

Water Management Plan

Revision 2

United States Environmental Protection Agency
National Health and Environmental Effects Research Laboratory
Mid-Continent Ecology Division
6201 Congdon Boulevard
Duluth, Minnesota 55804



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Point of Contact:
Rodney Booth, Facilities Manager
218-529-5040



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NATIONAL HEALTH AND ENVIRONMENTAL EFFECTS RESEARCH LABORATORY
MID-CONTINENT ECOLOGY DIVISION
DULUTH, MINNESOTA**

WATER MANAGEMENT PLAN, REVISION 2

Approved by:



Rodney Booth, Facilities Manager

9/10/13

Date



Carl Richards, Division Director

9/19/13

Date

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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) Mid-Continent Ecology Division (MED) Laboratory located in Duluth, Minnesota, in June 2013. Under this Water Management Plan, MED will consider implementing the potential water conservation opportunities identified during the water assessment, which are summarized in Table 1.

The rest of this Water Management Plan describes the facility's water reduction goals, water use trends, end uses of water, and drought management plans.

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[®] 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 executive orders 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 facility-specific Water Management Plan has been developed to document and promote the efficient use of water at MED, so that the facility can contribute to meeting these Agency-wide objectives.

Table 1. Potential Water Conservation Opportunities, MED

Suggested Priority	Project Description	Project Cost	Potential Water Savings (gallons)	Potential Energy Savings (MMBtus)	Potential Utility Cost Savings*	Potential Payback (years)
1	Retrofit remaining lavatory faucets with 0.5 gallon per minute (gpm) faucet aerators.	\$70	26,300	17	\$400	<1
2	Replace existing 2.5 gpm showerheads with 1.5 gpm WaterSense labeled models.	\$180	17,500	12	\$270	<1

*Utility cost savings are calculated using the most current water and sewer rates available. Water and sewer service is provided by Comfort Systems. According to its website, the water rate for a commercial facility using between 4,000 and 20,000 cubic feet of water per month is \$3.70 per 1,000 gallons. Based on its bills, MED is charged as a Class I sanitary sewer customer, so its sewer rate is \$7.42 per 1,000 gallons.

3.0 FACILITY INFORMATION

MED is located on a 13.2-acre site located on the east side of Duluth on the shore of Lake Superior. It is owned and operated by EPA. The site consists of 10 buildings with 88,577 gross square feet of conditioned space.

The main laboratory building was finished in 1967, with additions constructed in 1984 and 2001. The building houses both biology and chemistry labs, a large aquatic culture unit, and the administrative offices and library for the Division. The annex building was constructed in 1971 and modified in the late 1980s to provide office and support space for 50 staff. Other support buildings and structures include a shop/storage building, several storage-only buildings, pump house, water tower, emergency generator building, and a modular hazardous material storage building.

Duluth was selected as the site for this research facility because of the need for an uncontaminated source of natural fresh water (e.g., Lake Superior) to conduct its research. The lake's unchanging water quality over the past 45 years has been essential to the ongoing ecotoxicology research performed at MED.

Approximately 140 employees, 35 to 40 of which are based in the annex building, work at MED. The facility operates on a flex time schedule and is typically occupied Monday through Friday between the hours of 6:00 a.m. and 6:00 p.m.

4.0 WATER MANAGEMENT GOALS

MED achieves its resource conservation goals by implementing a standard EPA Office of Research and Development (ORD) Environmental Management System (EMS) program. Within the EMS and otherwise, the MED's water management goals include:

- Identify at least one water conservation project to be completed in FY 2013 and obtain funding.

- Implement site-specific water conservation projects to achieve the facility’s ConservW target—set annually by EPA’s Sustainable Facilities Practices Branch—with a goal of contributing to the combined ConservW target for all seven ORD facilities.

5.0 WATER USE INFORMATION

MED uses city-supplied potable water for sanitary needs and other miscellaneous uses. This water is metered and accounted for in MED’s potable water use intensity.

MED uses Lake Superior water for research, once-through process cooling, and as throughput to an overflow from the water tower to prevent water from freezing in the winter. Most of the lake water is returned directly to the lake. Some lake water used for research is sent to sewer. The lake water that is taken from the lake and returned to the lake is considered non-consumptive and is not included in MED’s annual ILA water use. The lake water used for research and sent to sewer is considered a consumptive use and makes up MED’s entire ILA water use total.

5.1 Water Supply

MED’s potable water and sewer service is supplied by the Comfort Systems. Non-potable water is pulled by the facility from Lake Superior. MED is not charged for any Lake Superior water used and returned to the lake but is charged sewer fees for any Lake Superior water that is sent to sanitary sewer.

5.2 Meters and Submeters

Incoming city water supply and lake water supply are both metered. Flow totalizing meters are also installed on many of the subsystem flows. Metered flows (with meter number) include:

- City water supply, main building (#049209-9, Acct # 250565510, Meter B888887429, #16)
- City water supply, annex (#049207-5, Acct # 250565503, Meter B99440124, #19)
- City water supply, spare meter (#049208-7, Acct # 250565505, #19)
- Sewer flow (#049210-2, Acct # 250565514-Sewer, Meter P183308, #11)
- Domestic hot water (#7)
- Lake water supply (#1)
- Lake water to research use (#3)
- Wet lab warm water supply (#12)
- Wet lab cold water supply (#13)
- Process cooling water (#6)
- Non-contact water for chiller (#47)
- RO system total consumption (#41, #42)
- RO system permeate (#39, #40)
- Water treatment system flow to lake (#48)

Flow totalizer readings on each meter are recorded monthly and reported to the Facilities Manager. Water use trends are monitored on an ongoing basis, and unexpected changes in water use are investigated and resolved.

5.3 Historical Water Use

This section discusses MED’s historical potable and ILA water use.

5.3.1 *Historical Potable Water Use*

In response to EO 13423, MED set a FY 2007 potable water use intensity baseline of 10.89 gallons per gsf. In FY 2012, water use intensity had decreased to 5.91 gallons per gsf—a 45.7 percent reduction compared to the FY 2007 baseline. Since the last water assessment conducted at MED in 2009, MED completed several projects to contribute to this significant reduction, including replacing an ice machine that used potable water for single-pass cooling with an air-cooled model, replacing its toilets and urinals with high-efficiency models, and installing some highly-efficient faucet aerators.

Figure 1 illustrates MED’s potable water use from FY 2007 to FY 2012. Figure 2 provides a graph of MED’s monthly water use in FY 2012. Water use is roughly equal each month because potable water is not used for building cooling, irrigation, or any other seasonal water uses.

Figure 1. Annual Potable Water Use, MED, FY 2007–FY 2012

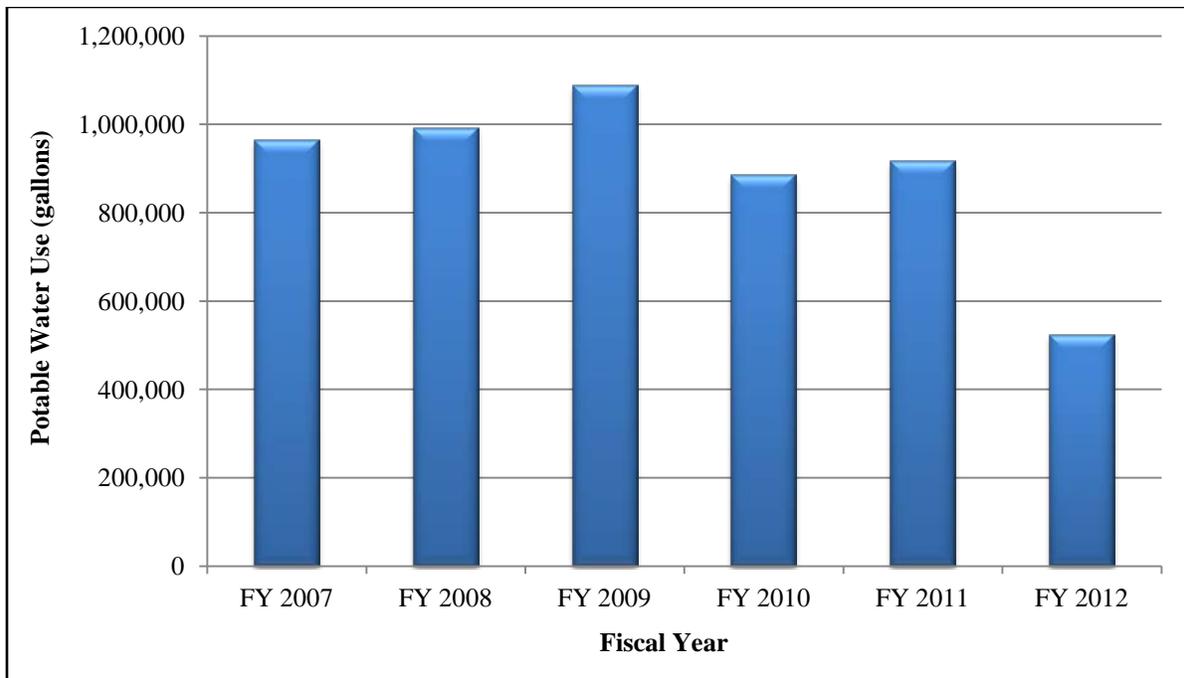
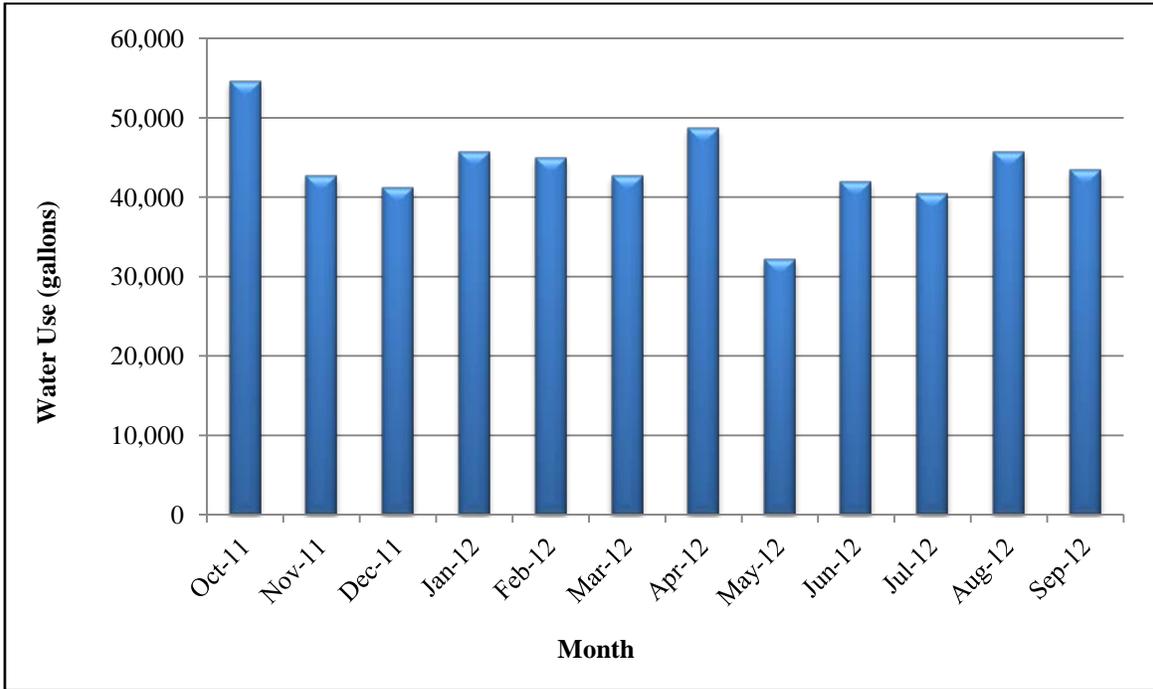


Figure 2. Monthly Potable Water Use, MED, FY 2012

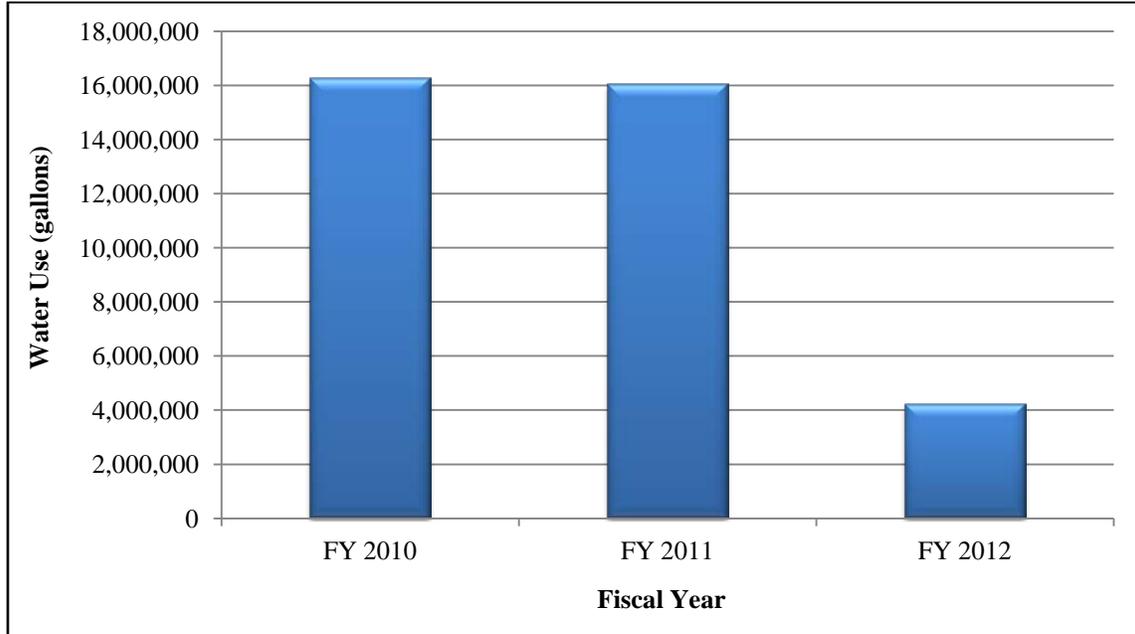


5.3.2 Historical ILA Water Use

MED established an ILA water baseline in FY 2010 and has significantly decreased this water use since. The reduction can mostly be attributed to a treatment and return system for the lake water used in the aquatic culture wet lab. Prior to installation of the treatment system, approximately 18 million gallons per year of lake water used in the aquatic culture system was discharged to the sanitary sewer. When the FY 2010 ILA baseline was established, a significant portion of this water was still going to sewer and considered a consumptive water use. Therefore, it is included in the baseline. With the treatment system now fully operational, MED's ILA water use has decreased by 74 percent since FY 2010. In addition, the treatment system is saving the facility in sewer costs and decreasing the load on the local wastewater treatment plant. Lake water used for other research purposes still flows to sanitary sewer and is counted as part of MED's annual ILA water use.

Figure 3 illustrates MED's ILA water use from FY 2010 to FY 2012.

Figure 3. ILA Water Use, MED, FY 2010–FY 2012



5.4 End Uses of Water

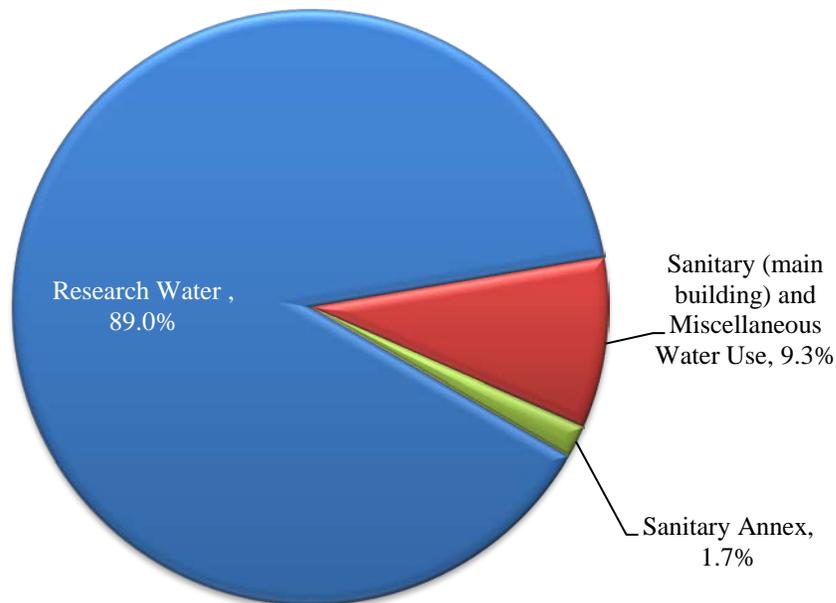
Table 2 and Figure 4 provide the end uses of water at MED. The uses are described in more detail on the following page. Potential projects discussed in this section are summarized in Table 1.

Table 2. Major Water Uses, MED, FY 2012

Major Process	Water Source	Discharge Point	FY 2012 Annual Consumption (gallons)	Percent of Total Water Use (%)	Estimated Utility Costs*	Supporting Calculations and Source Documentation
Sanitary (main building) and Miscellaneous Water Use	Potable	Sewer	440,603	9.3	\$4,900	FY 2012 potable meter readings (Meter B88887429, #16)
Sanitary (annex)	Potable	Sewer	83,034	1.7	\$900	FY 2012 potable meter readings (Meter B99040214, #19)
Potable Subtotal	Potable	Sewer	523,637	11.0	\$5,800	Sum of potable water uses
Research Water	Lake	Sewer	4,226,493	89.0	\$31,400	Calculated by difference from the sewer total and the total potable water use
ILA Subtotal	Lake	Sewer	4,226,493	89.0	\$31,400	Sum of ILA water uses
Total Consumptive Water Use	Potable and Lake	Sewer	4,750,130	100.0	\$37,200	FY 2012 sewer meter readings (Meter P183308, #11)

*Utility costs are calculated using the most current water and sewer rates available. Water and sewer service is provided by Comfort Systems. According to its website, the water rate for a commercial facility using between 4,000 and 20,000 cubic feet of water per month is \$3.70 per 1,000 gallons. Based on its bills, MED is charged as a Class I sanitary sewer customer, so its sewer rate is \$7.42 per 1,000 gallons.

Figure 4. Percentage of Water End Uses, MED, FY 2012



Research Water

MED primarily uses water for its research mission on aquatic species. Almost all water used for research comes from Lake Superior. Lake water used for research and returned to sanitary sewer accounts for all of MED's ILA water use.

Sanitary Fixtures

Water used for sanitary fixtures accounts for almost all of MED's potable water use. MED's restroom fixtures exceed the water efficiency requirements in the Energy Policy Act (EPA) of 1992, which requires that facilities install 1.6 gallons per flush (gpf) toilets and 1.0 gpf urinals. In 2012, MED completed a project to replace its toilets and urinals with high-efficiency models. During the renovation, MED installed dual-flush toilets with 1.6 and 1.1 gpf flushing options and 0.125 gpf urinals. Two of MED's toilets are a different type of technology and flush at or below the 1.6 gpf EPA requirement.

Most of MED's faucet fixtures are water-efficient, flowing at 0.5 gpm, although seven faucets still flow higher. The 0.5 gpm flow rate is lower than the EPA requirement for faucets and is compliant with the American Society of Mechanical Engineers/Canadian Standards Association (ASME/CSA) standard for lavatory faucets in public use. This flow rate is sufficient for hand washing and is considered a best practice for lavatory sinks in public settings.

MED's showerheads are compliant with the EPA requirement of 2.5 gpm.

Table 3 provides an inventory of sanitary fixtures.

Table 3. Sanitary Fixtures Inventory, MED

Fixture	Quantity	Flow Rate
Toilets	21	Dual-flush (1.6 and 1.1 gpf options)
	1	1.6 gpf
	1	1.1 gpf
Urinals	5	0.125 gpf
Lavatory Faucets	4	2.2 gpm
	2	2.0 gpm
	1	1.5 gpm
	14	0.5 gpm
Showerheads	7	2.5 gpm

To reduce water use in the restrooms, MED could install 0.5 gpm faucet aerators on the seven faucets that remain with higher flow rates. In addition, it could replace its existing showerheads with 1.5 gpm WaterSense labeled showerheads.

Miscellaneous Water Uses

MED does not have any other significant water uses other than those described above. The facility is equipped with tabletop, hand-filled steam sterilizers that are not connected directly to

potable water supply. In addition, the facility uses water for laboratory faucets, janitorial uses, galley sinks, hose bibs, and other minor uses.

5.5 Non-Consumptive End Uses of Water

MED uses a lake water for non-contact building and equipment cooling, aquatic culture research, water tower overflow, and producing RO water used for research. Since all of this water use is returned to the lake in the same quantity that it was taken, this water use is considered non-consumptive. Water used in aquatic culture research is treated by cartridge filtration, ozonation, sand filtration, and UV light disinfection, so that it can be returned to the lake in the same quality that it was taken. provides the end uses of non-consumptive water at MED.

Table 4. Major Non-Consumptive Water Uses, MED, FY 2012

Major Process	Water Source	Discharge Point	FY 2012 Annual Consumption (gallons)	Percent of Total Water Use (%)	Supporting Calculations and Source Documentation
Non-Contact Cooling Water (building and equipment cooling)	Lake	Lake	73,033,584	73.1	Calculated by difference from the lake water supply total and the other estimated lake water uses.
Aquatic Culture Water	Lake	Lake	23,605,242	23.7	FY 2012 water treatment system flow to lake meter readings (#48).
Water Tower Overflow	Lake	Lake	3,000,000	3.0	Engineering estimate based on difference between December 2011 use of just over 9,000,000 gallons per month and other baseline use of just over 6,000,000 gallons per month.
RO Reject Water	Lake	Lake	159,180	0.2	Difference between FY 2012 RO system feed meter readings (Meters #41 and #42) and RO permeate meter readings (Meters #39 and #40).
Total Non-Consumptive Water Use	Lake	Lake	99,798,006	100.0	FY 2012 lake water supply meter readings (Meter #1).

6.0 DROUGHT CONTINGENCY PLAN

Water shortages are uncommon in Duluth due to an abundant water supply from Lake Superior. The City of Duluth does not have an official water management plan specifically for droughts.

In the event that voluntary or mandatory water consumption reductions are instituted by Minnesota Department of Natural Resources or City of Duluth Public Works and Utilities Department, MED will form a task force of facility personnel to identify and implement modifications to facility operations to achieve specified reductions in water consumption.

Minnesota drought information resources, including the April 29, 2009, Minnesota Statewide Drought Plan, are available at:

http://climate.umn.edu/doc/journal/drought_information_resources.htm