



# Local Government Energy Audit: Energy Audit Report



Copyright ©2018 TRC Energy Services. All rights reserved.

Reproduction or distribution of the whole, or any part of the contents of this document without written permission of TRC is prohibited. Neither TRC nor any of its employees makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any data, information, method, product or process disclosed in this document, or represents that its use will not infringe upon any privately-owned rights, including but not limited to, patents, trademarks or copyrights.

**Lift Station #1, 3, 5, 6, 7, 8,  
and 9**

Whiting, NJ 08759

Manchester Township

August 7, 2018

Final Report by:

**TRC Energy Services**

## Disclaimer

---

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate savings are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

The energy conservation measures and estimates of energy savings have been reviewed for technical accuracy. However, estimates of final energy savings are not guaranteed, because final savings may depend on behavioral factors and other uncontrollable variables. TRC Energy Services (TRC) and New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. The owner of the facility should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

# Table of Contents

---

<b>1</b>	<b>Executive Summary.....</b>	<b>1</b>
1.1	Facility Summary .....	1
1.2	Your Cost Reduction Opportunities.....	2
	Energy Conservation Measures.....	2
	Energy Efficient Practices .....	3
	On-Site Generation Measures.....	4
1.3	Implementation Planning.....	4
<b>2</b>	<b>Facility Information and Existing Conditions .....</b>	<b>5</b>
2.1	Project Contacts .....	5
2.2	General Site Information.....	5
2.3	Lift Station #1 .....	6
2.4	Lift Station #3 .....	7
2.5	Lift Station #5 .....	8
2.6	Lift Station #6 .....	9
2.7	Lift Station #7 .....	10
2.8	Lift Station #8 .....	11
2.9	Lift Station #9 .....	12
<b>3</b>	<b>Site Energy Use and Costs.....</b>	<b>13</b>
3.1	Total Cost of Energy .....	13
3.2	Electricity Usage .....	14
3.3	Benchmarking.....	19
3.4	Energy End-Use Breakdown .....	20
<b>4</b>	<b>Energy Conservation Measures .....</b>	<b>21</b>
4.1	Recommended ECMs .....	21
4.1.1	Lighting Upgrades.....	22
	ECM 1: Install LED Fixtures .....	22
	ECM 2: Retrofit Fixtures with LED Lamps.....	23
4.1.2	Motor Upgrades .....	24
	ECM 3: Premium Efficiency Motors.....	24
4.1.3	Electric Unitary HVAC Measures .....	25
	ECM 4: Install High Efficiency Air Conditioning Units.....	25
4.2	ECMs Evaluated but Not Recommended .....	26
	Install Occupancy Sensor Lighting Controls .....	26
<b>5</b>	<b>Energy Efficient Practices .....</b>	<b>27</b>
	Ensure Lighting Controls Are Operating Properly .....	27
	Perform Routine Motor Maintenance .....	27
	Practice Proper Use of Thermostat Schedules and Temperature Resets .....	27
<b>6</b>	<b>On-Site Generation Measures .....</b>	<b>28</b>

6.1	Photovoltaic.....	28
6.2	Combined Heat and Power .....	30
<b>7</b>	<b>Demand Response .....</b>	<b>31</b>
<b>8</b>	<b>Project Funding / Incentives .....</b>	<b>32</b>
8.1	SmartStart .....	33
8.2	SREC Registration Program.....	34
8.3	Energy Savings Improvement Program .....	35
<b>9</b>	<b>Energy Purchasing and Procurement Strategies .....</b>	<b>36</b>
9.1	Retail Electric Supply Options.....	36
9.2	Retail Natural Gas Supply Options .....	36

Appendix A: Equipment Inventory & Recommendations

# Table of Figures

---

Figure 1 – Previous 12 Month Utility Costs..... 2

Figure 2 – Potential Post-Implementation Costs ..... 2

Figure 3 – Summary of Energy Reduction Opportunities ..... 3

Figure 4 – Project Contacts ..... 5

Figure 5 - Utility Summary ..... 13

Figure 6 - Energy Cost Breakdown ..... 13

Figure 7 - Electric Usage & Demand..... 14

Figure 8 - Electric Usage & Demand..... 14

Figure 9 - Lift Station #1 Monthly Electric Usage..... 15

Figure 10 - Lift Station #3 Monthly Electric Usage..... 15

Figure 11 - Lift Station #5 Monthly Electric Usage..... 16

Figure 12 - Lift Station #6 Monthly Electric Usage..... 16

Figure 13 - Lift Station #7 Monthly Electric Usage..... 17

Figure 14 - Lift Station #8 Monthly Electric Usage..... 17

Figure 15 - Lift Station #9 Monthly Electric Usage..... 18

Figure 16 - Energy Use Intensity Comparison – Existing Conditions..... 19

Figure 17 - Energy Use Intensity Comparison – Following Installation of Recommended Measures ..... 19

Figure 18 - Energy Balance (kBtu/SF)..... 20

Figure 19 – Summary of Recommended ECMs..... 21

Figure 20 – Summary of Lighting Upgrade ECMs..... 22

Figure 21 – Summary of Motor Upgrade ECMs ..... 24

Figure 22 - Summary of Unitary HVAC ECMs..... 25

Figure 23 – Summary of Measures Evaluated, but Not Recommended..... 26

Figure 24 - Photovoltaic Screening ..... 29

Figure 25 - ECM Incentive Program Eligibility ..... 32

# I EXECUTIVE SUMMARY

---

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Lift Stations #1, 3, 5, 6, 7, 8, and 9.

The goal of an LGEA report is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help facilities implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist New Jersey local governments in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

## I.1 Facility Summary

On April 18, 2017, TRC performed energy audits of the following seven lift stations in Manchester Township covering the western service area (WSA):

- Lift Station #1
- Lift Station #3
- Lift Station #5
- Lift Station #6
- Lift Station #7
- Lift Station #8
- Lift Station #9

Each of the lift stations is typically occupied only a few hours per week when Manchester Township staff visit each site to record pump motor run hours and check or repair pumping equipment. Most sites consist only of a small pump house with a few incandescent or compact fluorescent light bulbs and a few T8 or T12 linear fluorescent tubes.

Heating generally consists of a few electric space heaters, which are turned on as needed in winter. Except for Lift Station #1, which houses a small employee kitchen and office, none of the buildings are air conditioned.

Each of the sites has a back-up generator for emergencies. Some of the generators are gas-fired while others burn diesel fuel. Fuel usage for the sites for backup generation is negligible. Unless there is a power outage, generators typically run only about six hours per year for required testing.

About 88% of energy usage is electric power used for pump motors, pumping control systems, and a few ventilation fans. Pump motors range in size from 5 to 15 horsepower. Motor run hours differ from site to site and seasonally. Most pumps run every day, for a few hours each day, based on demand.

## I.2 Your Cost Reduction Opportunities

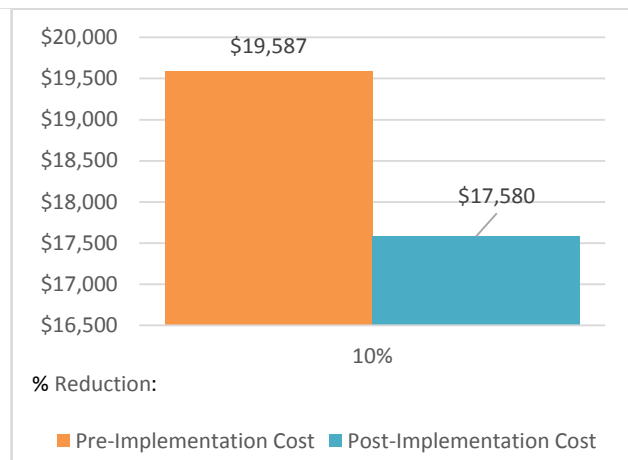
### Energy Conservation Measures

TRC evaluated five measures. Four measures are recommended for implementation which together represent an opportunity for Lift Stations #1, 3, 5, 6, 7, 8, and 9 to reduce annual energy costs by \$2,007 and annual greenhouse gas emissions by 12,977 lbs CO<sub>2</sub>e. The measures recommended for implementation is based on certain predetermined criteria such as simple payback in years as well as remaining useful life of the equipment. We estimate that if all measures were implemented as recommended, the project would pay for itself in 5.4 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce Lift Stations #1, 3, 5, 6, 7, 8, and 9's annual energy use by 10%.

**Figure 1 – Previous 12 Month Utility Costs**



**Figure 2 – Potential Post-Implementation Costs**



A detailed description of Lift Stations #1, 3, 5, 6, 7, 8, and 9's existing energy use can be found in Section 3.

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 3. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4.

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)*	Estimated Net Cost (\$)	Simple Payback Period (yrs)**	CO <sub>2</sub> e Emissions Reduction (lbs)
<b>Lighting Upgrades</b>			<b>9,279</b>	<b>2.1</b>	<b>\$1,445.26</b>	<b>\$8,331.54</b>	<b>\$1,265.00</b>	<b>\$7,066.54</b>	<b>4.9</b>	<b>9,344</b>
ECM 1	Install LED Fixtures	Yes	4,578	0.9	\$713.02	\$5,716.88	\$905.00	\$4,811.88	6.7	4,610
ECM 2	Retrofit Fixtures with LED Lamps	Yes	4,701	1.2	\$732.24	\$2,614.66	\$360.00	\$2,254.66	3.1	4,734
<b>Lighting Control Measures</b>			<b>435</b>	<b>0.1</b>	<b>\$67.68</b>	<b>\$1,350.00</b>	<b>\$175.00</b>	<b>\$1,175.00</b>	<b>17.4</b>	<b>438</b>
	Install Occupancy Sensor Lighting Controls	No	435	0.1	\$67.68	\$1,350.00	\$175.00	\$1,175.00	17.4	438
<b>Motor Upgrades</b>			<b>2,647</b>	<b>0.9</b>	<b>\$412.25</b>	<b>\$1,842.12</b>	<b>\$0.00</b>	<b>\$1,842.12</b>	<b>4.5</b>	<b>2,665</b>
ECM 3	Premium Efficiency Motors	Yes	2,647	0.9	\$412.25	\$1,842.12	\$0.00	\$1,842.12	4.5	2,665
<b>Electric Unitary HVAC Measures</b>			<b>526</b>	<b>0.3</b>	<b>\$81.99</b>	<b>\$849.03</b>	<b>\$0.00</b>	<b>\$849.03</b>	<b>10.4</b>	<b>530</b>
ECM 4	Install High Efficiency Electric AC	Yes	526	0.3	\$81.99	\$849.03	\$0.00	\$849.03	10.4	530
<b>TOTALS</b>			<b>12,887</b>	<b>3.4</b>	<b>\$2,007.17</b>	<b>\$12,372.69</b>	<b>\$1,440.00</b>	<b>\$10,932.69</b>	<b>5.4</b>	<b>12,977</b>
<b>TOTALS (All Recommended Measures)</b>			<b>12,453</b>	<b>3.3</b>	<b>\$1,939.49</b>	<b>\$11,022.69</b>	<b>\$1,265.00</b>	<b>\$9,757.69</b>	<b>5.0</b>	<b>12,540</b>

\* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

\*\* - Simple Payback Period is based on net measure costs (i.e. after incentives).

**Lighting Upgrades** generally involve the replacement of existing lighting components such as lamps and ballasts (or the entire fixture) with higher efficiency lighting components. These measures save energy by reducing the power used by the lighting components due to improved electrical efficiency.

**Lighting Controls** measures generally involve the installation of automated controls to turn off lights or reduce light output when not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

**Motor Upgrades** generally involve replacing older standard efficiency motors with high efficiency standard (NEMA Premium). Motors replacements generally assume the same size motors, just higher efficiency. Although occasionally additional savings can be achieved by downsizing motors to better meet current load requirements. This measure saves energy by reducing the power used by the motors, due to improved electrical efficiency.

**Electric Unitary HVAC** measures generally involve replacing older inefficient air conditioning systems with modern energy efficient systems. New air conditioning systems can provide equivalent cooling to older air condition systems at a reduced energy cost. These measures save energy by reducing the power used by the air conditioning systems, due to improved electrical efficiency.

### Energy Efficient Practices

TRC also identified three low cost (or no cost) energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at Lift Stations #1, 3, 5, 6, 7, 8, and 9 include:

- Ensure Lighting Controls Are Operating Properly
- Perform Routine Motor Maintenance
- Practice Proper Use of Thermostat Schedules and Temperature Resets

For details on these energy efficient practices, please refer to Section 5.



## **On-Site Generation Measures**

TRC evaluated the potential for installing on-site generation for Lift Stations #1, 3, 5, 6, 7, 8, and 9. Based on the configuration of the site and its loads there is a low potential for installing any PV and combined heat and power self-generation measures.

For details on our evaluation and on-site generation potential, please refer to Section 6.

### **I.3 Implementation Planning**

To realize the energy savings from the ECMs listed in this report, a project implementation plan must be developed. Available capital must be considered and decisions need to be made whether it is best to pursue individual ECMs separately, groups of ECMs, or a comprehensive approach where all ECMs are implemented together, possibly in conjunction with other facility upgrades or improvements.

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

The ECMs outlined in this report may qualify under the following program(s):

- SmartStart
- SREC (Solar Renewable Energy Certificate) Registration Program (SRP)
- Energy Savings Improvement Program (ESIP)

For facilities wanting to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SmartStart incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 3 are based on the SmartStart program. More details on this program and others are available in Section 8.

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.3 for additional information on the ESIP Program.

Additional information on relevant incentive programs is located in Section 8. You may also check the following website for more details: [www.njcleanenergy.com/ci](http://www.njcleanenergy.com/ci).

## 2 FACILITY INFORMATION AND EXISTING CONDITIONS

### 2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
<b>Customer</b>			
Joe Veni	Supervising Engineer	jveni@manchestertwp.com	732-65-8121
Jeff Ruerup	Maintainence Supervisor	jruerup@manchestertwp.com	908-963-6242
<b>TRC Energy Services</b>			
Vish Nimbalkar	Auditor	VNaikNimbalkar@trcsolutions.com	732-947-8898

### 2.2 General Site Information

On April 18, 2017, TRC performed an energy audit at seven lift stations located in Manchester Township, New Jersey. TRC’s auditor met with Steve to review the facility operations and help focus our investigation on specific energy-using systems. We inspected the following sites:

- Lift Station #1
- Lift Station #3
- Lift Station #5
- Lift Station #6
- Lift Station #7
- Lift Station #8
- Lift Station #9

Each of the lift stations is typically occupied only a few hours per week when Manchester Township staff visit each site to record pump motor run hours and check or repair pumping equipment. Most sites consist only of a small pump house with a few incandescent or compact fluorescent light bulbs and a few T8 or T12 linear fluorescent tubes. Some of the pump stations are located underground and have no structure, nor lighting fixtures.

Heating generally consists of a few electric space heaters, which are turned on as needed in winter. Except for Lift Station #1, which houses a small employee kitchen and office, none of the buildings are air conditioned.

Each of the sites has a back-up generator for emergencies. Some of the generators are gas-fired while others burn diesel fuel. Fuel usage for the sites for backup generation is negligible. Unless there is a power outage, generators typically run only about six hours per year for required testing.

About 88% of energy usage is electric power used for pump motors, pumping control systems, and a few ventilation fans. Pump motors range in size from 5 to 15 horsepower. Motor run hours differ from site to site and seasonally. Most pumps run every day, for a few hours each day, as needed.

Our observations at each site are summarized below. Lists of all major equipment at each pump station is provided in Appendix A.

## 2.3 Lift Station #1

Lift Station #1 is a 2,028 square foot brick building located at Brooks Court, Whiting. It has a gable roof finished with concrete shingles, glass doors, and operable double pane window. It is occupied by township staff daily from 7:00 am to 6:00 pm and also used as a break room. The building also has a few offices and a small tools room.



### Energy-Using Equipment

Major equipment on site includes: two 15-hp pumps (and related controls), 13 light fixtures, 1 through the wall AC unit and an electric space heater.

#### Motors

The two 15-hp pumps are submersed and below ground and were not accessible during the audit. According to the site contact both pump were replaced two years ago.

The pumps run at constant speed. Each of them typically runs for several hours a day, every day. Pumping hours vary seasonally. Based on the electric bills, the pumps generally run longer hours at this site than at most others. The electric cost for pumping at this site is about \$4,400 per year. Peak operation seems to occur in the winter and early spring.



#### Lighting

Building lighting consists of six T8 fixtures, four T12 linear fluorescent, two incandescent, and two CFL fixtures. Lighting is used only when occupied and is controlled by wall switches.

#### HVAC

The office section of the facility is conditioned by one 1-ton through the wall AC unit. This unit is original to the building and is more than 17 years old. It has been recommended for replacement. Space heating is provided by electric heater ranging from 3-5 kW and are controlled manually by an on/off switch.

#### On-Site Generation

There is no on-site generation at this facility.

## 2.4 Lift Station #3

Lift Station #3 is a 256 square foot concrete block building located at 15 Moccasin Drive, Whiting. It has a gable roof finished with shingles, steel doors, and no operable windows. The walls are concrete block and finished on the exterior with vinyl siding. It is occupied by township staff daily as needed to record the pump hours and address any maintenance issues. The building also has a fractional hp exhaust fan for venting.



### Energy-Using Equipment

Major equipment on site includes: two 5-hp pumps (and related controls), 5 light fixtures, 1 3-kW electric space heater.

#### Motors

The two 5-hp pumps are on ground as shown on the picture. Both pumps appear to be recently upgraded.

The pumps run at constant speed. Each of them typically runs for several hours a day, every day. Pumping hours vary seasonally. Based on the electric bills, the pumps generally run about four hours daily at this site. The electric cost for pumping at this site is about \$1,024 per year. Peak operation seems to occur in the winter and early spring.



#### Lighting

Building lighting consists of three T8 fixtures, four T12 linear fluorescent, and two CFL fixtures on the exterior. Lighting is used only when occupied and is controlled by wall switches.

#### HVAC

There is no air conditioning present at this building. To prevent water pipes from freezing in the winter and for the staff to be able to work, space heating is provided by electric heater rated at 3 kW and is controlled manually by an on/off switch. A 0.04 hp exhaust is installed for ventilation purposes and is operated as needed manually.

#### On-Site Generation

There is no on-site generation at this facility.

## 2.5 Lift Station #5

Lift Station #5 is a 339 square foot concrete block building located at 499 Central Avenue, Whiting. It has a gable roof finished with asphalt shingles, steel doors, and no operable windows. The walls are concrete block and finished on the exterior with vinyl siding. It is occupied by township staff daily as needed to record the pump hours and address any maintenance issues. The building also has two fractional hp exhaust fan for venting and a diesel electric generator.



### Energy-Using Equipment

Major equipment on site includes: two 15-hp pumps (and related controls), 10 light fixtures, 1 3.6-kW electric space heater.

#### Motors

The two 15-hp pumps are on ground as shown on the picture. Both pumps appear to be recently upgraded. They are assumed to be five years old.

The pumps are driven by a variable frequency drives (VFDs) that were seen to be running at 55 hz on the day of the audit. Each of them typically runs for several hours a day, every day. Pumping hours vary seasonally. Based on the electric bills, the pumps generally run about three hours daily at this site. The electric cost for pumping at this site is about \$2,662 per year. Peak operation seems to occur in the winter and early spring.



#### Lighting

Building lighting consists of six T8 fixtures, two incandescent, and two high pressure sodium fixtures on the exterior. Lighting is used only when occupied and is controlled by wall switches.

#### HVAC

There is no air conditioning present at this building. To prevent the water pipes from freezing in the winter and for the staff to be able to work, space heating is provided by electric heater rated at 3.6 kW and is controlled manually by an on/off switch. Two 0.3 hp exhaust fans are installed for ventilation purposes and are operated as needed manually.

#### On-Site Generation

An emergency Cummins diesel generator is used for back up.

## 2.6 Lift Station #6

Lift Station #6 is a 295 square foot concrete block building located at 25 Eagle Drive, Whiting. It has a gable roof finished with asphalt shingles, steel doors, and no operable windows. The walls are concrete block and finished on the exterior with vinyl siding. It is occupied by township staff daily as needed to record the pump hours and address any maintenance issues. The building also has two fractional hp exhaust fans for venting and a diesel electric generator.



### Energy-Using Equipment

Major equipment on site includes: two 3-hp pumps (and related controls), six light fixtures, 1 3.6-kW electric space heater.

#### Motors

The two 3-hp pumps are on ground as shown on the picture. Both pumps appear to be recently upgraded. They are driven by NEMA Premium Efficiency Motors.

The pumps run a constant speed. Each of them typically runs for only a few hours a day, every day. Pumping hours vary seasonally. Based on the electric bills, the pumps generally run about five hours daily at this site. The electric cost for pumping at this site is about \$922 per year. Peak operation seems to occur in the winter and early spring.



#### Lighting

Building lighting consists of five T8 fixtures, one incandescent on the exterior. Lighting is used only when occupied and is controlled by wall switches.

#### HVAC

There is no air conditioning present at this building. To prevent the water pipes from freezing in winter and for the staff to be able to work, space heating is provided by electric heater rated at 3.6 kW and is controlled manually by an on/off switch. Two 0.04 hp exhaust fans are installed for ventilation purposes and are operated as needed manually.

#### On-Site Generation

An emergency Cummins diesel generator is used as a backup power source.

## 2.7 Lift Station #7

Lift Station #7 is a 288 square foot concrete block building located at 20 Berkshire Road, Whiting. It has a gable roof finished with asphalt shingles, steel doors, and no operable windows. The walls are concrete block and finished on the exterior with vinyl siding. It is occupied by township staff daily as needed to record the pump hours and address any maintenance issues.



### Energy-Using Equipment

Major equipment on site includes: two 7.5-hp pumps (and related controls), eight light fixtures, 1 3.6-kW electric space heater.

### Motors

The two 7.5-hp pumps are on ground as shown on the picture. Both pumps appear to be recently upgraded.

The pumps run at a constant speed. Each of them typically runs for only a few hours a day, every day. Pumping hours vary seasonally. Based on the electric bills, the pumps generally run about three hours daily at this site. The electric cost for pumping at this site is about \$1,362 per year. Peak operation seems to occur in the winter and early spring



### Lighting

Building lighting consists of six T8 fixtures, one incandescent and one high pressure sodium fixture for the exterior. Lighting is used only when occupied and is controlled by wall switches.

### HVAC

There is no air conditioning present at this building. To prevent the water pipes from freezing in winter and for the staff to be able to work, space heating is provided by electric heater rated at 3.6 kW and is controlled manually by an on/off switch.

### On-Site Generation

An emergency diesel generator is used as a backup. Nameplate information was not available during the audit.

## 2.8 Lift Station #8

Lift Station #8 is a 399 square foot concrete block building located at 620 Petunia Lane, Whiting. It has a gable roof finished with asphalt shingles, steel doors, and no operable windows. The walls are concrete block and finished on the exterior with vinyl siding. It is occupied by township staff daily as needed to record the pump hours and address any maintenance issues. The building also has one fractional hp exhaust fans for venting and a diesel electric generator.



### Energy-Using Equipment

Major equipment on site includes: two 5-hp pumps (and related controls), four light fixtures, one 3.6-kW electric space heater.

#### Motors

The two 5-hp pumps are on ground as shown on the picture. Both pumps are fairly old and are recommended for replacement.

The pumps run at a constant speed. Each of them typically runs for only a few hours a day, every day. Pumping hours vary seasonally. Based on the electric bills, the pumps generally run about six hours daily at this site. The electric cost for pumping at this site is about \$2,174 per year. Peak operation seems to occur in the winter and early spring.



#### Lighting

Building lighting consists of two T12, one T8 fixtures, one incandescent fixture for the exterior. Lighting is used only when occupied and is controlled by wall switches.

#### HVAC

There is no air conditioning present at this building. To prevent the water pipes from freezing in winter and for the staff to be able to work, space heating is provided by electric heater rated at 3.6 kW and is controlled manually by an on/off switch. One 0.3 hp exhaust fans are installed for ventilation purposes and are operated as needed manually.

#### On-Site Generation

An emergency diesel generator is used as a backup power source.



## 2.9 Lift Station #9

Lift Station #9 is a 465 square foot concrete block building located at 4 Clear Lake Road, Whiting. It has a gable roof finished with asphalt shingles, steel doors, and no operable windows. The walls are concrete block and finished on the exterior with vinyl siding. It is occupied by township staff daily as needed to record the pump hours and address any maintenance issues. The building also has one fractional hp exhaust fan for venting and a diesel electric generator.



### Energy-Using Equipment

Major equipment on site includes: two 5-hp pumps (and related controls), seven light fixtures, one 3.6-kW electric space heater.

#### Motors

The two 5-hp pumps are on ground as shown on the picture. Both pumps appeared to be fairly new.

The pumps run at a constant speed. Each of them typically runs for only a few hours a day, every day. Pumping hours vary seasonally. Based on the electric bills, the pumps generally run about six hours daily at this site. The electric cost for pumping at this site is about \$1,638 per year. Peak operation seems to occur in the winter and early spring.



#### Lighting

Building lighting consists of five T8 fixtures, two high pressure sodium fixtures for the exterior. Lighting is used only when occupied and is controlled by wall switches.

#### HVAC

There is no air conditioning present at this building. To prevent the water pipes from freezing in winter and for the staff to be able to work, space heating is provided by electric heater rated at 3.6 kW and is controlled manually by an on/off switch. One 0.3 hp exhaust fans are installed for ventilation purposes and are operated as needed manually.

#### On-Site Generation

A Cummins diesel generator rated at 35 kW is used as a backup power source.

### 3 SITE ENERGY USE AND COSTS

Utility data for electricity was analyzed to identify opportunities for savings. In addition, data for Electricity was evaluated to determine the annual energy performance metrics for the building in energy cost per square foot and energy usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are a number of factors that could cause the energy use of this building to vary from the “typical” energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 3.3 for additional information.

#### 3.1 Total Cost of Energy

The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A combined profile of the annual energy consumption and energy cost of the facility was developed from this information.

*Figure 5 - Utility Summary*

Utility Summary for Lift Station #1, 3, 5, 6, 7, 8, and 9		
Fuel	Usage	Cost
Electricity	125,761 kWh	\$19,587
<b>Total</b>		<b>\$19,587</b>

The current annual energy cost for this facility is \$19,587 as shown in the chart below.

*Figure 6 - Energy Cost Breakdown*



### 3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was \$0.156/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The combined monthly electricity consumption and peak demand are shown in the chart below.

Figure 7 - Electric Usage & Demand

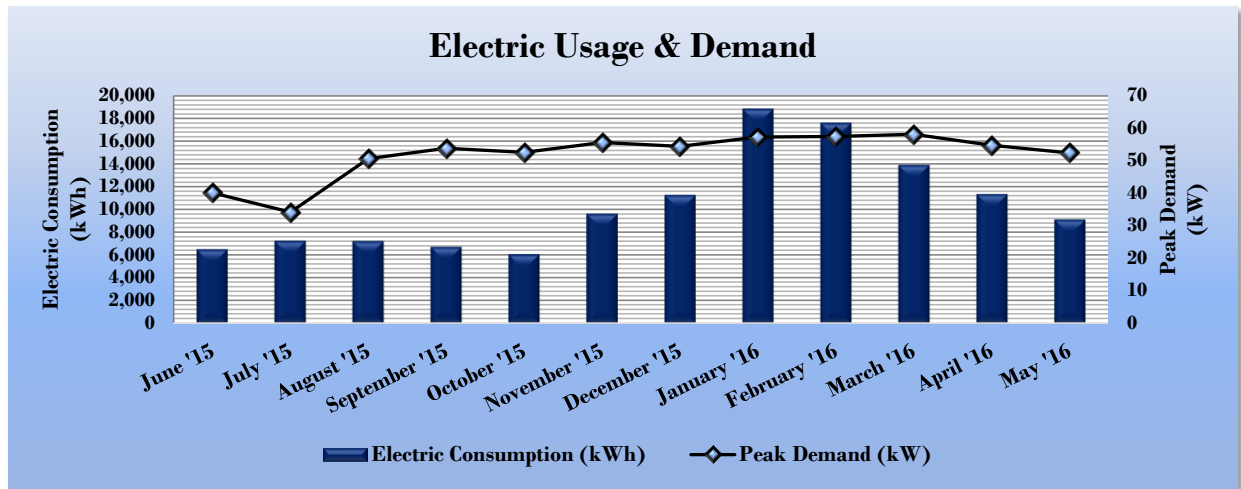


Figure 8 - Electric Usage & Demand

Electric Billing Data for Lift Station #1, 3, 5, 6, 7, 8, and 9					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
6/25/15	29	6,483	40		\$1,097
7/27/15	32	7,239	34		\$1,198
8/26/15	30	7,203	51		\$1,303
9/25/15	30	6,702	54		\$1,111
10/26/15	31	6,044	53		\$1,149
11/25/15	30	9,588	56		\$1,522
12/28/15	33	11,228	54		\$1,694
1/27/16	30	18,780	57		\$2,601
2/24/16	28	17,546	58		\$2,482
3/24/16	29	13,860	58		\$2,086
4/25/16	32	11,314	55		\$1,746
5/24/16	29	9,085	52		\$1,490
<b>Totals</b>	<b>363</b>	<b>125,072</b>	<b>58.1</b>	<b>\$0</b>	<b>\$19,480</b>
<b>Annual</b>	<b>365</b>	<b>125,761</b>	<b>58.1</b>	<b>\$0</b>	<b>\$19,587</b>

None of the lift station sites have any significant natural gas, propane, or diesel fuel usage, although small amounts are used at each site to run emergency back-up generators when needed. Graphs of monthly electric usage and power demand for each individual site are provided below.

Figure 9 - Lift Station #1 Monthly Electric Usage

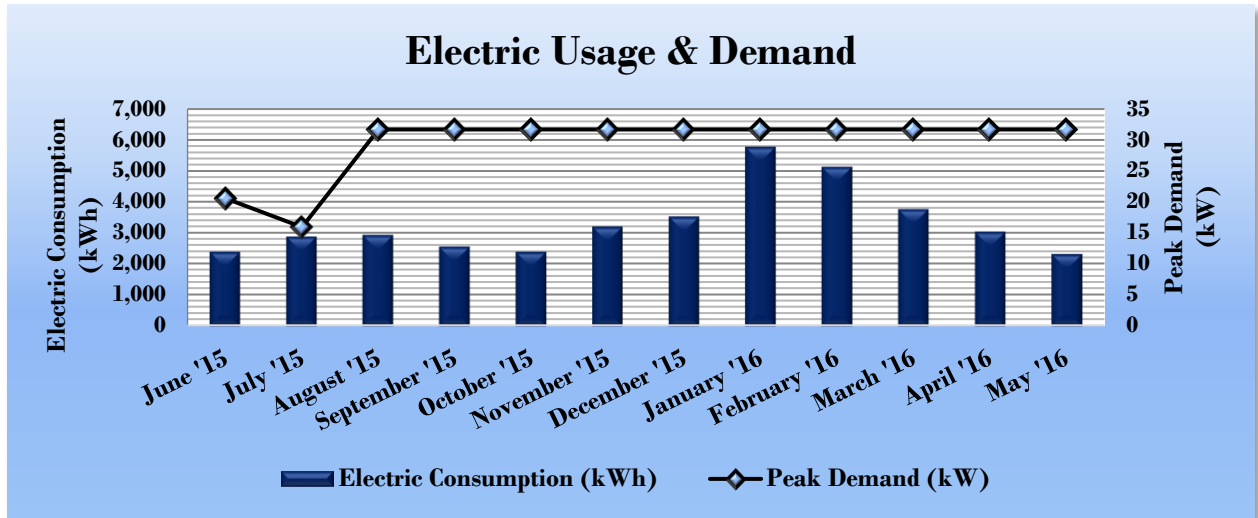


Figure 10 - Lift Station #3 Monthly Electric Usage

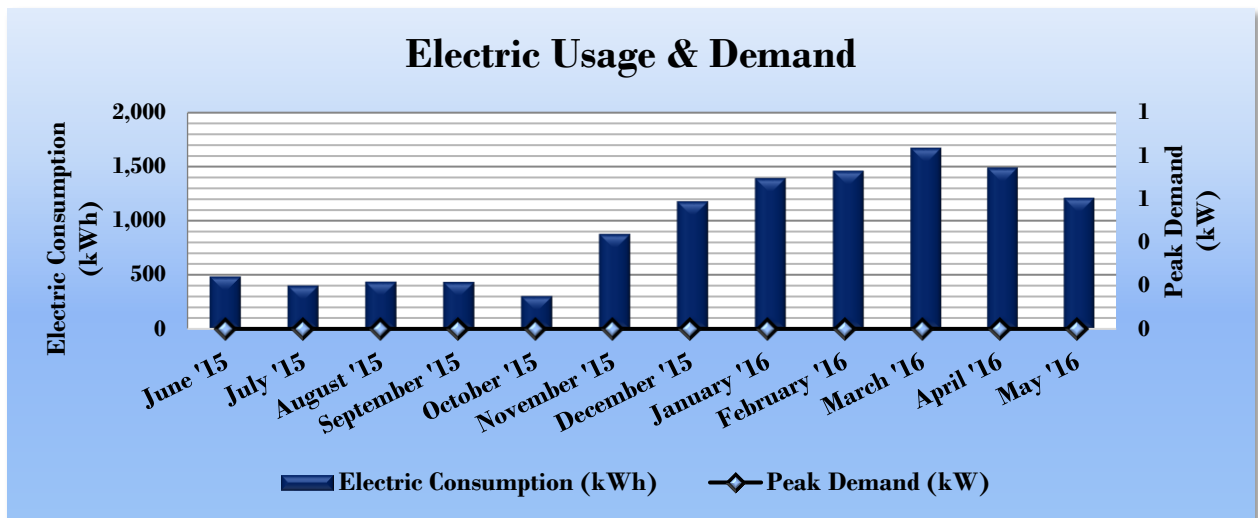


Figure 11 - Lift Station #5 Monthly Electric Usage

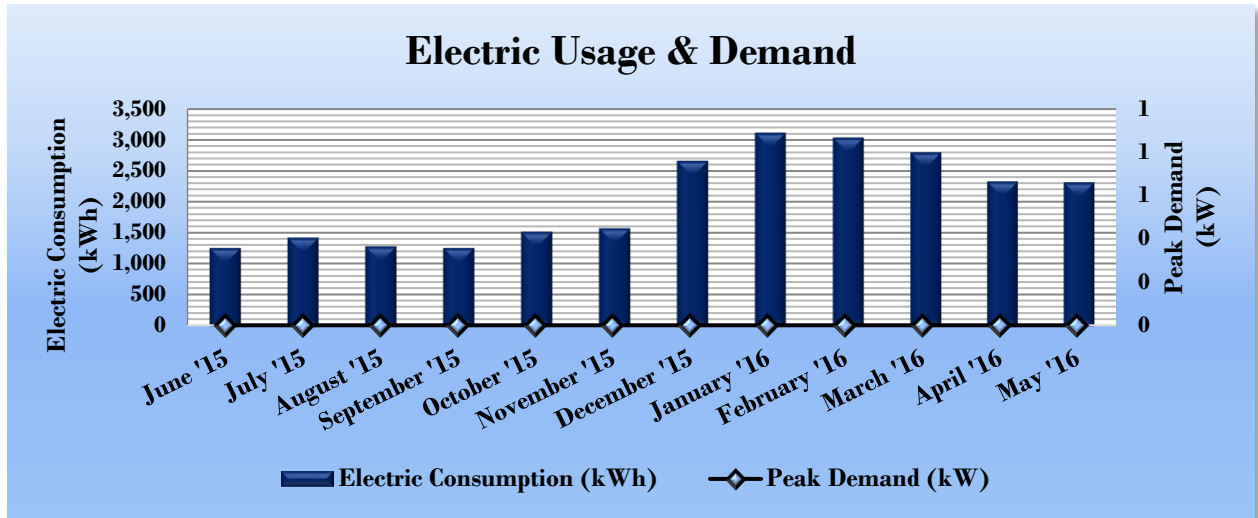


Figure 12 - Lift Station #6 Monthly Electric Usage

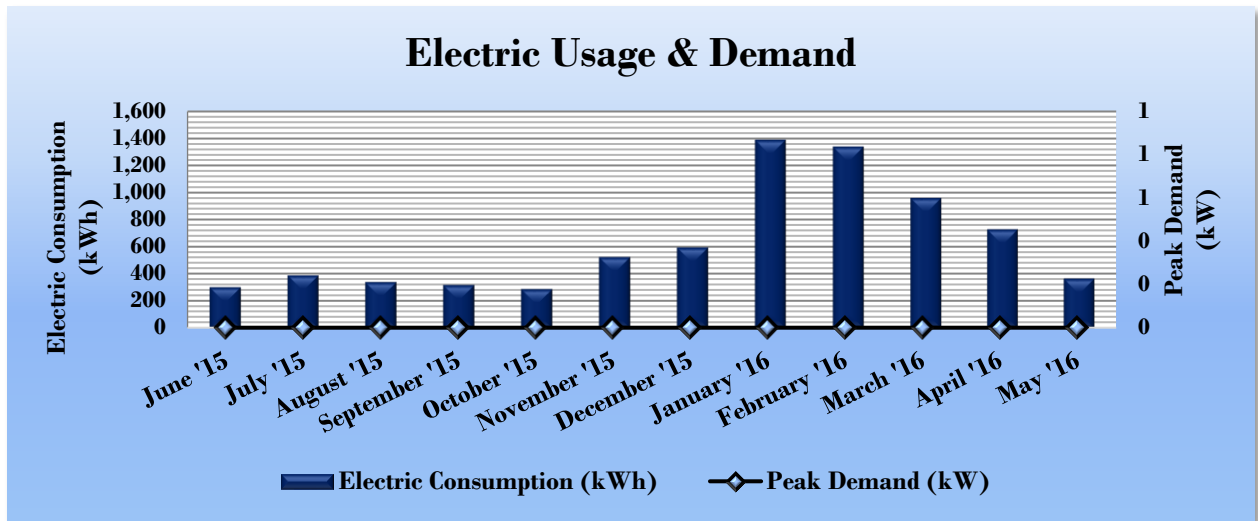


Figure 13 - Lift Station #7 Monthly Electric Usage

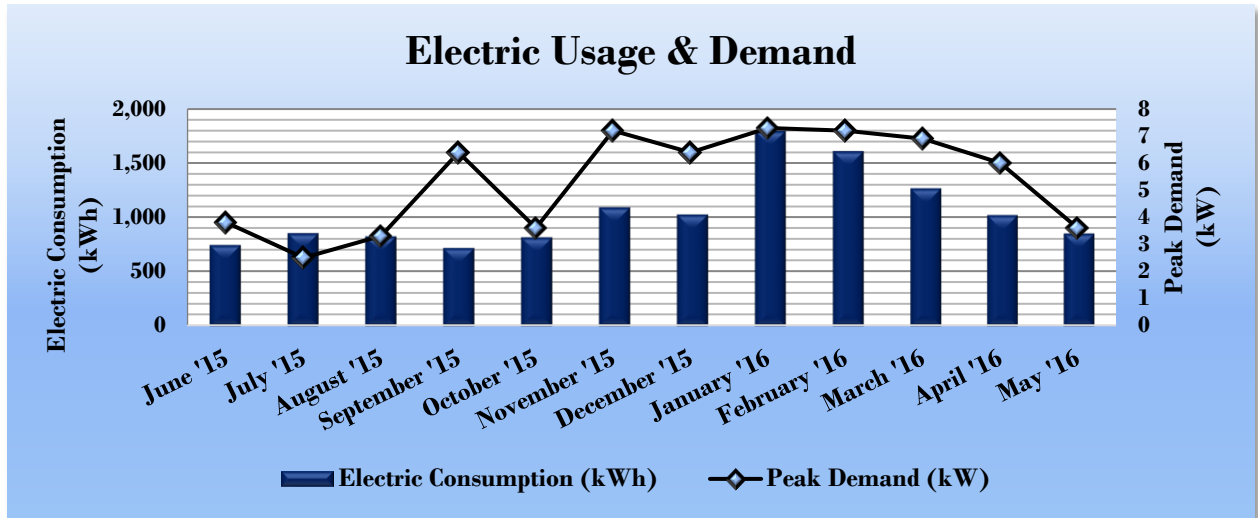


Figure 14 - Lift Station #8 Monthly Electric Usage

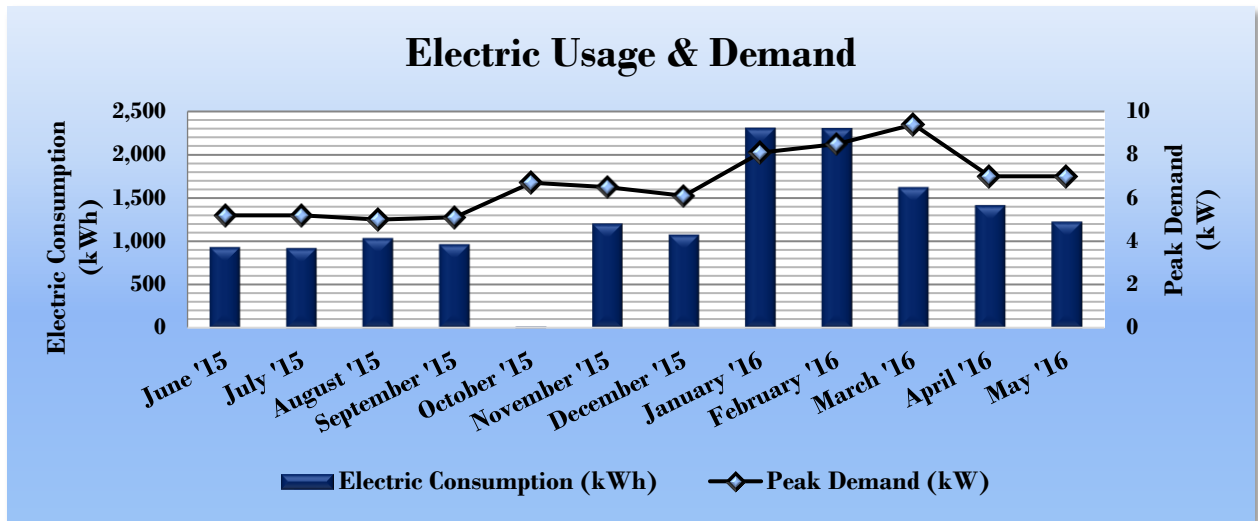
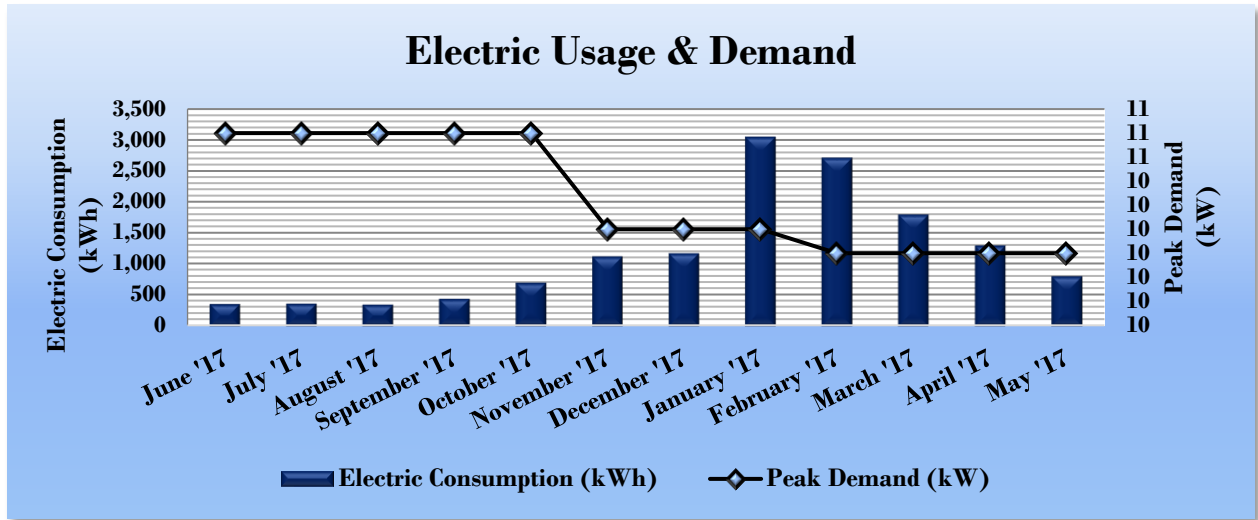


Figure 15 - Lift Station #9 Monthly Electric Usage



### 3.3 Benchmarking

Lift stations are not one of the facility types that is eligible to receive an ENERGY STAR® score. The energy use index (EUIs) would also not be comparable to any other facilities as energy used per square feet would not be an appropriate index to measure the facility performance. The reason being that most of these buildings are less than 500 square feet and host pumps and a few light fixtures.

The EUI is a measure of a facility’s energy consumption per square foot, and it is the standard metric for comparing buildings’ energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of “site energy” and “source energy.” Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

**Figure 16 - Energy Use Intensity Comparison – Existing Conditions**

Energy Use Intensity Comparison - Existing Conditions		
	Lift Station #1, 3, 5, 6, 7, 8, and 9	National Median Building Type: Municipal
Source Energy Use Intensity (kBtu/ft <sup>2</sup> )	331.0	148.1
Site Energy Use Intensity (kBtu/ft <sup>2</sup> )	105.4	67.3

Implementation of all recommended measures in this report would improve the buildings’ estimated EUI significantly, as shown in the table below:

**Figure 17 - Energy Use Intensity Comparison – Following Installation of Recommended Measures**

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Lift Station #1, 3, 5, 6, 7, 8, and 9	National Median Building Type: Municipal
Source Energy Use Intensity (kBtu/ft <sup>2</sup> )	298.3	148.1
Site Energy Use Intensity (kBtu/ft <sup>2</sup> )	95.0	67.3

A Portfolio Manager® account has been created online for other facilities in this energy audit and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager® regularly, so that you can keep track of your building’s performance. Free online training is available to help you use ENERGY STAR® Portfolio Manager® to track your building’s performance at: <https://www.energystar.gov/buildings/training>.

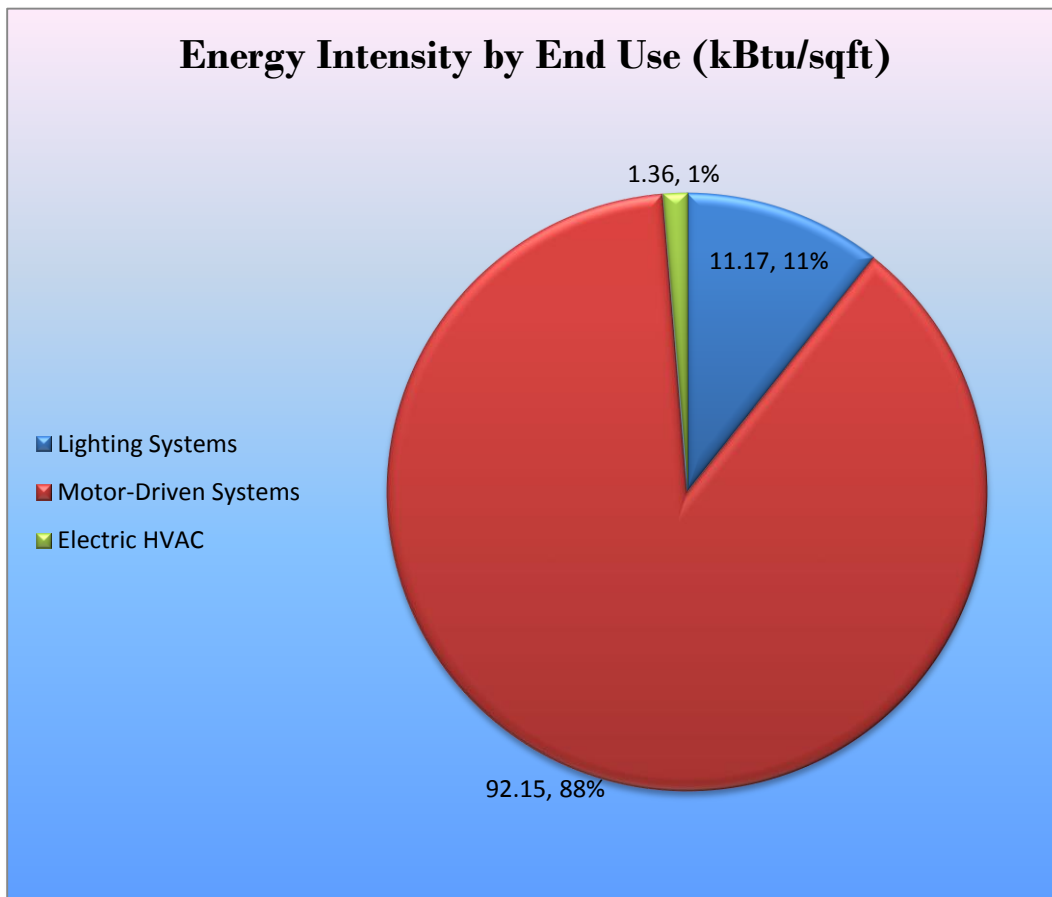
For more information on ENERGY STAR® certification go to: <https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1>.



### 3.4 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

Figure 18 - Energy Balance (kBtu/SF)



## 4 ENERGY CONSERVATION MEASURES

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to Lift Stations #1, 3, 5, 6, 7, 8, and 9 regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016, approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

### 4.1 Recommended ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

*Figure 19 – Summary of Recommended ECMs*

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)*	Estimated Net Cost (\$)	Simple Payback Period (yrs)**	CO <sub>2</sub> e Emissions Reduction (lbs)
<b>Lighting Upgrades</b>		<b>9,279</b>	<b>2.1</b>	<b>0.0</b>	<b>\$1,445.26</b>	<b>\$8,331.54</b>	<b>\$1,265.00</b>	<b>\$7,066.54</b>	<b>4.9</b>	<b>9,344</b>
ECM 1	Install LED Fixtures	4,578	0.9	0.0	\$713.02	\$5,716.88	\$905.00	\$4,811.88	6.7	4,610
ECM 2	Retrofit Fixtures with LED Lamps	4,701	1.2	0.0	\$732.24	\$2,614.66	\$360.00	\$2,254.66	3.1	4,734
<b>Motor Upgrades</b>		<b>2,647</b>	<b>0.9</b>	<b>0.0</b>	<b>\$412.25</b>	<b>\$1,842.12</b>	<b>\$0.00</b>	<b>\$1,842.12</b>	<b>4.5</b>	<b>2,665</b>
ECM 3	Premium Efficiency Motors	2,647	0.9	0.0	\$412.25	\$1,842.12	\$0.00	\$1,842.12	4.5	2,665
<b>Electric Unitary HVAC Measures</b>		<b>526</b>	<b>0.3</b>	<b>0.0</b>	<b>\$81.99</b>	<b>\$849.03</b>	<b>\$0.00</b>	<b>\$849.03</b>	<b>10.4</b>	<b>530</b>
ECM 4	Install High Efficiency Electric AC	526	0.3	0.0	\$81.99	\$849.03	\$0.00	\$849.03	10.4	530
<b>TOTALS</b>		<b>12,453</b>	<b>3.3</b>	<b>0.0</b>	<b>\$1,939.49</b>	<b>\$11,022.69</b>	<b>\$1,265.00</b>	<b>\$9,757.69</b>	<b>5.0</b>	<b>12,540</b>

\* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

\*\* - Simple Payback Period is based on net measure costs (i.e. after incentives).

## 4.1.1 Lighting Upgrades

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 20 below.

*Figure 20 – Summary of Lighting Upgrade ECMs*

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
<b>Lighting Upgrades</b>		<b>9,279</b>	<b>2.1</b>	<b>0.0</b>	<b>\$1,445.26</b>	<b>\$8,331.54</b>	<b>\$1,265.00</b>	<b>\$7,066.54</b>	<b>4.9</b>	<b>9,344</b>
ECM 1	Install LED Fixtures	4,578	0.9	0.0	\$713.02	\$5,716.88	\$905.00	\$4,811.88	6.7	4,610
ECM 2	Retrofit Fixtures with LED Lamps	4,701	1.2	0.0	\$732.24	\$2,614.66	\$360.00	\$2,254.66	3.1	4,734

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

### **ECM 1: Install LED Fixtures**

#### *Summary of Measure Economics*

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
Interior	925	0.3	0.0	\$144.14	\$3,763.49	\$405.00	\$3,358.49	23.3	932
Exterior	3,653	0.6	0.0	\$568.88	\$1,953.39	\$500.00	\$1,453.39	2.6	3,678

#### *Measure Description*

We recommend replacing existing fixtures containing linear fluorescent T12, high pressure sodium lamps with new high performance LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes.

## **ECM 2: Retrofit Fixtures with LED Lamps**

### *Summary of Measure Economics*

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
Interior	3,887	1.1	0.0	\$605.40	\$2,238.39	\$350.00	\$1,888.39	3.1	3,914
Exterior	814	0.1	0.0	\$126.84	\$376.27	\$10.00	\$366.27	2.9	820

### *Measure Description*

We recommend retrofitting existing T8 linear fixtures, incandescent, compact florescent lighting technologies with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than ten times longer than many incandescent lamps.

## 4.1.2 Motor Upgrades

Our recommendations for motor upgrades are summarized in Figure 21 below.

**Figure 21 – Summary of Motor Upgrade ECMs**

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)*	Estimated Net Cost (\$)	Simple Payback Period (yrs)**	CO <sub>2</sub> e Emissions Reduction (lbs)
<b>Motor Upgrades</b>		<b>2,647</b>	<b>0.9</b>	<b>0.0</b>	<b>\$412.25</b>	<b>\$1,842.12</b>	<b>\$0.00</b>	<b>\$1,842.12</b>	<b>4.5</b>	<b>2,665</b>
ECM 3	Premium Efficiency Motors	2,647	0.9	0.0	\$412.25	\$1,842.12	\$0.00	\$1,842.12	4.5	2,665

### **ECM 3: Premium Efficiency Motors**

#### *Summary of Measure Economics*

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
2,647	0.9	0.0	\$412.25	\$1,842.12	\$0.00	\$1,842.12	4.5	2,665

#### *Measure Description*

We recommend replacing the two standard efficiency motors with *NEMA Premium™* efficiency motors at Lift Station #8. The motors are rated at 5 hp each and are constant speed. Our evaluation assumes that existing motors will be replaced with motors of equivalent size and type. Although occasionally additional savings can be achieved by downsizing motors to better meet the motor’s current load requirements. The base case motor efficiencies are estimated from nameplate information and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the *New Jersey’s Clean Energy Program Protocols to Measure Resource Savings (2016)*. Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours.

### 4.1.3 Electric Unitary HVAC Measures

Our recommendations for unitary HVAC measures are summarized in Figure 22 below.

*Figure 22 - Summary of Unitary HVAC ECMs*

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
<b>Electric Unitary HVAC Measures</b>		<b>526</b>	<b>0.3</b>	<b>0.0</b>	<b>\$81.99</b>	<b>\$849.03</b>	<b>\$0.00</b>	<b>\$849.03</b>	<b>10.4</b>	<b>530</b>
ECM 4	Install High Efficiency Electric AC	526	0.3	0.0	\$81.99	\$849.03	\$0.00	\$849.03	10.4	530

#### **ECM 4: Install High Efficiency Air Conditioning Units**

##### *Summary of Measure Economics*

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
526	0.3	0.0	\$81.99	\$849.03	\$0.00	\$849.03	10.4	530

##### *Measure Description*

We recommend replacing standard efficiency packaged air conditioning units with high efficiency packaged air conditioning unit at Lift Station #1. The unit is rated at 1 ton and assumed to past it useful life. There have been significant improvements in both compressor and fan motor efficiencies over the past several years. Therefore, electricity savings can be achieved by replacing older units with new high efficiency units. A higher EER or SEER rating indicates a more efficient cooling system. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling load, and the estimated annual operating hours.

## 4.2 ECMs Evaluated but Not Recommended

The measures below have been evaluated by the auditor but are not recommended for implementation at the facility. Reasons for exclusion can be found in each measure description section.

**Figure 23 – Summary of Measures Evaluated, but Not Recommended**

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)*	Estimated Net Cost (\$)	Simple Payback Period (yrs)**	CO <sub>2</sub> e Emissions Reduction (lbs)
<b>Lighting Control Measures</b>	<b>435</b>	<b>0.1</b>	<b>0.0</b>	<b>\$67.68</b>	<b>\$1,350.00</b>	<b>\$175.00</b>	<b>\$1,175.00</b>	<b>17.4</b>	<b>438</b>
Install Occupancy Sensor Lighting Controls	435	0.1	0.0	\$67.68	\$1,350.00	\$175.00	\$1,175.00	17.4	438
<b>TOTALS</b>	<b>435</b>	<b>0.1</b>	<b>0.0</b>	<b>\$67.68</b>	<b>\$1,350.00</b>	<b>\$175.00</b>	<b>\$1,175.00</b>	<b>17.4</b>	<b>438</b>

\* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

\*\* - Simple Payback Period is based on net measure costs (i.e. after incentives).

### Install Occupancy Sensor Lighting Controls

#### *Summary of Measure Economics*

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO <sub>2</sub> e Emissions Reduction (lbs)
435	0.1	0.0	\$67.68	\$1,350.00	\$175.00	\$1,175.00	17.4	438

#### *Measure Description*

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in all lift stations. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are recommended for single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

#### *Reasons for not Recommending*

The simple payback of 17.4 years for this measure is higher than the useful life of the equipment as stated in the New Jersey Technical Reference Manual. As a result, this measure was not recommended for replacement. However, the facility may choose to include this measure for implementation due to the attractive payback for all measure combined.

## 5 ENERGY EFFICIENT PRACTICES

---

In addition to the quantifiable savings estimated in Section 4, a facility's energy performance can also be improved through application of many low cost or no-cost energy efficiency strategies. By employing certain behavioral and operational changes and performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and energy and O&M costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your facility. Consult with qualified equipment specialists for details on proper maintenance and system operation.

### **Ensure Lighting Controls Are Operating Properly**

Lighting controls are very cost effective energy efficient devices, when installed and operating correctly. As part of a lighting maintenance schedule, lighting controls should be tested annually to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight sensors, maintenance involves cleaning of sensor lenses and confirming setpoints and sensitivity are appropriately configured.

### **Perform Routine Motor Maintenance**

Motors consist of many moving parts whose collective degradation can contribute to a significant loss of motor efficiency. In order to prevent damage to motor components, routine maintenance should be performed. This maintenance consists of cleaning surfaces and ventilation openings on motors to prevent overheating, lubricating moving parts to reduce friction, inspecting belts and pulleys for wear and to ensure they are at proper alignment and tension, and cleaning and lubricating bearings. Consult a licensed technician to assess these and other motor maintenance strategies.

### **Practice Proper Use of Thermostat Schedules and Temperature Resets**

Ensure thermostats are correctly set back. By employing proper set back temperatures and schedules, facility heating and cooling costs can be reduced dramatically during periods of low or no occupancy. As such, thermostats should be programmed for a setback of 5°F-10°F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced further by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.



## 6 ON-SITE GENERATION MEASURES

On-site generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) on-site technologies that generate power to meet all or a portion of the electric energy needs of a facility, often repurposing any waste heat where applicable. Also referred to as distributed generation, these systems contribute to Greenhouse Gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, resulting in the electric system reliability through improved transmission and distribution system utilization.

The State of New Jersey’s Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines a goal of 70% of the State’s electrical needs to be met by renewable sources by 2050.

Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

### 6.1 Photovoltaic

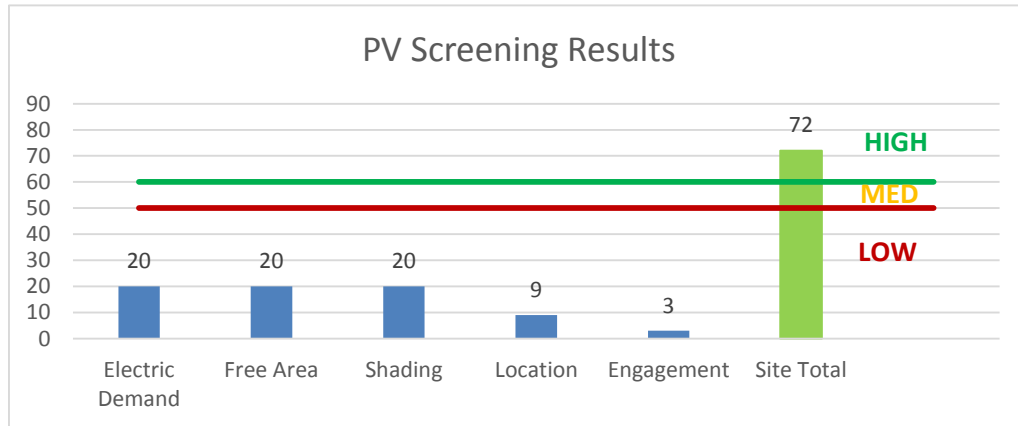
Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility’s electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

The facility requested TRC to analyze the solar potential at a former landfill site owned by the township located at 1360 Route 70, Whiting, New Jersey. The image below shows the area considered for the solar PV. The area is approximately 117,000 sq. feet.



A preliminary screening based on the facility’s electric demand, size and location of free area, and shading elements shows that the site has a high potential for cost-effective installation of a PV array. Please refer to the Municipal Building energy audit report for further details on the cost and savings analysis of installing solar PV at the location shown above. TRC recommends that the site be assessed by a qualified solar installer. Site conditions need to be assessed and options for sale of power or usage by municipal buildings need to be more fully explored in order to determine project cost-effectiveness.

**Figure 24 - Photovoltaic Screening**



Solar projects must register their projects in the SREC (Solar Renewable Energy Certificate) Registration Program (SRP) prior to the start of construction in order to establish the project’s eligibility to earn SRECs. Registration of the intent to participate in New Jersey’s solar marketplace provides market participants with information about developed new solar projects and insight into future SREC pricing. Refer to Section 8.2 for additional information.

For more information on solar PV technology and commercial solar markets in New Jersey, or to find a qualified solar installer, who can provide a more detailed assessment of the specific costs and benefits of solar develop of the site, please visit the following links below:

- **Basic Info on Solar PV in NJ:** <http://www.njcleanenergy.com/whysolar>
- **NJ Solar Market FAQs:** <http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs>
- **Approved Solar Installers in the NJ Market:** [http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved\\_vendorsearch/?id=60&start=1](http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/?id=60&start=1)

## 6.2 Combined Heat and Power

Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric generation from a CHP system is typically interconnected to local power distribution systems. Heat is recovered from exhaust and ancillary cooling systems and interconnected to the existing hot water (or steam) distribution systems.

CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for the purpose of space cooling. The key criteria used for screening, however, is the amount of time the system operates at full load and the facility's ability to use the recovered heat. Facilities with continuous use for large quantities of waste heat are the best candidates for CHP. As the lift stations do not have a need for heat constantly or have a natural gas connection, a CHP is not suitable at these locations.

## 7 DEMAND RESPONSE

---

Demand Response (DR) is a program designed to reduce the electric load of commercial facilities when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability.

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail their electric usage.

Typically an electric customer needs to be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with a greater capability to quickly curtail their demand during peak hours will receive higher payments. Customers with back-up generators onsite may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in a DR programs often find it to be a valuable source of revenue for their facility because the payments can significantly offset annual electric costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature set points on thermostats, so that air conditioning units run less frequently, or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR curtailment event. DR program participants may need to install smart meters or may need to also sub-meter larger energy-using equipment, such as chillers, in order to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a demand response activity in most situations.

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (<http://www.pjm.com/markets-and-operations/demand-response/csps.aspx>). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (<http://www.pjm.com/training/training%20material.aspx>), along with a variety of other DR program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding program rules and requirements for metering and controls, assess a facility's ability to temporarily reduce electric load, and provide details on payments to be expected for participation in the program. Providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment of their own to help ensure compliance with all terms and conditions of a DR contract.

## 8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey’s Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 25 for a list of the eligible programs identified for each recommended ECM.

*Figure 25 - ECM Incentive Program Eligibility*

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings	Large Energy Users Program	Combined Heat & Power and Fuel Cell
ECM 1	Install LED Fixtures	x					
ECM 2	Retrofit Fixtures with LED Lamps	x					
ECM 3	Premium Efficiency Motors	x					
ECM 4	Install High Efficiency Electric AC	x					

SmartStart is generally well-suited for implementation of individual measures or small group of measures. It provides flexibility to install measures at your own pace using in-house staff or a preferred contractor. Direct Install caters to small to mid-size facilities that can bundle multiple ECMs together. This can greatly simplify participation and may lead to higher incentive amounts, but requires the use of pre-approved contractors. Note that the volume of recommended work for these sites is probably insufficient to engage the services of a Direct Install contractor. The Pay for Performance (P4P) program is a “whole-building” energy improvement program designed for larger facilities. It requires implementation of multiple measures meeting minimum savings thresholds, as well as use of pre-approved consultants. The Large Energy Users Program (LEUP) is available to New Jersey’s largest energy users giving them flexibility to install as little or as many measures, in a single facility or several facilities, with incentives capped based on the entity’s annual energy consumption. LEUP applicants can use in-house staff or a preferred contractor.

Generally, the incentive values provided throughout the report assume the SmartStart program is utilized because it provides a consistent basis for comparison of available incentives for various measures, though in many cases incentive amounts may be higher through participation in other programs.

Brief descriptions of all relevant financing and incentive programs are located in the sections below. Further information, including most current program availability, requirements, and incentive levels can be found at: [www.njcleanenergy.com/ci](http://www.njcleanenergy.com/ci).

## 8.1 SmartStart

### Overview

The SmartStart program offers incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

### **Equipment with Prescriptive Incentives Currently Available:**

*Electric Chillers*

*Electric Unitary HVAC*

*Gas Cooling*

*Gas Heating*

*Gas Water Heating*

*Ground Source Heat Pumps*

*Lighting*

*Lighting Controls*

*Refrigeration Doors*

*Refrigeration Controls*

*Refrigerator/Freezer Motors*

*Food Service Equipment*

*Variable Frequency Drives*

Most equipment sizes and types are served by this program. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades.

### Incentives

The SmartStart prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the custom SmartStart program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentive offerings for specific devices.

Since your facility is an existing building, only the retrofit incentives have been applied in this report. Custom measure incentives are calculated at \$0.16/kWh and \$1.60/therm based on estimated annual savings, capped at 50% of the total installed incremental project cost, or a project cost buy down to a one year payback (whichever is less). Program incentives are capped at \$500,000 per electric account and \$500,000 per natural gas account, per fiscal year.

### How to Participate

To participate in the SmartStart program you will need to submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. Applicants may work with a contractor of their choosing and can also utilize internal personnel, which provides added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in this report.

Detailed program descriptions, instructions for applying and applications can be found at: [www.njcleanenergy.com/SSB](http://www.njcleanenergy.com/SSB).

## 8.2 SREC Registration Program

The SREC (Solar Renewable Energy Certificate) Registration Program (SRP) is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SRP prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

After the registration is accepted, construction is complete, and final paperwork has been submitted and is deemed complete, the project is issued a New Jersey certification number which enables it to generate New Jersey SRECs. SRECs are generated once the solar project has been authorized to be energized by the Electric Distribution Company (EDC).

Each time a solar installation generates 1,000 kilowatt-hours (kWh) of electricity, an SREC is earned. Solar project owners report the energy production to the SREC Tracking System. This reporting allows SRECs to be placed in the customer's electronic account. SRECs can then be sold on the SREC Tracking System, providing revenue for the first 15 years of the project's life.

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar RPS. One way they can meet the RPS requirements is by purchasing SRECs. As SRECs are traded in a competitive market, the price may vary significantly. The actual price of an SREC during a trading period can and will fluctuate depending on supply and demand.

Information about the SRP can be found at: [www.njcleanenergy.com/srec](http://www.njcleanenergy.com/srec).

### 8.3 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract," whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs can be leveraged to help further reduce the total project cost of eligible measures.

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

- (1) Use an Energy Services Company or "ESCO."
- (2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations.
- (3) Use a hybrid approach of the two options described above where the ESCO is utilized for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the Energy Savings Plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program descriptions and application can be found at: [www.njcleanenergy.com/ESIP](http://www.njcleanenergy.com/ESIP).

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize NJCEP incentive programs to help further reduce costs when developing the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.



## 9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

---

### 9.1 Retail Electric Supply Options

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law deregulated the retail electric markets, allowing all consumers to shop for service from competitive electric suppliers. The intent was to create a more competitive market for electric power supply in New Jersey. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party (i.e. non-utility) energy supplier.

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. So, though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third party supplier, consider shopping for a reduced rate from third party electric suppliers. If your facility is purchasing electricity from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party electric suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: [www.state.nj.us/bpu/commercial/shopping.html](http://www.state.nj.us/bpu/commercial/shopping.html).

### 9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a third party supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier is typically dependent upon whether a customer seeks budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your facility is purchasing natural gas from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party natural gas suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: [www.state.nj.us/bpu/commercial/shopping.htm](http://www.state.nj.us/bpu/commercial/shopping.htm)

# Appendix A: Equipment Inventory & Recommendations

## Lighting Inventory & Recommendations

Existing Conditions						Proposed Conditions						Energy Impact & Financial Analysis							
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Pump room	1	Incandescent 60W Inc.	Wall Switch	60	2,600	Relamp	No	1	LED Screw-In Lamps: 10W LED	Wall Switch	10	2,600	0.04	147	0.0	\$22.88	\$53.75	\$5.00	2.13
Pump room	1	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	2,600	Fixture Replacement	No	2	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	47	2,600	0.05	188	0.0	\$29.29	\$836.33	\$90.00	25.48
Storage room	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,600	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,600	0.05	165	0.0	\$25.63	\$95.13	\$20.00	2.93
Rest room	1	Incandescent 120W Inc.	Wall Switch	120	2,600	Relamp	No	1	LED Screw-In Lamps: 10W LED	Wall Switch	10	2,600	0.09	323	0.0	\$50.34	\$53.75	\$5.00	0.97
Break room	1	Linear Fluorescent - T8: 8' T8 (59W) - 2L	Wall Switch	110	2,600	Relamp	No	1	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	2,600	0.03	112	0.0	\$17.39	\$110.00	\$0.00	6.33
Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,600	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,600	0.03	97	0.0	\$15.10	\$58.50	\$10.00	3.21
Office	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	2,600	Fixture Replacement	No	1	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	47	2,600	0.03	120	0.0	\$18.76	\$418.17	\$45.00	19.89
Garage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,600	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,600	0.05	194	0.0	\$30.20	\$117.00	\$20.00	3.21
Garage	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	2,600	Fixture Replacement	No	1	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	47	2,600	0.03	120	0.0	\$18.76	\$418.17	\$45.00	19.89
Garage	1	Compact Fluorescent: 23W CFL	Wall Switch	23	2,600	Relamp	No	1	LED Screw-In Lamps: 10W LED	Wall Switch	10	2,600	0.01	38	0.0	\$5.95	\$53.75	\$0.00	9.04
Motor room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,600	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,600	0.03	97	0.0	\$15.10	\$58.50	\$10.00	3.21
Motor room	1	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	2,600	Fixture Replacement	No	2	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	47	2,600	0.05	188	0.0	\$29.29	\$836.33	\$90.00	25.48
Lift station #3	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,600	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,600	0.05	194	0.0	\$30.20	\$117.00	\$20.00	3.21
LS#3 pump room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,600	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,820	0.10	368	0.0	\$57.24	\$445.50	\$65.00	6.65
Lift station #3	2	Compact Fluorescent: 23W CFL	Daylight Dimming	23	4,368	Relamp	No	2	LED Screw-In Lamps: 10W LED	Daylight Dimming	10	4,368	0.02	128	0.0	\$19.99	\$107.51	\$0.00	5.38
Lift station #5	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,600	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,600	0.05	194	0.0	\$30.20	\$117.00	\$20.00	3.21
Lift station #5 pump room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,600	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,820	0.14	490	0.0	\$76.33	\$504.00	\$75.00	5.62
Lift station #5	2	Incandescent 60W Inc.	Daylight Dimming	60	4,368	Relamp	No	2	LED Screw-In Lamps: 10W LED	Daylight Dimming	10	4,368	0.08	494	0.0	\$76.88	\$107.51	\$10.00	1.27
Lift station #5	2	High-Pressure Sodium: (1) 150W Lamp	Daylight Dimming	188	4,368	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	40	4,368	0.24	1,461	0.0	\$227.55	\$781.35	\$200.00	2.55
Lift station #6	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,600	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,600	0.05	194	0.0	\$30.20	\$117.00	\$20.00	3.21
Lift station #6 pump room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,600	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,820	0.10	368	0.0	\$57.24	\$445.50	\$65.00	6.65
Lift station #6	1	Compact Fluorescent: 23W CFL	Daylight Dimming	23	4,368	Relamp	No	1	LED Screw-In Lamps: 10W LED	Daylight Dimming	10	4,368	0.01	64	0.0	\$9.99	\$53.75	\$0.00	5.38
Lift station #7 pump room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,600	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,820	0.14	490	0.0	\$76.33	\$504.00	\$75.00	5.62
Lift station #7	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,600	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,600	0.05	194	0.0	\$30.20	\$117.00	\$20.00	3.21

Existing Conditions						Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Lift station #7	1	Compact Fluorescent: 23W CFL	Daylight Dimming	23	4,368	Relamp	No	1	LED Screw-In Lamps: 10W LED	Daylight Dimming	10	4,368	0.01	64	0.0	\$9.99	\$53.75	\$0.00	5.38
Lift station #7	1	High-Pressure Sodium: (1) 150W Lamp	Daylight Dimming	188	4,368	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	40	4,368	0.12	731	0.0	\$113.78	\$390.68	\$100.00	2.55
Lift station #8	1	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	2,600	Fixture Replacement	No	2	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	47	2,600	0.05	188	0.0	\$29.29	\$836.33	\$90.00	25.48
Lift station #8 pump room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,600	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,600	0.03	97	0.0	\$15.10	\$58.50	\$10.00	3.21
Lift station #8 pump room	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	2,600	Fixture Replacement	No	1	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	47	2,600	0.03	120	0.0	\$18.76	\$418.17	\$45.00	19.89
Lift station #8	1	Compact Fluorescent: 23W CFL	Daylight Dimming	23	4,368	Relamp	No	1	LED Screw-In Lamps: 10W LED	Daylight Dimming	10	4,368	0.01	64	0.0	\$9.99	\$53.75	\$0.00	5.38
Lift station #9	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,600	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,600	0.05	194	0.0	\$30.20	\$117.00	\$20.00	3.21
Lift station #9 pump room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,600	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,820	0.10	368	0.0	\$57.24	\$445.50	\$65.00	6.65
Lift station #9	2	High-Pressure Sodium: (1) 150W Lamp	Daylight Dimming	188	4,368	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	40	4,368	0.24	1,461	0.0	\$227.55	\$781.35	\$200.00	2.55

### Motor Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
		Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Lift station #3	Lift Station #3 pump 1	1	Process Pump	5.0	87.5%	No	1,460	No	87.5%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Lift station #3	Lift Station #3 pump 2	1	Process Pump	5.0	87.5%	No	1,460	No	87.5%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Lift station #3	Lift Station #3 exhaust fan	1	Exhaust Fan	0.0	60.0%	No	1,460	No	60.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Lift station #5	Lift station #5 pump 1	1	Process Pump	15.0	92.4%	Yes	1,095	No	92.4%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Lift station #5	Lift station #5 pump 2	1	Process Pump	15.0	92.4%	Yes	1,095	No	92.4%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Lift station #5	Exhaust Fan	2	Exhaust Fan	0.3	60.0%	No	1,460	No	60.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Lift station #6	Lift station #6 pump 1	1	Process Pump	3.0	89.5%	No	1,825	No	89.5%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Lift station #6	Lift station #6 pump 1	1	Process Pump	3.0	89.5%	No	1,825	No	89.5%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Lift station #6	Exhaust Fan	2	Exhaust Fan	0.0	60.0%	No	1,825	No	60.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Lift station #7	Lift station #7 pump 1	1	Process Pump	7.5	89.5%	No	1,095	No	89.5%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Lift station #7	Lift station #7 pump 2	1	Process Pump	7.5	89.5%	No	1,095	No	89.5%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Lift station #8	Lift station #8 pump 1	1	Process Pump	5.0	75.0%	No	2,190	Yes	89.5%	No		0.45	1,323	0.0	\$206.12	\$921.06	\$0.00	4.47
Lift station #8	Lift station #8 pump 2	1	Process Pump	5.0	75.0%	No	2,190	Yes	89.5%	No		0.45	1,323	0.0	\$206.12	\$921.06	\$0.00	4.47
Lift station #8	Exhaust Fan	1	Exhaust Fan	0.3	60.0%	No	1,825	No	60.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Lift station #9	Lift station #9	1	Process Pump	5.0	84.0%	No	1,825	No	84.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Lift station #9	Lift station #9	1	Process Pump	5.0	84.0%	No	1,825	No	84.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Lift station #9	Exhaust Fan	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Lift Station #1	Lift Station #1	1	Process Pump	15.0	92.4%	No	1,825	No	92.4%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Lift Station #1	Lift Station #1	1	Process Pump	15.0	92.4%	No	1,825	No	92.4%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

### Electric HVAC Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions		Proposed Conditions										Energy Impact & Financial Analysis						
		System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Lift station #1	Offices	1	Through-The-Wall AC	0.97		Yes	1	Through-The-Wall AC	0.97		12.00		No	0.31	526	0.0	\$81.99	\$849.03	\$0.00	10.36