

# Water Management Plan

United States Environmental Protection Agency  
Land Remediation and Pollution Control Division  
Center Hill Research Laboratory  
5995 Center Hill Avenue  
Cincinnati, Ohio 45224



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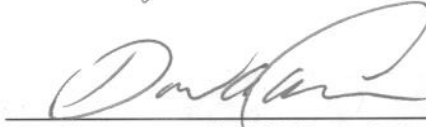


UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
CENTER HILL RESEARCH LABORATORY  
CINCINNATI, OHIO

WATER MANAGEMENT PLAN

Approved by:

  
Richard D. Koch, Director, Facilities Management and Services Division 3/2/09 Date

  
David Carson, Chief, Waste Management Branch 27 FEB 2009 Date

## TABLE OF CONTENTS

	<b>Page</b>
1.0 EPA'S STATEMENT OF PRINCIPLES ON EFFICIENT WATER USE .....	1
2.0 FACILITY DESCRIPTION.....	1
3.0 FACILITY WATER MANAGEMENT GOALS .....	1
4.0 UTILITY INFORMATION .....	3
5.0 FACILITY INFORMATION .....	3
6.0 BEST MANAGEMENT PRACTICE SUMMARY AND STATUS.....	4
7.0 DROUGHT CONTINGENCY PLAN.....	7
8.0 COMPREHENSIVE PLANNING .....	8
9.0 OPPORTUNITIES FOR FURTHER WATER CONSERVATION .....	9

Appendix A: WATER BALANCE SUPPORTING CALCULATIONS

## LIST OF TABLES

	<b>Page</b>
1 Major Water Using Processes, Center Hill Facility.....	4

## **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 also 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 Center Hill Research Laboratory located in Cincinnati, Ohio. The plan is organized according to the Federal Energy Management Program (FEMP) Facility Water Management Planning Guidelines under Executive Order 13423.

## **2.0 FACILITY DESCRIPTION**

The Center Hill Research Laboratory was originally constructed in the late 1960s. EPA initiated operations at the laboratory in the mid 1970s, building up the level of activity at the laboratory throughout the 1980s. Laboratory scientists conduct research related to treatment, immobilization, and containment of contaminants in soil and sediment, and related environmental exposures. The main laboratory building includes a research wing comprised of a high bay area with a row of laboratory spaces adjacent to the high bay, and an office wing with a reception area, staff offices, rest rooms and employee break room. A separate trailer building constructed in the mid 1990s is located behind the main laboratory, housing contractor staff offices. EPA owns the research buildings with a total estimated area of 23,659 gross square feet. The buildings are located on 18.5 acres of land leased from the University of Cincinnati. The current 20 year land lease runs through 2019. The University of Cincinnati operates additional research facilities on the adjacent property.

## **3.0 FACILITY WATER MANAGEMENT GOALS**

The water management goals of the Center Hill Laboratory are achieved through the implementation of an Environmental Management System (EMS). The EMS has been established and is being implemented consistent with EPA's Office of Administration and Resources Management environmental management policy for EPA-Cincinnati. The

environmental policy statement and EMS aspects and targets related to water management are included in the following sections.

### **Environmental Policy Statement**

The Mission of the U.S. Environmental Protection Agency (EPA) is to protect human health and environment. The Agency accomplishes this mission by developing and enforcing regulations, implementing environmental laws enacted by Congress, providing assistance to others charged with reducing and preventing pollution, and by conducting environmental research.

In support of this mission, EPA Cincinnati is committed to Environmental Stewardship. To accomplish this we must properly manage the environmental impacts of our own operations and facilities.

EPA Cincinnati is one of the Agency's largest research operations. Accordingly, we recognize our obligation and opportunity to provide leadership in protecting the environment, addressing emerging environmental issues, advancing science and technology of risk assessment and risk management, and promoting environmental education.

EPA Cincinnati is committed to reducing the environmental impacts of our operations and limiting our natural resource consumption. Our Environmental Management System (EMS) will address the following goals:

- Maintain a collaborative EMS that covers the EPA organizations in Cincinnati;
- Ensure compliance by meeting or exceeding all relevant environmental requirements to which we subscribe;
- Seek to continually reduce the environmental footprint of EPA Cincinnati;
- Consider environmental impacts in planning, constructing and operating facilities;
- Incorporate source reduction and pollution prevention into research activities;
- Establish, track and review environmental performance goals; and
- Share information about our EMS with interested parties.

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

In view of this environmental policy, EPA-Cincinnati has identified water consumption as a significant environmental aspect and has established the reduction of potable water consumption as an objective under the EMS. As a specific target, EPA-Cincinnati will reduce potable water consumption by an average of 2% per year over eight years (Fiscal Years 2008 to 2015) for a total of 16%, using Fiscal Year 2007 as a baseline.

#### **4.0 UTILITY INFORMATION**

##### **Contact Information**

Potable water is provided by:

City of Cincinnati  
Greater Cincinnati Water Works  
4747 Spring Grove Avenue  
Cincinnati, Ohio 45232

Phone: 513-591-7700

Sewage service is provided by:

Metropolitan Sewer District of Greater Cincinnati  
1600 Gest Street  
Cincinnati, OH 45204

Phone: 513-352-4900

##### **Rate Schedule**

Water and sewer charges are based on a prorated portion of the total metered water flow to the facilities located along the main drive way to the University of Cincinnati property where the EPA laboratory is located. The drive way supports both the EPA laboratory and facilities owned and operated by the University of Cincinnati.

EPA is billed by the University of Cincinnati for its portion of the combined water and sewer charges, determined by a meter installed on the supply line where it enters the EPA building. EPA is charged \$5.67 per hundred cubic feet (CCF) of water (\$7.58 per 1,000 gallons), as of September 2007.

##### **Payment Office**

Chris Hutcherson  
USEPA – Facilities  
26 West Martin Luther King Drive  
Mail Code 265  
Cincinnati, OH 45268

Phone: 513-569-7262

#### **5.0 FACILITY INFORMATION**

The primary feature of the Center Hill Research Laboratory is the high bay area and associated laboratory spaces. Water is used for sanitary needs, glassware washing, steam distillation, steam autoclave, general laboratory use, and non-contact cooling of analytical instrumentation.

## Major Water Using Processes

Estimates of water consumption by major use area are provided in Table 1. These data reflect average water use during FY 2007.

**Table 1. Major Water Using Processes, Center Hill Facility**

Major Process	Annual Consumption (gallons)	Percent of Total	Comments
Sanitary	130,000	16.0	Engineering estimate
Deionized water	26,395	3.2	Metered total
Steam sterilizer tempering water	160,000	19.7	Engineering estimate
Single pass cooling water (XRD cooler)	270,000	33.2	Engineering estimate
Other lab activities (primarily single pass cooling on Mossbauer analytical unit helium compressor)	226,585	27.9	Calculated by difference
<b>TOTAL</b>	<b>812,980</b>	<b>100</b>	<b>Metered Total</b>

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

## Measurement Devices

City water supplied to the Center Hill facility is metered by EPA and recorded monthly.

Flow totalizing meters are installed on the two deionized water supply systems supplying laboratory needs. Data from these meters are recorded weekly.

## Shut-off Valves

City water supply line shutoffs are located in the high bay area.

## Occupancy and Operating Schedules

Approximately 35 employees work at the Center Hill facility. The facility operates on a flex time schedule and is typically occupied between 6:00 a.m. and 6:00 p.m., Monday through Friday.

## 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 14 possible areas to help facilities identify and target water use reductions. The Center Hill facility has adopted BMPs in six of the areas, as checked below:

- Water Management Planning
- Information and Education Programs
- Distribution System Audits, Leak Detection and Repair
- Water Efficient Landscaping
- Water Efficient Irrigation
- Toilets and Urinals
- Faucets and Showerheads
- Boiler/Steam Systems
- Single-Pass Cooling Equipment
- Cooling Tower Management
- Commercial Kitchen Equipment
- Laboratory/Medical Equipment
- Other Water Use
- Alternate Water Sources

Additional information related to each BMP area is provided in the following sections.

### **Water Management Planning**

This plan addresses the recommended elements of a water management plan and satisfies best management practice related to water management planning.

### **Information and Education Programs**

The Center Hill facility promotes water conservation and awareness through the implementation of the EMS for EPA-Cincinnati. Best management practice status has been achieved in this area.

### **Distribution System Audits, Leak Detection and Repair**

A screening level system audit was conducted in December 2007. Known water uses accounted for over 90 percent of metered facility water consumption.

Facility staff are trained to report leaks and malfunctioning water using equipment to a facility maintenance trouble desk. Reported problems are assigned a work order, which is completed by the facility operation and maintenance (O&M) contractor.

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

Best management practices have been implemented in this area.

### **Water Efficient Landscape**

The laboratory is located on an 18.5 acre site with tree cover in undeveloped portions and grass and small shrubs surrounding the buildings and parking areas. The landscape is satisfied with natural precipitation. No irrigation is applied; turf areas are allowed to brown out during dry periods and are naturally restored when precipitation occurs. Best management practice status is achieved in this area.

### **Water Efficient Irrigation**

Not applicable, no irrigation water is utilized.

### **Toilets and Urinals**

Toilets and urinals have all been replaced or installed within the past ten years. One urinal in the primary men's restroom was converted to a non-water urinal in 2007. The six toilets and one other urinal meet water efficiency standards of 1.6 gallons per flush (gpf) and 1.0 gpf, respectively.

Janitorial staff and employees are trained to report leaks or other maintenance problems, which are immediately corrected by the O&M contractor. Best management practice status is achieved in this area.

### **Faucets and Showerheads**

Faucets and showerheads have all been replaced or installed within the past ten years. The primary men's restroom was renovated in 2007 and equipped with two 0.5 gpm lavatory faucets and one 1.6 gpm showerhead. The three other lavatory sinks at the Center Hill laboratory are equipped with 2.2 gpm faucets. The one other showerhead is rated at 2.5 gpm.

System pressure is maintained between 20 to 80 pounds per square inch, within the range recommended for optimum system performance. Janitorial staff and employees are trained to report leaks or other maintenance problems, which are immediately corrected by the O&M contractor.

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. No BMP credit is claimed in this area, pending replacement or retrofit of 2.2 gpm faucets with faucets or faucet flow controllers that have a maximum flow of 0.5 gpm.

### **Boiler/Steam Systems**

Heat is supplied by gas fired duct furnaces, no steam is utilized. A small steam generator supplies a dishwasher, sterilizer, and steam distillation unit. Condensate from these units is not recovered. No BMP credit is claimed in this area.

### **Single Pass Equipment Cooling**

Single pass water is used to cool a chiller that services an x-ray diffraction (XRD) instrument, to cool a helium compressor on the Mossbauer analytical instrument, and to cool an atomic adsorption spectrophotometer. Considering the ongoing use of single pass cooling water, no BMP credit is claimed in this area.

### **Cooling Tower Management**

The Center Hill facility is not equipped with a cooling tower. This criteria is not currently applicable; therefore, no BMP credit is claimed.

### **Commercial Kitchen Equipment**

The Center Hill facility is not equipped with a commercial kitchen. This criteria is not currently applicable; therefore, no BMP credit is claimed.

### **Laboratory/Medical Equipment**

Center Hill operates two steam sterilizers: one AMSCO 3021 and one manufactured by Consolidated Stills and Sterilizers. Approximately 0.3 gpm of tempering water flows to the drain connection of the AMSCO unit at all times, even when the sterilizer is not operating. BMP status has not been achieved in this area, pending modification of the AMSCO unit, or instituting operational controls to significantly reduce the cooling water flow.

### **Other Water Use**

No other significant uses of water have been identified. BMP status is not claimed in this area.

### **Alternate Water Sources**

No alternate water sources have been identified. BMP status is not claimed in this area.

## **7.0 DROUGHT CONTINGENCY PLAN**

The City of Cincinnati does not have a water management plan specifically for droughts. However, as conditions warrant, the Center Hill facility is prepared to follow the water use recommendations and restrictions outlined under the State of Ohio Drought Response Plan. Key recommendations of this plan are summarized below. Ohio has defined four levels of drought response: normal phase, alert phase, conservation phase, and emergency phase.

### **Normal Phase**

In this phase, water supplies are adequate and climatological conditions are normal. Recommended action is to develop water conservation measures and a water recycling program. Appropriate conservation and recycling measures at the Center Hill facility are being addressed under this plan.

## **Alert Phase**

Climatological data indicates above normal temperatures and below normal precipitation for an extended period. Streamflow, reservoir levels, and/or groundwater levels are below normal over an extended period of time. Recommended action is to activate conservation measures and reduce water for nonessential uses, such as fountains, landscape watering, and washing of motor vehicles.

## **Conservation Phase**

Climatological conditions worsen and water levels continue to decline. Water conservation measures are increased and all nonessential uses are eliminated.

The Center Hill facility strives to operate at a level consistent with the conservation phase as part of its routine operating practice. Water is not used for nonessential purposes such as landscape irrigation, decorative fountains, and motor vehicle washing.

## **Emergency Phase**

Climatological conditions continue to worsen and water levels continue to diminish. Conservation measures have to be more stringent to ensure adequate water supply for health and sanitary purposes. Recommended action is to reduce operational levels so that a water use reduction goal of 30 percent can be achieved.

If a conservation phase drought is declared in the greater Cincinnati water management district, the Director of the Land Remediation and Pollution Control Division will consult with the Director of the Facilities Management and Services Division and together they will identify modifications to facility operations that could be implemented to achieve emergency phase reductions. Operational changes will be implemented as necessary to meet declared emergency phase water use restrictions.

Additional information on the Ohio Drought Response Plan can be found at:

<http://www.epa.state.oh.us/ddagw/Documents/droughtactions.pdf>

## **8.0 COMPREHENSIVE PLANNING**

The Directors of the Land Remediation and Pollution Control Division and the Facilities Management and Services Division 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 equipment that would measurably change facility water consumption.

## 9.0 OPPORTUNITIES FOR FURTHER WATER CONSERVATION

The Center Hill facility is pursuing the following projects to achieve additional reductions in water use:

1. **Eliminate use of single pass cooling water.** Single pass cooling water for the XRD and Mossbauer analytical instruments constitute a significant quantity of Center Hill's water use. Center Hill will evaluate the option of eliminating this cooling water by using point of use, air cooled chillers. Alternatively, a small package chiller might be able to supply cooling water to both analytical instruments. Potential water and associated cost savings are 450,000 gallons and \$3,400 per year.
2. **Install Tempering Water Control Valve on the AMSCO steam sterilizer.** A tempering water control valve could be installed on the steam sterilizer, to restrict tempering water flow to only those periods when condensate above 140 °F is being discharged. At an installed cost of approximately \$2,500, the unit is estimated to save approximately 140,000 gallons per year, for annual savings of \$1,000 at current water rates. Simple payback would occur in less than three years. As an alternative, operational controls could be implemented to have the operator manually turn off the water supply to the sterilizer when it is not in use. Savings are anticipated to be similar, although the saving may decrease over time unless the operational control is implemented consistently on a long term basis.
3. **Retrofit remaining lavatory faucets with 0.5 gpm flow controllers.** High efficiency faucet flow controllers can be retrofit on existing 2.2 gpm faucets for approximately \$10 each, for a total cost of less than \$50. Projected savings are estimated to be 7,000 gallons and \$50 per year, offering a 1 year simple payback.

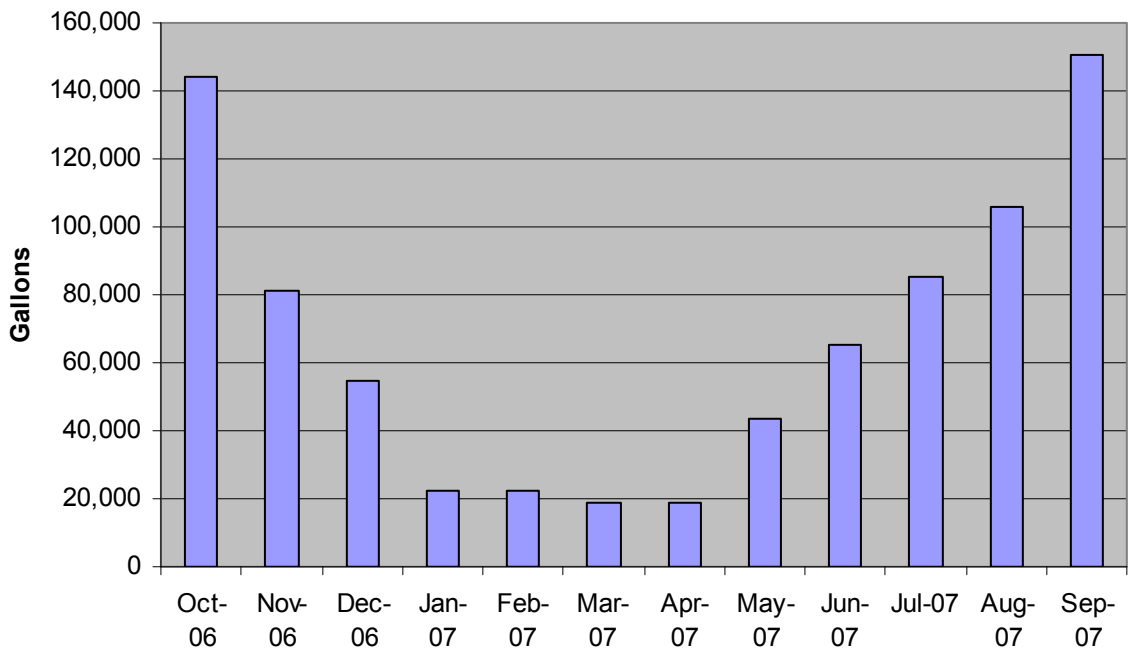
**Appendix A**

**WATER BALANCE SUPPORTING CALCULATIONS**

**Center Hill Facility, Cincinnati, Ohio**

<b>Major Process</b>	<b>Annual Consumption (gallons)</b>	<b>Supporting Calculations</b>
Sanitary	130,000	Engineering estimate. Based on 15 gallons per person per day. Assume 35 people and 250 operating days. $(35 \text{ people} \times 15 \text{ gal/person-day} \times 250 \text{ days/year}) = 131,250 \text{ gallons}$
Deionized water	26,395	Based on measured total flow on Kirby unit of 505 gallons, 2 October 2006 to 1 October 2007, plus measured flow on Main unit of 25,890 gallons from 2 October 2006 to 1 October 2007. Total of 26,395 gallons
Steam sterilizer tempering water	160,000	Estimated to flow continuously at 0.3 gpm. $0.3 \text{ gallons/minute} \times 60 \text{ minutes/hr} \times 24 \text{ hr/day} \times 365 \text{ days/yr} = 157,680 \text{ gallons}$
Single pass cooling water (XRD cooler)	270,000	Instantaneous flow measured at 4 liters/min, assume runs 6 months per year. $4 \text{ liters/min} \times 1 \text{ gallon/3.785 liters} \times 60 \text{ min/hr} \times 24 \text{ hr/day} \times 180 \text{ days/yr} = 273,923$
Other lab activities (primarily single pass cooling on Mossbauer analytical unit helium compressor)	226,585	Calculated by difference: $812,980 - 130,000 - 26,395 - 160,000 - 270,000 = 226,585$
<b>TOTAL</b>	<b>812,980</b>	<b>Metered Total</b>

### EPA Center Hill FY 2007 Water Use



EPA Center Hill Water Use - FY 2007			
Date	Meter Reading (Cubic Feet)	Cubic Feet Used	Gallons Used
Sep-06	95250		
Oct-06	114510	19,260	144,074
Nov-06	125330	10,820	80,939
Dec-06	132650	7,320	54,757
Jan-07	132650	3,015	22,554
Feb-07	138680	3,015	22,554
Mar-07	138680	2,535	18,963
Apr-07	143750	2,535	18,963
May-07	149600	5,850	43,761
Jun-07	158290	8,690	65,006
Jul-07	169660	11,370	85,053
Aug-07	183830	14,170	105,999
Sep-07	203930	20,100	150,358
<b>TOTAL</b>		<b>108,680</b>	<b>812,981</b>