EPA Cincinnati Research facilities

Andrew W. Breidenbach Environmental Research Center (AWBERC)

Total Facility Area: 472, 396 gross square feet
Estimated Personnel: 800 persons

Located on a 22-acre complex five miles north of downtown Cincinnati, this center is one of two major EPA research centers in the nation housing research laboratories, training facilities, and administrative offices. AWBERC is internationally recognized for water research and has become a leader in areas of bioremediation and pollution prevention. The center also includes a new Annex used for permanent office space, which received the U.S. Green Building Council's Leadership in Energy and Environmental Design Gold-level certification for new construction (LEED®-NC). Through AWBERC, EPA also provides public education on the environment, emergency response training, and other programs. The specialized laboratory facilities enable researchers to conduct studies to protect human health, safeguard the environment and reduce risks.

- **Advanced Materials and Solids Analysis Research Core (AMSARC) -** Laboratory suite housing instrumentation used for the analysis of solids, and is the foundation for the Agency's solids and surfaces analysis capabilities. The state-of-the-art analytical equipment that comprises AMSARC will benefit researchers in all of EPA's laboratories in Cincinnati, as well as other EPA research centers across the nation. Instrumentation includes: scanning electron microscope, x-ray diffraction, x-ray fluorescence, optical microscopy, carbon-sulfur analyzer, and total inorganic carbon analyzer. In addition, AMSARC also includes an electron microscopy laboratory located within the EPA's Full-Containment Facility (described below) and contains an atomic force microscope, scanning transmission electron microscope, field emission scan electron microscope, and a Confocal microscope (http://www.epa.gov/nrmrl/amsarc/).
- **Full Containment Facility** - Self-contained and environmentally isolated research facility designed for analytical and experimental research on highly toxic or hazardous materials, although additional water related research is also conducted. The facility is adjacent to the main AWBERC building and has one double and eight single laboratories with capacities to analyze and characterize unknown waste samples and for the conduction of laboratory-scale treatment and treatment-related research. Each laboratory is outfitted with standard exhaust hoods that contain air, water, and vacuum hook-ups and can be individually climate-controlled for temperature and humidity. Scientists can easily custom-configure the laboratories because they contain no fixed structures other than the exhaust hoods, sinks, and counter tops. In order to accommodate the sensitive microscopes included in AMSARC's electron microscopy laboratory (described above), the containment facility is situated over bedrock, which reduces floor movement to within instrument specifications.
- **Pilot Plant** - This large, two story open bay laboratory is used for performing pilot- and bench-scale studies to examine the removal of contaminants from drinking water and conduct distribution system research. The laboratory contains pipe loops, safety ventilation hoods, fabrication space, oven, and designated bench-scale space. Source waters can be brought in from nearby rivers, reservoirs, and ground water sources and stored in large tanks housed in the facility. The tanks are currently being configured to directly feed a pilot system designed to simulate coagulation, clarification, filtration, direct and biological filtration, and softening, although other pilot systems could also be used. Existing pilot systems can operate in series or in parallel, and disinfectant oxidants as chlorine, ozone, chloramine, and chlorine dioxide can be introduced at several locations. Specific water compositions can also be created in-house and contaminants, chemicals, or microbes may be added to the raw water as needed to simulate problematic waters. There is also a model home plumbing system that will be used to study corrosion and biofilm in drinking water distribution systems.
- **Biocontainment Suite (BCS)** - This 1070 ft^2 Suite is located within the western wing of the of the AWBERC main building. It is fully equipped to conduct research on detection, and inactivation of bacterial biological agents (BioSafety Level-2) using both molecular and culture methods for organism analysis and quantitation. The BCS uses a standalone HVAC system and houses five individual laboratory rooms that are contiguously arranged and share a common use support area. Studies focus on rapid methods for concentration and identification of pathogens from large volumes of water. Pathogen identification is by both culture and molecular methods. Protocols to inactivate pathogens in water and protect public health also are conducted in the BCS. All rooms operate under negative air pressure, and all laboratory modules are individually sealed and proximity-card locked, which aids in the physical separation and containment of the pathogens from the rest of the AWBERC facility.

Center Hill Facility

Total Facility Area: 20,468 gross square feet
Estimated Personnel: 30 persons

Scientists at the Center Hill Facility research sediment/soil contaminant interaction, form and transport of contaminants in the environment, bioavailability, waste containment and disposal, landfill bioreactors, and waste material leaching. Since the 1970s, researchers have supported several EPA programs using Center Hill's special features:

- 21,000 square feet of laboratory and office space in single-story buildings
- 10 laboratories where bench-scale and pilot-scale research projects are conducted A high-bay research area
- A machine shop for construction and maintenance of specialized research equipment
- Field vehicles for research sample recovery
- Specialized analytical equipment

The specialized equipment and instrumentation enable researchers to determine and measure the chemical and microbiological characteristics of waste, leachates, soil and sediments, and the form and transport characteristics of contaminants in soil and sediment. Center Hill uses research capabilities developed at the Advanced Photon Source of Argonne National Laboratory, which makes Center Hill the focal point for determining the atomic-level form, fate, and transport characteristics of specific metal contaminants.

Test and Evaluation Facility

Total Facility Area: 36,101 gross square feet
Estimated Personnel: 35 persons

The Test and Evaluation (T&E) Facility is a ventilated, fully heated and lighted facility that supports research on new treatment technologies for water and hazardous waste. This unique facility has a high-bay area for bench-, pilot-, and full-scale research, and is supported by analytical laboratories, chemical storage, and offices. On-site chemistry labs, and two water distribution system simulators, allow scientists the flexibility to study drinking water contaminants, biosensors, and small systems; this is unmatched by any similar facility in the nation. T&E has numerous specialized features:

- Wastewater flows to the 16 experimental locations in the 24,000-square-foot high-bay area
- Two 5-ton bridge cranes for ease of relocating large pieces of experimental equipment
- 700-square-foot machine shop for fabricating specialty items and building or repairing experimental apparatus
- A 275-square-foot greenhouse for agricultural studies of pollutant application to soils
- 10,000 gallons of stainless steel tank storage; drum storage areas for twenty 55-gallon drums
- Hazardous waste tank leak and spill monitoring and alarm capability tied into an automatic facility shutdown system

T&E is a permitted treatment, storage, and disposal facility that allows the researchers to conduct treatability studies using quantities of all categories of hazardous waste.

Experimental Stream Facility

Total Facility Area: 3,800 square feet
Estimated Personnel: 10 persons

The Experimental Stream Facility (ESF) is one of only a handful of research facilities in the U.S. designed to conduct small stream research. The facility has stream mesocosms that provide a balance between the benefits of a controlled laboratory study and a field study. This allows researchers to study how pollutant loads interact with important characteristics of stream habitat that may or may not change as a result of anthropogenic stress. There are several unique features that make the ESF a one-of-a-kind facility for conducting controlled, flow-through, meso-scale simulation studies of stream ecosystems:

- Stream channels - eight 40-footlong channels with upper and lower sections and a tail tank
- Multiple water sources - two natural fresh water sources as well as final effluent from an adjacent wastewater treatment plant.
- Variable Simulated Solar Irradiance - high intensity grow lights provide simulated sunlight
- Continuous Water Quality and Climate Monitoring - for measuring the surface water quality base analytical endpoints
- Chemical Dosing System - chemical doses of stressors/pollutants can be metered into the head of each mesocosm
- Supervisory Control and Data Acquisition system - sensors, valves, and meters connected to a central computer to monitor and control flows, lights, chemical delivery, and data collection
- Programmable Environmental Triggers - Logic control algorithms can be written for the SCADA system that trigger changes in flow rate, chemical dosing, or flow distribution in response to natural changes in climate or water quality.

Changes to the stream ecosystem structure and function can be measured and observed in ways that are not possible in field or laboratory studies. ESF studies can represent a primary tool providing the process-level understanding necessary to move basic research and development from the laboratory bench-top to field applications. ESF studies are designed to gain information on both watershed management and the impact of contaminants of concern (http://www.epa.gov/nrmrl/wswrd/wq/esf/esf.html).