

Building Energy Audit Report: City of Raleigh
NC Department of Commerce Energy Fellowship
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Executive Summary

Overview

The City of Raleigh has 26 community centers, two art centers, and eight community swimming pools. For the energy audit process, a variety of centers and pools were selected in order to receive an overall view of potential energy saving opportunities. All community centers have already completed lighting conversions from T12 bulbs to T8 lighting. These audits were conducted on a total of 13 buildings: ten community centers, one art center, and two swimming facilities. The suggestions found in this report identify and estimate potential cost and energy savings.

Analysis and Results

All auditing and reports were completed by Anna Leonard. Safety is always a priority while performing audits, Carbon levels and gas leaks were identified during the time of the audit and immediately flagged, reported, and repaired. Estimated energy cost savings are \$7,415 annually the equivalent of saving 258.2 mmBTU per year. The average emissions reductions from these savings will be an annual reduction in Carbon Dioxide by 92,570 lbs, Nitrogen Oxides by 223 lbs, and Sulfur Oxides by 578 lbs. The saving potentials and suggestions are reported in the following report and organized by community center. Additional utility use and cost information is available for all centers in the appendix including: kWh per month, therms per month, kWh/sf per month, cost per month, and gallons of water per month.

Conclusion

A total of 13 energy audits were completed for community centers, art centers, and community pool facilities. The reports from these building energy audits are included in this report. The staff would like to express its appreciation for the time and cooperation community center staff gave during the assessments.

I. Biltmore Hills Community Center

A. Overview

The assessment on the Biltmore Community Center was conducted on 3/20/12

B. Results

Biltmore Hills Community Center	
Potential Cost Savings/Yr	\$720
mmBTU savings/yr	27.1 mmBTU
Emissions Reductions	
Carbon Dioxide (CO ₂)	9,723.4 lb/yr
Nitrogen Oxides (NO _X)	23.4 lb/yr
Sulfur Oxides (SO _X)	60.7 lb/yr

C. Recommended Projects

Suggestion	Cost Savings	Investment Cost	Payback Period	kWh Saved/yr
Weatherization	\$500			5,500
Vending	\$142	None	Immediate	1,576
Refrigerator	\$78	None	Immediate	866
Gas Leak - meter				

D. Facility Background

Biltmore Hills Community Center was built in 1972. It is a 14,972 square foot building located at 2615 Fitzgerald Drive, Raleigh, NC 27610. It is a brick building containing 4 lockers, weight room, 2 meeting rooms, kitchen, office, and gymnasium. The building conditions at the time of the audit were as follows: Relative Humidity: 55.6; Temperature: 80°F (although the thermostats were set to 73); Wet bulb: 70.3; Dew Point: 64.6

E. Utility Use Analysis

The utility bills from January 2011 to December 2011 were used as a benchmark for Biltmore Hills Community Center. The average kbtu/sf/yr for a public assembly space is 68.9 kbtu/sf/yr (average benchmark information provided by Waste Reduction Partners and the North Carolina Energy Office). Utility Information can be found in the appendix.

Summary of Energy Benchmarks	
Total Energy Consumed:	1064.6 mmbtu / yr
Total Energy Index:	71.1 kbtu / sf / yr
Total Energy Cost:	\$ 15,613 \$ / yr
Total Energy Cost Index:	\$ 1.04 \$ / sf / yr

F. Electricity

Progress Energy is the service provider for Biltmore Hills. The rate schedule is Time of Use (TOU). The yearly savings in 2011 by using the TOU rate schedule was \$959.56.

G. Fuel

Natural Gas is provided by PSNC Energy. The building is on the Small General Service rate (125 rate).

H. HVAC Systems

Gemini Split-System

Carrier

38AH-034-511AC

Serial: 1809028180

Accumulator

Westmeyer Industries Inc

Carrier KH73LZ001

2 units

I. Water Heater

Rheem Ruud

G85-400A

Serial: URNG1007G00285

85 gal

Atmospheric

399,900 BTU/hr

Boiler - Raypack

J. Recommendations

1. Main Doors

The doors in Biltmore Hills Community Center need weather-stripping and door sweeps. Based on a previous study conducted by NIST on state owned buildings in Raleigh, NC. Based on building size a savings ranging from \$500-\$1,500 can be realized.

- i. Replace front doors
- ii. Weatherstrip

Cost Savings: \$500-\$1,500

2. Vending

- i. Remove lighting

$180W \times .001 \times 8,760 \text{ hours} = 1,576 \text{ kWh/machine}$

$1,576 \text{ kWh} \times \$0.09 = \underline{141.92}$

3. Refrigerator

- i. Remove extra refrigerator

EnergyStar.com gives an estimated savings of \$78/yr

4. Gas Leak

A gas leak was identified at the meter. It was flagged and reported for repair. Not only do gas leaks waste energy and cost money they are dangerous and should be repaired immediately.

II. Chavis Community Center

A. Overview

The assessment on the Chavis Community Center was conducted on January 30, 2012. The building's utility usage and costs were reviewed prior to the assessment to determine overall efficiency. This report provides an overview of the building's energy use as well as any recommendations to improve energy use in the future.

B. Results

Chavis Community Center	
Potential Cost Savings/Yr	\$802.44
mmBTU savings/yr	18.4 mmBTU
Emissions Reductions	
Carbon Dioxide (CO ₂)	6,601.92 lb/yr
Nitrogen Oxides (NO _x)	15.93 lb/yr
Sulfur Oxides (SO _x)	41.26 lb/yr

C. Recommended Projects

Suggestion	Cost Savings	Investment Cost	Payback Period	kWh Saved/yr
HVAC Maintenance Schedule	\$498	\$0	Immediate	145
HVAC Upgrade	\$137			1652
Motion Sensors	\$167.44	\$305	1 yr 9 mo	2,592

D. Facility Background

Chavis Community Center was built in 2000. It is a 22,624 square foot building located at 505 Martin Luther King Jr Blvd, Raleigh, NC 27601. It is a brick building containing meeting rooms, weight room, gymnasium, dance studio, game room, and a computer center. The building conditions at the time of the audit were as follows: Relative Humidity: 21.1; Temperature: 69.6°F; Wet bulb: 54.4; Dew Point: 30.8

E. Utility Use Analysis

The utility bills from December 2010 – November 2011 were used as a benchmark for the Chavis Community Center. The average kbtu/sf/yr for a public assembly space is 68.9 kbtu/sf/yr (average benchmark information provided by Waste Reduction Partners and the North Carolina Energy Office). The Chavis Community Center is running efficiently well below that average at 38.79 kbtu/sf/yr. Utility Information can be found in the appendix.

Summary of Energy Benchmarks	
Total Energy Consumed:	877.8 mmbtu / yr
Total Energy Index:	38.79 kbtu / sf / yr
Total Energy Cost:	16,619 \$ / yr
Total Energy Cost Index:	\$0.73 \$ / sf / yr

F. Electricity

Progress Energy is the service provider for Chavis Community Center. The rate schedule is Time of Use (TOU). The yearly savings in 2011 by using the TOU rate schedule was \$982.

G. Fuel

Fuel is provided by PSNC Energy. The building is on the Small General Service rate (125 rate).

H. HVAC Systems

Carrier CU 2

SN: 3897E07708

MN: 38CKC036520

11.5 SEER

Carrier CU 1

SN: 3897E07706

MN: 38CKC036520

11.5 SEER

<http://www.albeyers.com/pdf/38ckc.pdf>

Carrier Gemini Split System

SN: 1403G10032

MN: 38ARZ008---501—

SEER 11.3

http://www.commercial.carrier.com/commercial/hvac/product_description/1,,CL11_DIV1_2_ETI434_PRD186,00.html

Mitsubishi Heat Recovery System

MN: PURY-P120THMU-A

http://www.mitsubishipro.com/media/261644/pury-p240tshmu-a_208-230v_submittal.pdf

I. Recommendations

1. HVAC Maintenance Schedule

The coils in the Carrier unit need to be cleaned. By putting the HVAC system on a maintenance schedule to check for cleanliness and proper operability, energy and money savings can be realized. Typically 10% - 30% of HVAC energy is lost due to dirty HVAC coils/fins.

Average HVAC cost = \$16,619 x 30% = \$4,985 /yr

Cost Savings = \$4,985 (HVAC) x 10% = 498.57 savings/yr

Investment = \$0

Payback = Immediate

2. HVAC Upgrade

The current systems at Chavis have an 11.3 to 11.5 SEER ratings. As these systems become outdated and inefficient, replace with units rated at 14 SEER.

The efficiency of a 12 SEER unit is 33% by upgrading to a higher SEER unit (14 and higher is recommended) the efficiency increases to 50%.

Cost Savings = \$4,985 x (50%-33%) = \$847.45 /year

3. Motion Sensors

Chavis Community Center operates 66 hours a week (3,432 hrs/yr). The bathrooms, lockers, and the computer lab were operating with all lights on and no occupants. By installing motion detectors to these areas unnecessary use can be avoided. The following savings is calculated assuming the usage will be reduced by 1,000 hrs a year.

Cost Savings

32W/bulb x 81 bulbs x .001 kW/W x (3,432 hrs) x \$.0646/kwh = \$574.66 cost/year

32W/bulb x 81 bulbs x .001 kW/W x (2,432 hrs) x \$.0646/kwh = \$407.22 cost/year

Savings = **\$167.44 savings/yr**

Investment

Motion Sensor = \$61 x 5 = \$305

Payback Period

\$305 / \$167.44 x = 1 year 9 months

III. Green Road

A. Overview

The assessment on the Green Road Community Center was conducted on 3/20/2010.

B. Results

Green Road Community Center	
Potential Cost Savings/Yr	\$550
mmBTU savings/yr	16.5 mmBTU
Emissions Reductions	
Carbon Dioxide (CO2)	5,920.2 lb/yr
Nitrogen Oxides (NOX)	14.29 lb/yr
Sulfur Oxides (SOX)	36.96 lb/yr

C. Recommended Projects

Suggestion	Cost Savings	Investment Cost	Payback Period	kWh Saved/yr
Kalwal				
Photocells	\$170	50	3.5 months	629
Motion Sensors	\$380	244	7 months	4,228
Duct Work				

D. Facility Background

Green Road Community Center was built in 1985. It is a 24,582 square foot building located at 4201 Green Road, Raleigh, NC 27604. The building contains 3 classrooms/activity rooms, kitchen, 4 restrooms, 2 gymnasiums, 2 offices, and a lobby. The building conditions at the time of the audit were as follows: Relative Humidity: 60.8; Temperature: 76°F; Wet bulb: 67.2; Dew Point: 61.8

E. Utility Use Analysis

The utility bills from January 2011 to December 2011 were used as a benchmark for Green Road Community Center. The average kbtu/sf/yr for a public assembly space is 68.9 kbtu/sf/yr (average benchmark information provided by Waste Reduction Partners and the North Carolina Energy Office). Utility Information can be found in the appendix.

Summary of Energy Benchmarks	
Total Energy Consumed:	1353 mmbtu / yr
Total Energy Index:	112 kbtu / sf / yr
Total Energy Cost:	\$ 31,232 \$ / yr
Total Energy Cost Index:	\$ 1.38 \$ / sf / yr

F. Electricity

Progress Energy is the service provider for Green Rd. The rate schedule is Time of Use (TOU). The yearly savings in 2011 by using the TOU rate schedule was \$2209.35

G. Fuel

Natural Gas is provided by PSNC Energy. The building is on the Small General Service rate (125 rate).

H. HVAC Systems

Trane XE1200
Model YCP042F3MOAB
76,000 BTUH

Trane
2TEC3F60B1000AA
Serial: 90712JS24

Trane Voyager
YCH181C3LBCA
Serial: 911100857D
3/2009

Trane XB13
Model: 2TWA3060A3000AA

I. Water Heater

Rheemglass Fury
22VR75-70N
Serial: RHLN3934136626
75 Gallons
9/2004
283 therms/yr

Notes: Temperature setting missing.

J. Recommendations

1. Gym windows

Replace Glass block with Kalwall

2. Photocells

- a. The use of photocells on lighting allows for areas with day-lighting to minimize the use of light when unnecessary. Photocells work to turn lighting on and off based on the amount of natural lighting being received in the area. Both the new and original lobbies have efficient day-lighting (75-245 footcandles) to lessen the use of artificial lighting.
 - i. Lobby
 - ii. Lobby – New Gymnasium

Cost Savings

32W x 1092 hrs x .001 = 34.944 kWh/bulb
Lobby: 34.944 kWh x 36 bulbs = 1,258 kWh
New Lobby: 34.944 kWh x 18 bulbs = 629 kWh
(1,258 kWh + 629 kWh) x \$0.09/kWh = **\$169.83/year**

Investment

\$25 per sensor (lightswitch type)
\$25 x 2 = \$50

Payback

\$50 / 169.83 = .29 x 12 = 3.5 months

3. Motion Sensors

- a. Bathrooms
- b. Activity Room
- c. Lobby – New Gymnasium

Cost Savings

32W x 1716 hrs x .001 = 54.912 kWh/lamp
Bathrooms: 14 bulbs x 54.912 kWh = 769 kWh
Activity Room: 45 bulbs x 54.912 kWh = 2471 kWh
New Lobby: 18 bulbs x 54.912 kWh = 988 kWh
4228 kWh x \$0.09/kWh = \$380.52

Investment

\$61/motion sensor x 4 = \$244

Payback

\$244 / \$380.52 = .64 x 12 = 7 months

4. Duct Work

- a. Leaking

Duct work in the storage room gives evidence of pinched ducts and leaks.

IV. Lake Lynn

A. Overview

The assessment on the Lake Lynn Community Center was conducted on March 21, 2012.

B. Results

Lake Lynn Community Center	
Potential Cost Savings/Yr	\$449
mmBTU savings/yr	17 mmBTU
Emissions Reductions	
Carbon Dioxide (CO ₂)	6,099.6 lb/yr
Nitrogen Oxides (NO _x)	14.72 lb/yr
Sulfur Oxides (SO _x)	38.1 lb/yr

C. Recommended Projects

Suggestion	Cost Savings	Investment Cost	Payback Period	kWh Saved/yr
Lighting	\$242			2,688
Motion Sensors	\$207	305	1.4 years	2,304
Gas Leak - meter				

D. Facility Background

Lake Lynn Community Center was built in 1979. It is a 17,620 square foot building located at 7921 Ray Road, Raleigh, NC 27613. It is a block building containing a lobby, gymnasium, fitness room, studio, and lockers. This building's floorplan is similar to that of Laurel Hills. The building conditions at the time of the audit were as follows: Relative Humidity: 46.1; Temperature: 77.5°F; Wet bulb: 64.7; Dew Point: 55.3

E. Utility Use Analysis

The utility bills from January 2011 to December 2011 were used as a benchmark for Lake Lynn Community Center. The average kbtu/sf/yr for a public assembly space is 68.9 kbtu/sf/yr (average benchmark information provided by Waste Reduction Partners and the North Carolina Energy Office). Utility Information can be found in the appendix.

Summary of Energy Benchmarks	
Total Energy Consumed:	1925.2 mmbtu / yr
Total Energy Index:	109.2 kbtu / sf / yr
Total Energy Cost:	\$37,465 \$ / yr
Total Energy Cost Index:	2.13 \$ / sf / yr

F. Electricity

Progress Energy is the service provider for Lake Lynn Community Center. The rate schedule is Time of Use (TOU). The yearly savings in 2011 by using the TOU rate schedule was \$2,274.

G. Fuel

Natural Gas is provided by PSNC Energy. The building is on the Small General Service rate (125 rate).

H. HVAC Systems

York
Model: H5CE090A25A
Serial: (S)NBMM015192

York
Model HHCE090A25B
Serial: NEFM053053
Quantity: 2

York Stellar High Eff AC
Model: H108030506B
Quantity: 3

Carrier Centurion
Model: 48PMDC28-HJ51-A6
Serial: 0311630031
Quantity: 3

I. Water Heater

Ventura
Model:72V125
Serial: 1109128511
Size: 125 gal
Atmospheric

J. Recommendations

1. Lighting

Lighting in the gym should be able to utilize only half of gym. During time of audit, half of gym was empty and fully lit by 24 four bulb T5 lighting. 1,000 hours is an estimated time when half of gym goes unused.

$$\begin{aligned} \text{Cost Savings: } 28\text{W} \times 1,000 \text{ hours} \times .001 &= 28 \text{ kWh/bulb} \\ (24 \times 4 \text{ bulbs}) \times 28 \text{ kWh} &= 2,688 \text{ kWh} \\ 2,688 \text{ kWh} \times \$0.09 &= \underline{\$242} \end{aligned}$$

*This option has been previously explored using a lighting automation system. It was removed due to difficulties with usage.

2. Motion Sensors

Motion Sensors are needed in bathrooms, locker rooms, and weight room.

Cost Savings

32W x 1,000 hrs x .001 = 32 kWh/lamp
Bathrooms (2): 18 bulbs x 32 kWh = 576 kWh
Locker Room (2): 36 bulbs x 32 kWh = 1,152 kWh
Weight Room: 18 bulbs x 32 kWh = 576 kWh
2,304 kWh x \$0.09/kWh = \$207.36

Investment

\$61/motion sensor x 5 = \$305

Payback Period

\$305 / \$207.36 = 1.4 years

3. Gas Leak

Two gas leaks were identified on the line to the boiler. They were flagged and reported for repair. Not only do gas leaks waste energy and cost money they are dangerous and should be repaired immediately.

V. Laurel Hills

A. Overview

The assessment on the Laurel Hills Community Center was conducted on 3/21/2012

B. Results

Laurel Hills Community Center	
Potential Cost Savings/Yr	\$500
mmBTU savings/yr	18.9 mmBTU
Emissions Reductions	
Carbon Dioxide (CO2)	6,781.3 lb/yr
Nitrogen Oxides (NOX)	16.36 lb/yr
Sulfur Oxides (SOX)	42.3 lb/yr

C. Recommended Projects

Suggestion	Cost Savings	Investment Cost	Payback Period	kWh Saved/yr
Weather stripping	\$50			556
Lighting	\$242			2,688
Motion Sensors	\$207	305	1.4 years	2,304

D. Facility Background

Laurel Hills Community Center was built in 1979. It is a 22,576 square foot building located at 3808 Edwards Mill Rd, Raleigh, NC 27612. It is a block building containing a lobby, art room, bathroom, 2 meeting rooms, kitchen, office, downstairs lobby, dance studio, weight room, 2 locker rooms, and a gymnasium. Laurel Hills has the same floor plan and similar systems to Lake Lynn Community Center. The building conditions at the time of the audit were as follows: Relative Humidity: 50; Temperature: 75°F; Wet bulb: 63; Dew Point: 55

E. Utility Use Analysis

The utility bills from January 2011 to December 2011 were used as a benchmark for Laurel Hills Community Center. The average kbtu/sf/yr for a public assembly space is 68.9 kbtu/sf/yr (average benchmark information provided by Waste Reduction Partners and the North Carolina Energy Office). Utility Information can be found in the appendix.

Summary of Energy Benchmarks	
Total Energy Consumed:	2010.46 mmbtu / yr
Total Energy Index:	89.05 kbtu / sf / yr
Total Energy Cost:	31,232 \$ / yr
Total Energy Cost Index:	\$1.38 \$ / sf / yr

F. Electricity

Progress Energy is the service provider for Laurel Hills Community Center. The rate schedule is Time of Use (TOU). The yearly savings in 2011 by using the TOU rate schedule was \$2,209.

G. Fuel

Natural Gas is provided by PSNC Energy. The building is on the Small General Service rate (125 rate).

H. HVAC Systems

York Condensing Unit
Model: H4CE090A25B
Serial: NEFM053048
Quantity: 3

York Stellar High Eff AC
Model: H2DB024S06A
Serial: EFEM256394
Quantity: 3

Aquecoil Hydronic Heating Unity
Model: YPI
Date: 7/97

Boiler
Peerless Oil Boiler
Model: LC – 10 – W/S
Serial: LC-10918-0697

I. Water Heater

PVI
Model: 72P125
Serial: 069791740
125 Gallon
Atmospheric

J. Recommendations

1. Weather stripping

The doors in Laurel Hills Community Center need weather-stripping and door sweeps. Because of the overall excellent condition of the building, this appears to be the only area in need of immediate weather stripping.

- a. Downstairs double door has visible need for weather stripping.

2. Lighting

Lighting in the gym should be able to utilize only half of gym. During time of audit, half of gym was empty and fully lit by 24 four bulb T5 lighting. 1,000 hours is an estimated time when half of gym goes unused.

$$\begin{aligned} \text{Cost Savings: } & 28W \times 1,000 \text{ hours} \times .001 = 28 \text{ kWh/bulb} \\ & (24 \times 4 \text{ bulbs}) \times 28 \text{ kWh} = 2,688 \text{ kWh} \\ & 2,688 \text{ kWh} \times \$0.09 = \underline{\$242} \end{aligned}$$

*This option has been previously explored using a lighting automation system. It was removed due to difficulties with usage.

3. Motion Sensors

Motion Sensors are needed in bathrooms, locker rooms, and weight room.

Cost Savings

$$\begin{aligned} & 32W \times 1,000 \text{ hrs} \times .001 = 32 \text{ kWh/lamp} \\ \text{Bathrooms (2):} & \quad 18 \text{ bulbs} \times 32 \text{ kWh} = 576 \text{ kWh} \\ \text{Locker Room (2):} & \quad 36 \text{ bulbs} \times 32 \text{ kWh} = 1,152 \text{ kWh} \\ \text{Weight Room:} & \quad 18 \text{ bulbs} \times 32 \text{ kWh} = 576 \text{ kWh} \\ & 2,304 \text{ kWh} \times \$0.09/\text{kWh} = \underline{\$207.36} \end{aligned}$$

Investment

$$\$61 \text{ per motion sensor} \times 5 = \underline{\$305}$$

Payback Period

$$\$305 / \$207.36 = \underline{1.4 \text{ years}}$$

4. Gas Leak

A gas leak was identified at the meter. It was flagged and reported for repair. Not only do gas leaks waste energy and cost money they are dangerous and should be repaired immediately.

VI. Marsh Creek Community Center

A. Overview

The assessment on the Marsh Creek Community Center was conducted on April 16, 2012.

B. Results

Marsh Creek Community Center	
Potential Cost Savings/Yr	\$504.62
mmBTU savings/yr	17.2 mmBTU
Emissions Reductions	
Carbon Dioxide (CO ₂)	6,171.3 lb/yr
Nitrogen Oxides (NO _x)	14.9 lb/yr
Sulfur Oxides (SO _x)	38.5 lb/yr

C. Recommended Projects

Suggestion	Cost Savings	Investment Cost	Payback Period	kWh Saved/yr
Motion Sensors	\$57.60	\$61	1.05 yr	576
Light Switch Labels	\$44.80			448
Outside Lighting	\$67.20			672
Photocells	\$51.20	\$50	1 yr	512
Vending Lights	\$283.82	None	Immediate	2,838

D. Facility Background

Marsh Creek Community Center was built in 2010. It is a 26,600 square foot building located at 3050 New Hope Rd, Raleigh, NC 27604. The building contains a gymnasium, weight room, office, art room, classroom, kitchen, and computer room. The building conditions at the time of the audit were as follows: Relative Humidity: 38.8; Temperature: 78°F; Wet bulb: 62.5; Dew Point: 50

E. Utility Use Analysis

The utility bills from January 2011 to December 2011 were used as a benchmark for Marsh Creek Community Center. The average kbtu/sf/yr for a public assembly space is 68.9 kbtu/sf/yr (average benchmark information provided by Waste Reduction Partners and the North Carolina Energy Office). Utility Information can be found in the appendix.

Summary of Energy Benchmarks	
Total Energy Consumed:	1,404.2 mmbtu / yr
Total Energy Index:	52.7 kbtu / sf / yr
Total Energy Cost:	\$28,361 \$ / yr
Total Energy Cost Index:	\$1.07 \$ / sf / yr

F. Electricity

Progress Energy is the service provider for Marsh Creek Community Center. The rate schedule is Time of Use (TOU).

G. Fuel

Natural Gas is provided by PSNC Energy. The building is on the Small General Service rate (125 rate).

H. HVAC Systems

Trane

M Series Climate Changer Air Handler

Model #: MCCB021UA0C0UB

Serial: K09J31801

Quantity: 2

I. Boiler

Peerless Boiler

Series TC Boiler

Model: TC-05-W/S

Series: 627640

120 gal storage

Quantity: 2

J. Recommendations

1. Motion Sensors

A motion sensor should be added to the weight room and the motion sensor in the storage closet behind the front desk needs to be relocated.

Cost Savings

$32\text{W} \times 1,000 \text{ hrs} \times .001 = 32\text{kWh}$

$32 \text{ kWh} \times 18 = \underline{576 \text{ kWh}}$

$576\text{kWh} \times \$0.1/\text{kWh} = \underline{\$57.60}$

Investment Cost

$\$61 \times 1 = \underline{\$61}$

Payback Period

$\$61 / \$57.60 = \underline{1.05 \text{ yrs}}$

2. Light Switches

There are numerous rooms including the kitchen, storage closets, and office in which lights were left on. These rooms are not frequented enough to warrant motion sensors but can benefit by reminders on or near light switches reminding patrons to turn the light off.

Cost Savings

$32\text{W} \times 1,000 \times .001 = 32\text{kWh}$

$32\text{kWh} \times 14 \text{ bulbs} = \underline{448\text{kWh}}$

$448\text{kWh} \times \$0.1 = \underline{\$44.80}$

3. Outside Lighting

At the time of the audit, all 42 exterior lighting fixtures at the main entrance and lower patio were on in full daylight. These lights should be on a schedule or use photocells to determine when it is necessary to be on and adjusted with lighting automation.

Cost Savings

$$16W \times 1,000 \times .001 = 16kWh$$

$$16kWh \times 42 = \underline{672 kWh}$$

$$672kWh \times \$0.1 = \underline{\$67.20}$$

5. Photocells

Lighting levels in the lobby varied from 74-285 foot candles. The skylights and large windows allow for significant daylight to enter. The use of photocells could allow the lights (especially directly next to skylights) to turn on and off as necessary.

Cost Savings

$$16W \times 1,000 \times .001W/kWh = 16$$

$$16kWh \times 32 = \underline{512kWh}$$

$$512kWh \times \$0.1 = \underline{\$51.20}$$

Investment Cost

$$\$25 \times 2 = \$50$$

Payback Period

$$\$50 / \$51.20 = .97 \text{ yrs}$$

5. Vending

There are 3 vending machines all of which are lit.

Cost Savings

$$108W \times 8,760 \times .001 = 946.08kWh$$

$$946.08 kWh \times 3 = \underline{2,838.24 kWh}$$

$$2,838.24 \times \$0.1 = \underline{\$283.82}$$

Investment Cost

None

Payback Period

Immediate

VII. Millbrook Exchange Community Center

A. Overview

The assessment on the Millbrook Exchange Community Center was conducted on January 27, 2012. The building's utility usage and cost were reviewed prior to the assessment to determine overall efficiency. This report provides an overview of the building's energy use as well as any recommendations to improve energy use in the future.

B. Results

Millbrook Exchange Community Center	
Potential Cost Savings/Yr	\$269.43
mmBTU savings/yr	14.5 mmBTU
Emissions Reductions	
Carbon Dioxide (CO ₂)	5,202.6 lb/yr
Nitrogen Oxides (NO _x)	12.6 lb/yr
Sulfur Oxides (SO _x)	32.48 lb/yr

C. Recommended Projects

Suggestion	Cost Savings	Investment Cost	Payback Period	kWh Saved/yr
Thermostats set to 70°	\$141.33	0	Immediate	2684
Daylighting in gym	\$128.1			1581

D. Facility Background

Millbrook Exchange Community Center was built in 1972. It is a 15,016 square foot building located at 1905 Spring Forest Rd, Raleigh, NC 27615. It is a brick building containing a gym, meeting rooms, and a weight room. The building conditions at the time of the audit were as follows: Relative Humidity: 57.1; Temperature: 71.7°F; Wet bulb: 61.9; Dew Point: 54

E. Utility Use Analysis

The utility bills from December 2010 – November 2011 were used as a benchmark for Millbrook Exchange Community Center. The average kbtu/sf/yr for a public assembly space is 68.9 kbtu/sf/yr (average benchmark information provided by Waste Reduction Partners and the North Carolina Energy Office). Utility Information can be found in the appendix.

Summary of Energy Benchmarks	
Total Energy Consumed:	1354.9 mmbtu / yr
Total Energy Index:	90.23 kbtu / sf / yr
Total Energy Cost:	23,555 \$ / yr
Total Energy Cost Index:	1.57 \$ / sf / yr

F. Electricity

Progress Energy is the service provider for Millbrook Exchange Community Center. The rate schedule is Time of Use (TOU). The yearly savings in 2011 by using the TOU rate schedule was \$1,851.

G. Fuel

Fuel is provided by PSNC Energy. The building is on the Small General Service rate (125 rate).

H. HVAC Systems

Lennox

Model Number: HP29-036-5Y

Serial Number: 5804M17047

Trane

Model Number: 2TTA2060A3000AB

Serial Number: 41656FH3F

Serial Number: 41656BK3F

Serial Number: 41656CB3F

Serial Number: 41655783F

Serial Number: 41655913F

Trane

Odyssey

EER: 11.2

<http://www.trane.com/commercial/dna/view.aspx?i=1110>

Model Number: TWE120B300EL

Serial Number: 4173L2ABD

Serial Number: 4172RM7BD

Low Pressure Boiler

Lochinvar

<http://www.lochinvar.com/products/Default.aspx?type=ProductLine&lineid=8#>

Model: CBN0745

Serial: L04H00171919

I. Recommendations

1. Lower Thermostats to 70°

By setting thermostats to 70°F in the winter and 76°F in the summer a typical energy savings of 1% per degree can be realized. The temperature in the building was set to 72°F at the time of the audit.

Average HVAC cost = \$ 23,555 x 30% = \$7,066.50 /yr

Cost Savings = \$7,066.50 x 2% = \$141.33

Investment = \$0

Payback = Immediate

2. Daylighting in gym

The gym does not currently allow for any natural light to enter the building. By converting current panels to Kalwall, the use of artificial lighting will be reduced during the day. Daylighting will also add a brighter light and more attractive atmosphere to the gym. There are 96 four foot bulbs in the gym at 32 watts each. Typically a 15% savings in lighting is realized due to daylighting.

Cost Savings

Operating cost= 32W x 3,432 hr x .001 kW/W x \$0.081/kwh = \$8.89/bulb

\$8.89 x 96 = \$854 / year

32W x 3,432 hr/yr x .001 kW/W = 109.82 kWh/bulb

109.82 x 96 = 10542.72 kWh/year

\$854 x 15% = \$128.10/savings/year

10542.72 x 15% = 1581.4 kwh/savings/year

VIII. Optimist Community Center

A. Overview

The assessment on the Optimist Community Center was conducted on January 27, 2012.

B. Results

Optimist Community Center	
Potential Cost Savings/Yr	\$731.33
mmBTU savings/yr	28.4 mmBTU
Emissions Reductions	
Carbon Dioxide (CO2)	10,190 lb/yr
Nitrogen Oxides (NOX)	24.59 lb/yr
Sulfur Oxides (SOX)	63.6 lb/yr

C. Recommended Projects

Suggestion	Cost Savings	Investment Cost	Payback Period	kWh Saved/yr
Hot Water Gas Leak				
Thermostats to 70°	\$134.33	0	Immediate	990
Weather-stripping/sensors in louvers	\$500			6,000
Motion Sensors	\$97	183	1 yr 9 months	1,344

D. Facility Background

Optimist Community Center was built in 1972. It is a 11,040 square foot building located at 1900 Whittier Dr, Raleigh, NC 27615. It is a brick building containing 2 meeting rooms, kitchen, gym, and weight room. The building conditions at the time of the audit were as follows: Relative Humidity: 49.5; Temperature: 73.6°F; Wet bulb: 61.9; Dew Point: 54.9

E. Utility Use Analysis

The utility bills from December 2010 – November 2011 were used as a benchmark for Optimist Community Center. The average kbtu/sf/yr for a public assembly space is 68.9 kbtu/sf/yr (average benchmark information provided by Waste Reduction Partners and the North Carolina Energy Office). Utility Information can be found in the appendix.

Summary of Energy Benchmarks	
Total Energy Consumed:	797.2 mmbtu / yr
Total Energy Index:	72.21 kbtu / sf / yr
Total Energy Cost:	11,194 \$ / yr
Total Energy Cost Index:	\$1.01 \$ / sf / yr

F. Electricity

Progress Energy is the service provider for Optimist Community Center. The rate schedule is Time of Use (TOU). The yearly savings in 2011 by using the TOU rate schedule was \$1,367.

G. Fuel

Fuel is provided by PSNC Energy. The building is on the Small General Service rate (125 rate).

H. HVAC Systems

These systems are scheduled to be upgraded in the coming year.

Trane XB 13

Model: 2TTA3060A3000AA

Serial: 6315TT24F

Year: 2006

SEER 14.5

<http://trane.com/Residential/Products/Air-Conditioners/XB13-Air-Conditioners>

Trane XR90

Model: 2TXCD061AC3HCAA

Serial: 6204KU85G

Year: 2006

Split Wall System

Office

I. Recommendations

1. Hot Water Heater Gas Leak

Using a combustible leak detector, a gas leak was found in the hot water heater in the mechanical room. The leak was flagged and sealed within the week. Combustible gas leaks are not only dangerous but expensive.

2. Thermostat to 70°

The inside temperature at the time of the audit was 74°. By setting thermostats to 70°F in the winter and 76°F in the summer a typical energy savings of 1% per degree can be realized. The temperature in the building was set to 72°F at the time of the audit.

Average HVAC cost = \$ 11,194 x 30% = \$3358.20 /yr

Cost Savings = \$3358.20 x 4% = \$134.33

Investment = \$0

Payback = Immediate

3. Weather Stripping and Sweeps/Gymnasium Louvers

The doors in Optimist Community Center need weather-stripping and door sweeps. Based on previous studies and based on the building size, savings from \$300 to \$1,000 can be saved from weatherization techniques. At the time of the audit, the louvers in the gym were open while the heat was running. The gym was not in use at the time. By using CO2 sensors or timers these louvers can be closed when unnecessary. NIST study can be found in appendix item 3F.

4. Motion Sensors

Optimist Community Center operates 66 hours a week (3,432 hrs/yr). The lobby bathrooms and dance/activity room were operating with all lights on and no occupants. By installing motion detectors to these areas unnecessary use can be avoided. The following savings is calculated assuming the usage will be reduced by at least 1,000 hrs of use a year.

Cost Savings

32W/bulb x 42 bulbs x .001 kW/W x (3,432 hrs) x \$0.0772/kwh = \$356.09 cost/year

32W/bulb x 42 bulbs x .001 kW/W x (2,432 hrs) x \$0.0772/kwh = \$252.34 cost/year

Savings = **\$103.75 savings/yr**

Investment

Motion Sensor = \$61 x 3 = \$183

Payback Period

\$183 / \$103.75 = 1 year 9 months

IX. Optimist Pool

A. Overview

The assessment on the Optimist Pool was conducted on January 27, 2012.

B. Results

Optimist Pool	
Potential Cost Savings/Yr	\$1,440
mmBTU savings/yr	60.8 mmBTU
Emissions Reductions	
Carbon Dioxide (CO2)	21,815 lb/yr
Nitrogen Oxides (NOX)	52.6 lb/yr
Sulfur Oxides (SOX)	136.2 lb/yr

C. Recommended Projects

Suggestion	Cost Savings	Investment Cost	Payback Period	kWh Saved/yr
Photocell Sensors	\$939.78	125	1.5 months	10,442
Weatherize pool doors	\$500			7,396

D. Facility Background

Optimist Pool was built in 2009. It is a 35,000 square foot building located at 1900 Whittier Drive, Raleigh, NC 27615. The building is primarily brick with decorative block at the entrance, it contains locker rooms, lobby, classroom, office, lifeguard room, and pool. The building conditions at the time of the audit were as follows: Relative Humidity: 60.4; Temperature: 76.2°F; Wet bulb: 66.9; Dew Point: 61.9

E. Utility Use Analysis

The utility bills from December 2010 – November 2011 were used as a benchmark for Optimist Community Center. Utility Information can be found in the appendix.

Summary of Energy Benchmarks	
Total Energy Consumed:	12,517.9 mmbtu / yr
Total Energy Index:	357.6 kbtu / sf / yr
Total Energy Cost:	\$124,600 \$ / yr
Total Energy Cost Index:	\$3.56 \$ / sf / yr

F. Electricity

Progress Energy is the service provider for Optimist Community Center. The rate schedule is Time of Use (TOU). The yearly savings in 2011 by using the TOU rate schedule was \$8,086.

G. Fuel

Fuel is provided by PSNC Energy. The building is on the Large-Quantity General Service Rate (145 rate).

H. Recommendations

1. Photocells on lights

The Optimist Pool building is designed with significant day lighting. This day lighting allows for areas to be significantly lit without the use of artificial lighting. A light-meter measured footcandles ranging from 85fc to 200fc. The recommended lighting level for hallways, restrooms, and general areas is 10fc to 50fc. By using photocells in these areas, lighting can be turned off when unnecessary due to the available natural light. If needed, task lighting can be added to areas performing visual tasks such as the front desk. There are 69 32W bulbs and 5 13W bulbs in the lobby. The pool is open for 88.5 hours a week, approximately 24 of these hours have enough daylight to provide lighting naturally. Assuming a period of 1,248 hours without lighting due to daylighting.

$$\begin{aligned} \text{Cost Savings} &= 32\text{W} \times 1,248 \text{ hours} \times .001 = 147\text{kWh/bulb} \\ &147\text{W} \times 69 = 10,143 \text{ kWh} \\ &13\text{W} \times 1,248 \text{ hours} \times .001 = 59.826\text{kWh/bulb} \\ &59.8 \times 5 = 299 \text{ kWh} \\ &(10,143 + 299) \times \$0.09/\text{kWh} = \underline{\$939.78} \end{aligned}$$

Investment

$$\$25 \times 5 = \underline{\$125}$$

Payback Period

$$\$125 / \$939.78 = .126 \times 12 = \underline{1.5 \text{ months}}$$

2. Weatherize doors in pool

The doors in the pool area have large gaps in which outside air is entering and escaping. Based on previous studies on savings by the building size, savings between \$500 and \$2,300 can be saved from weatherization techniques. NIST study for potential savings can be found in Appendix item 15.

X. Pullen Aquatic Center

A. Overview

The assessment on the Pullen Aquatic Center was conducted on April 16, 2012.

B. Results

Pullen Aquatic Center	
Potential Cost Savings/Yr	\$220.64
mmBTU savings/yr	10.7 mmBTU
Emissions Reductions	
Carbon Dioxide (CO ₂)	3,839 lb/yr
Nitrogen Oxides (NO _X)	9.3 lb/yr
Sulfur Oxides (SO _X)	24 lb/yr

C. Recommended Projects

Suggestion	Cost Savings	Investment Cost	Payback Period	kWh Saved/yr
Vending	\$220.64	None	Immediate	3,152

D. Facility Background

Pullen Aquatic Center was built in 1992. It is a 42,470 square foot building located at 410 Ashe Avenue, Raleigh, NC 27606. It is a brick building containing 3 pools, 2 lockers, 1 family locker, 2 bathrooms, and a lobby. The building conditions at the time of the audit were as follows: Relative Humidity: 49; Temperature: 82.3°F; Wet bulb: 69.5; Dew Point: 61.4

E. Utility Use Analysis

The utility bills from Jan 2011 to December 2011 were used as a benchmark for Pullen Aquatic Center. The average kbtu/sf/yr for a public assembly space is 68.9 kbtu/sf/yr (average benchmark information provided by Waste Reduction Partners and the North Carolina Energy Office). Utility Information can be found in the appendix.

Summary of Energy Benchmarks	
Total Energy Consumed:	10,342 mmbtu / yr
Total Energy Index:	295 kbtu / sf / yr
Total Energy Cost:	\$123,693 \$ / yr
Total Energy Cost Index:	\$2.91 \$ / sf / yr

F. Electricity

Progress Energy is the service provider for Pullen Aquatic Center. The rate schedule is Time of Use (TOU). The yearly savings in 2011 by using the TOU rate schedule was \$23,729.

G. Fuel

Fuel is provided by PSNC Energy. The building is on the Large-Quantity General Service Rate (145 rate).

H. HVAC Systems

Not accessible at time of audit - On roof

I. Boiler

Raypack

J. Recommendations

1. Vending

Two vending machines containing snack foods have not yet had their lights removed.

Cost Savings

$$180 \text{ W} \times .001 \times 8,760 \text{ hr} = 1,576 \text{ kWh}$$

$$1,576 \text{ kWh} \times \$0.07/\text{kWh} = \$110.32$$

$$\$110.32 \times 2 = \underline{\$220.64}$$

2. Lighting

There are 16 two bulb incandescent fixtures in the women's locker room (the men's locker was not checked due to use). These light fixtures should be removed and cleaned to provide brighter light for the showers or replaced with lighting with higher lumens.

*This option has been looked into and was not plausible due to original construction techniques. Lighting in the ceiling could not be changed without completely removing ceiling above.

XI. Pullen Arts Center

A. Overview

The assessment on the Pullen Arts Center was conducted on April 16, 2012.

B. Results

Pullen Arts Center	
Potential Cost Savings/Yr	\$1,028
mmBTU savings/yr	21.9 mmBTU
Emissions Reductions	
Carbon Dioxide (CO ₂)	7,857.7 lb/yr
Nitrogen Oxides (NO _X)	18.9 lb/yr
Sulfur Oxides (SO _X)	49 lb/yr

C. Recommended Projects

Suggestion	Cost Savings	Investment Cost	Payback Period	kWh Saved/yr
Lighting Print and Camp Room	\$127.79			798.72
Motion Sensors	\$400	\$183	5.5 months	2,496
Weatherization	\$500			3125

D. Facility Background

Pullen Arts Center was built in 1960. It is a 14,760 square foot building located at 105 Pullen Rd, Raleigh, NC 27607. It is a brick building containing lobby, glass making studio, pottery studio, kitchen, jewelry room, painting room, weaving room, office, and camp room. The building conditions at the time of the audit were as follows: Relative Humidity: 42.4; Temperature: 77.2°F; Wet bulb: 63.9; Dew Point: 54.7

E. Utility Use Analysis

The utility bills from January 2011 – December 2011 were used as a benchmark for Pullen Arts Center. The average kbtu/sf/yr for a public assembly space is 68.9 kbtu/sf/yr (average benchmark information provided by Waste Reduction Partners and the North Carolina Energy Office). Utility Information can be found in the appendix.

Summary of Energy Benchmarks	
Total Energy Consumed:	968.1 mmbtu / yr
Total Energy Index:	65.59 kbtu / sf / yr
Total Energy Cost:	\$39,610 \$ / yr
Total Energy Cost Index:	\$2.68 \$ / sf / yr

F. Electricity

Progress Energy is the service provider for Pullen Arts Center. The rate schedule is Time of Use (TOU).

G. Fuel

Fuel is provided by PSNC Energy. The building is on the Small General Service rate (125 rate).

H. HVAC Systems

Trane

Model: LPCAD08D4H0LT000000103EANA00000000000000

Serial: T09H17794

I. Recommendations

1. Lighting

Lighting in the Old Print Room and Camp Room are currently connected to other rooms forcing them to be on at all times even when not in use.

- a. Switches needed in Old Print room and Camp room.

Cost Savings

$$32W \times 1,040 \text{ hrs} \times .001kW/W = 33.28 \text{ kWh}$$

$$33.28kWh \times 24 = \underline{798.72 \text{ kWh}}$$

$$798.72kWh \times \$0.16 = \underline{\$127.79/yr}$$

2. Motion Sensors

- a. Pottery
- b. Glass Making

Cost Savings

$$32W \times 500\text{hrs} \times .001kW/W = 16kWh/bulb$$

$$16kWh \times 156 \text{ bulbs} = \underline{2,496 \text{ kWh}}$$

$$2,496kWh \times \$0.16 = \underline{\$399.36}$$

Investment Cost

$$\$61 \times 3 = \underline{\$183}$$

Payback Period

$$\$183 / \$399.36 = .458 \text{ yrs} \times 12 = \underline{5.5 \text{ months}}$$

3. Weatherization

Based on previous studies on savings by the building size by NIST, savings between \$500 and \$1,000 can be saved from weatherization techniques. NIST study for potential savings can be found in Appendix item 15.

- a. Front Doors

XII. Pullen Community Center

A. Overview

The assessment on the Pullen Community Center was conducted on April 16, 2012.

B. Recommended Projects

Suggestion	Cost Savings	Investment Cost	Payback Period	kWh Saved/yr
Continued HVAC maintenance				

C. Facility Background

Pullen Community Center was built in 1981. It is a 14,368 square foot building located at 408 Ashe Ave. It is a brick building containing card rooms, lobby, weight/exercise room, lobby, activity rooms, and computer room. The building conditions at the time of the audit were as follows: Relative Humidity: 37; Temperature: 84°F; Wet bulb: 66; Dew Point: 55

D. Utility Use Analysis

The utility bills from January 2011 to December 2011 were used as a benchmark for Pullen Community Center. The average kbtu/sf/yr for a public assembly space is 68.9 kbtu/sf/yr (average benchmark information provided by Waste Reduction Partners and the North Carolina Energy Office). Utility Information can be found in the appendix.

Summary of Energy Benchmarks	
Total Energy Consumed:	556 mmbtu / yr
Total Energy Index:	38.7 kbtu / sf / yr
Total Energy Cost:	\$12,289 \$ / yr
Total Energy Cost Index:	\$0.86 \$ / sf / yr

E. Electricity

Progress Energy is the service provider for Pullen Community Center. The rate schedule is Time of Use (TOU). The yearly savings in 2011 by using the TOU rate schedule was \$1,478.90.

F. Recommendations

There are currently no recommendations for Pullen Community Center. HVAC equipment should continue to be regularly checked for maintenance and any significant changes in energy use should be investigated.

XIII. Tarboro Road

A. Overview

The assessment on the Tarboro Road Community Center was conducted on January 27, 2012.

B. Results

Tarboro Road Community Center	
Potential Cost Savings/Yr	\$200
mmBTU savings/yr	6.8 mmBTU
Emissions Reductions	
Carbon Dioxide (CO ₂)	2,439.8 lb/yr
Nitrogen Oxides (NO _x)	5.8 lb/yr
Sulfur Oxides (SO _x)	15.23 lb/yr

C. Recommended Projects

Suggestion	Cost Savings	Investment Cost	Payback Period	kWh Saved/yr
Weatherstripping	\$200			2,000

D. Facility Background

Tarboro Road Community Center was built in 1974. It is a 11,804 square foot building located at 121 N Tarboro Rd, Raleigh, NC 27610. It is a brick building containing meeting rooms, gym, and weight room. The building conditions at the time of the audit were as follows: Relative Humidity: 66; Temperature: 68°F; Wet bulb: 61.5; Dew Point: 56.9

E. Utility Use Analysis

The utility bills from December 2010 – November 2011 were used as a benchmark for Tarboro Road Community Center. The average kbtu/sf/yr for a public assembly space is 68.9 kbtu/sf/yr (average benchmark information provided by Waste Reduction Partners and the North Carolina Energy Office). Utility Information can be found in the appendix.

Summary of Energy Benchmarks	
Total Energy Consumed:	808.8 mmbtu / yr
Total Energy Index:	68.5 kbtu / sf / yr
Total Energy Cost:	8,938 \$ / yr
Total Energy Cost Index:	\$0.76 \$ / sf / yr

F. Electricity

Progress Energy is the service provider for Tarboro Community Center. The rate schedule is Time of Use (TOU). The yearly savings in 2011 by using the TOU rate schedule was \$676.12.

G. Fuel

Fuel is provided by PSNC Energy. The building is on the Small General Service rate (125 rate).

H. HVAC Systems

At the time of the audit the HVAC systems were not available for viewing due to location on roof.

I. Recommendations

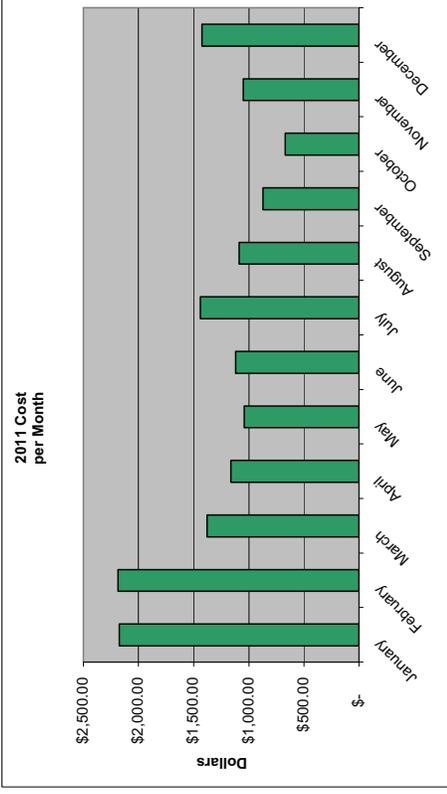
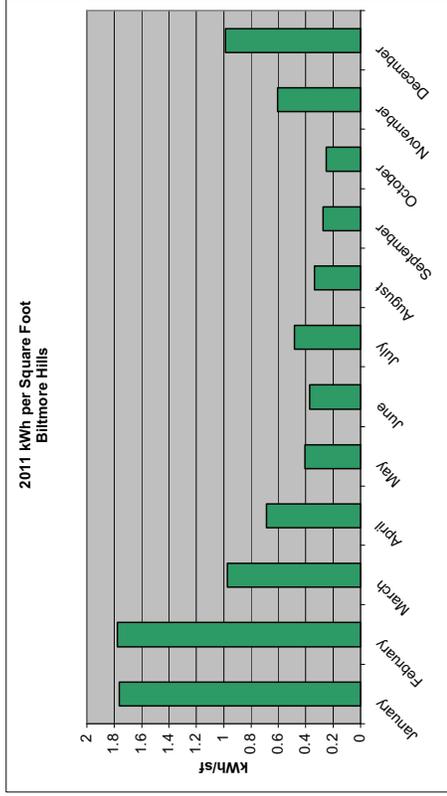
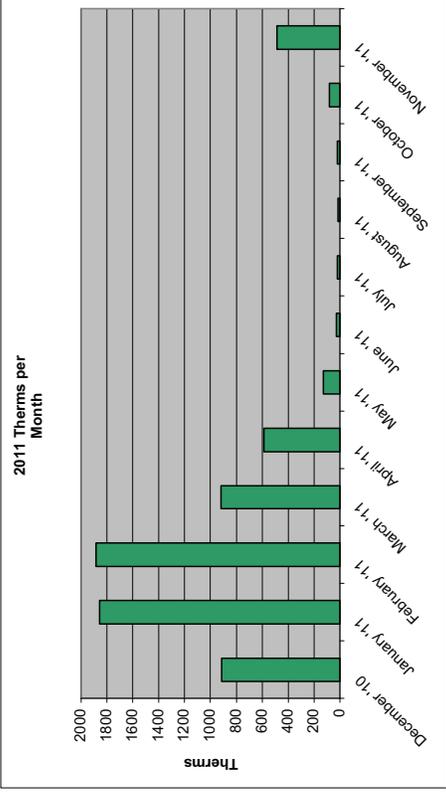
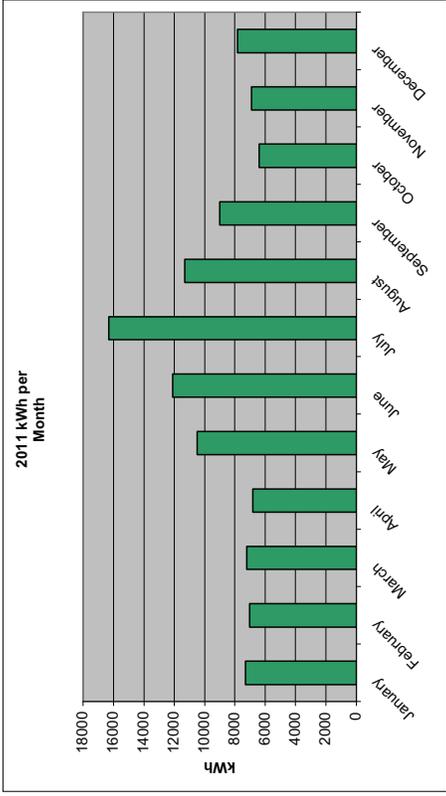
1. Weatherize doors in pool

The doors have large gaps in which outside air is entering and escaping. Based on previous studies on savings by the building size, savings between \$200 and \$1,000 can be saved from weatherization techniques. The NIST study for potential savings can be found in Appendix item 15.

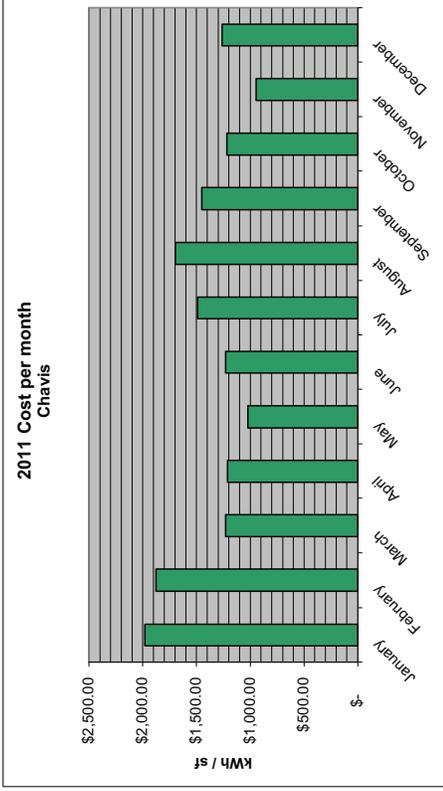
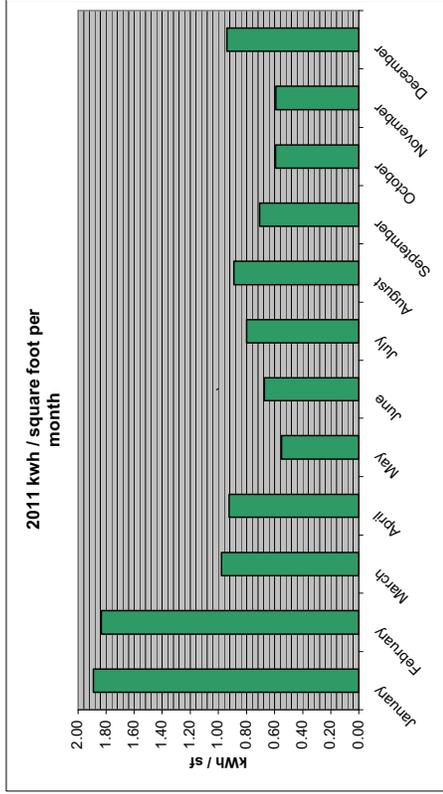
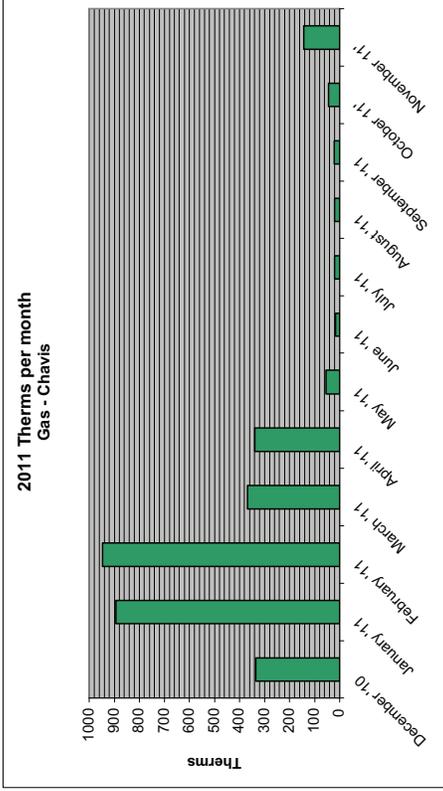
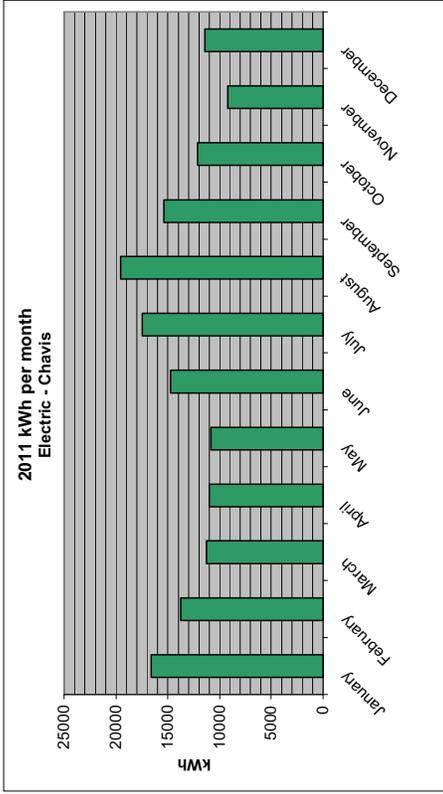
Appendix

All information was obtained through City of Raleigh utility bills.
Any missing information was estimated based on previous and past month's bills.

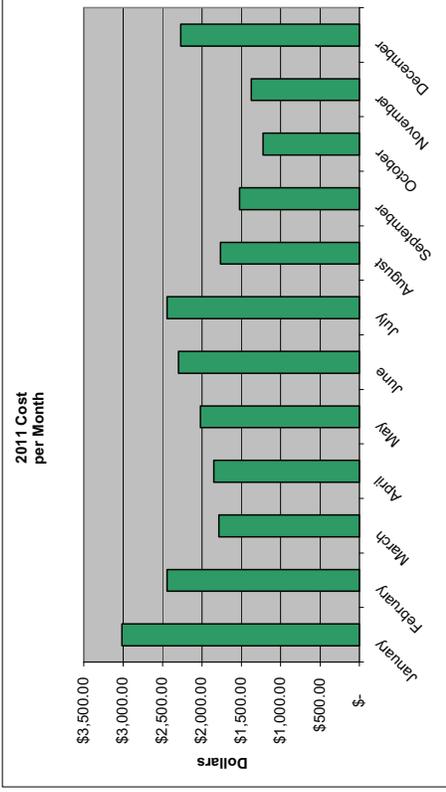
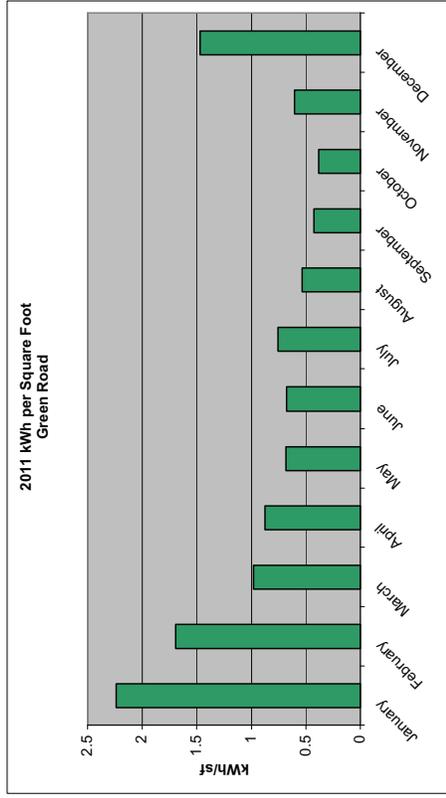
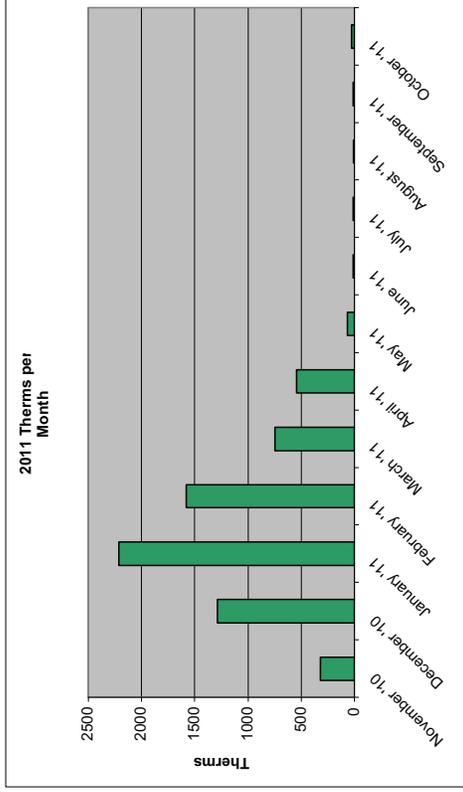
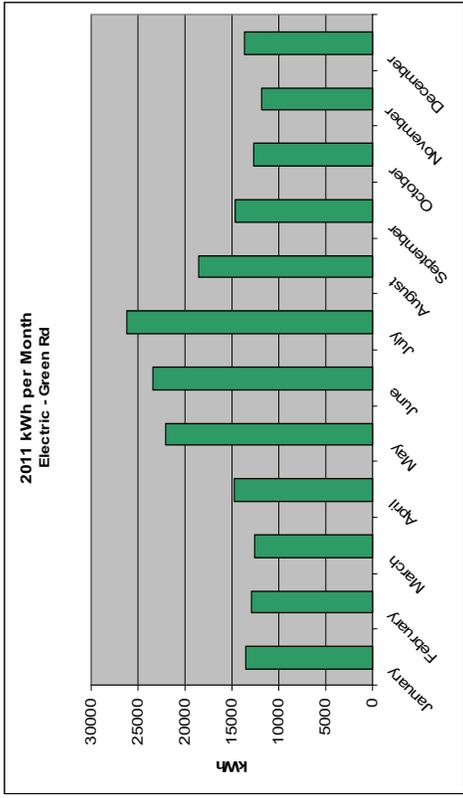
1. Biltmore Hills



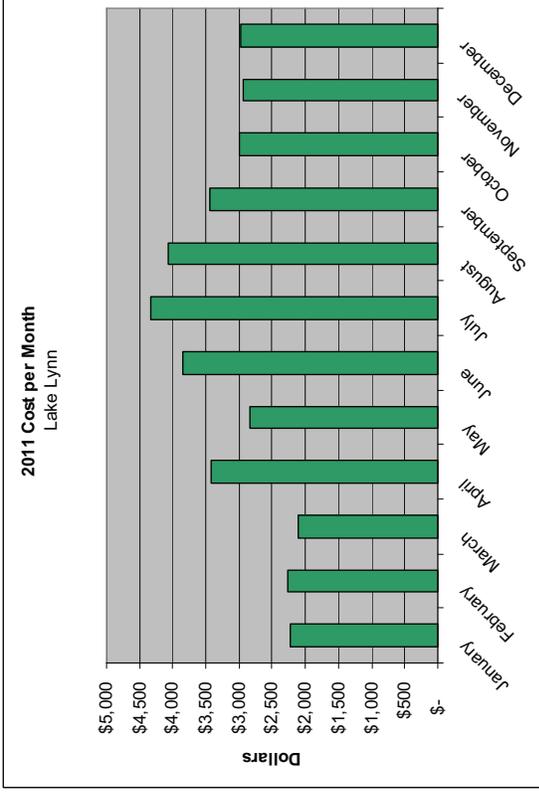
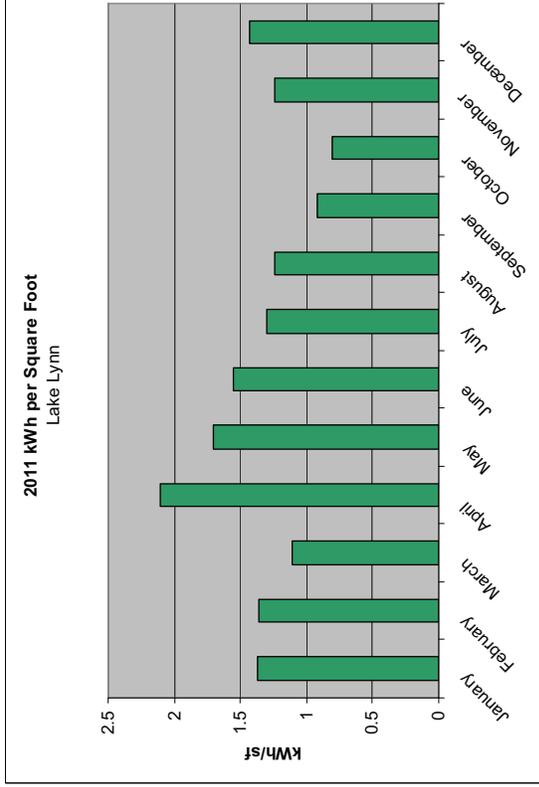
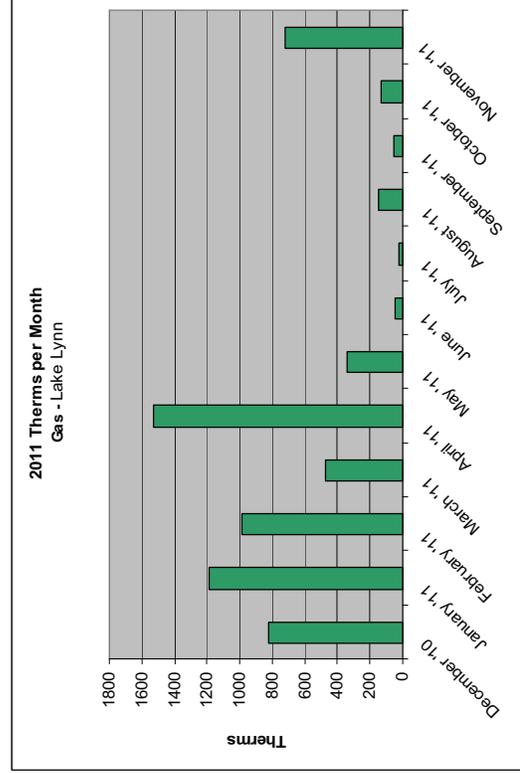
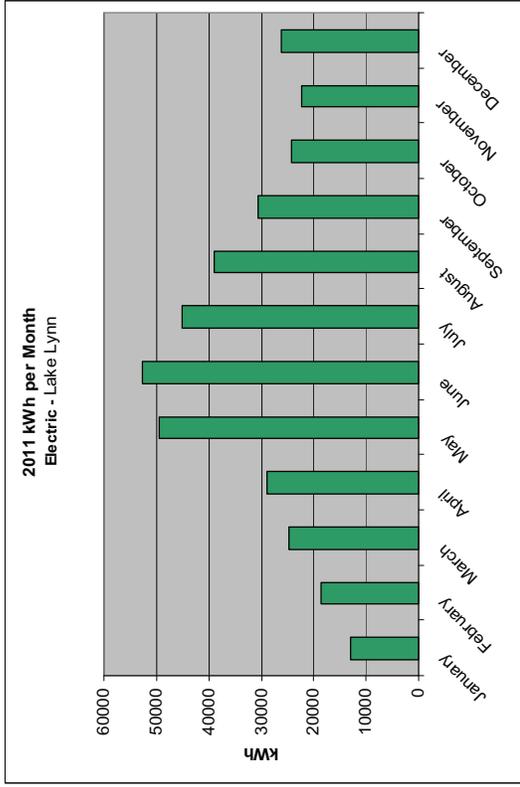
2. Chavis Community Center



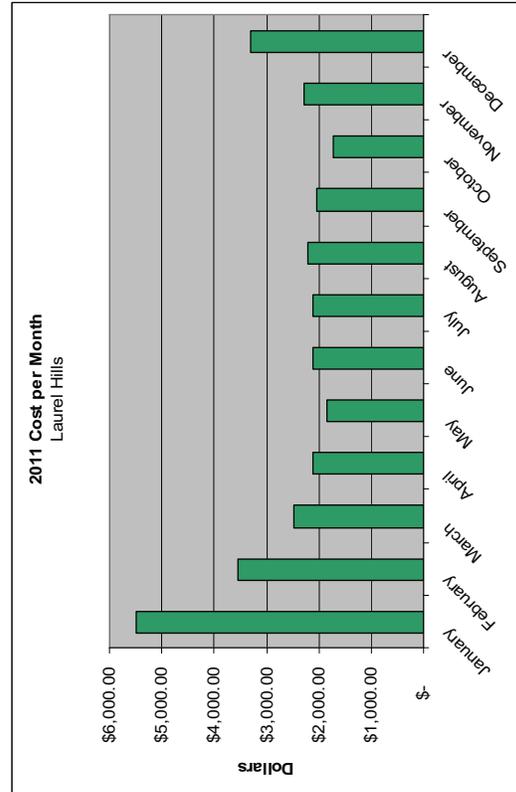
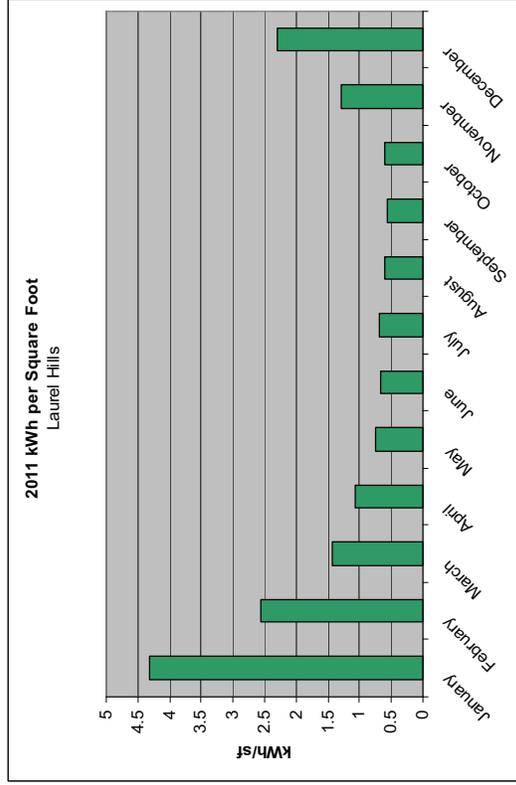
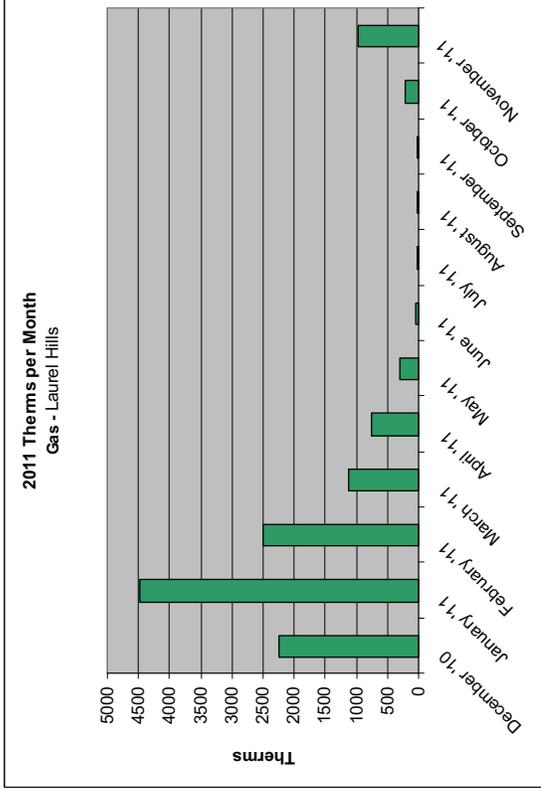
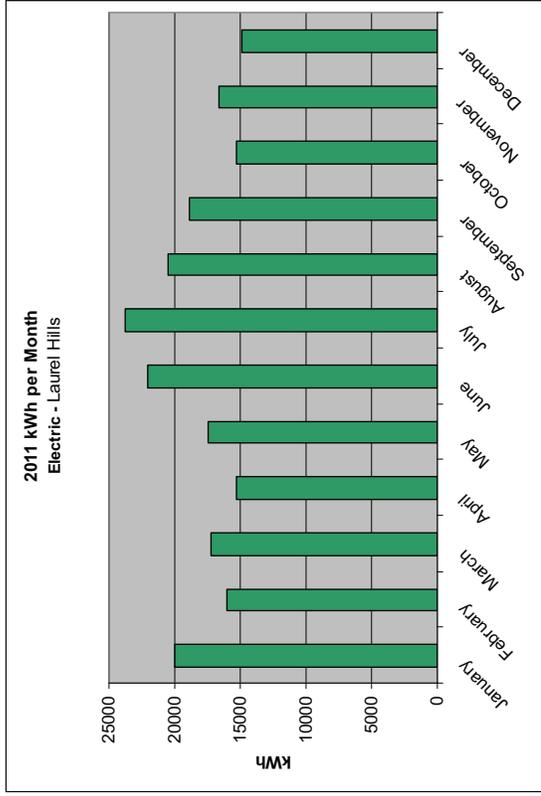
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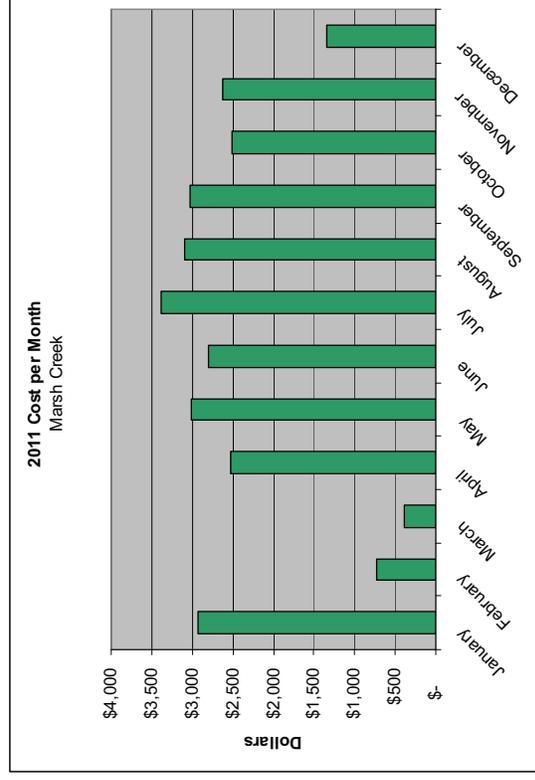
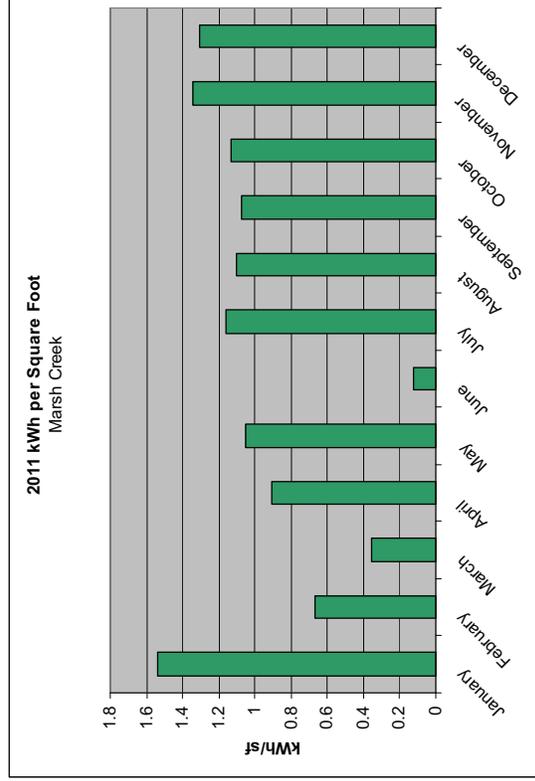
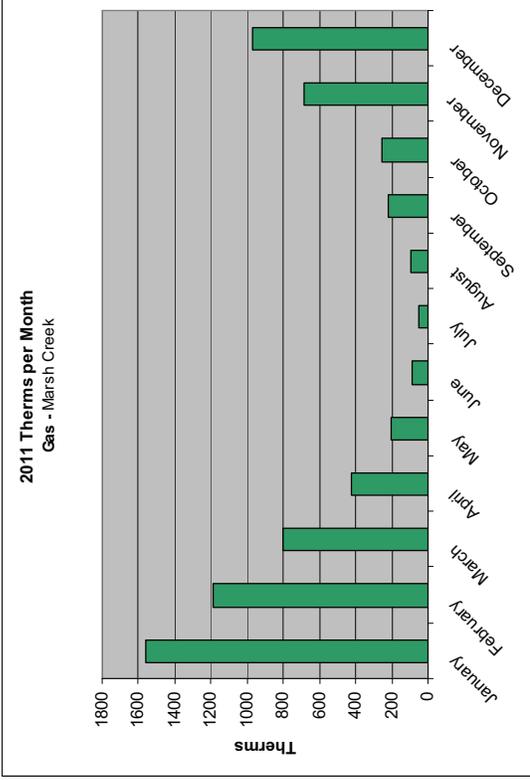
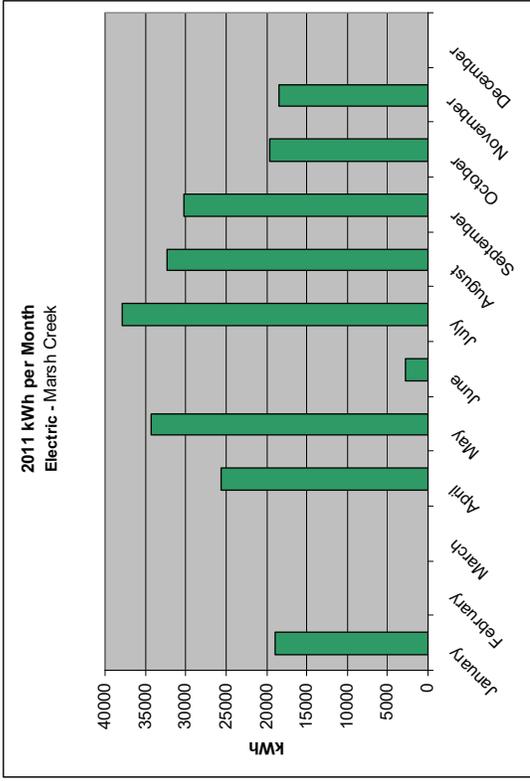
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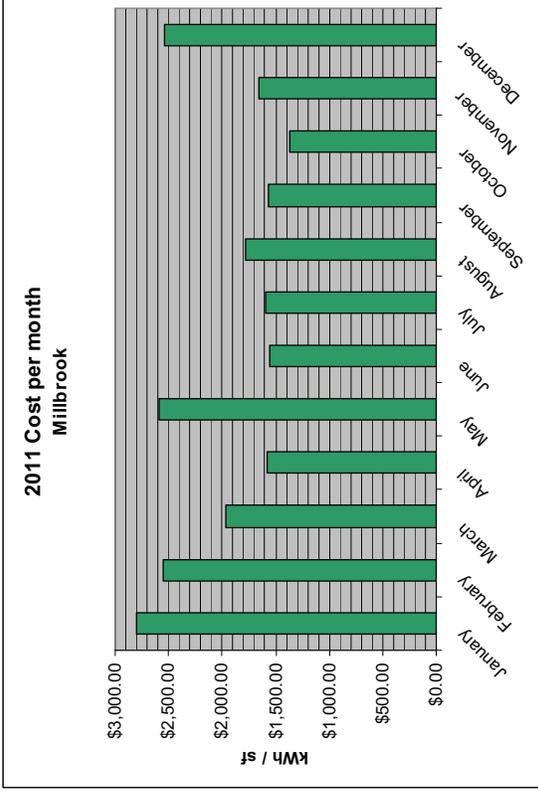
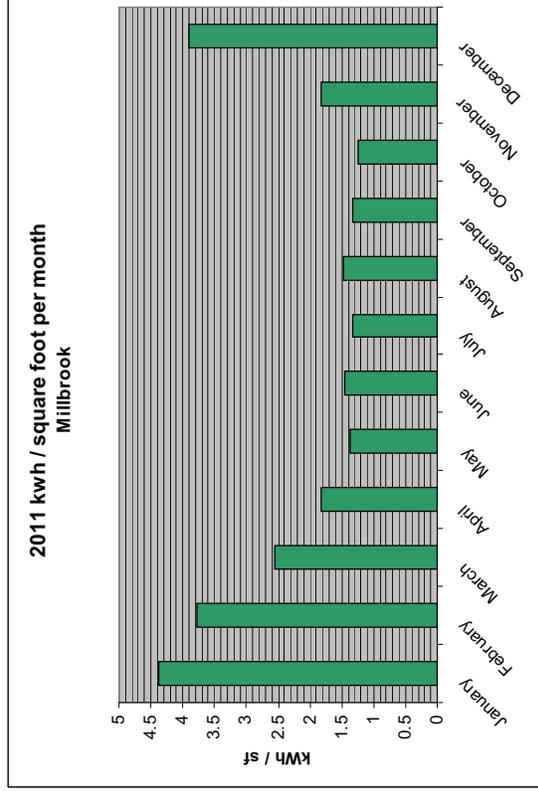
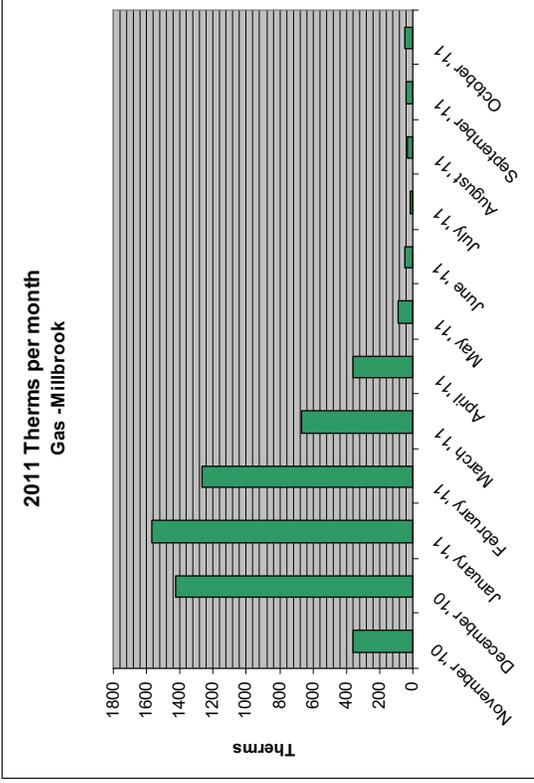
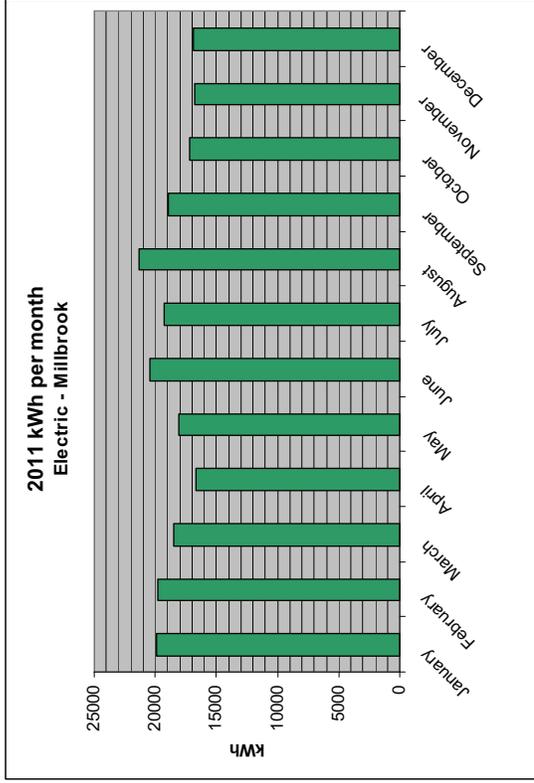
5. Laurel Hills



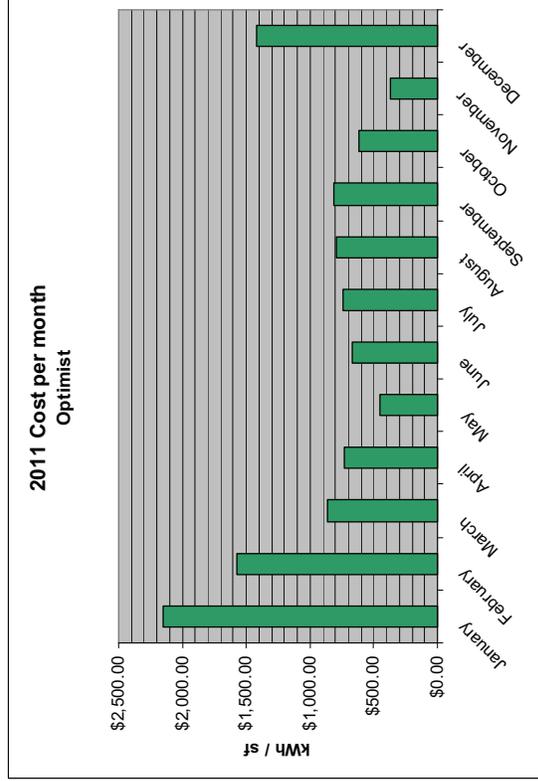
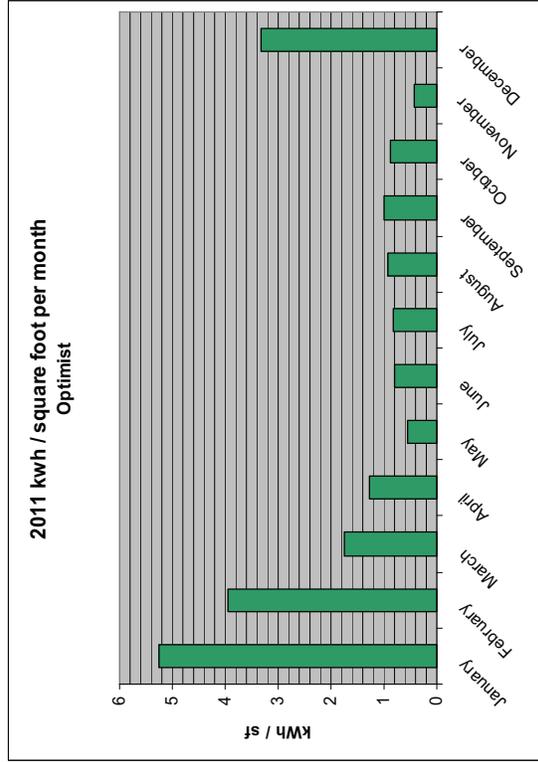
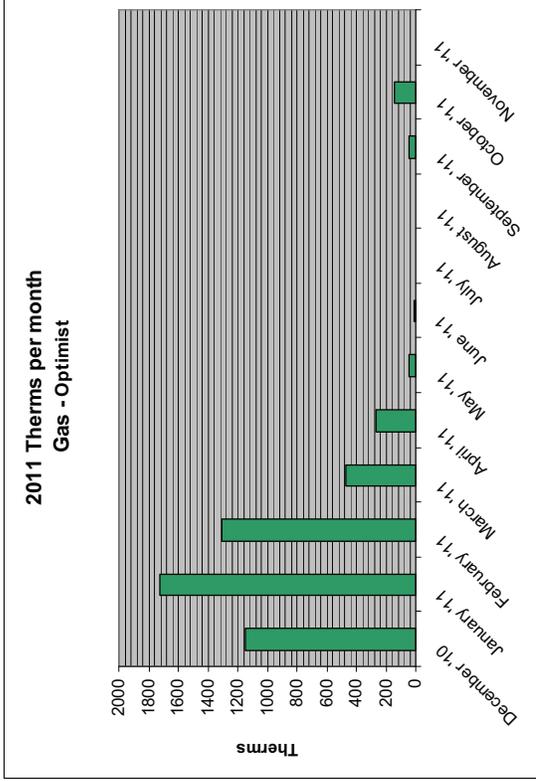
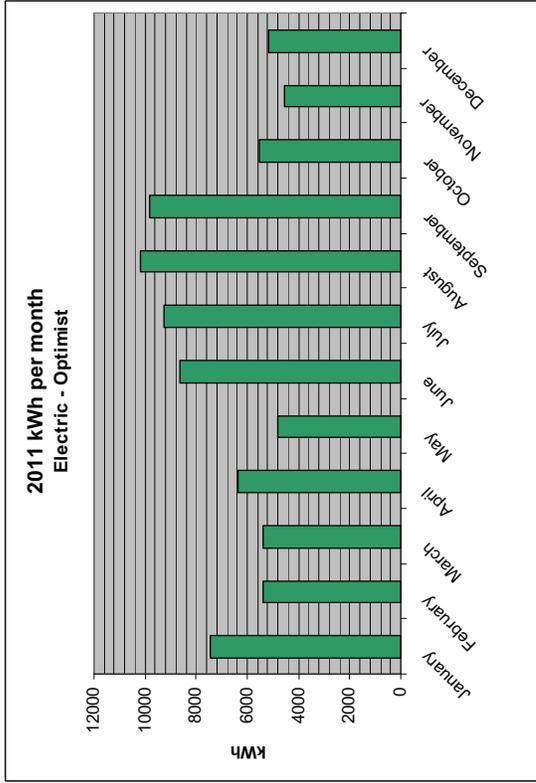
6. Marsh Creek



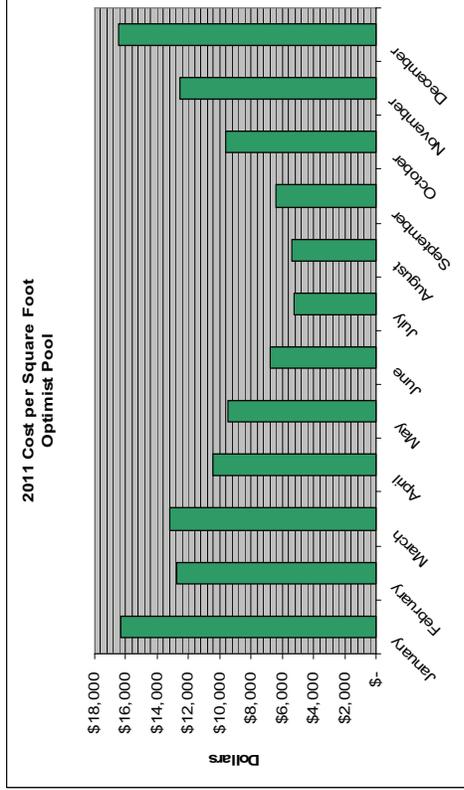
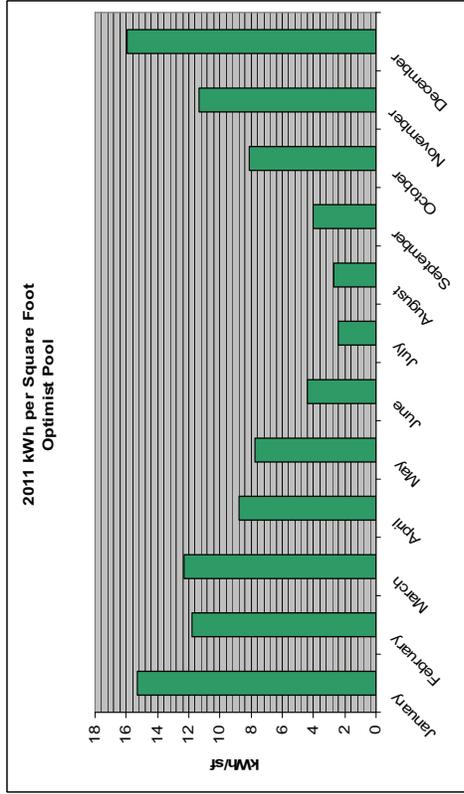
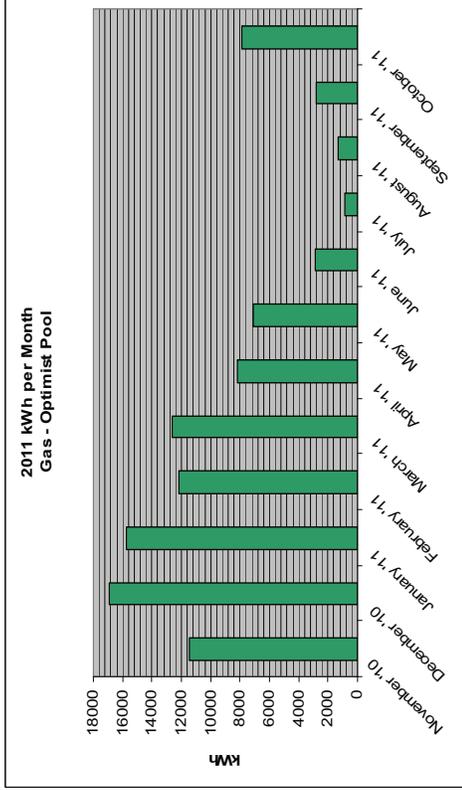
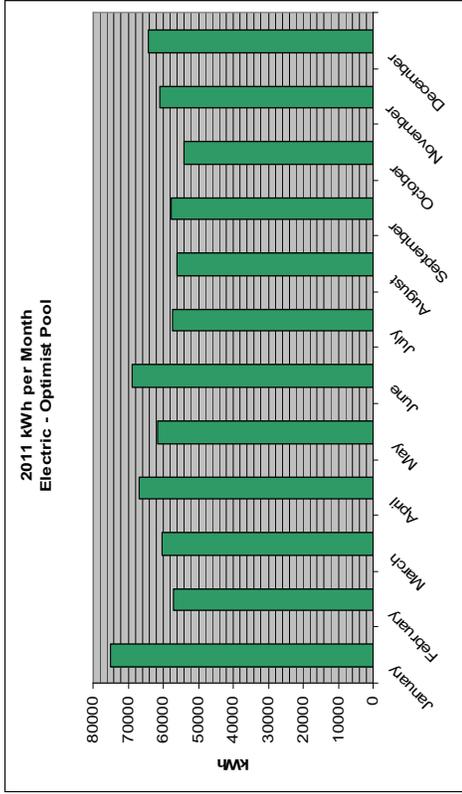
7. Millbrook Exchange



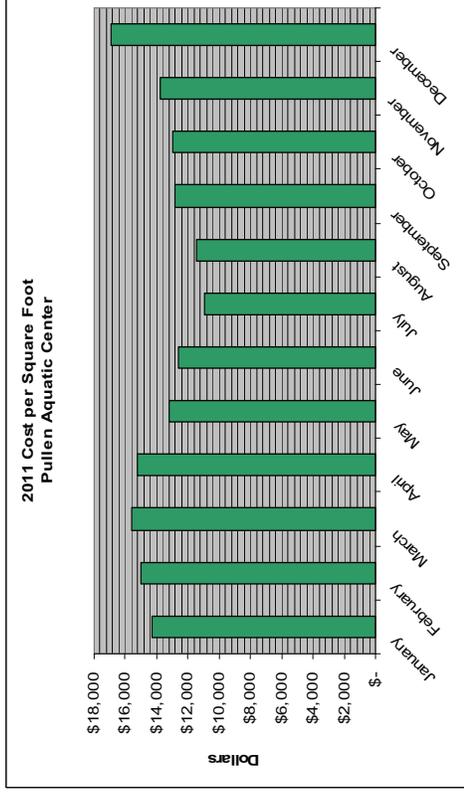
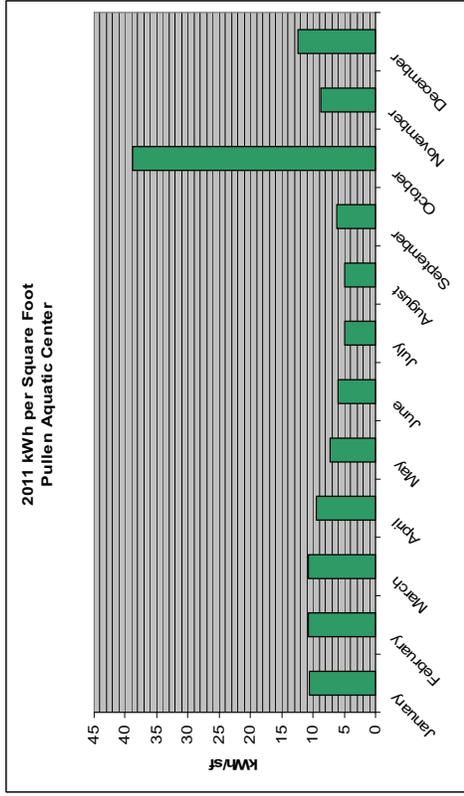
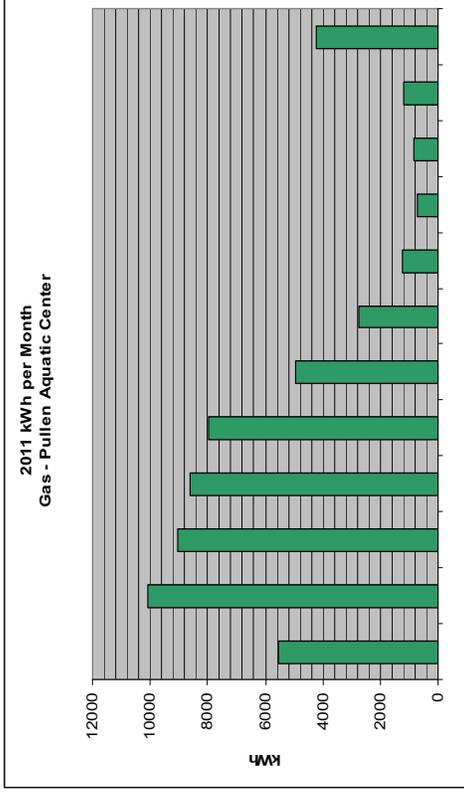
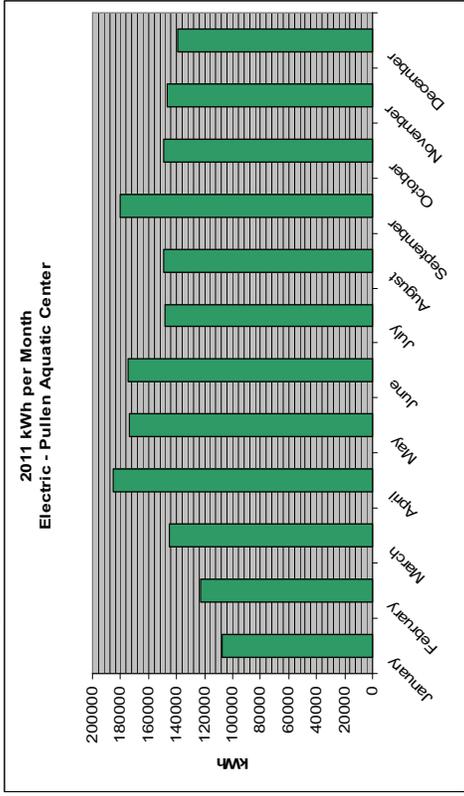
8. Optimist Community Center



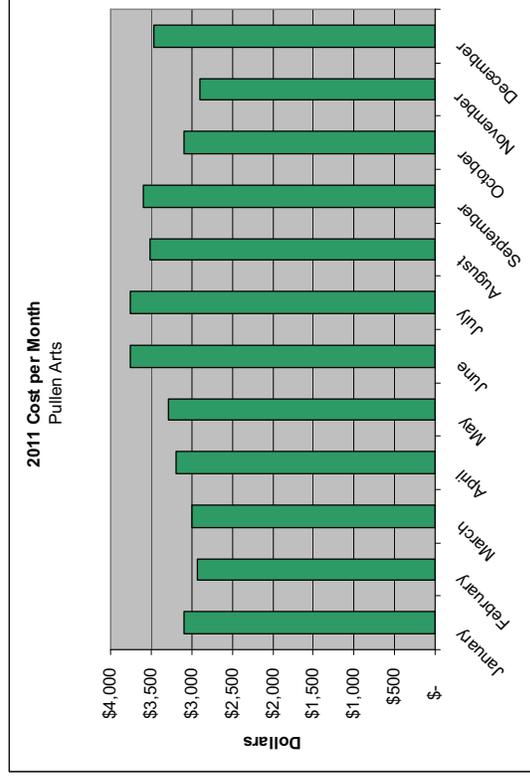
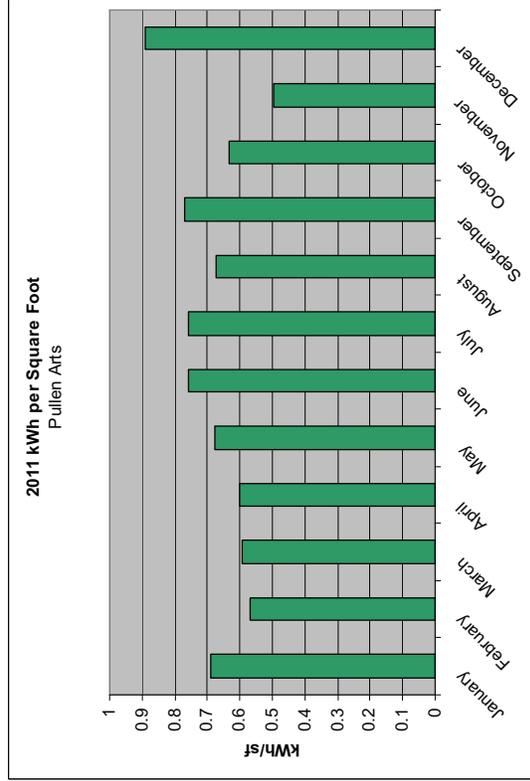
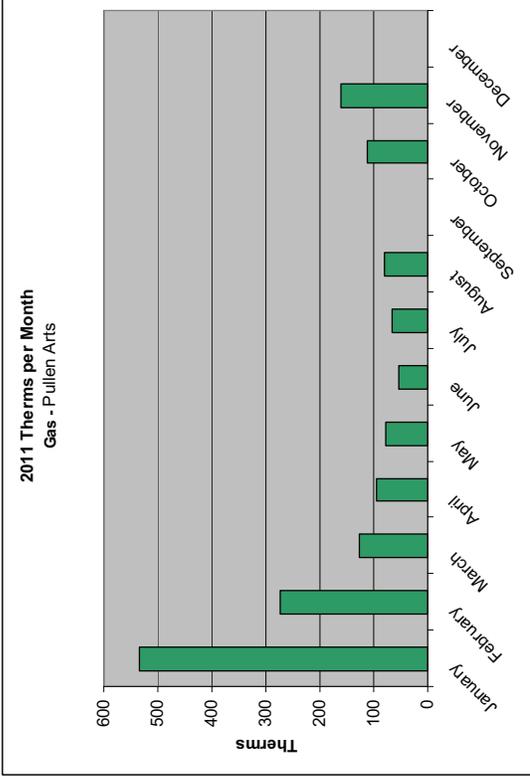
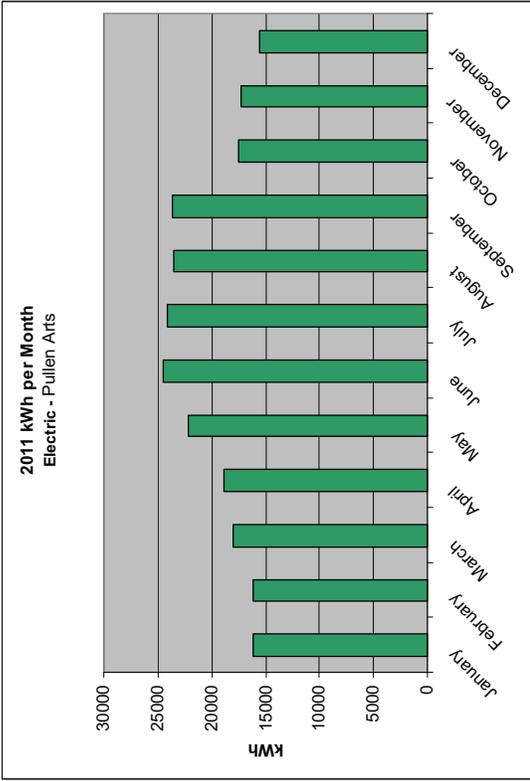
9. Optimist Pool



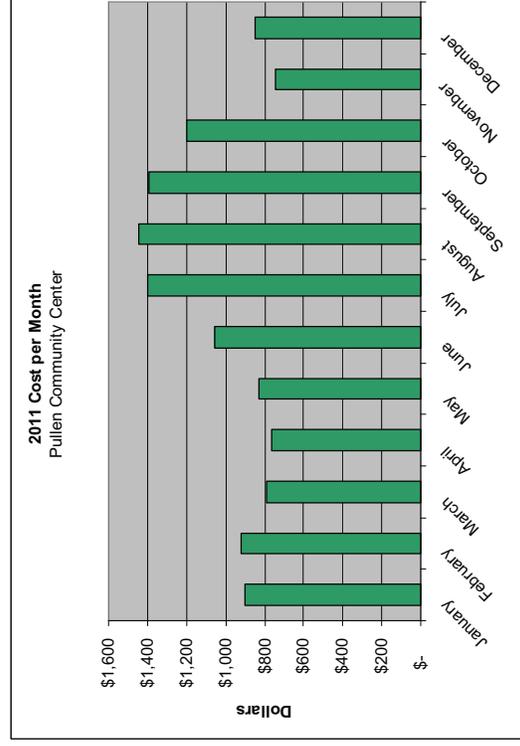
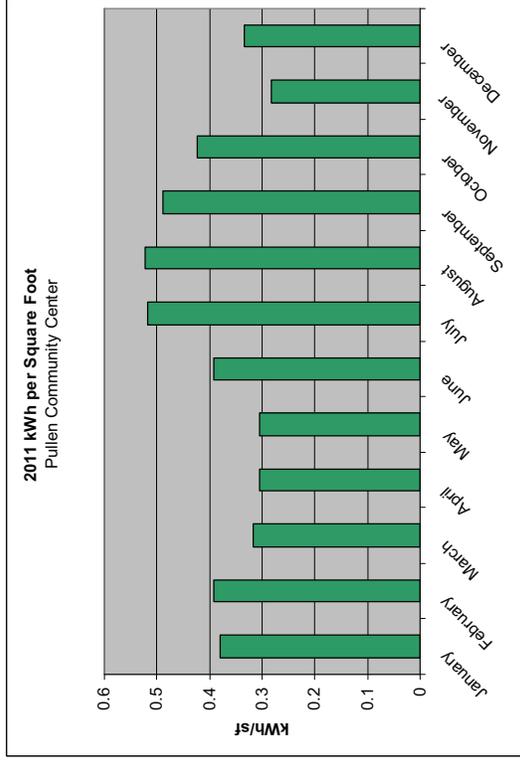
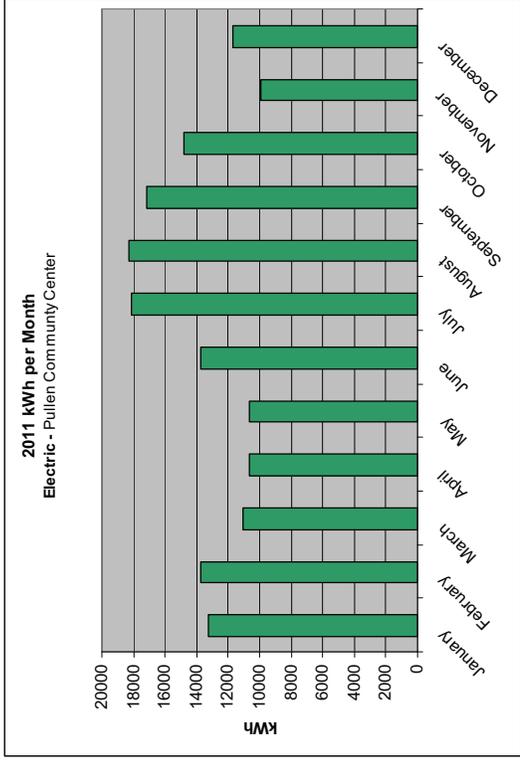
10. Pullen Aquatic Center



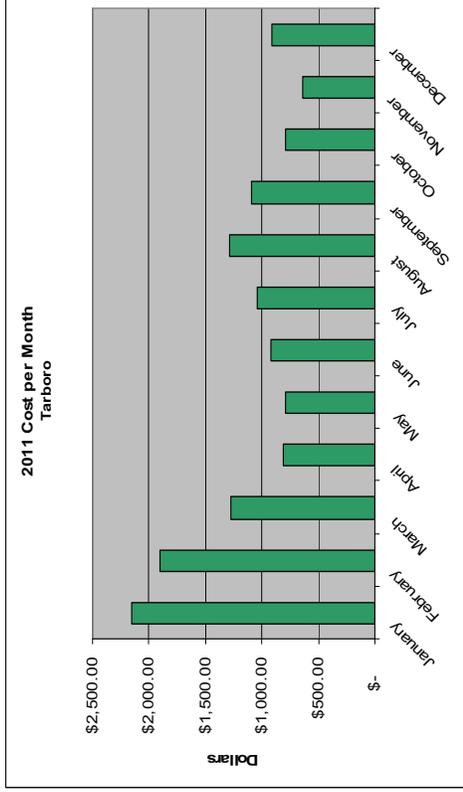
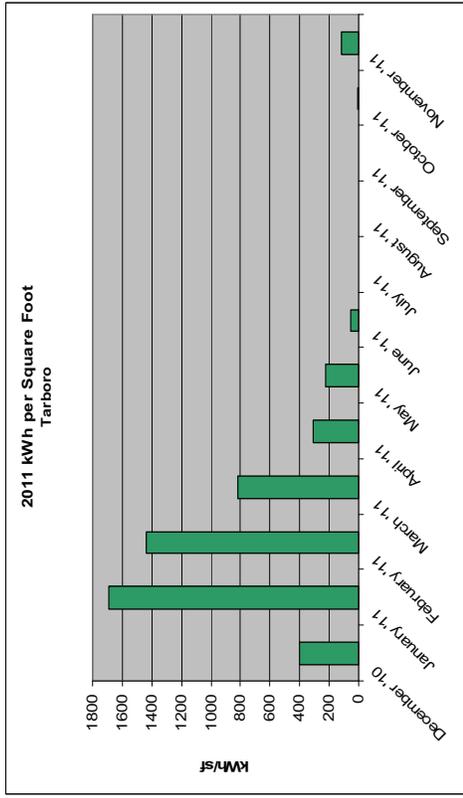
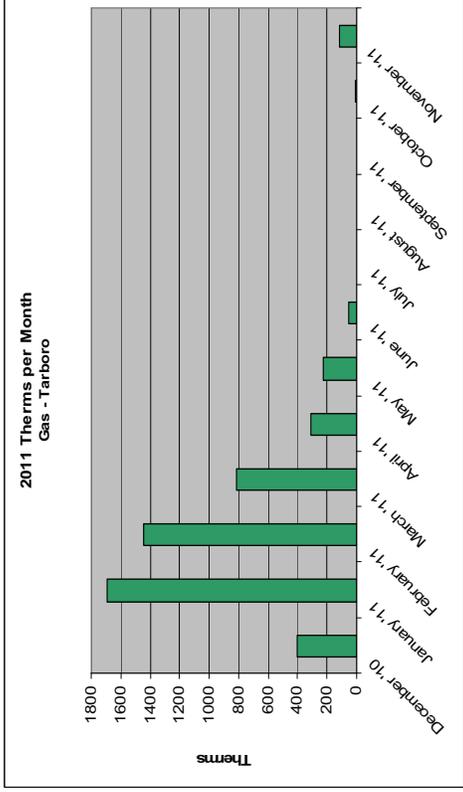
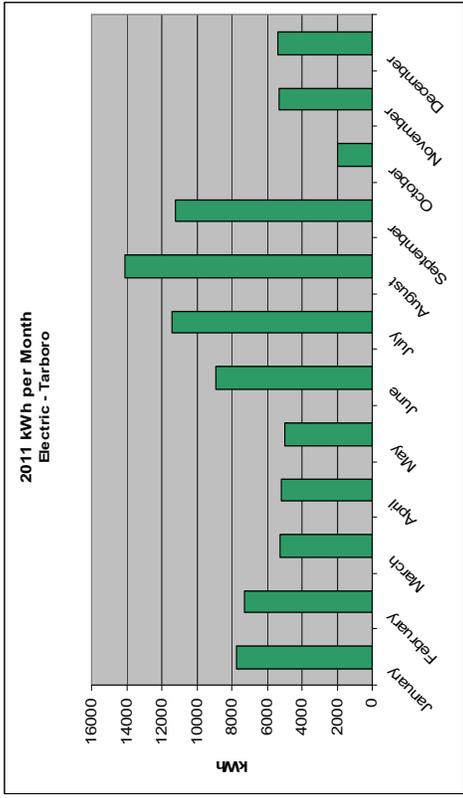
11. Pullen Arts



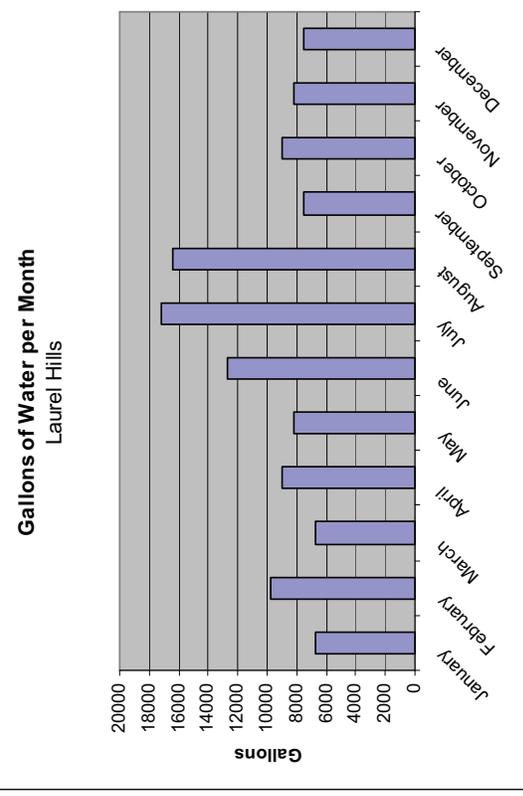
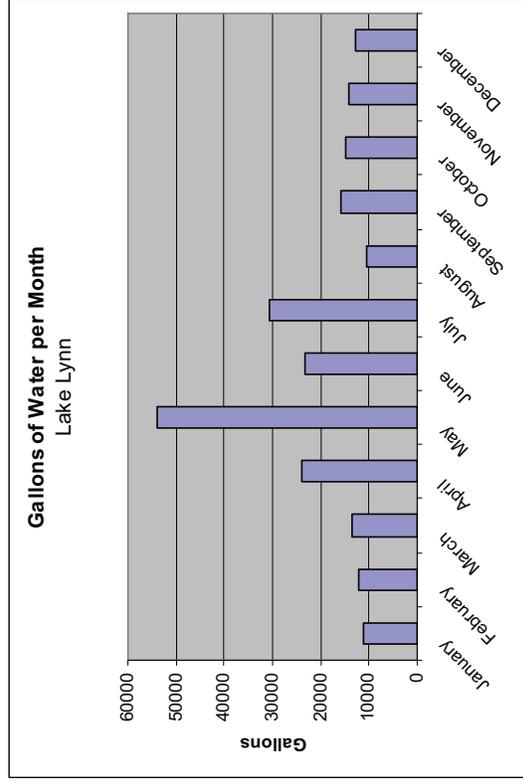
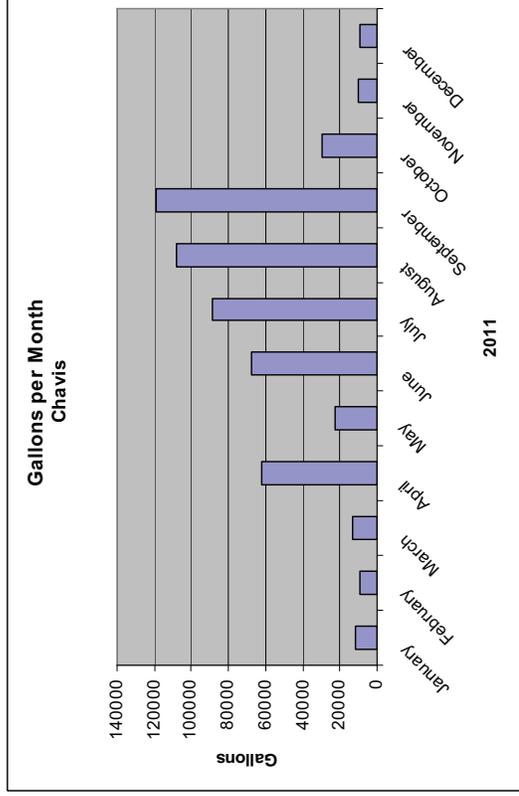
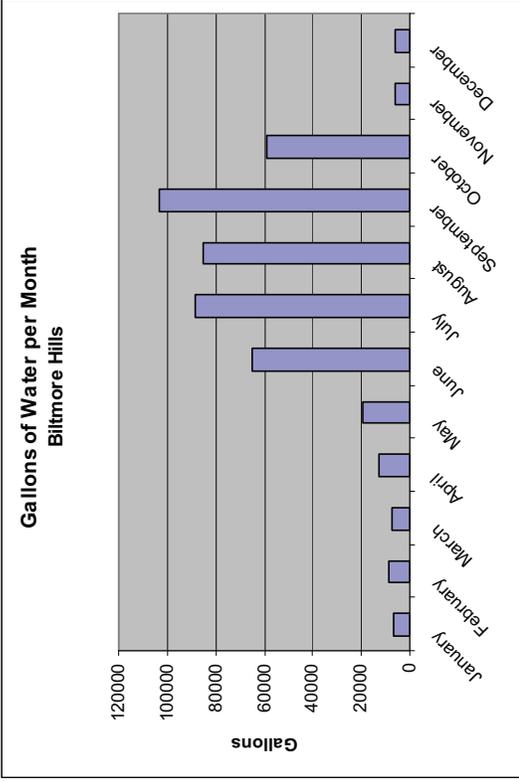
12. Pullen Community Center

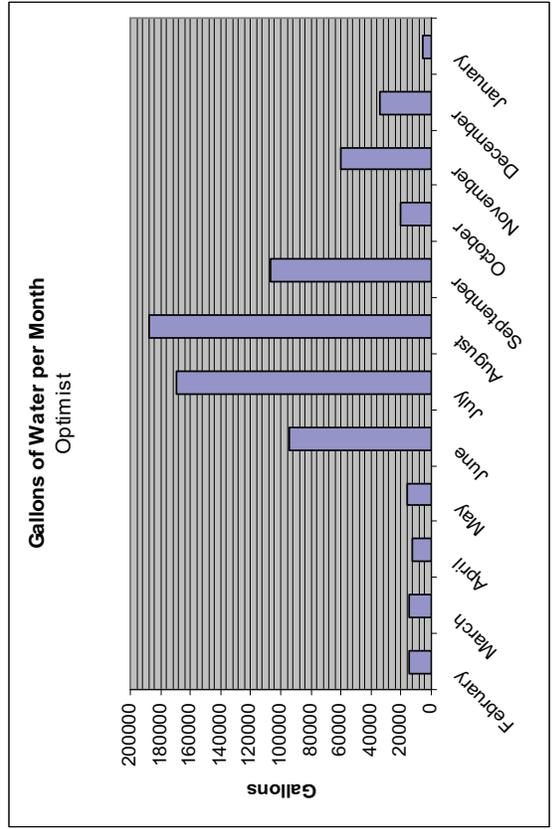
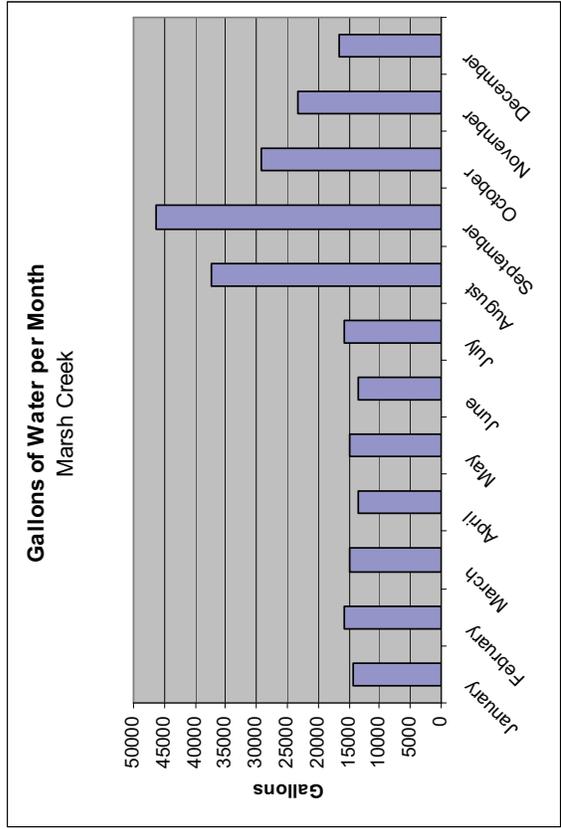
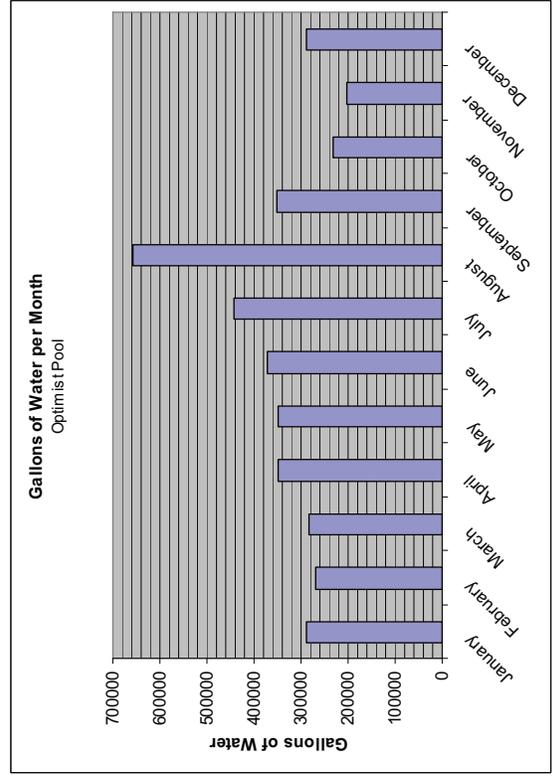
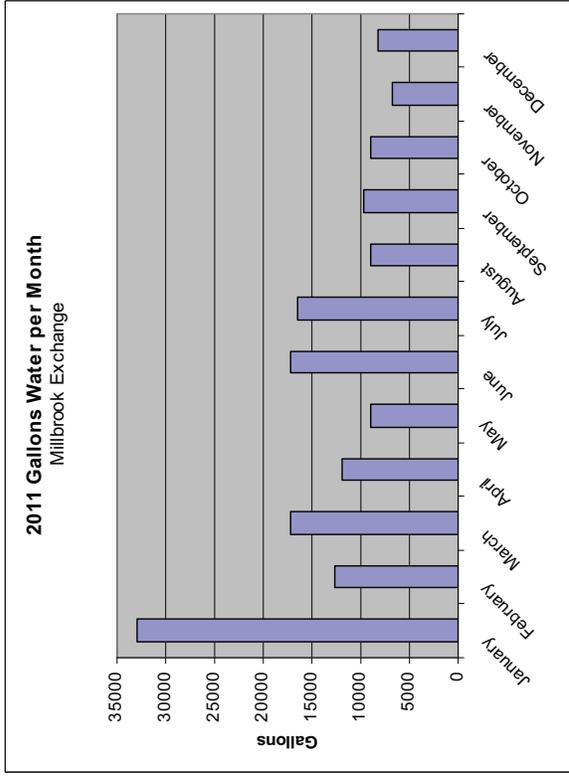


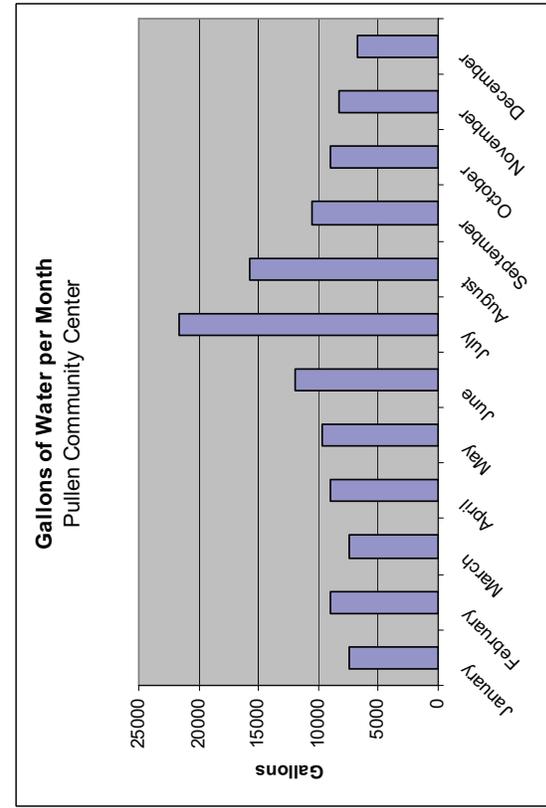
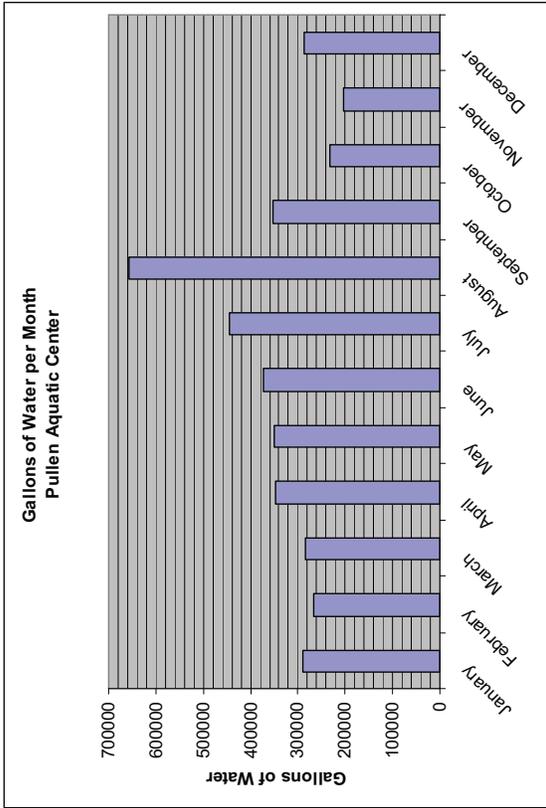
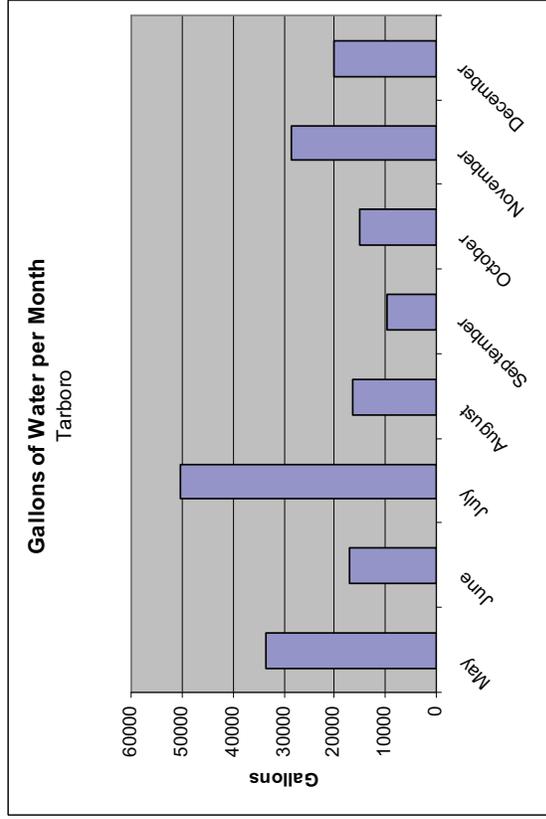
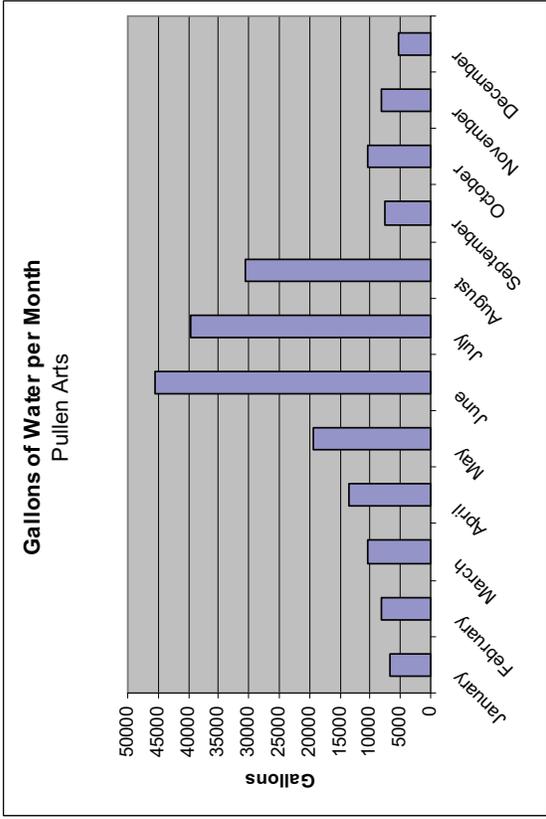
13. Tarboro Road



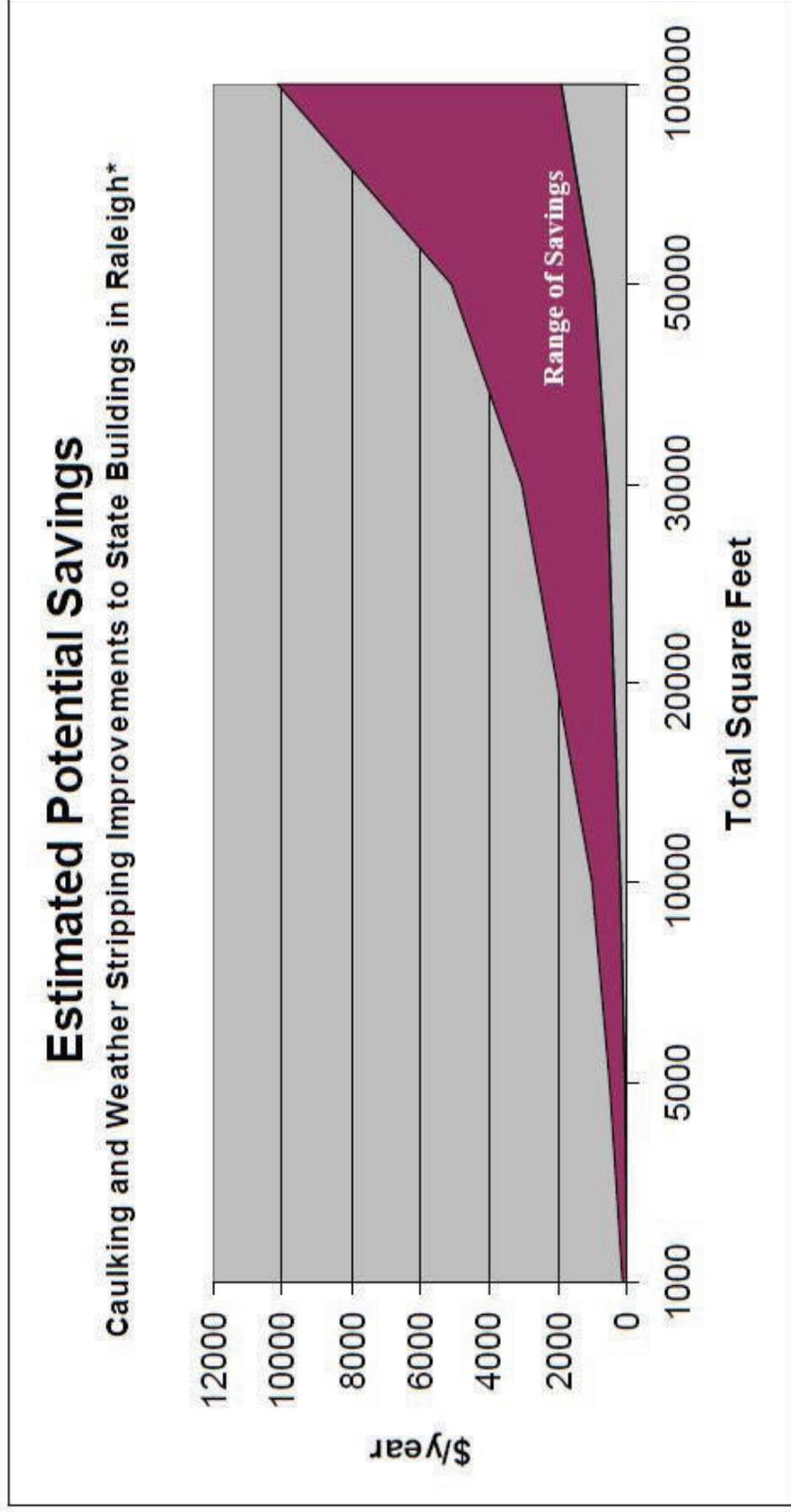
14. Water







15. Weatherization Savings



*The above estimates are based on a NIST study of air infiltration rates in two buildings using the actual total energy cost of \$1.59/sf for state-owned facilities in Raleigh, NC.

http://portal.ncdenr.org/c/document_library/get_file?uuid=6634eddd-a1a6-41d7-852b-1133e0805d45&groupId=38322

Glossary of Terms

Benchmark – establishes an annual energy use reference for comparing energy use to other buildings of similar size, function, and operating schedules

BTU – unit of energy, approximately the amount of energy needed to raise one pound of water one degree

Energy Index – measures the energy use per square foot of a building, this number can be used to easily compare the energy efficiency of multiple buildings

Energy Cost Index – measures the cost per square foot of a building, this number can be used to easily compare the cost efficiency of multiple buildings

HVAC – heating ventilation, and air conditioning, mechanical equipment used to regulate temperature, humidity, and air quality to best reach a comfort level for occupants

Kalwall – a reinforced, light emitting material used in buildings for daylighting. It is efficient due to its high insulation values that are significantly higher than glass, plastic, or polycarbonates

kWh – unit of energy used to measure kWhs used in one hour

Lighting automation – automated system used to manage lighting based on a predetermined schedule

Motion Sensor – also known as an occupancy sensor, detects the presence of occupants using infrared or acoustic technology to adjust lighting accordingly

Photocells – recognize light levels to turn on or off attached appliances as necessary

SEER – Seasonal Energy Efficiency Ratio, measures efficiency of air conditioner units

T12 bulb - T12 bulbs are a size of fluorescent bulb measuring 1 ½” in diameter, T12s are typically 40W making them less efficient than T8s

T8 bulb – T8 bulbs are a size of fluorescent bulb measuring 1” in diameter, T8s are typically 32W making them more efficient than T12s

Time-of-Use Rate (TOU) – electric rate based on the time of day that electricity is used, if electricity is used when usage is low the rate is less expensive than the standard rate

Weatherization – sealing fenestrations using caulk, weather stripping, foam, and additional products to prevent outdoor elements such as wind and water from entering the building