Telephone and Mech. Room	61	2' U-shaped T12	magnetic	4	2	Fluorescent	40	15	4800	Switch	No	320
138	Somerset Hall	First Level	Telephone and Mech. Room	61	4' linear T8	magnetic	3	2	Fluorescent	32	15	2880	Switch	No	192
139	Somerset Hall	First Level	Telephone and Mech. Room	61	8' linear T12	magnetic	2	2	Fluorescent	72	15	4320	Switch	No	288
140	Somerset Hall	First Level	Hallway to Cont. Center	79	4' linear T12	magnetic	6	3	Fluorescent	40	15	10800	None	Yes	720
141	Somerset Hall	First Level	Main Entrance	60	18W Halogen	-	10	1	Halogen	16	15	2400	Switch	Yes	160
142	Somerset Hall	First Level	Lobby Area	60	2' U-shaped T8	electronic	3	3	Fluorescent	32	15	4320	Switch	No	288
143	Somerset Hall	First Level	Lobby Area	60	2' U-shaped T12	magnetic	1	2	Fluorescent	40	15	1200	Switch	No	80

**Appendix A: Lighting study (Sheet 2 – Proposed lights)**

Proposed Lighting Conditions																
#	Building	Level/Floor	Location in Building	Measured Lighting Level in Footcandles	Fixture Type	Ballast Type	No. of Fixtures	No. of Lamps	Type of Lamp	Watts/Lamp	Hrs/Day	Energy Use (Watt hours/day)	Controls	Daylighting possible?	Total Power (Watts)	
1	Somerset Hall	Second Level	Human Resource Offices	42	4' linear T8	electronic	19	4	Fluorescent	32	12	29184	Switch	No	2432	
2	<b>Somerset Hall</b>	<b>Second Level</b>	<b>Area near elevators</b>	<b>30</b>	<b>2' U-shaped T8</b>	<b>electronic</b>	<b>16</b>	<b>2</b>	<b>Fluorescent</b>	<b>32</b>	<b>15</b>	<b>15360</b>	<b>Switch</b>	<b>No</b>	<b>1024</b>	
3	Somerset Hall	Second Level	Area near elevators	30	LED Exit Signs	-	2	1	LED	5	24	240	None	No	10	
4	<b>Somerset Hall</b>	<b>Second Level</b>	<b>Men's Room</b>	<b>28</b>	<b>2' U-shaped T8</b>	<b>electronic</b>	<b>3</b>	<b>2</b>	<b>Fluorescent</b>	<b>32</b>	<b>15</b>	<b>2880</b>	<b>Switch</b>	<b>No</b>	<b>192</b>	
5	<b>Somerset Hall</b>	<b>Second Level</b>	<b>Women's Room</b>	<b>28</b>	<b>2' U-shaped T8</b>	<b>electronic</b>	<b>3</b>	<b>2</b>	<b>Fluorescent</b>	<b>32</b>	<b>15</b>	<b>2880</b>	<b>Switch</b>	<b>No</b>	<b>192</b>	
6	Somerset Hall	Second Level	Room 243	27	4' linear T8	electronic	12	3	Fluorescent	32	12	13824	Switch	No	1152	
7	Somerset Hall	Second Level	Room 243	27	20W CFL	-	27	2	CFL	20	12	12960	Switch	No	1080	
8	Somerset Hall	Second Level	Room 244	28	4' linear T8	electronic	12	3	Fluorescent	32	12	13824	Switch	No	1152	
9	Somerset Hall	Second Level	Room 244	28	20W CFL	-	27	2	CFL	20	12	12960	Switch	No	1080	
10	Somerset Hall	Second Level	Room 245	82	4' linear T8	electronic	12	3	Fluorescent	32	12	13824	Switch	No	1152	
11	Somerset Hall	Second Level	Room 245	82	20W CFL	-	26	2	CFL	20	12	12480	Switch	No	1040	
12	Somerset Hall	Second Level	Room 246	50	4' linear T8	electronic	12	3	Fluorescent	32	12	13824	Switch	No	1152	
13	Somerset Hall	Second Level	Room 246	50	20W CFL	-	26	2	CFL	20	12	12480	Switch	No	1040	
14	Somerset Hall	Second Level	Room 247	91	4' linear T8	electronic	12	3	Fluorescent	32	12	13824	Switch	No	1152	
15	Somerset Hall	Second Level	Room 247	91	20W CFL	-	27	2	CFL	20	12	12960	Switch	No	1080	
16	Somerset Hall	Second Level	Hallway	38	2' U-shaped T8	electronic	22	2	Fluorescent	32	15	21120	Switch	No	1408	
17	Somerset Hall	Second Level	Hallway	38	LED Exit Signs	-	2	1	Fluorescent	5	24	240	None	No	10	
18	<b>Somerset Hall</b>	<b>Second Level</b>	<b>Custodian's Closet</b>	<b>17</b>	<b>4' linear T8</b>	<b>electronic</b>	<b>1</b>	<b>2</b>	<b>Fluorescent</b>	<b>32</b>	<b>4</b>	<b>256</b>	<b>Switch</b>	<b>No</b>	<b>64</b>	
19	Somerset Hall	Second Level	Room 242	46	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512	
20	Somerset Hall	Second Level	Room 240 and Reception area	68	4' linear T8	electronic	6	4	Fluorescent	32	12	9216	Switch	No	768	
21	Somerset Hall	Second Level	Room 241	68	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512	
22	Somerset Hall	Second Level	Room 239	68	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512	
23	Somerset Hall	Second Level	Room 235A	73	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512	
24	Somerset Hall	Second Level	Room 235	72	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512	
25	Somerset Hall	Second Level	Break Room	53	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256	
26	Somerset Hall	Second Level	Room 227	67	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512	
27	Somerset Hall	Second Level	Room 225	68	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512	
28	Somerset Hall	Second Level	Room 223B	63	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512	
29	Somerset Hall	Second Level	Room 223A	59	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512	
30	Somerset Hall	Second Level	Room 238	71	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256	
31	Somerset Hall	Second Level	Room 237	70	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256	
32	Somerset Hall	Second Level	Room 232	65	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512	
33	Somerset Hall	Second Level	Room 230	60	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256	
34	Somerset Hall	Second Level	Room 229	74	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256	
35	Somerset Hall	Second Level	Room 226	71	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256	
36	Somerset Hall	Second Level	Room 224	69	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256	
37	Somerset Hall	Second Level	Room 222	65	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512	
38	Somerset Hall	Second Level	Office Hallway	44	2' U-shaped T8	electronic	11	2	Fluorescent	32	15	10560	Switch	No	704	
39	<b>Somerset Hall</b>	<b>Third Level</b>	<b>Area near elevators</b>	<b>34</b>	<b>2' U-shaped T8</b>	<b>electronic</b>	<b>11</b>	<b>2</b>	<b>Fluorescent</b>	<b>32</b>	<b>15</b>	<b>10560</b>	<b>Switch</b>	<b>No</b>	<b>704</b>	
40	<b>Somerset Hall</b>	<b>Third Level</b>	<b>Men's Room</b>	<b>60</b>	<b>2' U-shaped T8</b>	<b>electronic</b>	<b>3</b>	<b>2</b>	<b>Fluorescent</b>	<b>32</b>	<b>15</b>	<b>2880</b>	<b>Switch</b>	<b>No</b>	<b>192</b>	
41	<b>Somerset Hall</b>	<b>Third Level</b>	<b>Women's Room</b>	<b>60</b>	<b>2' U-shaped T8</b>	<b>electronic</b>	<b>3</b>	<b>2</b>	<b>Fluorescent</b>	<b>32</b>	<b>15</b>	<b>2880</b>	<b>Switch</b>	<b>No</b>	<b>192</b>	
42	<b>Somerset Hall</b>	<b>Third Level</b>	<b>Stairwells</b>	<b>60</b>	<b>4' linear T8</b>	<b>electronic</b>	<b>11</b>	<b>2</b>	<b>Fluorescent</b>	<b>32</b>	<b>15</b>	<b>10560</b>	<b>Switch</b>	<b>No</b>	<b>704</b>	
43	Somerset Hall	Third Level	Stairwells	60	LED Exit Signs	-	1	1	LED	5	24	120	None	No	5	
44	<b>Somerset Hall</b>	<b>Third Level</b>	<b>Office Reception Area</b>	<b>68</b>	<b>4' linear T8</b>	<b>electronic</b>	<b>10</b>	<b>3</b>	<b>Fluorescent</b>	<b>32</b>	<b>12</b>	<b>11520</b>	<b>Switch</b>	<b>No</b>	<b>960</b>	
45	Somerset Hall	Third Level	Office Reception Area	68	LED Exit Signs	-	2	1	LED	5	24	240	None	No	10	
46	<b>Somerset Hall</b>	<b>Third Level</b>	<b>Room 303</b>	<b>57</b>	<b>4' linear T8</b>	<b>electronic</b>	<b>2</b>	<b>3</b>	<b>Fluorescent</b>	<b>32</b>	<b>12</b>	<b>2304</b>	<b>Switch</b>	<b>No</b>	<b>192</b>	
47	<b>Somerset Hall</b>	<b>Third Level</b>	<b>Room 303</b>	<b>57</b>	<b>4' linear T8</b>	<b>electronic</b>	<b>4</b>	<b>2</b>	<b>Fluorescent</b>	<b>32</b>	<b>12</b>	<b>3072</b>	<b>Switch</b>	<b>No</b>	<b>256</b>	
48	<b>Somerset Hall</b>	<b>Third Level</b>	<b>Room 305</b>	<b>61</b>	<b>4' linear T8</b>	<b>electronic</b>	<b>2</b>	<b>3</b>	<b>Fluorescent</b>	<b>32</b>	<b>12</b>	<b>2304</b>	<b>Switch</b>	<b>No</b>	<b>192</b>	
49	<b>Somerset Hall</b>	<b>Third Level</b>	<b>Room 307</b>	<b>60</b>	<b>4' linear T8</b>	<b>electronic</b>	<b>2</b>	<b>3</b>	<b>Fluorescent</b>	<b>32</b>	<b>12</b>	<b>2304</b>	<b>Switch</b>	<b>No</b>	<b>192</b>	
50	<b>Somerset Hall</b>	<b>Third Level</b>	<b>Room 309</b>	<b>59</b>	<b>4' linear T8</b>	<b>electronic</b>	<b>2</b>	<b>3</b>	<b>Fluorescent</b>	<b>32</b>	<b>12</b>	<b>2304</b>	<b>Switch</b>	<b>No</b>	<b>192</b>	

51	Somerset Hall	Third Level	Room 308 - Meeting Room	73	4' linear T8	magnetic	4	3	Fluorescent	40	12	5760	Switch	No	480
52	Somerset Hall	Third Level	Room 308 - Meeting Room	73	40W Flood lights	-	4	1	Flood lights	40	4	640	Switch	No	160
53	Somerset Hall	Third Level	Room 306	69	4' linear T8	electronic	2	3	Fluorescent	32	12	2304	Switch	No	192
54	Somerset Hall	Third Level	Room 304	68	4' linear T8	electronic	2	3	Fluorescent	32	12	2304	Switch	No	192
55	Somerset Hall	Third Level	Room 302	71	4' linear T8	electronic	2	3	Fluorescent	32	12	2304	Switch	No	192
56	Somerset Hall	Third Level	Room 310	67	4' linear T8	electronic	2	3	Fluorescent	32	12	2304	Switch	No	192
57	Somerset Hall	Third Level	Room 312	58	4' linear T8	electronic	2	3	Fluorescent	32	12	2304	Switch	No	192
58	Somerset Hall	Third Level	Room 314	61	4' linear T8	electronic	2	3	Fluorescent	32	12	2304	Switch	No	192
59	Somerset Hall	Third Level	Room 316	63	4' linear T8	electronic	2	3	Fluorescent	32	12	2304	Switch	No	192
60	Somerset Hall	Third Level	Storage	59	4' linear T8	electronic	1	2	Fluorescent	32	2	128	Switch	No	64
61	Somerset Hall	Third Level	Room 319	57	4' linear T8	electronic	2	3	Fluorescent	32	12	2304	Switch	No	192
62	Somerset Hall	Third Level	Room 317	73	4' linear T8	electronic	2	3	Fluorescent	32	12	2304	Switch	No	192
63	Somerset Hall	Third Level	Room 315	66	4' linear T8	electronic	2	3	Fluorescent	32	12	2304	Switch	No	192
64	Somerset Hall	Third Level	Room 313	69	4' linear T8	electronic	2	3	Fluorescent	32	12	2304	Switch	No	192
65	Somerset Hall	Third Level	Room 311	74	4' linear T8	electronic	2	3	Fluorescent	32	12	2304	Switch	No	192
66	Somerset Hall	Third Level	Hallway	47	2' U-shaped T8	electronic	22	2	Fluorescent	40	15	26400	Switch	No	1760
67	Somerset Hall	Third Level	Hallway	47	LED Exit Signs	-	3	1	LED	5	24	360	Switch	No	15
68	Somerset Hall	Third Level	Room 349	107	4' linear T8	electronic	12	3	Fluorescent	32	12	13824	Switch	No	1152
69	Somerset Hall	Third Level	Room 349	107	20W CFL	-	26	2	CFL	20	12	12480	Switch	No	1040
70	Somerset Hall	Third Level	Room 350	59	4' linear T8	electronic	12	3	Fluorescent	32	12	13824	Switch	No	1152
71	Somerset Hall	Third Level	Room 350	59	20W CFL	-	25	2	CFL	20	12	12000	Switch	No	1000
72	Somerset Hall	Third Level	Room 351	72	4' linear T8	electronic	12	3	Fluorescent	32	12	13824	Switch	No	1152
73	Somerset Hall	Third Level	Room 351	72	20W CFL	-	25	2	CFL	20	12	12000	Switch	No	1000
74	Somerset Hall	Third Level	Room 352	64	4' linear T8	electronic	12	3	Fluorescent	32	12	13824	Switch	No	1152
75	Somerset Hall	Third Level	Room 352	64	20W CFL	-	25	2	CFL	20	12	12000	Switch	No	1000
76	Somerset Hall	Third Level	Room 353	97	4' linear T8	electronic	12	3	Fluorescent	32	12	13824	Switch	No	1152
77	Somerset Hall	Third Level	Room 353	97	20W CFL	-	25	2	CFL	20	12	12000	Switch	No	1000
78	Somerset Hall	Third Level	Custodian's Closet	17	4' linear T8	electronic	1	2	Fluorescent	32	4	256	Switch	No	64
79	Somerset Hall	Third Level	Room 346 and Reception Area	62	4' linear T8	electronic	6	4	Fluorescent	32	12	9216	Switch	No	768
80	Somerset Hall	Third Level	Room 348	57	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
81	Somerset Hall	Third Level	Room 347	62	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
82	Somerset Hall	Third Level	Room 347A	61	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
83	Somerset Hall	Third Level	Room 345	60	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
84	Somerset Hall	Third Level	Room 341	63	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
85	Somerset Hall	Third Level	Room 339	72	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
86	Somerset Hall	Third Level	Room 333	71	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
87	Somerset Hall	Third Level	Room 333A	65	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
88	Somerset Hall	Third Level	Room 331	62	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
89	Somerset Hall	Third Level	Room 329	69	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
90	Somerset Hall	Third Level	Storage	64	4' linear T8	electronic	1	4	Fluorescent	32	12	1536	Switch	No	128
91	Somerset Hall	Third Level	Room 328	79	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
92	Somerset Hall	Third Level	Room 330	72	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
93	Somerset Hall	Third Level	Room 332	78	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
94	Somerset Hall	Third Level	Room 334	79	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
95	Somerset Hall	Third Level	Room 335	71	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
96	Somerset Hall	Third Level	Room 336	74	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
97	Somerset Hall	Third Level	Room 337	68	4' linear T8	electronic	4	4	Fluorescent	32	12	6144	Switch	No	512
98	Somerset Hall	Third Level	Room 340	77	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
99	Somerset Hall	Third Level	Room 342	59	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
100	Somerset Hall	Third Level	Room 343	62	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
101	Somerset Hall	Third Level	Room 344	67	4' linear T8	electronic	2	4	Fluorescent	32	12	3072	Switch	No	256
102	Somerset Hall	Third Level	Office Hallway	58	2' U-shaped T8	electronic	11	2	Fluorescent	32	12	8448	Switch	No	704
103	Somerset Hall	First Level	Tutoring Center	75	4' linear T8	electronic	57	2	Fluorescent	32	12	43776	Switch	No	3648
104	Somerset Hall	First Level	Tutoring Center	75	LED Exit Signs	-	4	1	LED	5	24	480	None	No	20
105	Somerset Hall	First Level	Room S017	58	4' linear T8	electronic	15	2	Fluorescent	32	12	11520	Switch	No	960
106	Somerset Hall	First Level	Room S017	58	LED Exit Signs	-	1	1	LED	5	24	120	None	No	5

107	Somerset Hall	First Level	New Security Office	100	2' U-shaped T8	electronic	11	3	Fluorescent	32	12	12672	Switch	No	1056
108	Somerset Hall	First Level	New Security Office	100	20W CFL	-	6	2	CFL	20	12	2880	Switch	No	240
109	Somerset Hall	First Level	New Security Office	100	LED Exit Signs	-	1	1	LED	5	24	120	None	No	5
110	Somerset Hall	First Level	Room 012	87	4' linear T8	electronic	12	2	Fluorescent	32	12	9216	Switch	No	768
111	Somerset Hall	First Level	Room 012	87	100W Floods	-	8	1	Flood lights	100	4	3200	Switch	No	800
112	Somerset Hall	First Level	Room 012	87	LED Exit Signs	-	2	1	LED	5	24	240	None	No	10
113	Somerset Hall	First Level	Room 014	42	4' linear T8	electronic	12	2	Fluorescent	32	12	9216	Switch	No	768
114	Somerset Hall	First Level	Room 014	42	LED Exit Signs	-	2	1	LED	5	24	240	None	No	10
115	Somerset Hall	First Level	Room 016	41	4' linear T8	electronic	12	2	Fluorescent	32	12	9216	Switch	No	768
116	Somerset Hall	First Level	Room 016	41	100W Floods	-	8	1	Flood lights	100	4	3200	Switch	No	800
117	Somerset Hall	First Level	Room 016	41	LED Exit Signs	-	2	1	LED	5	24	240	None	No	10
118	Somerset Hall	First Level	Room 018 - Media Depot	23	4' linear T8	electronic	14	2	Fluorescent	32	12	10752	Switch	No	896
119	Somerset Hall	First Level	Room 018 - Media Depot	23	LED Exit Signs	-	1	1	LED	5	24	120	None	No	5
120	<b>Somerset Hall</b>	<b>First Level</b>	<b>Storage</b>	<b>26</b>	<b>4' linear T8</b>	<b>electronic</b>	<b>1</b>	<b>2</b>	<b>Fluorescent</b>	<b>32</b>	<b>4</b>	<b>256</b>	<b>Switch</b>	<b>No</b>	<b>64</b>
121	Somerset Hall	First Level	Janitor's Closet 1	17	4' linear T8	electronic	1	1	Fluorescent	32	4	128	Switch	No	32
122	Somerset Hall	First Level	Janitor's Closet 2	16	4' linear T8	electronic	1	1	Fluorescent	32	4	128	Switch	No	32
123	<b>Somerset Hall</b>	<b>First Level</b>	<b>Elevators</b>	<b>23</b>	<b>4' linear T8</b>	<b>electronic</b>	<b>2</b>	<b>2</b>	<b>Fluorescent</b>	<b>32</b>	<b>24</b>	<b>3072</b>	<b>None</b>	<b>No</b>	<b>128</b>
124	Somerset Hall	First Level	Hallway	32	2' U-shaped T8	magnetic	20	2	Fluorescent	32	15	19200	Switch	No	1280
125	Somerset Hall	First Level	Hallway	32	LED Exit Signs	-	3	1	LED	5	24	360	None	No	15
126	Somerset Hall	First Level	Room 015	32	4' linear T8	electronic	1	1	Fluorescent	32	12	384	Occ. Sensor	No	32
127	Somerset Hall	First Level	Room 013	32	4' linear T8	electronic	9	2	Fluorescent	32	12	6912	Switch	No	576
128	<b>Somerset Hall</b>	<b>First Level</b>	<b>Hallway in front of coffee shop</b>	<b>28</b>	<b>2' U-shaped T8</b>	<b>electronic</b>	<b>8</b>	<b>2</b>	<b>Fluorescent</b>	<b>32</b>	<b>15</b>	<b>7680</b>	<b>Switch</b>	<b>No</b>	<b>512</b>
129	Somerset Hall	First Level	Stairwells	25	2' U-shaped T8	electronic	12	2	Fluorescent	32	15	11520	Switch	No	768
130	Somerset Hall	First Level	Hallway towards bookstore	28	2' linear T8	electronic	2	1	Fluorescent	17	15	510	Switch	No	34
131	Somerset Hall	First Level	Coffee Shop	36	4' linear T8	electronic	4	1	Fluorescent	32	12	1536	Switch	No	128
132	Somerset Hall	First Level	Coffee Shop	36	40W Flood lights	-	7	1	Flood lights	40	12	3360	Switch	No	280
133	<b>Somerset Hall</b>	<b>First Level</b>	<b>Hallway near security</b>	<b>46</b>	<b>2' U-shaped T8</b>	<b>electronic</b>	<b>12</b>	<b>2</b>	<b>Fluorescent</b>	<b>32</b>	<b>15</b>	<b>11520</b>	<b>Switch</b>	<b>No</b>	<b>768</b>
134	Somerset Hall	First Level	Hallway near security	46	LED Exit Signs	-	1	1	LED	5	24	120	None	No	5
135	Somerset Hall	First Level	Hallway near security	46	Fluorescent Exit Signs	-	2	1	Fluorescent	20	24	960	None	No	40
136	<b>Somerset Hall</b>	<b>First Level</b>	<b>Hallway display/bulletins</b>	<b>46</b>	<b>4' linear T8</b>	<b>electronic</b>	<b>2</b>	<b>2</b>	<b>Fluorescent</b>	<b>32</b>	<b>15</b>	<b>1920</b>	<b>Switch</b>	<b>No</b>	<b>128</b>
137	<b>Somerset Hall</b>	<b>First Level</b>	<b>Telephone and Mech. Room</b>	<b>61</b>	<b>2' U-shaped T8</b>	<b>electronic</b>	<b>4</b>	<b>2</b>	<b>Fluorescent</b>	<b>32</b>	<b>15</b>	<b>3840</b>	<b>Switch</b>	<b>No</b>	<b>256</b>
138	<b>Somerset Hall</b>	<b>First Level</b>	<b>Telephone and Mech. Room</b>	<b>61</b>	<b>4' linear T8</b>	<b>electronic</b>	<b>3</b>	<b>2</b>	<b>Fluorescent</b>	<b>32</b>	<b>15</b>	<b>2880</b>	<b>Switch</b>	<b>No</b>	<b>192</b>
139	<b>Somerset Hall</b>	<b>First Level</b>	<b>Telephone and Mech. Room</b>	<b>61</b>	<b>8' linear T8</b>	<b>electronic</b>	<b>2</b>	<b>2</b>	<b>Fluorescent</b>	<b>56</b>	<b>15</b>	<b>3360</b>	<b>Switch</b>	<b>No</b>	<b>224</b>
140	<b>Somerset Hall</b>	<b>First Level</b>	<b>Hallway to Conf. Center</b>	<b>79</b>	<b>4' linear T8</b>	<b>electronic</b>	<b>6</b>	<b>3</b>	<b>Fluorescent</b>	<b>32</b>	<b>15</b>	<b>8640</b>	<b>None</b>	<b>No</b>	<b>576</b>
141	Somerset Hall	First Level	Main Entrance	60	16W Halogen	-	10	1	Halogen	16	15	2400	Switch	No	160
142	Somerset Hall	First Level	Lobby Area	60	2' U-shaped T8	electronic	3	3	Fluorescent	32	15	4320	Switch	No	288
143	Somerset Hall	First Level	Lobby Area	60	2' U-shaped T12	magnetic	1	2	Fluorescent	40	15	1200	Switch	No	80

<b>Existing</b>															
<b>Totals</b>		Interior Lighting Total Watts		74765	Watts										
Existing Usage (kWh/year)		241,480	Interior Lighting Power Density (W/sqft)		1.07	W/sqft									
Proposed Usage (kWh/year)		232,241													
<b>Proposed</b>															
Existing Est. Cost (\$/year)		\$ 37,429.37	Interior Lighting Total Watts		72161	watts									
Proposed Est. Cost (\$/year)		\$ 35,997.43	Interior Lighting (W/sqft)		1.03	W/sqft									
Total kWh savings		9,238													
Total \$ Savings		\$ 1,431.95													

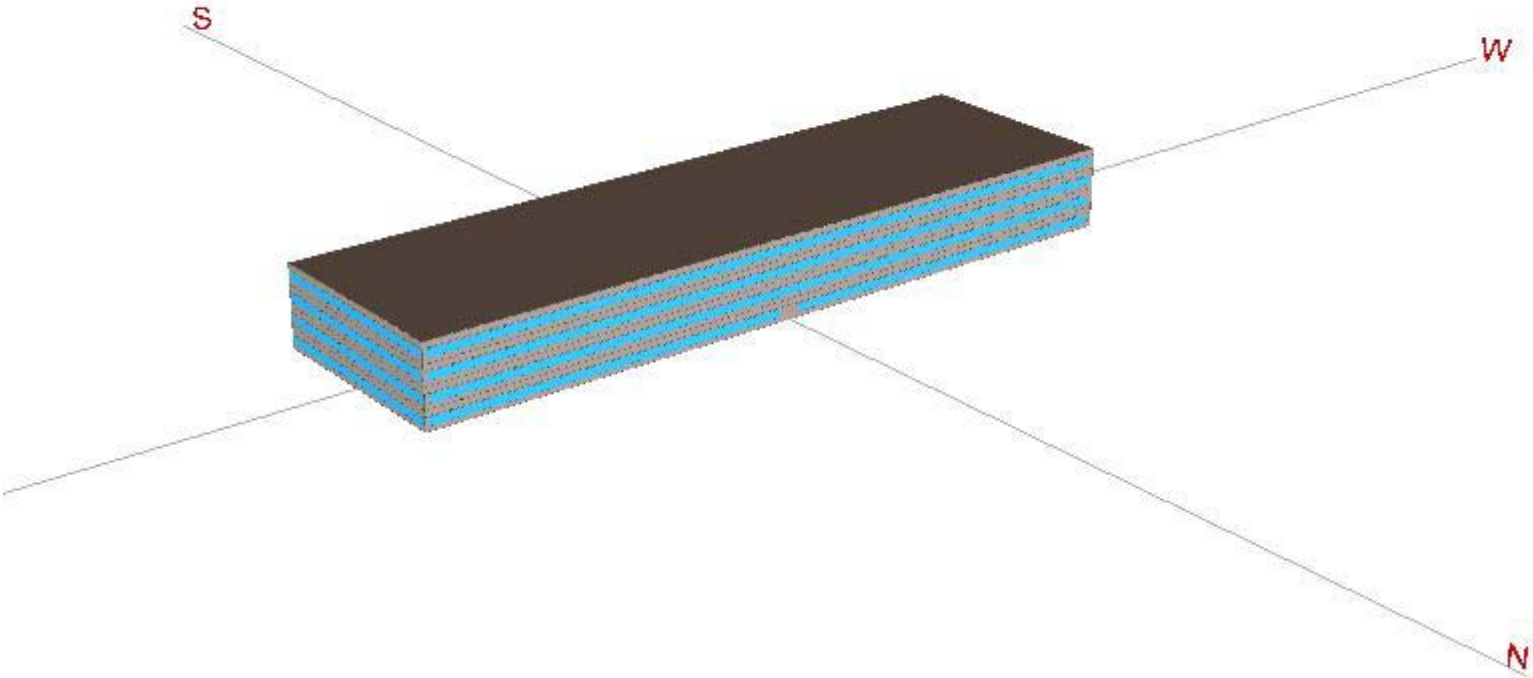
Appendix A: Lighting study (Sheet 3 – Proposed lighting controls)

Proposed Lighting Controls																
#	Building	Level/Floor	Location in Building	Measured Lighting Level in Footcandles	Fixture Type	Ballast Type	No. of Fixtures	No. of Lamps	Type of Lamp	Watts/Lamp	Hrs/Day	Energy Use (Watt hours/day)	Controls	New sensors	Daylighting possible?	Total Power (Watts)
1	Somerset Hall	Second Level	Human Resource Offices	42	4' linear T8	electronic	19	4	Fluorescent	32	10	24320	Occ. Sensor	1	No	2432
2	Somerset Hall	Second Level	Area near elevators	30	2' U-shaped T8	electronic	16	2	Fluorescent	32	12	12288	Occ. Sensor	1	No	1024
3	Somerset Hall	Second Level	Area near elevators	30	LED Exit Signs	-	2	1	LED	5	24	240	None		No	10
4	Somerset Hall	Second Level	Men's Room	28	2' U-shaped T8	electronic	3	2	Fluorescent	32	12	2304	Occ. Sensor	1	No	192
5	Somerset Hall	Second Level	Women's Room	28	2' U-shaped T8	electronic	3	2	Fluorescent	32	12	2304	Occ. Sensor	1	No	192
6	Somerset Hall	Second Level	Room 243	27	4' linear T8	electronic	12	3	Fluorescent	32	10	11520	Occ. Sensor	1	No	1152
7	Somerset Hall	Second Level	Room 243	27	20W CFL	-	27	2	CFL	20	10	10800	Occ. Sensor	1	No	1080
8	Somerset Hall	Second Level	Room 244	28	4' linear T8	electronic	12	3	Fluorescent	32	10	11520	Occ. Sensor	1	No	1152
9	Somerset Hall	Second Level	Room 244	28	20W CFL	-	27	2	CFL	20	10	10800	Occ. Sensor	1	No	1080
10	Somerset Hall	Second Level	Room 245	82	4' linear T8	electronic	12	3	Fluorescent	32	10	11520	Occ. Sensor	1	No	1152
11	Somerset Hall	Second Level	Room 245	82	20W CFL	-	26	2	CFL	20	10	10400	Occ. Sensor	1	No	1040
12	Somerset Hall	Second Level	Room 246	50	4' linear T8	electronic	12	3	Fluorescent	32	10	11520	Occ. Sensor	1	No	1152
13	Somerset Hall	Second Level	Room 246	50	20W CFL	-	26	2	CFL	20	10	10400	Occ. Sensor	1	No	1040
14	Somerset Hall	Second Level	Room 247	91	4' linear T8	electronic	12	3	Fluorescent	32	10	11520	Occ. Sensor	1	No	1152
15	Somerset Hall	Second Level	Room 247	91	20W CFL	-	27	2	CFL	20	10	10800	Occ. Sensor	1	No	1080
16	Somerset Hall	Second Level	Hallway	38	2' U-shaped T8	electronic	22	2	Fluorescent	32	12	16896	Occ. Sensor	1	No	1408
17	Somerset Hall	Second Level	Hallway	38	LED Exit Signs	-	2	1	Fluorescent	5	24	240	None		No	10
18	Somerset Hall	Second Level	Custodian's Closet	17	4' linear T8	electronic	1	2	Fluorescent	32	4	256	Switch		No	64
19	Somerset Hall	Second Level	Room 242	46	4' linear T8	electronic	4	4	Fluorescent	32	10	5120	Occ. Sensor	1	No	512
20	Somerset Hall	Second Level	Room 240 and Reception area	68	4' linear T8	electronic	6	4	Fluorescent	32	10	7680	Occ. Sensor	1	No	768
21	Somerset Hall	Second Level	Room 241	68	4' linear T8	electronic	4	4	Fluorescent	32	10	5120	Occ. Sensor	1	No	512
22	Somerset Hall	Second Level	Room 239	68	4' linear T8	electronic	4	4	Fluorescent	32	10	5120	Occ. Sensor	1	No	512
23	Somerset Hall	Second Level	Room 235A	73	4' linear T8	electronic	4	4	Fluorescent	32	10	5120	Occ. Sensor	1	No	512
24	Somerset Hall	Second Level	Room 235	72	4' linear T8	electronic	4	4	Fluorescent	32	10	5120	Occ. Sensor	1	No	512
25	Somerset Hall	Second Level	Break Room	53	4' linear T8	electronic	2	4	Fluorescent	32	10	2560	Occ. Sensor	1	No	256
26	Somerset Hall	Second Level	Room 227	67	4' linear T8	electronic	4	4	Fluorescent	32	10	5120	Occ. Sensor	1	No	512
27	Somerset Hall	Second Level	Room 225	68	4' linear T8	electronic	4	4	Fluorescent	32	10	5120	Occ. Sensor	1	No	512
28	Somerset Hall	Second Level	Room 223B	63	4' linear T8	electronic	4	4	Fluorescent	32	10	5120	Occ. Sensor	1	No	512
29	Somerset Hall	Second Level	Room 223A	59	4' linear T8	electronic	4	4	Fluorescent	32	10	5120	Occ. Sensor	1	No	512
30	Somerset Hall	Second Level	Room 238	71	4' linear T8	electronic	2	4	Fluorescent	32	10	2560	Occ. Sensor	1	No	256
31	Somerset Hall	Second Level	Room 237	70	4' linear T8	electronic	2	4	Fluorescent	32	10	2560	Occ. Sensor	1	No	256
32	Somerset Hall	Second Level	Room 232	65	4' linear T8	electronic	4	4	Fluorescent	32	10	5120	Occ. Sensor	1	No	512
33	Somerset Hall	Second Level	Room 230	60	4' linear T8	electronic	2	4	Fluorescent	32	10	2560	Occ. Sensor	1	No	256
34	Somerset Hall	Second Level	Room 229	74	4' linear T8	electronic	2	4	Fluorescent	32	10	2560	Occ. Sensor	1	No	256
35	Somerset Hall	Second Level	Room 226	71	4' linear T8	electronic	2	4	Fluorescent	32	10	2560	Occ. Sensor	1	No	256
36	Somerset Hall	Second Level	Room 224	69	4' linear T8	electronic	2	4	Fluorescent	32	10	2560	Occ. Sensor	1	No	256
37	Somerset Hall	Second Level	Room 222	65	4' linear T8	electronic	4	4	Fluorescent	32	10	5120	Occ. Sensor	1	No	512
38	Somerset Hall	Second Level	Office Hallway	44	2' U-shaped T8	electronic	11	2	Fluorescent	32	12	8448	Occ. Sensor	1	No	704
39	Somerset Hall	Third Level	Area near elevators	34	2' U-shaped T8	electronic	11	2	Fluorescent	32	12	8448	Occ. Sensor	1	No	704
40	Somerset Hall	Third Level	Men's Room	60	2' U-shaped T8	electronic	3	2	Fluorescent	32	12	2304	Occ. Sensor	1	No	192
41	Somerset Hall	Third Level	Women's Room	60	2' U-shaped T8	electronic	3	2	Fluorescent	32	12	2304	Occ. Sensor	1	No	192
42	Somerset Hall	Third Level	Stairwells	60	4' linear T8	electronic	11	2	Fluorescent	32	12	8448	Occ. Sensor	1	Yes	704
43	Somerset Hall	Third Level	Stairwells	60	LED Exit Signs	-	1	1	LED	5	24	120	None		Yes	5
44	Somerset Hall	Third Level	Office Reception Area	68	4' linear T8	electronic	10	3	Fluorescent	32	10	9600	Occ. Sensor	1	No	960
45	Somerset Hall	Third Level	Office Reception Area	68	LED Exit Signs	-	2	1	LED	5	24	240	None		No	10
46	Somerset Hall	Third Level	Room 303	57	4' linear T8	electronic	2	3	Fluorescent	32	10	1920	Occ. Sensor	1	No	192
47	Somerset Hall	Third Level	Room 303	57	4' linear T8	electronic	4	2	Fluorescent	32	10	2560	Occ. Sensor	1	No	256
48	Somerset Hall	Third Level	Room 305	61	4' linear T8	electronic	2	3	Fluorescent	32	10	1920	Occ. Sensor	1	No	192
49	Somerset Hall	Third Level	Room 307	60	4' linear T8	electronic	2	3	Fluorescent	32	10	1920	Occ. Sensor	1	No	192
50	Somerset Hall	Third Level	Room 309	59	4' linear T8	electronic	2	3	Fluorescent	32	10	1920	Occ. Sensor	1	No	192

51	Somerset Hall	Third Level	Room 308 - Meeting Room	73	4' linear T8	electronic	4	3	Fluorescent	40	10	4800	Occ. Sensor	1	No	480
52	Somerset Hall	Third Level	Room 308 - Meeting Room	73	40W Flood lights	-	4	1	Flood lights	40	4	640	Switch		No	160
53	Somerset Hall	Third Level	Room 306	69	4' linear T8	electronic	2	3	Fluorescent	32	10	1920	Occ. Sensor	1	No	192
54	Somerset Hall	Third Level	Room 304	68	4' linear T8	electronic	2	3	Fluorescent	32	10	1920	Occ. Sensor	1	No	192
55	Somerset Hall	Third Level	Room 302	71	4' linear T8	electronic	2	3	Fluorescent	32	10	1920	Occ. Sensor	1	No	192
56	Somerset Hall	Third Level	Room 310	67	4' linear T8	electronic	2	3	Fluorescent	32	10	1920	Occ. Sensor	1	No	192
57	Somerset Hall	Third Level	Room 312	58	4' linear T8	electronic	2	3	Fluorescent	32	10	1920	Occ. Sensor	1	No	192
58	Somerset Hall	Third Level	Room 314	61	4' linear T8	electronic	2	3	Fluorescent	32	10	1920	Occ. Sensor	1	No	192
59	Somerset Hall	Third Level	Room 316	63	4' linear T8	electronic	2	3	Fluorescent	32	10	1920	Occ. Sensor	1	No	192
60	Somerset Hall	Third Level	Storage	59	4' linear T8	electronic	1	2	Fluorescent	32	2	128	Switch		No	64
61	Somerset Hall	Third Level	Room 319	57	4' linear T8	electronic	2	3	Fluorescent	32	10	1920	Occ. Sensor	1	No	192
62	Somerset Hall	Third Level	Room 317	73	4' linear T8	electronic	2	3	Fluorescent	32	10	1920	Occ. Sensor	1	No	192
63	Somerset Hall	Third Level	Room 315	66	4' linear T8	electronic	2	3	Fluorescent	32	10	1920	Occ. Sensor	1	No	192
64	Somerset Hall	Third Level	Room 313	69	4' linear T8	electronic	2	3	Fluorescent	32	10	1920	Occ. Sensor	1	No	192
65	Somerset Hall	Third Level	Room 311	74	4' linear T8	electronic	2	3	Fluorescent	32	10	1920	Occ. Sensor	1	No	192
66	Somerset Hall	Third Level	Hallway	47	2' U-shaped T8	electronic	22	2	Fluorescent	40	12	21120	Occ. Sensor	1	No	1760
67	Somerset Hall	Third Level	Hallway	47	LED Exit Signs	-	3	1	LED	5	24	360	Switch		No	15
68	Somerset Hall	Third Level	Room 349	107	4' linear T8	electronic	12	3	Fluorescent	32	10	11520	Occ. Sensor	1	No	1152
69	Somerset Hall	Third Level	Room 349	107	20W CFL	-	26	2	CFL	20	10	10400	Occ. Sensor	1	No	1040
70	Somerset Hall	Third Level	Room 350	59	4' linear T8	electronic	12	3	Fluorescent	32	10	11520	Occ. Sensor	1	No	1152
71	Somerset Hall	Third Level	Room 350	59	20W CFL	-	25	2	CFL	20	10	10000	Occ. Sensor	1	No	1000
72	Somerset Hall	Third Level	Room 351	72	4' linear T8	electronic	12	3	Fluorescent	32	10	11520	Occ. Sensor	1	No	1152
73	Somerset Hall	Third Level	Room 351	72	20W CFL	-	25	2	CFL	20	10	10000	Occ. Sensor	1	No	1000
74	Somerset Hall	Third Level	Room 352	64	4' linear T8	electronic	12	3	Fluorescent	32	10	11520	Occ. Sensor	1	No	1152
75	Somerset Hall	Third Level	Room 352	64	20W CFL	-	25	2	CFL	20	10	10000	Occ. Sensor	1	No	1000
76	Somerset Hall	Third Level	Room 353	97	4' linear T8	electronic	12	3	Fluorescent	32	10	11520	Occ. Sensor	1	No	1152
77	Somerset Hall	Third Level	Room 353	97	20W CFL	-	25	2	CFL	20	10	10000	Occ. Sensor	1	No	1000
78	Somerset Hall	Third Level	Custodian's Closet	17	4' linear T8	electronic	1	2	Fluorescent	32	4	256	Switch		No	64
79	Somerset Hall	Third Level	Room 346 and Reception Area	62	4' linear T8	electronic	6	4	Fluorescent	32	10	7680	Occ. Sensor	1	No	768
80	Somerset Hall	Third Level	Room 348	57	4' linear T8	electronic	4	4	Fluorescent	32	10	5120	Occ. Sensor	1	No	512
81	Somerset Hall	Third Level	Room 347	62	4' linear T8	electronic	4	4	Fluorescent	32	10	5120	Occ. Sensor	1	No	512
82	Somerset Hall	Third Level	Room 347A	61	4' linear T8	electronic	4	4	Fluorescent	32	10	5120	Occ. Sensor	1	No	512
83	Somerset Hall	Third Level	Room 345	60	4' linear T8	electronic	4	4	Fluorescent	32	10	5120	Occ. Sensor	1	No	512
84	Somerset Hall	Third Level	Room 341	63	4' linear T8	electronic	4	4	Fluorescent	32	10	5120	Occ. Sensor	1	No	512
85	Somerset Hall	Third Level	Room 339	72	4' linear T8	electronic	4	4	Fluorescent	32	10	5120	Occ. Sensor	1	No	512
86	Somerset Hall	Third Level	Room 333	71	4' linear T8	electronic	2	4	Fluorescent	32	10	2560	Occ. Sensor	1	No	256
87	Somerset Hall	Third Level	Room 333A	65	4' linear T8	electronic	4	4	Fluorescent	32	10	5120	Occ. Sensor	1	No	512
88	Somerset Hall	Third Level	Room 331	62	4' linear T8	electronic	4	4	Fluorescent	32	10	5120	Occ. Sensor	1	No	512
89	Somerset Hall	Third Level	Room 329	69	4' linear T8	electronic	4	4	Fluorescent	32	10	5120	Occ. Sensor	1	No	512
90	Somerset Hall	Third Level	Storage	64	4' linear T8	electronic	1	4	Fluorescent	32	10	1280	Occ. Sensor	1	No	128
91	Somerset Hall	Third Level	Room 328	79	4' linear T8	electronic	4	4	Fluorescent	32	10	5120	Occ. Sensor	1	No	512
92	Somerset Hall	Third Level	Room 330	72	4' linear T8	electronic	2	4	Fluorescent	32	10	2560	Occ. Sensor	1	No	256
93	Somerset Hall	Third Level	Room 332	78	4' linear T8	electronic	2	4	Fluorescent	32	10	2560	Occ. Sensor	1	No	256
94	Somerset Hall	Third Level	Room 334	79	4' linear T8	electronic	2	4	Fluorescent	32	10	2560	Occ. Sensor	1	No	256
95	Somerset Hall	Third Level	Room 335	71	4' linear T8	electronic	2	4	Fluorescent	32	10	2560	Occ. Sensor	1	No	256
96	Somerset Hall	Third Level	Room 336	74	4' linear T8	electronic	4	4	Fluorescent	32	10	5120	Occ. Sensor	1	No	512
97	Somerset Hall	Third Level	Room 337	68	4' linear T8	electronic	4	4	Fluorescent	32	10	5120	Occ. Sensor	1	No	512
98	Somerset Hall	Third Level	Room 340	77	4' linear T8	electronic	2	4	Fluorescent	32	10	2560	Occ. Sensor	1	No	256
99	Somerset Hall	Third Level	Room 342	59	4' linear T8	electronic	2	4	Fluorescent	32	10	2560	Occ. Sensor	1	No	256
100	Somerset Hall	Third Level	Room 343	62	4' linear T8	electronic	2	4	Fluorescent	32	10	2560	Occ. Sensor	1	No	256
101	Somerset Hall	Third Level	Room 344	67	4' linear T8	electronic	2	4	Fluorescent	32	10	2560	Occ. Sensor	1	No	256
102	Somerset Hall	Third Level	Office Hallway	58	2' U-shaped T8	electronic	11	2	Fluorescent	32	10	7040	Occ. Sensor	1	No	704
103	Somerset Hall	First Level	Tutoring Center	75	4' linear T8	electronic	57	2	Fluorescent	32	10	36480	Occ. Sensor	1	No	3648
104	Somerset Hall	First Level	Tutoring Center	75	LED Exit Signs	-	4	1	LED	5	24	480	None		No	20
105	Somerset Hall	First Level	Room S017	58	4' linear T8	electronic	15	2	Fluorescent	32	10	9600	Occ. Sensor	1	No	960
106	Somerset Hall	First Level	Room S017	58	LED Exit Signs	-	1	1	LED	5	24	120	None		No	5

107	Somerset Hall	First Level	New Security Office	100	2' U-shaped T8	electronic	11	3	Fluorescent	32	10	10560	Occ. Sensor	1	No	1056
108	Somerset Hall	First Level	New Security Office	100	20W CFL	-	6	2	CFL	20	10	2400	Occ. Sensor	1	No	240
109	Somerset Hall	First Level	New Security Office	100	LED Exit Signs	-	1	1	LED	5	24	120	None		No	5
110	Somerset Hall	First Level	Room 012	87	4' linear T8	electronic	12	2	Fluorescent	32	10	7680	Occ. Sensor	1	No	768
111	Somerset Hall	First Level	Room 012	87	100W Floods	-	8	1	Flood lights	100	4	3200	None		No	800
112	Somerset Hall	First Level	Room 012	87	LED Exit Signs	-	2	1	LED	5	24	240	None		No	10
113	Somerset Hall	First Level	Room 014	42	4' linear T8	electronic	12	2	Fluorescent	32	10	7680	Occ. Sensor	1	No	768
114	Somerset Hall	First Level	Room 014	42	LED Exit Signs	-	2	1	LED	5	24	240	None		No	10
115	Somerset Hall	First Level	Room 016	41	4' linear T8	electronic	12	2	Fluorescent	32	10	7680	Occ. Sensor	1	No	768
116	Somerset Hall	First Level	Room 016	41	100W Floods	-	8	1	Flood lights	100	4	3200	Switch		No	800
117	Somerset Hall	First Level	Room 016	41	LED Exit Signs	-	2	1	LED	5	24	240	None		No	10
118	Somerset Hall	First Level	Room 018 - Media Depot	23	4' linear T8	electronic	14	2	Fluorescent	32	10	8960	Occ. Sensor	1	No	896
119	Somerset Hall	First Level	Room 018 - Media Depot	23	LED Exit Signs	-	1	1	LED	5	24	120	None		No	5
120	Somerset Hall	First Level	Storage	26	4' linear T8	electronic	1	2	Fluorescent	32	4	256	Switch		No	64
121	Somerset Hall	First Level	Janitor's Closet 1	17	4' linear T8	electronic	1	1	Fluorescent	32	4	128	Switch		No	32
122	Somerset Hall	First Level	Janitor's Closet 2	16	4' linear T8	electronic	1	1	Fluorescent	32	4	128	Switch		No	32
123	Somerset Hall	First Level	Elevators	23	4' linear T8	electronic	2	2	Fluorescent	32	24	3072	None		No	128
124	Somerset Hall	First Level	Hallway	32	2' U-shaped T8	electronic	20	2	Fluorescent	32	12	15360	Switch		No	1280
125	Somerset Hall	First Level	Hallway	32	LED Exit Signs	-	3	1	LED	5	24	360	None		No	15
126	Somerset Hall	First Level	Room 015	32	4' linear T8	electronic	1	1	Fluorescent	32	10	320	Occ. Sensor	1	No	32
127	Somerset Hall	First Level	Room 013	32	4' linear T8	electronic	9	2	Fluorescent	32	10	5760	Occ. Sensor	1	No	576
128	Somerset Hall	First Level	Hallway in front of coffee shop	28	2' U-shaped T8	electronic	8	2	Fluorescent	32	12	6144	Occ. Sensor	1	No	512
129	Somerset Hall	First Level	Stairwells	25	2' U-shaped T8	electronic	12	2	Fluorescent	32	12	9216	Occ. Sensor	1	No	768
130	Somerset Hall	First Level	Hallway towards bookstore	28	4' linear T8	electronic	2	1	Fluorescent	17	15	510	Switch		No	34
131	Somerset Hall	First Level	Coffee Shop	36	4' linear T8	electronic	4	1	Fluorescent	32	10	1280	Occ. Sensor	1	No	128
132	Somerset Hall	First Level	Coffee Shop	36	40W Flood lights	-	7	1	Flood lights	40	12	3360	Switch		No	280
133	Somerset Hall	First Level	Hallway near security	46	2' U-shaped T8	electronic	12	2	Fluorescent	32	12	9216	Occ. Sensor	1	No	768
134	Somerset Hall	First Level	Hallway near security	46	LED Exit Signs	-	1	1	LED	5	24	120	None		No	5
135	Somerset Hall	First Level	Hallway near security	46	Fluorescent Exit Signs	-	2	1	Fluorescent	20	24	960	None		No	40
136	Somerset Hall	First Level	Hallway display/bulletins	46	4' linear T8	electronic	2	2	Fluorescent	32	15	1920	Switch		No	128
137	Somerset Hall	First Level	Telephone and Mech. Room	61	2' U-shaped T8	electronic	4	2	Fluorescent	32	12	3072	Occ. Sensor	1	No	256
138	Somerset Hall	First Level	Telephone and Mech. Room	61	4' linear T8	electronic	3	2	Fluorescent	32	15	2880	Switch		No	192
139	Somerset Hall	First Level	Telephone and Mech. Room	61	8' linear T8	electronic	2	2	Fluorescent	56	12	2688	Occ. Sensor	1	No	224
140	Somerset Hall	First Level	Hallway to Conf. Center	79	4' linear T8	electronic	6	3	Fluorescent	32	12	6912	Occ. Sensor	1	No	576
141	Somerset Hall	First Level	Main Entrance	60	16W Halogen	-	10	1	Halogen	16	15	2400	Switch		No	160
142	Somerset Hall	First Level	Lobby Area	60	2' U-shaped T8	electronic	3	3	Fluorescent	32	12	3456	Occ. Sensor	1	No	288
143	Somerset Hall	First Level	Lobby Area	60	2' U-shaped T12	magnetic	1	2	Fluorescent	40	15	1200	Switch		No	80
														111		
			<b>Totals</b>													
			Proposed Usage with existing controls (kWh/year)													232,241
			Proposed Usage with new controls (kWh/year)													193,208
			Total kWh savings													39,033
			Total annual \$ Savings													\$ 6,050.06

Appendix B: eQUEST model



**Appendix C: Third Party Energy Suppliers (ESCOs)**

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

<b>JCP&amp;L ELECTRICAL SERVICE TERRITORY</b>		
<b>Last Updated: 06/15/09</b>		
<p><b>Hess Corporation</b> 1 Hess Plaza Woodbridge, NJ 07095 (800) 437-7872 <a href="http://www.hess.com">www.hess.com</a></p>	<p><b>BOC Energy Services, Inc.</b> 1135 Mountain Avenue Murray Hill, NJ 011374 (800) 247-2644 <a href="http://www.boc.com">www.boc.com</a></p>	<p><b>Commerce Energy, Inc.</b> 4400 Route 9 South, Suite 100 Freehold, NJ 07728 (800) 556-84113 <a href="http://www.commerceenergy.com">www.commerceenergy.com</a></p>
<p><b>Constellation NewEnergy, Inc.</b> 900A Lake Street, Suite 2 Ramsey, NJ 07446 (888) 635-0827 <a href="http://www.newenergy.com">www.newenergy.com</a></p>	<p><b>Direct Energy Services, LLC</b> 120 Wood Avenue Suite 611 Iselin, NJ 08830 (866) 547-2722 <a href="http://www.directenergy.com">www.directenergy.com</a></p>	<p><b>FirstEnergy Solutions Corp.</b> 300 Madison Avenue Morristown, NJ 0113113 (800) 977-0500 <a href="http://www.fes.com">www.fes.com</a></p>
<p><b>Glacial Energy of New Jersey, Inc.</b> 207 LaRoche Avenue Harrington Park, NJ 07640 (877) 569-2841 <a href="http://www.glacialenergy.com">www.glacialenergy.com</a></p>	<p><b>Integrays Energy Services, Inc.</b> 99 Wood Ave, South, Suite 802 Iselin, NJ 08830 (877) 763-9977 <a href="http://www.integraysenergy.com">www.integraysenergy.com</a></p>	<p><b>Strategic Energy, LLC</b> 55 Madison Avenue, Suite 400 Morristown, NJ 011360 (888) 925-9115, <a href="http://www.sel.com">www.sel.com</a></p>
<p><b>Liberty Power Holdings, LLC</b> Park 80 West, Plaza II, Suite 200 Saddle Brook, NJ 07663 (866) 769-31139 <a href="http://www.libertypowercorp.com">www.libertypowercorp.com</a></p>	<p><b>Pepco Energy Services, Inc.</b> 112 Main St. Lebanon, NJ 08833 (800) ENERGY-9 (363-7499) <a href="http://www.pepco-services.com">www.pepco-services.com</a></p>	<p><b>PPL EnergyPlus, LLC</b> 811 Church Road Cherry Hill, NJ 08002 (800) 281-2000 <a href="http://www.pplenergyplus.com">www.pplenergyplus.com</a></p>
<p><b>Sempra Energy Solutions</b> The Mac-Cali Building 581 Main Street, 8<sup>th</sup> Floor Woodbridge, NJ 07095 (877) 273-6772 <a href="http://www.semprasolutions.com">www.semprasolutions.com</a></p>	<p><b>South Jersey Energy Company</b> One South Jersey Plaza Route 54 Folsom, NJ 08037 (800) 800-756-3749 <a href="http://www.southjerseyenergy.com">www.southjerseyenergy.com</a></p>	<p><b>Suez Energy Resources NA, Inc.</b> 333 Thornall Street 6th Floor Edison, NJ 08837 (888) 644-1014 <a href="http://www.suezenergyresources.com">www.suezenergyresources.com</a></p>
<p><b>UGI Energy Services, Inc.</b> 704 East Main Street, Suite 1 Moorestown, NJ 080113 (856) 273-9995 <a href="http://www.ugienergyservices.com">www.ugienergyservices.com</a></p>	<p><b>American Powernet Management, LP</b> 437 North Grove St. Berlin, NJ 08009 (800) 437-7872 <a href="http://www.hess.com">www.hess.com</a></p>	<p><b>ConEdison Solutions</b> Cherry Tree, Corporate Center 1135 State Highway 38 Cherry Hill, NJ 08002 (888) 625-0955 <a href="http://www.conedsolutions.com">www.conedsolutions.com</a></p>
<p><b>Credit Suisse, (USA) Inc.</b> 700 College Road East Princeton, NJ 08450 212-1138-3124 <a href="http://www.creditsuisse.com">www.creditsuisse.com</a></p>	<p><b>Sprague Energy Corp.</b> 12 Ridge Road Chatham Township NJ 011328 (800) 225-1560 <a href="http://www.spragueenergy.com">www.spragueenergy.com</a></p>	

**PSE&G NATURAL GAS SERVICE TERRITORY**

**Last Updated: 06/15/09**

<p><b>Cooperative Industries</b> 412-420 Washington Avenue Belleville, NJ 07109 800-6BUYGAS (6-289427) <a href="http://www.cooperativenet.com">www.cooperativenet.com</a></p>	<p><b>Direct Energy Services, LLP</b> 120 Wood Avenue, Suite 611 Iselin, NJ 08830 866-547-2722 <a href="http://www.directenergy.com">www.directenergy.com</a></p>	<p><b>Dominion Retail, Inc.</b> 395 Highway 170 - Suite 125 Lakewood, NJ 08701 866-275-4240 <a href="http://retail.dom.com">http://retail.dom.com</a></p>
<p><b>Gateway Energy Services Corp.</b> 44 Whispering Pines Lane Lakewood, NJ 08701 800-805-8586 <a href="http://www.gesc.com">www.gesc.com</a></p>	<p><b>UGI Energy Services, Inc. d/b/a GASMAR</b> 704 East Main Street, Suite 1 Moorestown, NJ 080113 856-273-9995 <a href="http://www.ugienergyservices.com">www.ugienergyservices.com</a></p>	<p><b>Great Eastern Energy</b> 116 Village Riva, Suite 200 Princeton, NJ 08540 888-651-4121 <a href="http://www.greastern.com">www.greastern.com</a></p>
<p><b>Hess Energy, Inc.</b> One Hess Plaza Woodbridge, NJ 07095 800-437-7872 <a href="http://www.hess.com">www.hess.com</a></p>	<p><b>Hudson Energy Services, LLC</b> 871 Route 17 South Ridgewood, NJ 07450 877- Hudson 9 <a href="http://www.hudsonenergyservices.com">www.hudsonenergyservices.com</a></p>	<p><b>Intelligent Energy</b> 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024 800-724-1880 <a href="http://www.intelligentenergy.org">www.intelligentenergy.org</a></p>
<p><b>Keil &amp; Sons</b> 1 Bergen Blvd. Fairview, NJ 07002 1-877-Systrum <a href="mailto:www.systrumenergy@aol.com">www.systrumenergy@aol.com</a></p>	<p><b>Metromedia Energy, Inc.</b> 6 Industrial Way Eatontown, NJ 07724 877-750-7046 <a href="http://www.metromediaenergy.com">www.metromediaenergy.com</a></p>	<p><b>Metro Energy Group, LLC</b> 14 Washington Place Hackensack, NJ 07601 888-113-Metro <a href="http://www.metroenergy.com">www.metroenergy.com</a></p>
<p><b>MxEnergy, Inc.</b> 510 Thornall Street, Suite 270 Edison, NJ 088327 800-375-1277 <a href="http://www.mxenergy.com">www.mxenergy.com</a></p>	<p><b>NATGASCO (Mitchell Supreme)</b> 1132 Freeman Street Orange, NJ 07050 800-840-4GAS <a href="http://www.natgasco.com">www.natgasco.com</a></p>	<p><b>Pepco Energy Services, Inc.</b> 112 Main Street Lebanon, NJ 08833 800-363-7499 <a href="http://www.pepco-services.com">www.pepco-services.com</a></p>
<p><b>PPL EnergyPlus, LLC</b> 811 Church Road - Office 105 Cherry Hill, NJ 08002 800-281-2000 <a href="http://www.pplenergyplus.com">www.pplenergyplus.com</a></p>	<p><b>Sempra Energy Solutions</b> The Mac-Cali Building 581 Main Street, 8th fl. Woodbridge, NJ 07095 877-273-6772 800-2 SEMPRA <a href="http://www.semprasolutions.com">www.semprasolutions.com</a></p>	<p><b>South Jersey Energy Company</b> One South Jersey Plaza, Route 54 Folsom, NJ 08037 800-756-3749 <a href="http://www.sjindustries.com/sje.htm">www.sjindustries.com/sje.htm</a></p>
<p><b>Sprague Energy Corp.</b> 12 Ridge Road Chatham Township, NJ 011328 800-225-1560 <a href="http://www.spragueenergy.com">www.spragueenergy.com</a></p>	<p><b>Stuyvesant Energy LLC</b> 10 West Ivy Lane, Suite 4 Englewood, NJ 07631 800-646-64113 <a href="http://www.stuyfuel.com">www.stuyfuel.com</a></p>	<p><b>Woodruff Energy</b> 73 Water Street Bridgeton, NJ 08302 800-5113-1121 <a href="http://www.woodruffenergy.com">www.woodruffenergy.com</a></p>