

# Water Management Plan

Revision 1

United States Environmental Protection Agency  
Region 4  
Science and Ecosystem Support Division

Science and Ecosystem Technology Center  
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 4  
SCIENCE AND ECOSYSTEM SUPPORT DIVISION  
SCIENCE AND ECOSYSTEM TECHNOLOGY CENTER

WATER MANAGEMENT PLAN, REVISION 1

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## 1.0 IDENTIFIED WATER CONSERVATION OPPORTUNITIES

A water use and conservation assessment was conducted at the U.S. Environmental Protection Agency's (EPA's) Region 4 Science and Ecosystem Support Division (SESD) laboratory in Athens, Georgia, in March 2014. Under this Water Management Plan, SESD will consider implementing the potential water conservation and management opportunities identified during the water assessment, which are summarized in Table 1.

The rest of this Water Management Plan describes the facilities' water reduction goals, water use trends, end uses of water, completed conservation projects, and drought management plans.

**Table 1. Potential Water Conservation Opportunities, SESD**

Suggested Priority	Project Description	Project Cost	Potential Water Savings (gallons)	Potential Energy Savings (MMBtus)	Potential Utility Cost Savings	Potential Payback (years)
1	Install 1.0-gallon per minute (gpm) or less aerators on 18 lavatory faucets.	\$180	25,000	10	\$240	0.8
2	Replace urinal diaphragm inserts with units rated at 0.5 gallons per flush (gpf). First, implement a pilot project replacing a limited number of inserts to assess the impact on drainline and urinal performance.	\$240	21,000	0	\$190	1.3
3	Replace six existing showerheads with WaterSense labeled models flowing at 1.75 gpm or less.	\$180	8,000	5	\$120	1.5
4	Replace the pre-rinse spray valve in the Custody Room with a WaterSense labeled model flowing at 1.0 gpm or less.	\$80	1,300	1	\$21	3.9
5	Install 2.2-gpm aerators on laboratory faucets.	\$480	8,400	0	\$77	6.2
6	Install a water meter to monitor quantity of make-up water for the reverse osmosis (RO) system. Track and optimize laboratory water use, and investigate and resolve any unexpected trends.	\$400	No water savings associated. This is a best practice that should improve operations.	0	0	N/A
7	Install advanced meters to monitor cooling tower make-up, blow down, and condensate recovery lines.	\$6,000	No water savings associated. This is a best practice that should improve operations.	0	0	N/A

**Table 1. Potential Water Conservation Opportunities, SESD**

Suggested Priority	Project Description	Project Cost	Potential Water Savings (gallons)	Potential Energy Savings (MMBtus)	Potential Utility Cost Savings	Potential Payback (years)
8	Consider implementing the rain barrel demonstration project at community garden.	\$300	2,000	0	\$18	16
9	Install well water line to the boat storage area (Boatel) to be used for boat washing and community garden watering. This project will increase nonpotable water use while decreasing potable water use. SESD values on-site resources rather than city resources, particularly in instances of drought.	\$2,000	4,200	0	\$39	52

## 2.0 BACKGROUND AND PURPOSE

In 2007, Executive Order (EO) 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, called for federal agencies to reduce water use intensity by 2 percent per year between fiscal year (FY) 2007 and FY 2015 for a total reduction of 16 percent, compared to a FY 2007 baseline. This goal was revised and extended by EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*. EO 13514 calls for reducing potable water consumption intensity by 2 percent annually through FY 2020, relative to the FY 2007 baseline, for a 26 percent total reduction. Water use intensity is measured in gallons per gross square feet (gsf).

The implementation instructions for water efficiency and management provisions of EO 13514 direct that agencies replacing fixtures or other water-using products should purchase Federal Energy Management Program-designated or WaterSense<sup>®</sup> labeled products.

In addition to the potable water use reduction requirements, EO 13514 requires agencies to reduce industrial, landscaping, and agricultural (ILA) water consumption by 2 percent annually or 20 percent by the end of FY 2020, relative to an FY 2010 baseline (including non-potable sources). The EO also directs agencies to identify, promote, and implement water reuse strategies that reduce potable water consumption.

The Energy Independence and Security Act of 2007 directs agencies to complete comprehensive energy and water evaluations of 25 percent of covered facilities (i.e., those accounting for 75 percent of total energy use) each year; implement cost-effective measures identified through life cycle analyses; and measure and verify water savings.

In summary, existing EOs and federal law require substantial reductions in all forms of water use, as well as ongoing, regular assessments of facility water use to identify and implement saving opportunities.

This Water Management Plan has been developed to document and promote the efficient use of water at SESD, so that the facility can contribute to meeting these Agency-wide objectives.

### **3.0 FACILITY INFORMATION**

Located in Athens, Georgia, SESD, through its scientific and technical support services, provides a solid foundation for decision making by a wide variety of environmental programs and initiatives. With its state-of-the-art laboratory facility and its multidisciplinary staff of chemists, biologists, engineers, and other scientists and professionals, SESD serves as the primary provider of scientific and technical expertise and environmental data for the EPA's Region 4 program offices located in Atlanta, Georgia.

SESD's principal field components are the Field Services Branch and the Enforcement and Investigations Branch. In field services, human health and environmental issues, questions, requests, and problems are brought to the table, and field studies, investigations and training activities are designed, implemented, and/or conducted. The Analytical Support Branch and the Quality Assurance Section, in partnership with the SESD's field components, produce the quality analytical data necessary to make a variety of environmental decisions. In addition, the Immediate Office and the Management and Technical Services Branch provide other critical administrative, program, and technical support services.

SESD activities are housed primarily in a single story laboratory building constructed in 1996 located on a 12-acre parcel. The facility, known as the Science and Ecosystem Technology Center (SETC), is owned and managed by Colliers Keenen, and leased to EPA through GSA under a 20-year lease that runs until 2016. The laboratory building contains 66,201 square feet of conditioned space, configured for a mixed use of office and laboratory activities.

The laboratory space is configured to conduct bench-scale analysis of environmental samples and research on chemicals and other environmental stressors. Water is used for mechanical systems, sanitary needs, laboratory processes, and irrigation. Additional details on facility water use are provided in the following sections.

Approximately 100 full time employees work at SESD, including contractors and grantees. The facility operates on a flexible time schedule but is typically occupied during normal business hours between 6:30 a.m. and 6:30 p.m., Monday through Friday.

On April 1, 2014, EPA Ecosystems Research Division (ERD) relinquished the Field Research Annex to SESD. SESD will not assume full control of this facility until October 1, 2014. The Field Research Annex is located at 130 North Oconee Access Road Athens, Georgia 30605 and consists of 6.5 acres with one primary building and a number of small support structures. The water use information presented in this plan does not reflect the addition of the Field Research Annex.

### **4.0 WATER MANAGEMENT GOALS**

The water management goals of the SESD are achieved through the implementation of the SESD Environmental Management System (EMS). The SESD environmental policy statement, as well as objectives and targets related to water consumption, are provided in the following sections.

#### **4.1 Environmental Management System Policy**

It is the policy of EPA Region 4 SESD to continually improve our environmental management practices and procedures through defining, developing, implementing, and reviewing processes to meet our environmental obligations. An effective Environmental Management System (EMS) is built upon the ideas of enhancing our organization's practice of environmental stewardship and of employing preventive measures that promote a safe and healthy environment. A framework of commitment for continual improvement will be employed to monitor the effectiveness as well as implement changes by establishing objectives and targets described in existing and new EOs.

The SESD commits to lead by example through our EMS and to lessen our environmental footprint by:

- Complying with applicable environmental laws, regulations, policies and other requirements relating to the SESD's environmental aspects;
- Identifying new and existing environmental aspects arising from the operations of the SESD and their potential environmental impacts;
- Decreasing energy consumption and improving our water conservation efforts;
- Committing to pollution prevention efforts via source reduction, waste prevention, recycling, and other methods;
- Reducing harmful air emissions by decreasing petroleum consumption and purchasing alternative fuels;
- Purchasing green products through sustainable acquisitions;
- Training and communicating the SESD environmental policy and associated procedures to employees throughout the organization;
- Establishing, tracking and reviewing environmental objectives and targets; and
- Striving for and demonstrating continual improvement in the SESD's environmental performance (e.g., chemical management, waste reduction, field activity, etc).

#### **4.2 EMS Water Management Objectives and Targets**

To fulfill this environmental policy, SESD has identified water consumption as a significant environmental aspect. The SESD EMS developed, established, and implemented a Water Conservation Environmental Management Program (EMP) with the primary objective to reduce water consumption and promote water conservation practices at the SESD. With respect to this objective, SESD established targets to:

- Achieve a 2 percent potable water reduction each year or a 26 percent total reduction by the end of FY 2020, compared to a FY 2007 baseline of 3,429,669 gallons per year. More information about SESD's FY 2007 potable water use baseline is included in Appendix A.
- Achieve a 2 percent non-potable landscaping and agricultural water reduction each year or a 20 percent reduction by the end of FY 2020, compared to a FY 2010 baseline of 960 gallons per year.



In addition to the targets in the EMP, SESD strives to achieve the facility ConservW target (set annually by EPA's Sustainable Facilities Practices Branch).

#### **4.3 Information and Education Programs**

Employees are continually educated and trained on water and other resource conservation topics through the implementation of the SESD EMS. Water consumption has been identified as a significant environmental aspect, an EMP has been established, operational controls implemented, and progress towards attaining objectives and targets monitored and measured. SESD employees are trained annually through EMS Awareness training about SESD's environmental policy, significant environmental aspects, and EMPs. Additionally, employees are reminded of conscientious resource conservation practices. Internal communications through the use of emails, posters, and bulletin boards are also used to communicate water conservation practices to employees.

#### **5.0 UTILITY INFORMATION**

This section provides information about SESD's water and sewer services.

#### **5.1 Contact Information**

Potable water and sewer service are provided by:

Athens-Clarke County  
Water Business Office  
P.O. Box 1948  
Athens, Georgia 30603

Phone: 706-613-3500

#### **5.2 Water Rate Schedule**

SESD is billed monthly for water use associated with two meters, one for building water service (Meter Number 49539425) and one for irrigation service (Meter Number 11960000). SESD only uses potable city water for irrigation on a rare basis.

As of June 2013, water service provided by Athens-Clarke County was billed as follows:

- A water use unit charge of \$4.61/1,000 gallons;
- A customer service fee of \$8.30/month for building water service;
- A customer service fee of \$8.30/month for irrigation water service;
- A service charge of \$15.00/month for water supplied through an 8-inch line for the fire sprinkler system;
- A service charge of \$18.54/month for meter management services associated with building water service; and
- A service charge of \$1.03/month for meter management services associated with irrigation waste service.

### **5.3 Sewer Rate Schedule**

SESD is billed monthly for sewer service associated with its building water service (Meter Number 49539425).

As of June 2013, sewer service provided by Athens-Clarke County was billed as follows:

- A consumption unit charge of \$4.60/1,000 gallons; and
- A customer service fee of \$8.30/month.

### **5.4 Payment Office**

SESD's water and sewer bills are paid by:

Research Triangle Park Finance Center (RTP-FC)  
Kim Poteat  
Phone: 919-541-1468  
Fax: 919-541-4975

(Pouch and Regular Mail)  
Environmental Protection Agency  
Mail Code - D143-02  
Research Triangle Park, NC 27711

(FEDEX)  
Environmental Protection Agency  
Mail Code - D143-02  
4930 Page Road  
Research Triangle Park, NC 27703

Invoices should be emailed to [RTPReceiving@epa.gov](mailto:RTPReceiving@epa.gov).

### **6.0 WATER USE INFORMATION**

SESD's potable water use has decreased since the last water assessment in 2006. The facility has implemented suggested water efficiency projects from the last Water Management Plan. Non-potable water use has also decreased since the last assessment.

SESD uses city-supplied potable water for mechanical systems, sanitary needs, laboratory processes, and irrigation.

SESD uses non-potable water for irrigation when necessary to ensure landscape survival. City-supplied potable water is connected to the irrigation system, but is used for irrigation only when on-site non-potable well water is not available.

The following sections provide additional details on SESD's water use.

## 6.1 Meters and Submeters

Potable water is supplied by Athens-Clarke County through a metered 4-inch service line. The city also supplies potable water to the facility's secondary metered irrigation line. Meters are read monthly by the Athens-Clarke County Water Business Office. These meters are maintained, tested, and repaired at the discretion of City personnel.

Water for grounds maintenance, including irrigation, is primarily supplied by a metered well water line. A submeter assesses well water from this line that is used in laboratories for experiments. SESD is not billed for its onsite well water use. Meters are read monthly by the Facility Maintenance Engineer.

SESD also has several water use submeters. The facility's cooling tower is equipped with meters on the potable make-up water line and blowdown line. The Facility Maintenance Engineer monitors and records readings from each of these meters monthly. These meters are maintained and repaired at the discretion of the Facility Maintenance Engineer.

For a list of measurement devices responsible for recording water use, as well as location and a description, see Table 2.

**Table 2. SESD Facility Water Meters and Submeters**

Name	Type	Location	Description
City water meter, Athens-Clarke County (#70010229)	Main potable water meter	Northeast front, near front building entrance	Measures total potable water supplied to the facility by the City.
City irrigation meter, Athens-Clarke County (#49539425)	Main potable water meter	Northeast front, near front building entrance, right side of city water	Measures total potable water supplied to the facility's irrigation system by the City.
Well water meter	Main well water meter	Southeast rear of the building near the well house	Measures well water used for irrigation system and in labs F-114 and F-118.
Cooling tower make-up water meter	Potable water submeter	North wall in Mechanical Room #1	Measures potable water supplied to the cooling tower as make-up. This is a subset of the total potable water supplied to the building from Meter (#70010229).
Cooling tower blowdown water meter	Cooling tower make-up submeter	West wall in Mechanical Room #1	Measures cooling tower blowdown water that is discharged to the sanitary sewer system. This is a subset of the total cooling tower potable water, as well as recovered air handler condensate.
Laboratory well water meter	Well water submeter	Service chase 2A on right side at the south end in the main building	Measures well water used for labs F-114 and F-118. Deduction from well water meter gives gallons of well water used for irrigation.

Trends in monthly water use are monitored by the Facility Maintenance Engineer and SESD facility representative. Trends that are identified as irregular or unexpected will be investigated and, if an issue is identified, resolved.

## 6.2 Shut-off Valves

Shut-off valves for the main building and irrigation potable water supplied by the city are located northeast near the front entrance of the facility. Shut off valves for the well water supply are located southeast at the rear of the building near the well house.

## 6.3 Historical Water Use

In response to EO 13423, SESD set a FY 2007 potable water use intensity baseline of 51.81 gallons per gsf. In FY 2013, water use intensity had decreased to 22.68 gallons per gsf—a 56 percent reduction compared to the FY 2007 baseline. Figure 1 illustrates SESD’s potable water use intensity from FY 2007 to FY 2013. Since the last water assessment conducted at SESD in 2006, SESD completed several projects to contribute to this reduction. These projects are described in Table 3.

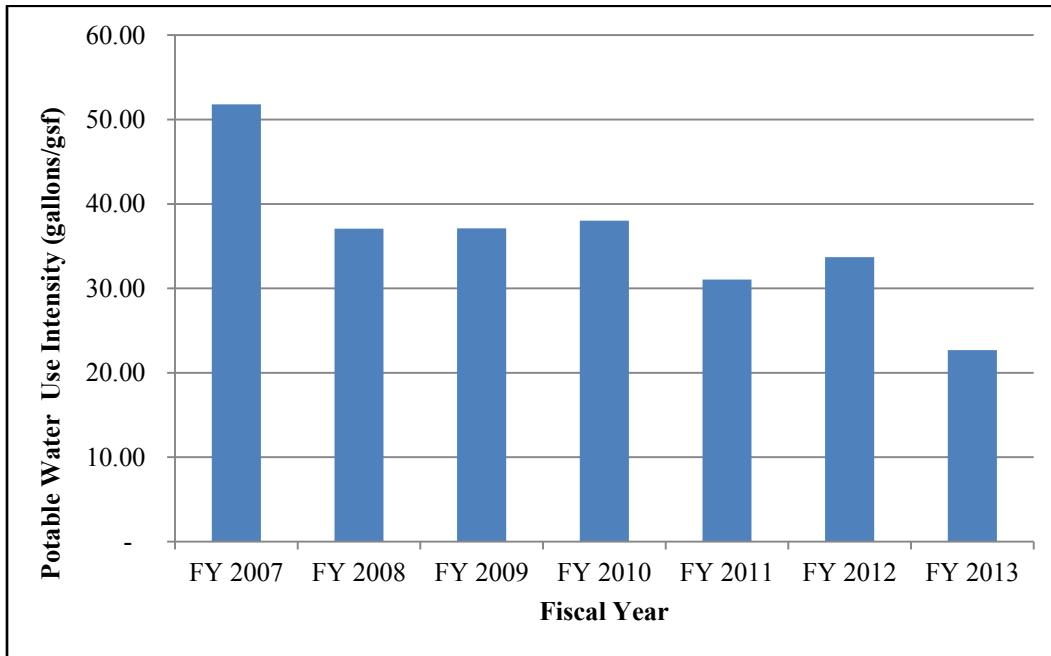
**Table 3. Completed Water Efficiency Projects Since FY 2008, ERD**

Project	Implementation Cost	Estimated Annual Water Savings (gallons)	Completion Year	Additional Notes
Installed 1.5-gpm aerators on lavatory faucets	\$180	35,000	FY 2014	As of April, 2014, all lavatory faucets had been retrofitted with 1.5-gpm aerators.
Air handler condensate recovery	\$1,000	340,000	FY 2008	In FY 2013, the air handler condensate recovery system provided 338,170 gallons of make-up water to the cooling tower system.
Irrigation system audit	\$3,500	NA	FY 2008	In FY 2008, a WaterSense irrigation partner audited SESD’s irrigation system. The audit didn’t result in any direct water savings, but would result in savings if recommendations are implemented.

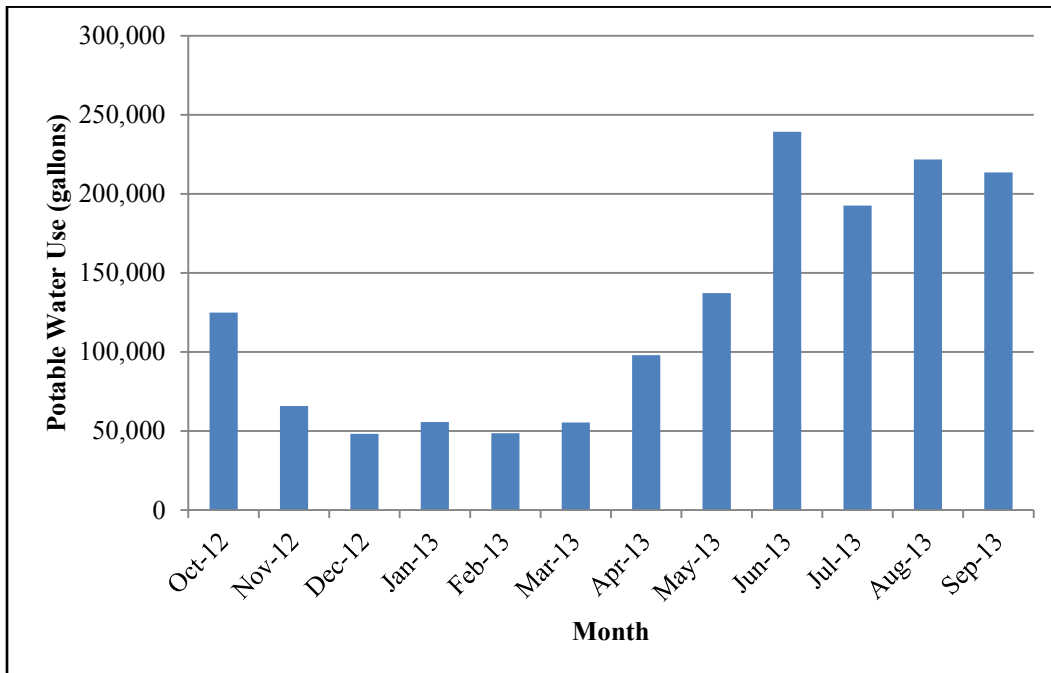
Figure 2 provides a graph of SESD’s monthly potable water use in FY 2013, which illustrates SESD’s seasonal water use pattern that can be attributed to high cooling tower make-up water use in the summer months.

SESD’s non-potable ILA water use has remained relatively steady. Its FY 2010 non-potable ILA water use baseline was 960 gallons, and its FY 2013 non-potable ILA water use was 1,400 gallons. Non-potable water is used sparingly for irrigation to prevent damage to landscape plantings during extremely dry period. Since supplemental irrigation is not always needed, irrigation water is applied based on the facility management contractor’s judgment instead of on a regular schedule.

**Figure 1. Annual Potable Water Use Intensity, SESD, FY 2007–FY 2013**



**Figure 2. Monthly Potable Water Use, SESD, FY 2013**



## 6.4 End Water Uses

Estimates of potable water and well water consumption by major end use are provided in Table 4. These estimates reflect the most current facility water use data available when this plan was developed. A detailed inventory of potable water-using processes and equipment at SESD is provided in Appendix B.

Figure 3. Percentage of Potable Water End Uses, SESD, FY 2013

illustrates the end uses of City-supplied potable water only, and Figure 4 illustrates SESD's water use by source. The end uses are described in more detail below. Potential projects discussed in this section are summarized in Table 1.

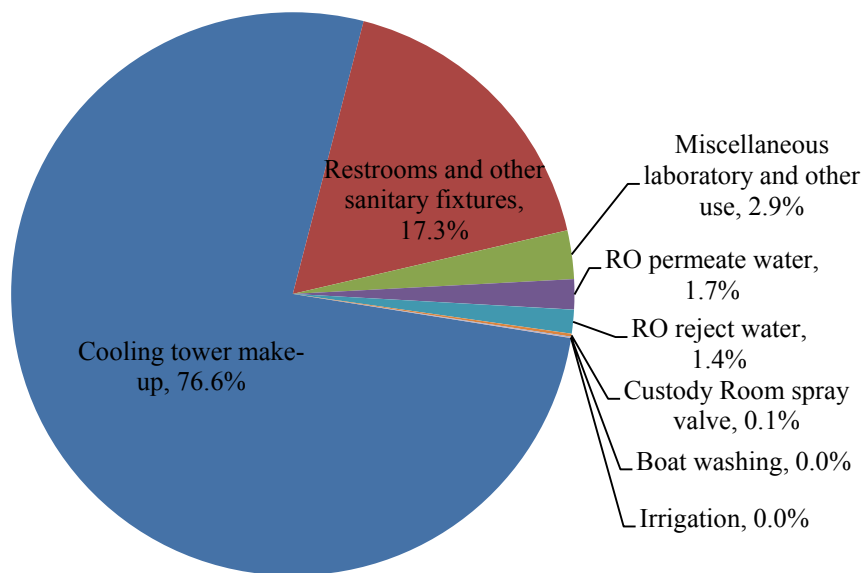
**Table 4. Major Water Uses, SESD, FY 2013**

<b>Major Process</b>	<b>FY 2013 Annual Consumption (gallons)</b>	<b>Percent of Total Potable Water Use (%)</b>	<b>Estimated Utility Costs<sup>a</sup></b>	<b>Supporting Calculations and Source Documentation</b>
<b>Potable Water Usage</b>				
Cooling tower make-up (potable City water)	1,149,300	76.6	\$11,000	FY 2013 metered total.
Restroom and other sanitary fixtures	260,000	17.3	\$2,400	Engineering estimate based on 100 daily employees using fixtures installed as of March 2013.
Miscellaneous laboratory and other use	41,916	2.8	\$390	Calculated by difference from the FY 2013 total water use and the other estimated and metered uses.
RO permeate water	26,000	1.7	\$240	Engineering estimate based on an assumed 500 gallons used per week.
RO reject water	20,500	1.4	\$190	Based on the design ratio of the RO system. The product water to reject water ratio is 3.8 gallons product to 3.0 gallons reject.
Custody Room sample handling spray valve	2,500	0.2	\$20	Engineering estimate based on a measured flow rate of 2 gpm. Based on interview with personnel, spray valve is used approximately 5 minutes per day, 250 days per year.

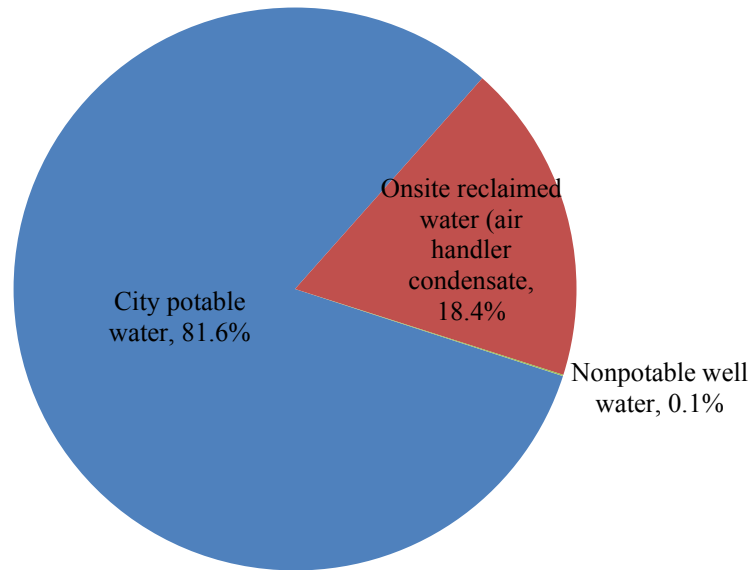
**Table 4. Major Water Uses, SESD, FY 2013**

Major Process	FY 2013 Annual Consumption (gallons)	Percent of Total Potable Water Use (%)	Estimated Utility Costs <sup>a</sup>	Supporting Calculations and Source Documentation
Boat washing	750	0.0	\$10	Engineering estimate based on interview with personnel. Assumes washing 10 boats per year, 15 minutes per boat at 5 gpm.
Irrigation (potable City water)	337	0.0	<\$10	FY 2013 metered total.
<b>Total potable water use</b>	<b>1,501,303</b>	<b>100</b>	<b>\$14,000</b>	FY 2013 metered total.
<b>Reclaimed Water Usage</b>				
Cooling tower make-up (air handler condensate)	338,170	-	-	Based on pump runtimes in FY 2013 for each of the three pumps that deliver air handler condensate to the cooling towers.
<b>Well Water Usage</b>				
Irrigation (non-potable well water)	1,400	-	-	Metered total from well water meter readings in FY 2013.
<b>FY 2013 Total Water Use</b>	<b>1,840,873</b>			

**Figure 3. Percentage of Potable Water End Uses, SESD, FY 2013**



**Figure 4. Percentage of Water Sources, SESD, FY 2013**



### **Cooling Tower Make-Up**

The facility's chilled water system operates on a closed loop using the City water supply for make-up. Two chillers located in Mechanical Room #1 cool the chilled water which is discharged by chilled water pumps to the cooling coils in the air handlers and laboratory areas. The condenser water used to cool the chilled water loop is transferred to a two-cell, 780-ton capacity cooling tower where two circulating fans dissipate heat transferred during the cooling process.

Potable, City-supplied make-up water is supplied to the cooling tower. This line is equipped with a pulse meter which serves two purposes: it measures the amount of water, in gallons, supplied to the cooling tower and is interlocked with a conductivity and inhibitor controller for biocide control. For every pulse, or 100 gallons, the feed pump supplies chemicals to the tower through condenser water flow. Chemical treatment is provided to control scale and corrosion. The cooling tower is equipped with a conductivity monitor and automatic blowdown control system. The conductivity meter is set at 1,075 Ohms ( $\Omega$ ) with a 25  $\Omega$  differential. This set point will result in efficient water use, providing for approximately 9 cycles of concentration.

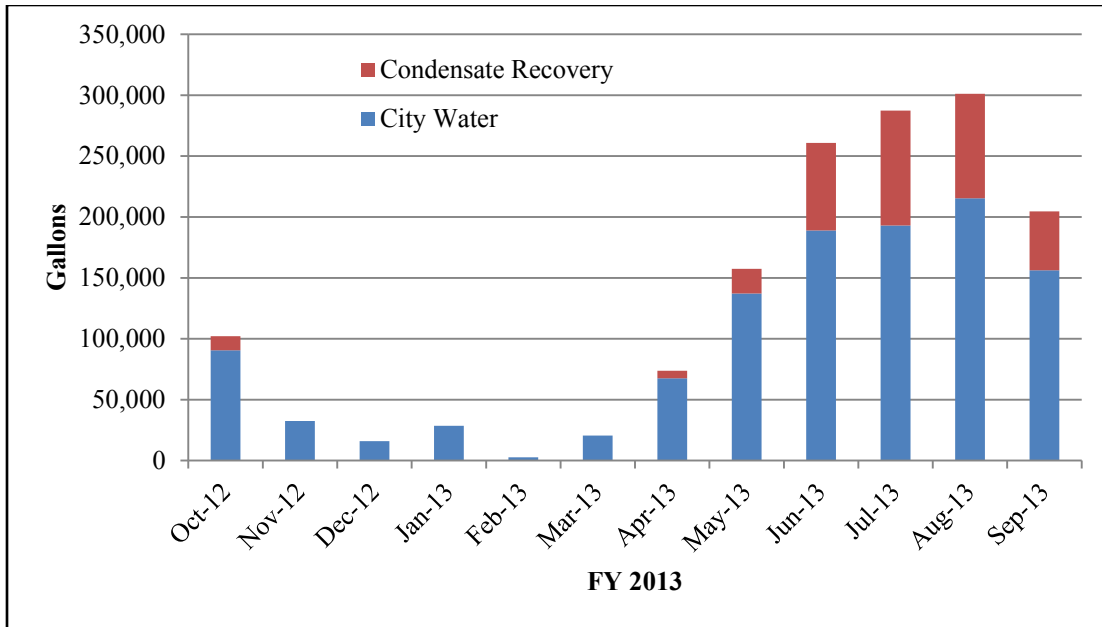
In FY 2008, SESD implemented a water reclamation system to provide make-up water for the cooling tower using condensate recovered from air handlers. As outside air is forced across the cooling coils in the air handlers, condensation occurs. The condensate is collected in a 5-gallon housing that holds a pump. As the housing is filled, the pump is activated, and the reclaimed condensate is pumped to the cooling tower as make-up water. SESD's water reclamation system is operational between April and October for roof top units 1, 2, and 5. The reclamation pumps are metered to monitor the amount of water recycled. Readings are taken monthly by the Facility



Maintenance Engineer and monitored for variations in expected trends. In FY 2013, SESD’s reclamation system recovered 338,170 gallons of air handler condensate, accounting for 22.7 percent of the total needed cooling tower make-up.

See Figure 5 for an illustration of the sources of SESD’s cooling tower make-up water.

**Figure 5. Source of Cooling Tower Make-Up Water, SESD, FY 2013**



SESD could consider installing advanced meters to monitor cooling tower make-up, blow down, and air handler condensate recovery lines. Advanced meters could be connected to the facility’s building automation system (BAS) in order to allow improved tracking and trending of cooling tower water use and operation efficiency.

**Restroom and Other Sanitary Fixtures**

Toilets and urinals throughout SESD are all 1992 Energy Policy Act (EPAct) compliant and flush at efficient volumes (1.6 gpf for toilets and 1.0 gpf for urinals). Urinal flush valves are controlled with automatic sensors.

There are six showerheads located throughout SESD, all of which meet EPAct water efficiency requirements with a flow rate of 2.5 gpm or less. Four of the showerheads flow at 2.5 gpm, and two flow at 2.0 gpm.

Automatic sensing faucet fixtures have been installed in the men and women’s restrooms in all three restrooms in the facility (F Hallway, D Hallway, and C Hallway). All 18 lavatory faucets are equipped with 1.5 gpm aerators.

Table 5 provides an inventory of sanitary fixtures.

**Table 5. SESD Inventory of Sanitary Fixtures**

Fixture Type	Estimated Flow Rate	Total Number
Toilets	1.6 gpf	18
Urinals	1.0 gpf	6
Lavatory faucets	1.5 gpm	18
Showers	2.5 gpm	4
	2.0 gpm	2

gpf – gallons per flush  
gpm – gallons per minute

While it is not cost effective to replace existing toilets and urinals with higher-efficiency models, it may be possible to reduce urinal flush volumes by replacing the current 1.0 gpf diaphragm valve inserts with 0.5 gpf inserts. Before implementing this change, it could be piloted to verify that there are no negative impacts on urinal flushing performance.

As of April 2014, SESD completed installation of 1.5 gpm aerators on all lavatory faucets. Depending on user satisfaction, to save additional water in restrooms, faucet aerators could be replaced with models flowing at 1.0 gpm.

Since showerheads are inexpensive and have a relatively short payback, SESD should consider replacing all existing showerheads with WaterSense labeled models that flow at 1.75 gpm or less.

Facility staff are trained to report leaks and malfunctioning fixtures either directly to the Facility Maintenance Engineer or a SESD facility representative. Reported maintenance problems are assigned a work order, which is completed promptly by the Facility Maintenance Engineer or other qualified operations and maintenance (O&M) staff. Maintenance and repairs are tracked through completion and closed out by the Facility Maintenance Engineer who informs the SESD facility representative, if necessary.

**Miscellaneous Laboratory and Other Uses**

The laboratory is equipped with a Gentinge Model 533HCMC steam sterilizer located in lab E-104. The steam used for sterilization is supplied by a boiler which was previously operated on a continual basis. In FY 2013, SESD began shutting down the boiler during periods of non-operation. If operation of the equipment is necessary, the Facility Maintenance Engineer is notified and activates the boiler for sterilization use.

The laboratory is also equipped with a PRIMUS PSS 500 steam sterilizer which is located in lab E-107. In FY 2013, the sterilizer’s onboard RO system was disconnected to improve overall system water efficiency. Use of the onboard RO system would purge an approximately 20-gallon holding tank each time the sterilizer is powered up. The sterilizer was instead connected directly to the building’s deionized water supply, which provides the necessary make-up water. This change prevents water use that was resulting from the onboard RO system purge.

Both sterilizers are used infrequently. Tempering water is supplied only as needed.

The facility is also equipped with two Heinicke Model H 4000 E glassware washers. Only one glassware washer is fully operational, while the other one is permanently out of service and used solely for repair parts. City water is used for wash cycles and deionized water is used for rinse cycles.

A Miele Professional large chamber glassware washer, acquired in FY 2012, is also located in lab E-107. This washer features shorter cycle times, lower water and energy consumption, and a flow meter to monitor and control water intake quantities.

SESD uses steam directly for building humidification and also supplies heat exchangers that maintain a recirculating heating hot water loop. Steam is provided by two gas-fired, low-pressure steam boilers located in Mechanical Room #1. City water is treated by water softeners and fed into a boiler feed water tank, where it is supplied to the boilers by two pumps. The boilers supply 11 psi steam to a heat exchanger on the facility's heating water loop. This loop serves the reheat coils in the laboratory areas and hallways for supply air and is a closed system requiring very little makeup water.

Steam is also piped to a coil in rooftop air handlers #1 and #2 for direct building humidification.

Condensate from the heat exchangers is collected and returned to the boiler feed water tank as a means of conserving water and energy. In addition, approximately 75 percent of condensate produced from direct building humidification is also returned to the boiler feed water tank.

The Facility Maintenance Engineer inspects facility equipment daily to ensure proper operation. The steam boiler system is maintained on a monthly basis under a service contract to prevent system corrosion and optimize condensate recovery. Boiler water quality parameters such as conductivity, hardness, alkalinity, chloride, and sulfite are monitored and controlled through periodic testing and chemical treatment.

Water is used as necessary in individual laboratories for bench-scale experiments and glassware preparation. Laboratory faucets are not currently equipped with any flow restriction devices, and therefore can flow up to approximately 5 gpm when operated at full flow. To reduce water use in the laboratories, SESD should consider installing 2.2 gpm faucet aerators on all laboratory faucets. Installing aerators can reduce water use while reducing splashing and allowing better user control.

In addition, water is used to perform building and facility maintenance. On an annual basis the condenser coils of facility coolers, freezers, environmental chambers, air handlers, cooling tower, and other systems are cleaned with a pressure washer. Every two years, sidewalks and the exterior of the main building are also pressure washed to maintain facility appearance.

SESD eliminated the use of single-pass cooling water. All laboratory equipment cooling needs are supplied by point of use, air-cooled chiller units.

## **Reverse Osmosis (RO) System**

SESD is equipped with a RO system supplied with potable water. Hot and cold water enters a blending valve and is adjusted up to 77°F. This tempered water is filtered through a multimedia filter for silt and dirt removal down to the 15-20 micron range. The filtered water then flows to the water softener for calcium and magnesium removal. The softened water then flows through an activated carbon filter for chlorine removal and then through twin five-micron polypropylene filters. The pretreated water then enters the RO system for removal of the majority of dissolved solids, undissolved solids, organics, and any bacteria. The RO treated water enters a 500-gallon sealed and sterile vented tank for storage and distribution. Twin manual alternating stainless steel pumps deliver RO water to the service deionization system for complete deionization. The expected quality of the product water is between 16.7 and 18.3 MΩ resistivity. The deionized water then flows through an ultraviolet (UV) light for bacteria growth and then through twin 0.2 micron filters for final filtration before being stored or pumped to the labs for use. The water is kept in continuous recirculation during use and nonuse periods to maintain quality and control bacteria. The flow rate is maintained at 10 gpm at 55 to 60 pounds per square inch (psi). The RO unit rejects 3.0 gallons of water for every 3.8 gallons of product water.

To help identify water use trends and confirm the operational efficiency of the RO system, SESD should consider installing a flow meter to monitor the make-up water line to the RO system.

## **Custody Room Sample Handling Spray Valve**

In the facility Custody Room, a spray valve is used for sample preparation and to clean coolers and materials used for sampling events. The flow rate of the spray valve is 2.0 gpm. Based on discussions with Custody Room personnel, the spray valve is used for approximately 5 minutes per day.

Since spray valves are inexpensive and have a relatively short payback, SESD should consider replacing the existing spray valve with a WaterSense labeled pre-rinse spray valve that flows at 1.0 gpm or less.

## **Boat Washing**

Various water vessels and boats are used for sampling and research purposes throughout the year. When boats are returned to their storage bay, known as the “Boatel,” they are often rinsed of debris, salt, or other materials that may have collected on its sides. Potable water is used for boat washing. Based on an interview with laboratory personnel who utilize the boats for research and sampling, the boats are washed for approximately 15 minutes each. In FY 2013, boats were taken out and washed on approximately ten occasions.

The Boatel consists of two open air bays covered by roofs. The bays are each 33 feet wide by 75 feet long and are at opposite sides of the parking lot from each other. Only one of the Boatel bays has access to potable water.

To reduce potable water use from boat washing, SESD could consider installing a well water line to the Boatel. To provide well water access to the Boatel, approximately 120 feet of water pipe would need to be installed.

## Irrigation

Approximately one acre of the 12-acre SESD property is developed and equipped with an irrigation system. The irrigated area is divided into ten zones and primarily planted with native and hearty grasses and shrubs. There are some flower beds located immediately adjacent to the main entrance.

SESD conserves water year round by only irrigating on an as-needed basis. Professional judgment is used to determine whether the irrigation system is activated. Facility staff take into consideration recent weather patterns, plant conditions, and feedback received from the grounds maintenance contractors when determining when to irrigate. In addition, the irrigation system has a sensor mounted on the roof above Mechanical Room #2 that automatically interrupts an irrigation event if rain or moisture is detected. Supplemental irrigation was applied very infrequently in FY 2013.

The irrigation system can be supplied by either City water or well water. SESD primarily uses well water for irrigation purposes; City water is utilized on limited occasions. The ten zones, identified in Table 6, use a combination of rotary and spray nozzles and drip hoses. The irrigation program is set up to run certain zones for a specified run time over a four day period in order to accommodate the output of the well water pump. Time and flow rates are determined by the type and establishment of the plants in each zone. In general, plants that are more established and require less water are programmed with shorter run times so that water is used efficiently and only where needed.

**Table 6. SESD Irrigation System Zones and Settings**

Zone	Location	Flow rate	Irrigation Type	Program Setting	Program Start Time	Run Time	Day of the week
1	Front Turf	10 gpm*	Rotary	Program A	5:00 am	20 min	Monday
2	Front Left above wall and turf	7 gpm	Rotary	Program A	5:00 am	20 min	Monday
3	Front sprays	29 gpm	Spray	Program A	5:00 am	5 min	Monday
4	Front right turf and slope	15 gpm	Rotary	Program B	5:00 am	20 min	Tuesday
5	Right side turf	14 gpm	Rotary	Program B	5:00 am	20 min	Tuesday
6	Right side back turf	26 gpm	Spray	Program B	5:00 am	5 min	Tuesday
7	Back sprays	29 gpm	Spray	Program D	5:00 am	5 min	Thursday
8	Front drip	3 gpm	Drip	Program C	5:00 am	45 min	Wednesday
9	Front drip	3 gpm	Drip	Program D	5:00 am	45 min	Thursday
10	Back trees and islands	26 gpm	Spray	Program C	5:00 am	5 min	Wednesday

\* gpm = gallons per minute

Employees and staff at SESD also maintain a community garden adjacent to the Boatel. The community garden is 25 feet wide by 35 feet long. At the discretion of the employees and staff with plantings in the garden, hand watering occurs periodically.

As a demonstration project, SESD could consider installing a set of rain barrels to collect rainwater from the Boatel roof to use for community garden watering. Rainwater collected in the rain barrels could be stored and used in place of potable water when the community garden requires watering. Two 55-gallon rain barrels could collect approximately 2,000 gallons of rainwater annually. Water provided by the rain barrels could be supplemented with well water if well water supply is extended to the Boatel.

## **7.0 DROUGHT CONTINGENCY PLAN**

Under non-drought conditions, SESD will comply with “pre-drought” water use restrictions mandated by the Georgia Department of Natural Resources (DNR) in Rules for Outdoor Water Use (Chapter 391-3-30-.03). For facilities with even-numbered addresses (e.g., 980 College Station Road), outdoor water use is permitted on Mondays, Wednesdays, and Saturdays.

In the event of a drought, SESD will make all reasonable efforts to follow water use restrictions described in the Georgia Drought Management Plan (Section 4) and Rules for Outdoor Water Use (Chapter 391-3-30-.03) according to the following levels, as declared by DNR’s Environmental Protection Division (EPD):

- Drought Response Level One
  - Outdoor water use follows “pre-drought” address scheduling.
  - Outdoor water use is allowed only between 4 p.m. and 10 a.m.
  - Use of fire hydrants for purposes other than firefighting, public health, safety, or flushing is prohibited.
  
- Drought Response Level Two
  - Outdoor water use follows “pre-drought” address scheduling.
  - Outdoor water use is allowed only between 12 a.m. and 10 a.m.
  - Use of fire hydrants for purposes other than firefighting, public health, safety, or flushing is prohibited.
  - Washing hard surfaces (such as streets, gutters, sidewalks, and driveways) is only permitted when necessary for public health and safety.
  
- Drought Response Level Three
  - Even-numbered addresses: outdoor water use only permitted on Saturdays.
  - Odd-numbered addresses: outdoor water use only permitted on Sundays.
  - Outdoor water use is allowed only between 12 a.m. and 10 a.m.
  - The following uses are prohibited (except when necessary for public health and safety):
    - Using fire hydrants.
    - Washing hard surfaces, such as gutters, sidewalks, and driveways.
    - Filling installed swimming pools.
    - Washing vehicles, such as cars, boats, trailers, and motorcycles.

- Washing buildings or structures.
  - Using water for non-commercial fundraisers, such as car washes.
  - Using water for ornamental purposes, such as fountains, reflecting pools, and waterfalls.
- Drought Response Level Four
    - No outdoor water use is permitted except for activities exempted by EPD in 391-3-30-.05 or by the EPD Director.

Regional drought conditions and general information on water supply management can be found at the “Drought in Georgia” website provided by the University of Georgia College of Agriculture and Environmental Sciences at: <http://www.georgiadrought.org/>.

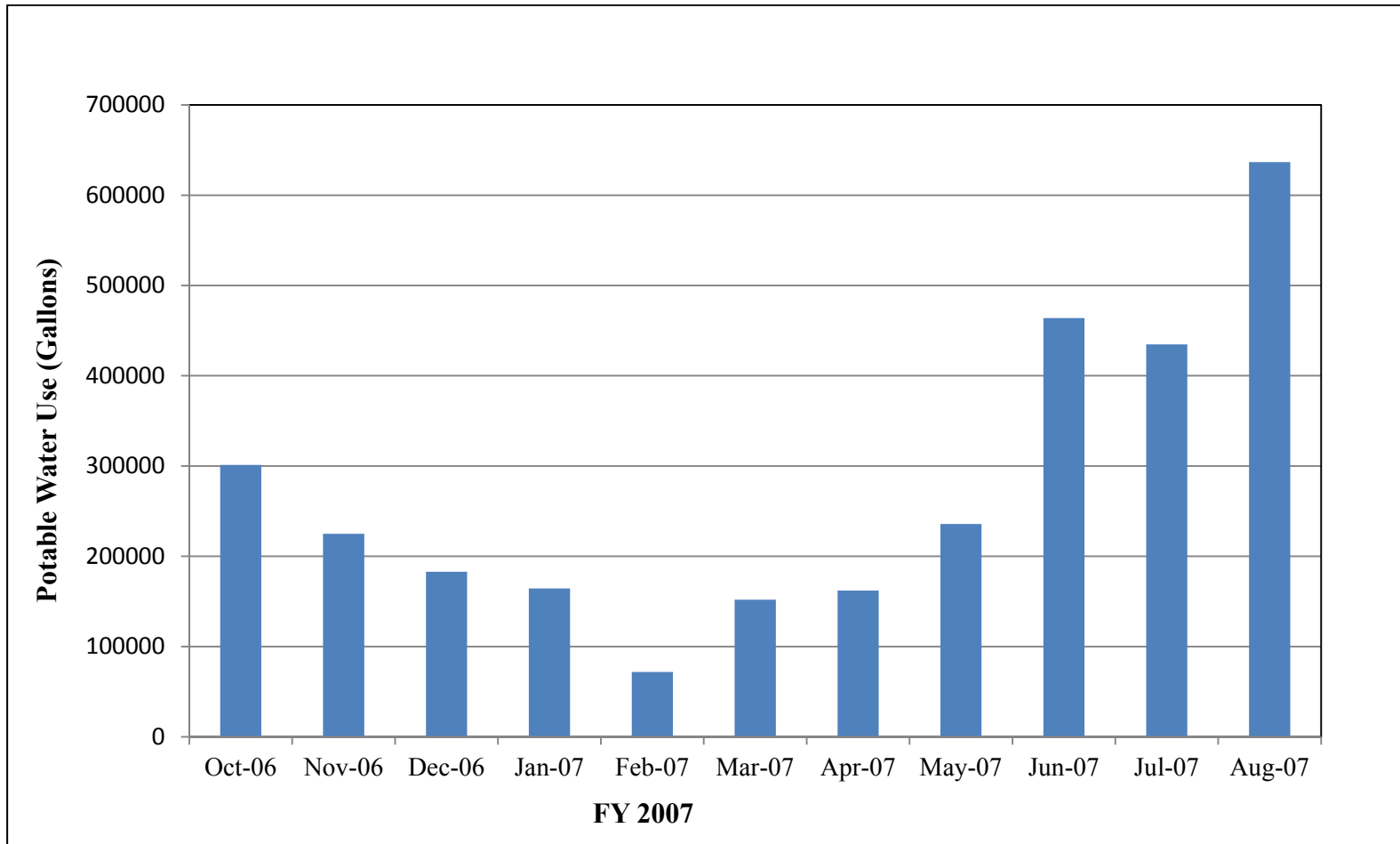
SESD will also follow applicable local water use restrictions mandated by Athens-Clarke County that extend beyond state-imposed water use restrictions. Information on Athens-Clarke County water use restrictions are found on the Athens-Clarke County Public Utilities website at: <http://www.athensclarkecounty.com/publicutilities/>.

**Appendix A**

**FACILITY BASELINE WATER USE**



**Figure A-1. Monthly Baseline Potable Water Use, SESD, FY 2007**



**Table A-1. Monthly Baseline Potable Water Use, SESD, FY 2007**

<b>Month-Year</b>	<b>Water Use (gallons)</b>
October-2006	301,294
November-2006	224,998
December-2006	182,811
January-2007	164,410
February-2007	71,883
March-2007	151,919
April-2007	162,017
May-2007	235,770
June-2007	463,910
July-2007	434,812
August-2007	636,623
September-2007	398,983
<b>TOTAL</b>	<b>3,429,430</b>

**Appendix B**

**DETAILED POTABLE WATER-USING PROCESSES AND EQUIPMENT**

**Table B-1. Detailed Potable Water Using Processes and Equipment**

<b>Equipment Type</b>	<b>Location</b>	<b>Description and Purpose</b>
Boilers	Mechanical Room #1	Make-up water supplied to two 129.6 horsepower Kewaunee boilers.
Cooling Tower	Rear of main building	Make-up water supplied to facility cooling tower. The cooling tower is a two-cell unit with a total cooling capacity of 780 tons.
Hot Water Loop System	Overhead piping throughout facility	Make-up water supplied for hot water loops system for laboratory heat and heating coils in roof top units (RTU) 1 and 2.
Chilled Water Loop System	Overhead piping throughout facility	Make-up water supplied for chilled water loops system to five air handlers (RTU 1-5) for air delivered to offices, labs, and equipment rooms (i.e. electrical switch gear room, UPS room, electrical room #3, access system room, computer room, and telephone closets).
Boiler Soft Water Tanks	Mechanical Room	Make-up water supplied for the soft water tanks which feed water to the boilers.
Hot Water Boilers	Mechanical Room #2	Three boilers supply hot water to the laboratories on hallways D, E, and F, bathrooms on D and F halls and the janitorial closet on G hall.
	C Hallway Janitorial Closet	One boiler supplies hot water to the bathrooms on C hall, the breakroom on A hall, and the break area in cubicle section A.
Water Fountains	1-A Hallway	Six water fountains located on hallways throughout the building supplying potable water.
	1-C Hallway	
	1-D Hallway	
	1-F Hallway	
	1-H Hallway	
Ice Makers	1- A Hall Breakroom	Water used to supply equipment in order to make ice for consumption purposes (breakroom) or for fish tissue preparation (F-103).
	1-Lab F-103	
Safety Equipment	Throughout main building and Hazardous Material (HAZMAT) Building	Water supplied to safety equipment throughout the building which includes eye washes, soaker hoses, and emergency showers, and fire sprinkler system. HAZMAT building contains eyewashes in four of the five bays. The battery charging station (bay 5) contains both an eyewash and emergency shower.
Boatel Spigots	1-south side of Boatel	Water used to wash down boats, vehicles, specialty vehicles, and field equipment, if necessary.
	1-north side of Boatel	
Reverse Osmosis (RO) System	Mechanical Room #2	Water used and treated through three softeners and the commercial RO system to supply deionized water to the laboratories.
Electric Steam Boiler	Service Chase 2A	Sussman electric steam boiler is supplied water primarily from the facility's deionized water system; however, City water can also be used. This steam boiler provides steam to the autoclave in lab E-104.
Laboratory Dishwasher	3-Lab E-107	Potable water is used during wash cycles of laboratory glassware and deionized water used during rinse cycles.
Steam Sterilizer	1-Lab E-104	Water is used to generate steam in order to run cycles for the sterilization of microbes or method digestions.
	1-Lab E-107	