Water Management Plan

United States Environmental Protection Agency
Large Lakes Research Station

9311 Groh Road
Grosse Ile, Michigan 48138

20 August 2007

Point of Contact:
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EPA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
LARGE LAKES RESEARCH STATION

WATER MANAGEMENT PLAN

Approved by:

Mr. Rodney Booth, Facilities Manager — Date 8/21/07

Dr. Russell G. Kreis, Jr., Station Chief — Date August 24, 2007

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1.0 EPA'S STATEMENT OF PRINCIPLES ON EFFICIENT WATER USE

In order to meet the needs of existing and future populations and ensure that habitats and ecosystems are protected, the nation's water must be sustainable and renewable. Sound water resource management, which emphasizes careful, efficient use of water, is essential to achieve these objectives.

Efficient water use can have major environmental, public health, and economic benefits by helping to improve water quality, maintain aquatic ecosystems, and protect drinking water resources. As we face increasing risks to ecosystems and their biological integrity, the inextricable link between water quality and water quantity becomes more important. Water efficiency is one way of addressing water quality and quantity goals. The efficient use of water can prevent pollution by reducing wastewater flows, recycling process water, reclaiming wastewater, and using less energy.

EPA recognizes that regional, state, and local differences exist regarding water quality, quantity, and use. Differences in climate, geography, and local requirements influence the water efficiency programs applicable to specific facilities. Therefore, EPA is establishing facility-specific Water Management Plans to promote the efficient use of water and meet the water conservation requirements under Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management.

This Water Management Plan has been established to document and promote the efficient use of water at the EPA, Office of Research and Development, Mid-Continent Ecology Division, Large Lakes Research Station in Grosse Ile, Michigan. The plan is organized according to the Federal Energy Management Program (FEMP) Facility Water Management Planning Guidelines.

2.0 FACILITY DESCRIPTION

The Large Lakes Research Station (LLRS) houses the Large Lakes and Rivers Forecasting Research Branch within the Mid-Continent Ecology Division, and staff from EPA Region 5 Superfund Emergency Response Section, Office of Enforcement and Compliance Assurance – Region 5 Criminal Investigation Division, Region 5 Great Lakes National Program Office, US Fish and Wildlife Service, and support contractors.

Research is focused on developing methods to predict and assess the effects of pollution on freshwater ecological resources. The primary research activities are modeling of environmental stressors and analysis of inorganic chemicals in soils, sediments, and biota. The research station is composed of a main laboratory building and three ancillary buildings, the carpenter shop, the boat shop and tin hanger. Laboratory facilities are located on a three acre parcel at the southern end of Grosse Ile, an island in the mouth of the Detroit River.

The station has a long history. First developed in the late 1920’s as a naval reserve aviation base, the boat shop is associated with this period. During the early 1940’s, the Navy base at Grosse Ile became a significant naval aviation training center and the main laboratory building was constructed, although at the time its primary function was to support aviation operations. Laboratory operations began in the 1960s under the Public Health Service of the Department of Health Education and Welfare. In 1970 the laboratory joined the newly formed U.S.

Environmental Protection Agency. The main laboratory building was renovated into its current laboratory configuration in 1974. LLRS contains 32,477 square feet of conditioned space and is owned and operated by EPA.

3.0 FACILITY WATER MANAGEMENT GOALS

The resource conservation goals of Mid-Continent Ecology Division (MED) are achieved through the implementation of an Environmental Management System (EMS). The MED EMS policy statement is provided below.

Environmental Management System Policy

The U.S. Environmental Protection Agency's Office of Research and Development (ORD) mission is to perform state-of-the-science research to identify, understand, and solve current and future environmental problems; provide responsive technical support to EPA's mission; integrate the work of ORD's scientific partners (other agencies, nations, private sector organizations, and academic institutions); provide leadership in addressing emerging environmental issues; and advance the science and technology of risk assessment and risk management.

ORD continues to encourage and set an example of research and development activities which use effective environmental management systems that focus on regulatory compliance, pollution prevention, and resource preservation. With this policy, the National Health and Environmental Effects Research Laboratory – Mid-Continent Ecology Division joins other ORD sites in committing to implement EMS for our own employees, operations, and facilities. Collectively, ORD will become a leader in executing a model environmental management system within the Agency.

At the Division, we commit to reduce the environmental impacts and consumption of natural resources by our facilities operations and to comply with all legal and applicable requirements. Our environmental management system will be designed to meet the following goals:

- Ensure progress by meeting or exceeding all applicable environmental requirements while conducting research and other operations activities;
- Strive to continually improve environmental management;
- As appropriate, integrate source reduction and other pollution prevention approaches into day to day research activities;
- As appropriate, consider the environment when making planning, purchasing, and operating decisions;
- Establish, track, and review specific environmental performance goals and employee awareness; and
- As appropriate, share environmental management information with our research partners and other interested parties.

4.0 UTILITY INFORMATION

Rate Schedule and Contact Information

Potable water and sewer service is provided by:

The Township of Grosse Ile
Department of Public Services
9601 Groh Road
Grosse Ile, MI 48138

734-676-4422

Water and sewer service is provided at a rate of $4.32 per 100 cubic feet ($5.78 per 1,000 gallons).

Payment Office

Mark Horngren
USEPA Environmental Effects Research Laboratory
Mid-Continent Ecology Division/ORD
6201 Congdon Boulevard
Duluth, MN 55804

218-529-5055

5.0 FACILITY WATER USE INFORMATION

The laboratory building contains a mixed use of laboratory and office space. The laboratory space is configured for bench scale analyses of samples for inorganic constituents. Water is used for sanitary needs, building mechanical systems (including single pass cooling), laboratory processes, and irrigation. Additional details on facility water use are provided in the following sections.

Major Water Using Processes

Estimates of potable water consumption by major use area are provided in Table 1. These data reflect average annual facility water use between April 2005 and March 2007.

Measurement Devices

Incoming water is supplied by the Township of Grosse Ile Department of Public Services through two metered supply lines, one each to the main laboratory building and the carpenter shop. The main laboratory supply line is equipped with a compound meter that measures flow under both high flow and low flow conditions.

Virtually all of the water used is delivered through the meter to the main laboratory. The meter in the carpenter shop, which supplies two utility sinks, has not registered any measurable flow in the past two years.

Shut-off Valves

A shut off valve for the main laboratory supply is located in a metering closet in the employee break room. A shut off valve for the supply to the carpenter shop is located in the corner of the building adjacent to the water meter.

Occupancy and Operating Schedules

Approximately 50 people work at LLRS. The facility operates on a flex time schedule, one shift per day, Monday through Friday.

Table 1. Major Water Using Processes – Potable Water

Major Process	Annual Consumption (gallons)	Percent of Total	Comments
Sanitary water	250,000	49.9	Engineering estimate
Miscellaneous laboratory water use	78,000	15.6	Engineering estimate
Irrigation water	70,000	14.0	Engineering estimate
Single pass cooling of air conditioner unit in Room DD.	103,000	20.6	Engineering estimate, calculated by difference
TOTAL	501,000	100	**Average annual metered usage, April 2005 to March 2007**

Additional detail on assumptions and calculations supporting these water use estimates are provided in Appendix A.

6.0 BEST MANAGEMENT PRACTICE SUMMARY AND STATUS

The President has established Water Reduction Goals under Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management. Under the Executive Order, Agencies must establish a FY 2007 water use baseline, and then reduce water use intensity by 2 percent annually through the end of FY 2015, for a total reduction of 16 percent. Facilities should implement Best Management Practices (BMPs) related to water use, considering life-cycle cost effectiveness, to achieve these water reduction goals. The Federal Energy Management Program (FEMP) has identified BMPs in 10 possible areas to help facilities identify and target water use reductions. LLRS has adopted BMPs in three of the areas, as checked below:

- □ Public Information and Education Programs
- ✓ Distribution System Audits, Leak Detection, and Repair
- ✓ Water-Efficient Landscape
- □ Toilets and Urinals
- □ Faucets and Showerheads
- ✓ Boiler/Steam Systems
- □ Single-Pass Cooling Systems
- □ Cooling Tower Systems
- □ Miscellaneous High Water-Using Processes
- □ Water Reuse and Recycling

Public Information and Education Programs

Employees have been educated on water and other resource conservation topics through implementation of the MED EMS. No BMP status is claimed in this area, pending establishing specific water conservation objectives for the LLRS.

Distribution System Audits, Leak Detection, and Repair

Facility staff are trained to report leaks and malfunctioning water-using equipment to the on-site facilities manager designee. Reported maintenance problems are assigned a work order, which are completed by the facility operation and maintenance (O&M) contractor. Work orders are tracked until the job is completed and the request is closed out.

The on-site O&M contractor performs a visual inspection of core building and mechanical spaces each morning and again before leaving for the day. Any leaks or other mechanical problems are corrected promptly. Janitors are trained to report any observed problems to the facilities manager designee. The facility also makes use of an automatic leak detection system, based on conductivity bridges ("water bugs") placed on the floor adjacent to water using equipment. If water leaks on the floor, it completes a circuit across the contacts of the conductivity bridge, which triggers an alarm on the building control system.

A screening level system review was conducted in July 2007, and known water uses account for over 90% of water consumption.

Under this plan, trends in monthly water use will be monitored by the facilities manager designee and changes that are not understood or expected will be investigated and resolved.

LLRS has an aggressive program in place to identify and respond to leaks; BMP status has been achieved in this area.

Water-Efficient Landscape

Minimal landscape irrigation water is used at LLRS. Across most of the three acre site, grasses and shrubs are climate appropriate and survive on natural rainfall. Some hand watering is practiced, as necessary, during dry periods in the summer. The hand watering is limited to maintaining the health of shrubs and trees planted along the foundation perimeter of the main

laboratory building, and a lawn area adjacent to the building entrance. The lawn area requires supplemental irrigation because it is planted in relatively thin soil cover placed over a driveway taken out of service for security reasons. BMP status has been achieved in this area as irrigation is only applied on a limited basis to keep plants from dying off during dry conditions.

Toilets and Urinals

Toilets and urinals installed during the laboratory renovation in the early 1970s predate the 1992 Energy Policy Act (EPAct) water efficiency requirements (1.6 gallons per flush for toilets and 1.0 gallons per flush for urinals), and flow at higher flow rates. An inventory of sanitary fixtures is provided in Table 2.

Table 2. LLRS, Inventory of Sanitary Fixtures

Fixture Type	Estimated Flow Rate	Total Number
Toilets	5 gpf	5
Urinals	3 gpf	4
Lavatory faucets	>2.2 gpm	5
Showers	Not applicable	0

gpf – gallons per flush
gpm – gallons per minute

Janitorial staff and employees are trained to report leaks or other maintenance problems to the facilities manager designee or O&M staff, which are immediately corrected.

BMP status is not claimed in this area, pending replacement of sanitary fixtures with ones that are EPAct compliant at a minimum, or even more efficient.

Faucets and Showerheads

Faucets predate the 1992 Energy Policy Act (EPAct) water efficiency requirements (2.2 gallons per minute for faucets) and flow at higher flow rates. An inventory of sanitary fixtures is provided in Table 2.

The American Society of Mechanical Engineers has established a standard for lavatory faucets in public use (essentially all applications but domestic residences) with a maximum flow rate of 0.5 gpm (ASME A112.18.1). This flow rate is sufficient for hand washing and is considered a best practice for lavatory sinks in public settings.

Water pressure is 50 pounds per square inch, within the range for optimum system performance.

Janitorial staff and employees are trained to report leaks or other maintenance problems to the facilities manager designee or O&M staff, which are immediately corrected.

No BMP credit is claimed in this area, pending replacement of existing faucets or faucet aerators with ones that flow at 0.5 gpm.

Boiler/Steam Systems

LLRS is equipped with two steam boilers, each rated at 960,000 btus. The boilers were originally installed in 1968 and are nearing the end of their service life. An active project is underway to replace the boilers. Conceptual planning is being conducted in 2007 with construction scheduled for 2008. A decision has not yet been made whether the current boilers will be replaced with a steam or hot water system.

Steam is currently generated to supply primary heat to the building air handlers, and to supply heat to a heat exchanger used to generate building hot water. The building hot water is used for exterior wall baseboard heating on the main laboratory first floor, and to supply reheat coils in the air handlers. Steam condensate is collected and returned to the boilers. A small quantity of steam is blown down from the boilers each morning as a preventative maintenance measure. Steam and condensate return lines are inspected on a bimonthly basis. No chemical treatment of the boiler water is provided.

There is good condensate recovery from the existing system and BMP credit is claimed in this area.

Once the new boiler system is installed in 2008, a routine monitoring system will be instituted to evaluate and control boiler water chemistry. This will prevent scale and corrosion and should help optimize boiler efficiency.

Single-Pass Cooling

Single pass cooling is used to cool an air conditioner located in Room DD. The air conditioner is used to provide supplemental cooling for a low level metals analysis laboratory in Rooms 201 and 203. The analytical instrumentation is being replaced in 203, and design work for a remote condensing air conditioning system that would eliminate the use of single pass cooling water has been completed. However, the replacement project has not been approved.

No BMP credit is claimed in this area pending the elimination of single pass cooling water use.

Cooling Tower Systems

No cooling towers are used; no BMP credit is claimed in this area.

Miscellaneous High Water-Using Processes

No other high water-using processes were identified; no BMP credit is claimed in this area.

Water Reuse and Recycling

LLRS is evaluating a potential option to divert rainwater from a roof drain and store it in a cistern in the basement of the main laboratory building. The cistern would be created from the existing foundation walls of an enclosed area of the basement. Stored water could be used for landscape irrigation. The structural impact of this approach on the building has not been evaluated. No BMP credit is claimed in this area at this time.

7.0 DROUGHT CONTINGENCY PLAN

The Township of Grosse Ile Department of Public Services does not have a specific drought management plan. In the event that voluntary or mandatory water conservation reductions are instituted by the Department of Public Services, LLRS will form a task force of facility and operating personnel to identify and implement modifications to facility operations to achieve additional specified reductions in water consumption.

8.0 COMPREHENSIVE PLANNING

The facilities manager will ensure that water supply, wastewater generation, and water efficiency BMPs are taken into account during the initial stages of planning and design for any facility renovations or new construction. These factors will also be considered prior to the purchase and installation of any water using equipment. Where applicable, LLRS will purchase WaterSense[SM] labeled products.

9.0 OPPORTUNITIES FOR FURTHER WATER CONSERVATION

LLRS is implementing or considering the following projects to achieve additional reductions in water use:

1) **Install 0.5 gpm faucet aerators on bathroom sinks.** High efficiency faucet aerators can be purchased and installed for less than $5 each, for a total cost of less than $100. Projected savings are estimated to be 40,000 gallons and $230 per year.

2) **Upgrade non EPAct compliant toilets and urinals.** Renovate restrooms with EPAct compliant, or even more efficient, toilets and urinals. Projected savings are estimated to be 80,000 gallons and $460 per year. Cost of 9 upgraded fixtures, at an approximate cost of $500 per fixture, is $4500 for a simple 9 year payback.

3) **Eliminate single pass cooling water for air conditioner cooling in Room DD**. Projected savings would be 100,000 gallons and $580 per year. The planned air conditioner replacement project, with an estimated cost of $85,000, would not be cost effective based on water savings alone. However, the current air conditioner is inadequate to maintain the required laboratory environment. Other alternatives to reduce or eliminate single pass cooling water should be investigated if the replacement project is not implemented.

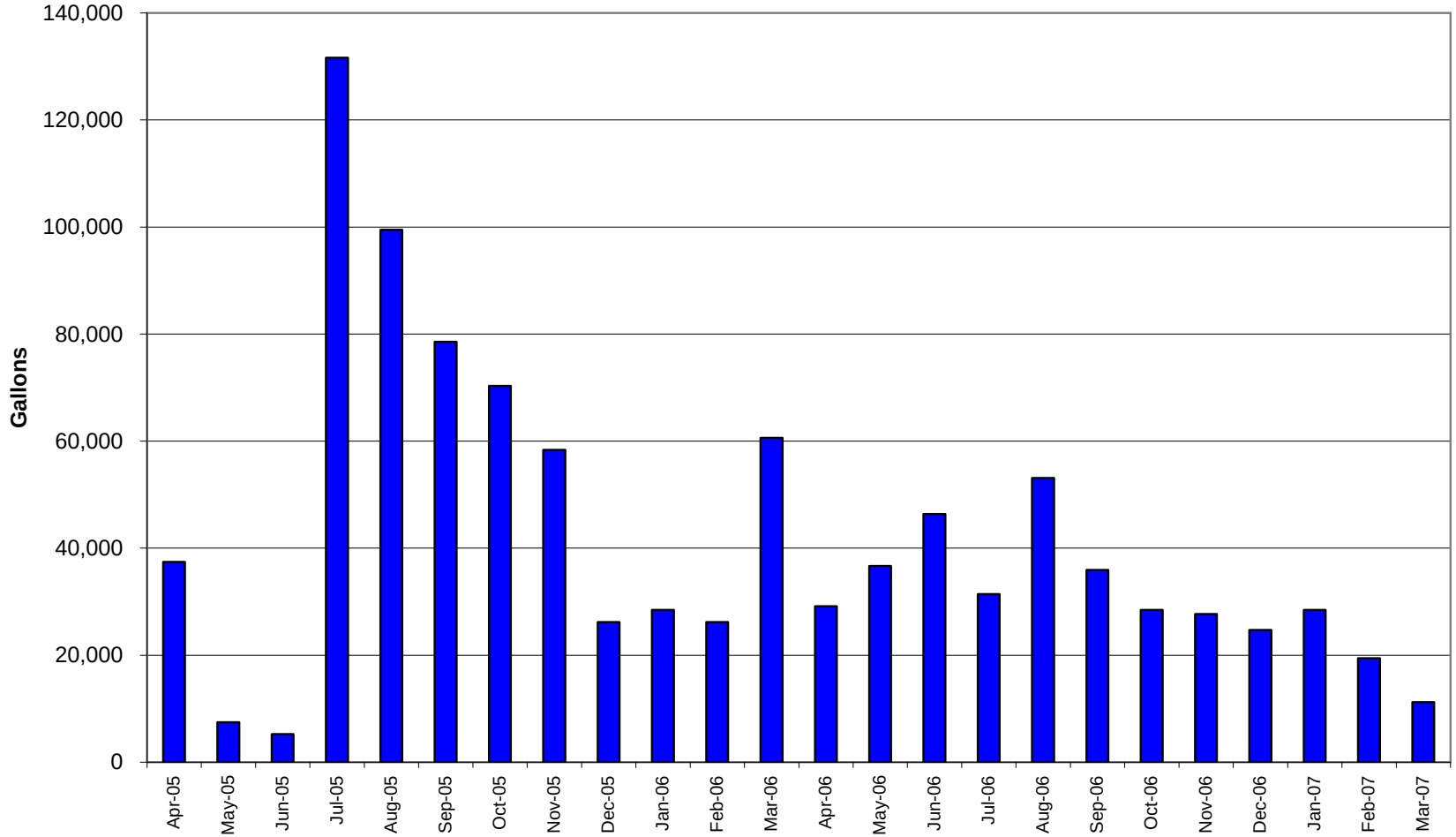
Appendix A

WATER USE AND WATER BALANCE SUPPORTING CALCULATIONS

Large Lakes Research Station
Water Balance Supporting Calculations
Based on Water use Data from April 2005 to March 2007

Major Process	Annual Consumption (gallons)	Supporting Calculations
Sanitary water	250,000	Engineering estimate based on 50 people using 20 gallons/day, 250 days per year. 50 × 20 × 250 = 250,000 gallons.
Miscellaneous laboratory water use	78,000	Baseline water use, calculated from monthly data from October 2006 to January 2007 is 27,300 gallons per month. This period does not include irrigation water or once through cooling of air conditioning unit in Room DD. 27,300 gallons/month × 12 months = 327,600. Baseline use minus sanitary use gives: 327,600 -250,000 = 77,600 gallons.
Irrigation water	70,000	Irrigation water can be calculated as the excess above baseline use for the period May 2006 to September 2006. Total of May 2006 to September 2006 is 203,470 gallons. Baseline use is 5 × 27,300 = 136,500 gallons. Irrigation water, calculated by difference, is 203,470 – 136,500 = 66,970 gallons.
Single pass cooling of air conditioner unit in Room DD.	103,000	Calculated by difference. 501,000 – 250,000 – 78,000 – 70,000 = 103,000
TOTAL	501,000	**Average annual metered usage, April 2005 to March 2007**

Total Water Use (gallons) at the Large Lakes Research Station, Gross Ile, Michigan
(April 2005 - March 2007)



Water Use at the Large Lakes Research Station - Grosse Ile
April 2005 to March 2007

Month-Year	Total (CCF)	Total (gallons)
Apr-05	50.0	37,403
May-05	10.0	7,481
Jun-05	7.0	5,236
Jul-05	176.0	131,657
Aug-05	133.0	99,491
Sep-05	105.0	78,545
Oct-05	94.0	70,317
Nov-05	78.0	58,348
Dec-05	35.0	26,182
Jan-06	38.0	28,426
Feb-06	35.0	26,182
Mar-06	81.0	60,592
Apr-06	39.0	29,174
May-06	49.0	36,655
Jun-06	62.0	46,379
Jul-06	42.0	31,418
Aug-06	71.0	53,112
Sep-06	48.0	35,906
Oct-06	38.0	28,426
Nov-06	37.0	27,678
Dec-06	33.0	24,686
Jan-07	38.0	28,426
Feb-07	26.0	19,449
Mar-07	15.0	11,221
TOTAL	**1,340.0**	**1,002,390**
ANNUAL USE		**501,195**