2025 U.S. Department of Energy PORTS Annual Site Environmental Report (ASER): Student Summary

Message from the U.S. Department of Energy

The U.S. Department of Energy (DOE) conducts environmental monitoring at the Portsmouth Gaseous Diffusion Plant Site (PORTS) on an ongoing basis. Each year, the information collected is presented in a comprehensive publication entitled the Annual Site Environmental Report (ASER). Each year, high school students from the area are invited to participate in the student summary project in which students review the most recent ASER, participate in educational outreach efforts to learn about PORTS, and help to develop this summary report. This year students from Waverly High School in Pike County, Ohio, and Valley High School in Scioto County, Ohio, participated in the program in which they developed and presented summary academic posters from the 2023 ASER at a student-led exposition open to the public. These posters are compiled and featured in this summary report.

Both the ASER and this summary report serve important functions as they allow DOE to clearly and concisely explain our environmental monitoring programs to our many stakeholders. The information presented in this summary shows that the PORTS site near Piketon, Ohio, is operated in an environmentally safe manner. The work at DOE facilities is highly detailed and technically complex, but DOE is committed to performing each of these activities safely. DOE's first priority is to protect the well-being of our workers, the surrounding communities, and the environment. DOE would like to offer its sincerest appreciation to the students and faculty leaders at Waverly and Valley high schools who worked on this summary document. DOE congratulates each of you for your effort, enthusiasm, and willingness to support this project.

DOE hopes you enjoy reading the PORTS 2025 *Annual Site Environmental Report Summary.*

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Waverly High School Student Recognition 2024-2025

The students of Mr. Trevor Arnett's environmental science class at Waverly High School worked in collaboration with Ohio University's Voinovich School of Leadership and Public Service PORTSfuture Program to produce this ASER Summary report. The Voinovich School thanks the students for their hard work. Their effort in this public service is much appreciated and worthy of special recognition. The high school students who participated in this year's project are listed below:

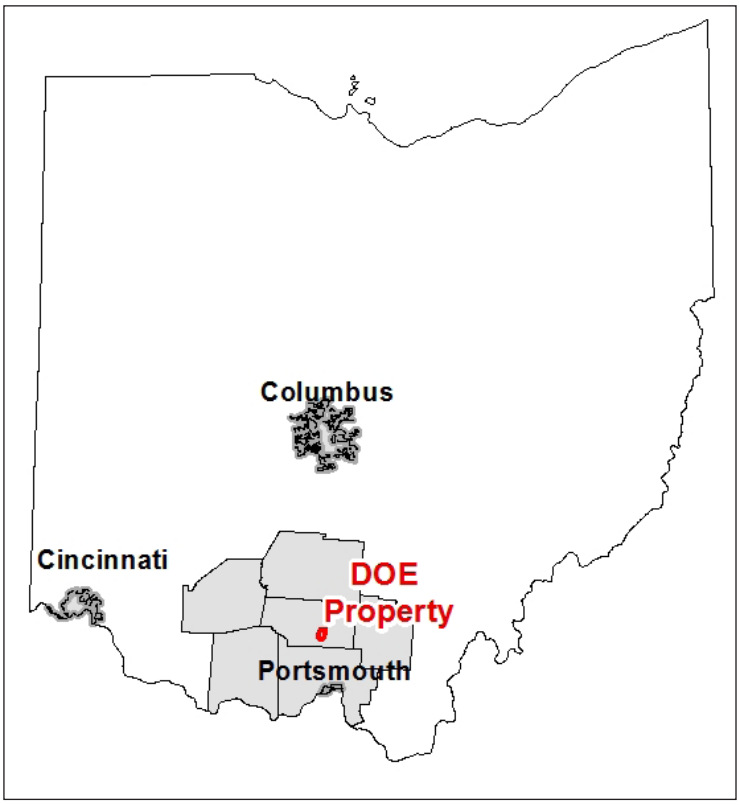
Mackenzie Barrett, Zarian Cantar, Kylie Clark, Caeleb Cox, Dillynne Davis, Faith Gonzales, Kaeden Hooks, Alyssa Hopkins, Andrew (Jimmy) Moraleja, Kylee Newland, Devin Osborne, Rachel Remy, Ryan Schelske, Skyle South, Gracie Willison

Valley High School Student Recognition 2024-2025

The students of Mr. Justin Howard's biology and chemistry classes at Valley High School worked in collaboration with Ohio University's Voinovich School of Leadership and Public Service PORTSfuture Program to produce this ASER Summary report. The Voinovich School thanks the students for their hard work. Their effort in this public service is much appreciated and worthy of special recognition. The high school students who participated in this year's project are listed below:

Emilie Barr, Camry Carpenter, Tyler Carver, Laurianne DeAtley, Grace Keating, Andrew Metzler, Miriam Phipps, Cheyenne Shope, Ava Smith, Travis Thompson, Tristan Wood

The Portsmouth Gaseous Diffusion Plant (PORTS) located in Pike County, Ohio, was the Department of Energy (DOE)'s third plant of its kind. Selection criteria for this specific plant included the abundance of water resources, reliable electric power, and a dependable labor force. With construction beginning in 1952, production of enriched uranium for nuclear defense and energy systems was initiated in 1954 and continued through 2001.



Map: Matt Trainer, Voinovich School of Leadership and Public Service

In total, the plant site occupies 5.4 square miles of land within rural Pike County, Ohio, surrounded by farmland and wooded hills, as well as private residences. Home to just over 27,000 residents (according to the 2020 Census), Pike County contains several small villages among scattered rural development including the communities of Piketon, Beaver, and Waverly, all within 10 miles of the PORTS site. Little Beaver Creek flows northwest through the middle of the site, two additional streams are located in the southern portions of the industrialized area, and Big Run Creek flows in the southeast region of the site. All streams flowing through the site discharge into the Scioto River.

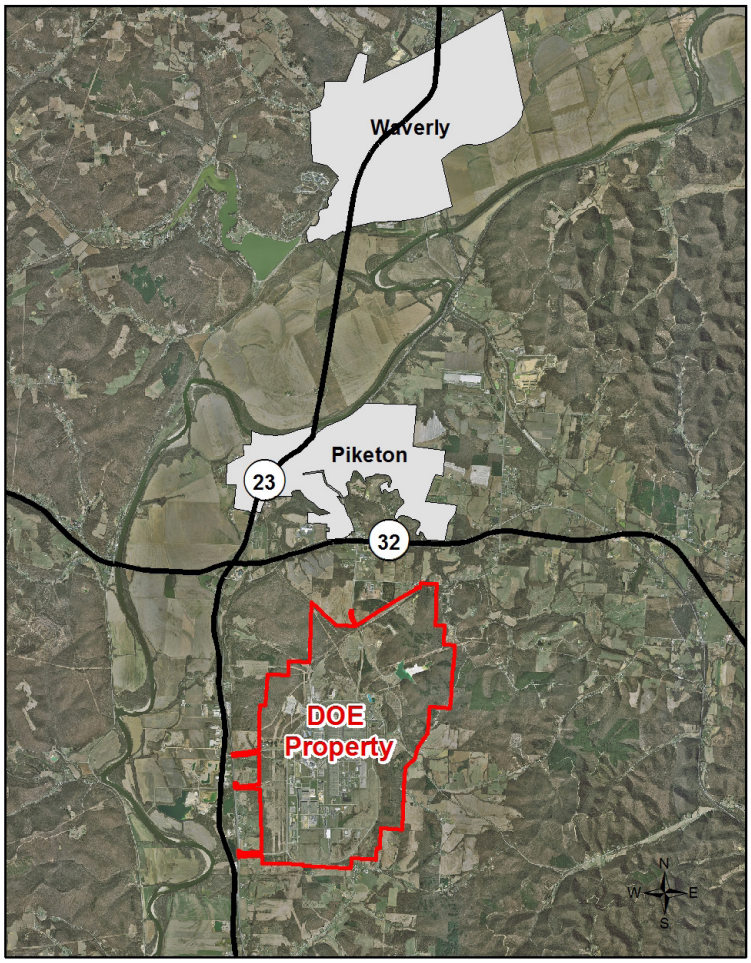
Uranium enrichment occurred at the PORTS site for 45 years with the latter half managed by the United States Energy Corporation (USEC), which began leasing the plant in 1993. Enrichment of uranium concluded in 2001. At present, DOE and managing contractors are responsible for decontamination and decommissioning gaseous diffusion uranium enrichment buildings and other associated facilities. Additional responsibilities include environmental restoration, waste management, uranium management, risks, and remediation efforts.

Various tasks are associated with Deactivation and Demolition (D&D) including deactivation of equipment, removal and cleansing of residue on equipment, structures, and piping, and dismantling and removal of equipment, structures, and piping that are no longer part of current operations. Additionally, this endeavor involves evaluation of alternatives for the disposition of waste produced through this process. Environmental program and activities efforts involve verification of investigation into past operational releases associated with uranium enrichment through the gaseous diffusion process and implementation of necessary remedial measures to protect the health of both humans and the environment. Investigations involve defining the nature and extent of contamination, evaluation of potential risks, remediation efforts, as well as continued monitoring. Waste management involves waste generated by DOE activities at PORTS including those resulting from D&D, environmental restoration, and the depleted uranium hexafluoride (DUF6) Conversion Facility. Waste is identified and stored in accordance

with environmental regulations through generation to treatment, recycling, or disposal. Uranium management includes management of uranium product and coordination with the DUF6 Conversion Facility. The Annual Site Environmental Report (ASER) is a key component of DOE's effort to keep the public informed about environmental conditions at PORTS.

References

- DOE 2024. U.S. Annual Site Environmental Report-2023, Piketon, Ohio, DOE/PPPO/03, U.S. Department of Energy, Piketon, OH, September 2024.



Map: Matt Trainer, Voinovich School of Leadership and Public Service

PORTSfuture Program & STEM Enrichment

Students from Pike County, Ohio, have been participating in the Ohio University Voinovich School of Leadership and Public Service PORTSfuture project, funded by a grant from the U.S. Department of Energy Office of Environmental Management Portsmouth/Paducah Project Office, for over 14 years. This ongoing program has been a huge success for the region and has reached hundreds of Pike County students and residents. As a result, the PORTSfuture program was expanded to Scioto County, Ohio, for the second Regional Annual Site Environmental Report Summary. This expansion brought students from Scioto and Pike Counties together to learn about PORTS and participate in professional development. The Regional Program has added a level of student collaboration that has amplified students' understanding of the PORTS site and future plan, community outreach, and Science, Technology, Engineering and Math (STEM) enrichment.

The PORTSfuture STEM enrichment program is designed to inspire regional students to learn about and engage in activities in STEM disciplines with the goal of encouraging students to pursue careers in these in-demand fields that provide well-paying employment opportunities. STEM enrichment is a learner-centered approach to education that provides students with a problem-based, multidisciplinary, personalized learning experience. Through STEM learning, students build the necessary skills for critical thinking, problem-solving and solution design, and career exploration through real-world experiences. STEM enrichment has the ability to enhance learning experiences and to overcome obstacles for students by providing accessible, inclusive, culturally responsive experiences.

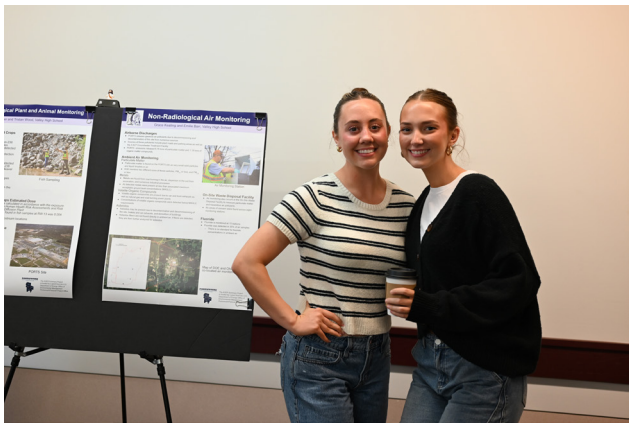
Some of the opportunities the PORTSfuture program offers include direct connection to industry professionals, demonstrations in industry-level STEM occupations, and collegiate-level activities and experiences. The program directly connects students with industry professionals working in STEM careers to learn about diverse available regional opportunities. It is a valuable experience for students to gain insight into specific careers or industry sectors and can help build connections and networks in the regional STEM career field. The program also offers students collegiate engagement to prepare them for a post-secondary education to enhance their opportunity for successful employment.

The PORTSfuture program involves the development of the ASER Student Summary which is tailored after a similar report produced by DOE's PORTS operations. The ASER Student Summary utilizes information found in the most recent ASER (2023) released publicly by PORTS with presentation materials developed by high school students and staff. The goals of the ASER Student Summary are to educate regional high school students about activities and opportunities at the PORTS site and develop materials that facilitate area residents learning more about DOE operations at the PORTS site.

References

- DOE 2024. U.S. Annual Site Environmental Report-2023, Piketon, Ohio, DOE/PPPO/03, U.S. Department of Energy, Piketon, OH, September 2024.
- "STEM – Science, Technology, Engineering and Mathematics: Ohio Department of Education and Workforce." Ohio Department of Education, education.ohio.gov
- "STEM Entrepreneurship." PORTSfuture, 8 May 2019, www.portsfuture.com/ASER.

Student Expo



As part of this year's PORTSfuture program, the students participated in the second annual ASER Student Expo. An expo is a student-led celebration of deeper learning where students can highlight their abilities and share what they have learned with a wider audience through the development and presentation of a scientific poster.

This culminating experience not only provides an outlet to summarize the annual report, but also promotes student engagement, deepens significant learning, encourages visual and scientific communication, and spreads knowledge throughout the community. Student expos are highly research-focused and lead to greater development and engagement. Through the ASER Student Expo, students were able to articulate their research about the PORTS site and the reindustrialization directly to their local communities.

The ASER Student Expo allowed students to produce high-quality research and develop confidence in their public speaking skills. The students were able to articulate what they learned and work through a structured process that aimed to build supportive relationships with the community. The students summarized several sections of the 2023 PORTS ASER to support community understanding of the past and present operations at the PORTS site. The sections below showcase the students' poster work and summary of the 2023 PORTS ASER.

Posters were developed to provide an overview of the following topics from the Annual Report:

Site History and Compliance

Environmental Programs and Activities

Environmental Radiological Protection and Monitoring

Environmental Non-Radiological Programs

Groundwater Protection Programs

Site History and Compliance

PORTS Site Overview:
Rachel Remy

Environmental Management and Waste Compliance:
Camry Carpenter and Ava Smith

Data Management:
Jimmy Moraleja and Devin Osborne

PORTS Site Overview

Rachel Remy, Waverly City High School

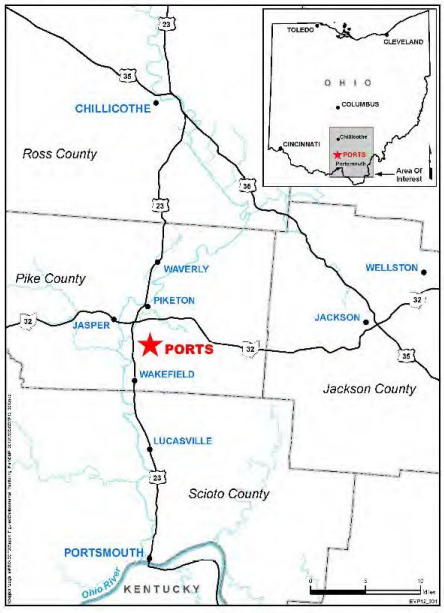
Site History

- The Portsmouth Gaseous Diffusion Site (PORTS) produced enriched uranium between 1954 and 2001
- The purpose was to supply the nation's nuclear defense and energy systems
- In 1993 the Department of Energy (DOE) leased the uranium enrichment plant to the United States Enrichment Corporation (USEC)
- In 2011, USEC returned the facilities to DOE for decontamination and decommissioning

Historical Announcement for PORTS Site

Site Location

- PORTS is a rural area in Pike County, Ohio, originally located on a 5.8-square-mile site
  - The size of the site has decreased in recent years, to 5.4 square-miles, due to the transfer of 307 acres of land to the Southern Ohio Diversification Initiative (SODI)
- DOE chose this location for its third gaseous diffusion plant due to its abundant water resources, reliable electric power, and dependable labor force
- There are around 27,000 people who live in Pike County



Map of PORTS Site Location

Environmental Setting

- The land surrounding the plant site consists of farmland and wooded hills
  - PORTS is located ~2 miles east of the Scioto River
  - The PORTS site is dominated by ancient and recent streams creating small valleys and low-lying hills
- In the industrialized area of PORTS, the land has been modified for construction of buildings and other infrastructure
  - Much of the native soil and rock removed from higher elevations was used as fill in existing drainage valleys and depressions

Site Operations

- Construction of the PORTS site began in 1952
- From 1954 to 2001, the PORTS site enriched uranium via gaseous diffusion
- DOE and contractors are responsible for decontamination and decommissioning of the gaseous diffusion uranium enrichment buildings and associated facilities, environmental restoration, and waste management at the site
  - DOE is also responsible for uranium management, which includes the DUF6 Conversion Facility
- The goal of the Environmental Restoration Program is to verify the environmental safety of the site and ensure remedial actions are taken to protect human health and the environment when necessary

PORTS Site Welcome Sign

The ASER Summary Project is funded by a grant from the U.S. Department of Energy Office of Environmental Management Portsmouth/Paducah Project Office

PORTSFUTURE

Environmental and Waste Management Compliance

Camry Carpenter and Ava Smith, Valley High School

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

- Site is investigated if it poses risk to health or the environment
- Cleanup of soil and groundwater is conducted in accordance with the Consent Decree with the State of Ohio
- National Response Center must be notified if hazardous substances are released into the environment in too large amounts

Emergency Planning and Community Right-To-Know-Act (EPCRA)

- Increase the public's knowledge and access to information of chemical hazards
- Businesses must report the safety data sheets, locations, and quantities of chemicals stored on the site

Demolition Gear Cleaning

Resource Conservation and Recovery Act (RCRA)

Hazardous Waste

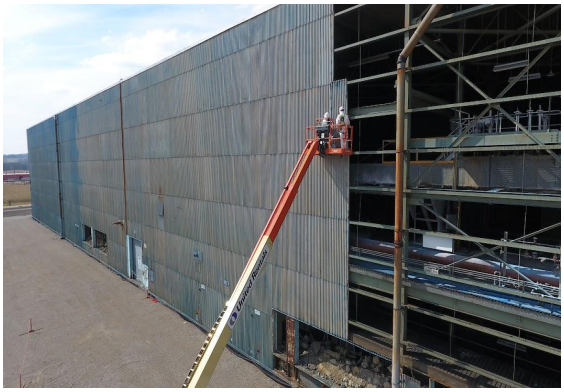
- DOE can store hazardous waste at PORTS
- Must have permit for identifying waste and emergency equipment
- Biennial report must be submitted every other year due to generation of hazardous waste
- Groundwater monitoring is required at hazardous waste sites
- DOE submits an annual groundwater report summarizing the results of the monitoring
- Waste disposed at OSWDF meets all requirements related to hazardous waste, PCBs, and radioactive waste
- Hazardous waste generators have requirements such as waste identification, appropriate use of containers, and emergency equipment

Solid Waste Disposal Facilities

- Groundwater monitoring required at solid waste disposal facilities

Underground Storage Tank Regulations

- Program for underground tanks storing petroleum or certain hazardous substances



Deconstruction at PORTS Site

Federal Facility Compliance Act (FFCA)

- Waived federal facilities' immunity from fines and penalties as well as penalties from violations related to hazardous waste management
- Provided for the development of site treatment plans for treating mixed waste

National Environmental Policy Act (NEPA)

- Requires agencies to evaluate potential environmental impact and examine alternatives to proposed activities
- Restoration actions, waste management, facility maintenance, and other activities are examined to determine the level of evaluation and documentation
- Operation and maintenance activities are evaluated to assess potential environmental impacts

Debris Loading

Toxic Substance Control Act (TSCA)

- PORTS complies with polychlorinated biphenyls (PCB) regulations and Acts
- PCBs most commonly found in electrical systems and gaseous diffusion buildings
- PORTS makes an annual log to meet requirements
- 2023 Log:
  - 11 PCB transformers in service
  - Approximately 6,755 tons of PCB waste was generated
  - Approximately 351 tons of PCB waste was shipped off site for disposal
  - Approximately 53,907 tons of PCB waste was disposed in OSWDF

PORTSFUTURE

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Data Management

Jimmy Moraleja and Devin Osborne, Waverly City High School

Quality Assurance

- Quality assurance is an important part of environmental monitoring that requires sampling the environment and analyzing the samples in a systematic way including
  - Implementing standard operating procedures (SOPs)
  - Training and qualifying surveyors and analysts
  - Implementing sample tracking procedures to demonstrate traceability and integrity of samples and data
  - Participating in external and internal quality control programs
  - Frequently calibrating and routinely maintaining measuring and test equipment
  - Implementing good measurement techniques and good laboratory practices
  - Frequently assessing field sampling, measurement activities, and laboratory processes

Quality Assurance Characteristics

PEGASIS

- PEGASIS is a database that stores the environmental monitoring data from the PORTS site
- It provides dynamic mapping and displays of environmental monitoring data
- PEGASIS is accessible to the public and displays the data on a local map to show where it was collected
- PEGASIS offers a variety of data including:
  - Site GIS Viewer
  - Analytical Data and Plotting
  - Well and Bore Logs
  - Environmental Reports

PEGASIS Website Homepage

Data Verification, Validation, and Assessment

- DOE receives analytical data and verifies with written analytical specifications
- Selected data are validated to determine the technical reliability of the results
- Data are qualified as *acceptable*, *estimated,* or *rejected* and stored in the Project Environmental Measurements System until transferred to PORTS OREIS
  - At least 10% of analytical data associated with the environmental sampling programs are validated
- Current analytical results are compared to previous results for the sampling location
- Data may be analyzed for trends or summary statistics such as average, median, or data range

Historic Aerial View of PORTS Site

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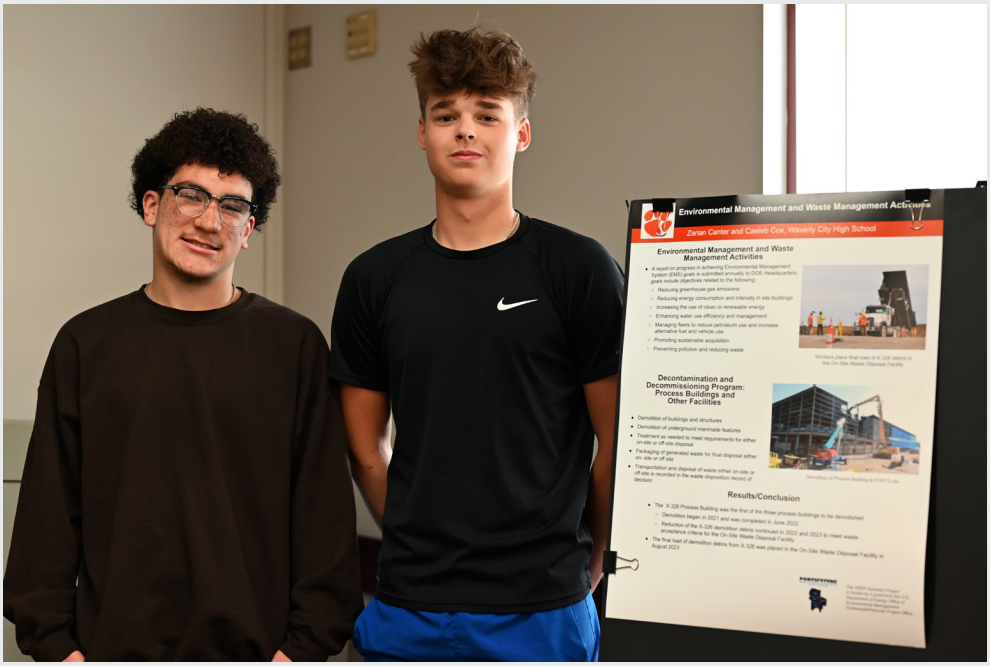

Environmental Programs and Activities

Site Sustainability Program:
Faith Gonzales and Dillynne Davis

Environmental Management and Waste Management Activities:
Zarian Canter and Caeleb Cox

Public Awareness Program:
Mackenzie Barrett and Skyle South

Site Sustainability Program

Faith Gonzales (and Dillynne Davis), Waverly City High School

PORTS Sustainability

- DOE is committed to managing sustainability at the PORTS site by
  - reducing potential environmental risks, costs, wastes, and future liability
  - Integrating environmental sustainability principles
- The DOE Environmental Sustainability Program is balanced, budgeted, measured, thus improving PORTS' overall Environmental Management system
- The program has factors of pollution prevention, waste minimization, sustainable procurement, sustainable design, and energy and water efficiency

Plentiful wildlife at PORTS site

Eliminating Waste

- To achieve the eliminating waste task, DOE developed a well- defined strategy for updating and achieving objectives in line with the pollution prevention through the Environmental Sustainability Program including:
  - Eliminating, minimizing, or recycling wastes that would require storage and long-term monitoring
  - Eliminating the use of toxic chemicals and associated environmental releases that would require treatment, surveillance, and reporting
  - Minimizing the economic and environmental impacts of handling by-products and wastes made by mission-related activities
  - Reduces life-cycle costs

2024 Site Sustainability Plan

- The *Fiscal Year 2024 Site Sustainability Plan for the Portsmouth Gaseous Diffusion Plant* provides goals and progress through 2023 for reducing greenhouse gas discharge and water consumption, reusing and separating wastes, refining electronic stewardship, etc.
- Energy use intensity (measured in British thermal units per gross square 'Btu') has reduced by 47% over the 2021 baseline
- Greenhouse gas releases (mostly associated with electricity consumption) have been decreased by 85% against fiscal year 2008 baseline emissions
- Water use severity (measured in gallons per gross square footage) has been decreased by 55% over the 2021 baseline

PORTS Site Aerial Overview

PORTSFUTURE

The ASER Summary Project is funded by a grant from the U.S. Department of Energy Office of Environmental Management Portsmouth/Paducah Project Office

Environmental Management and Waste Management Activities

Zarian Canter and Caeleb Cox, Waverly City High School

Environmental Management and Waste Management Activities

- A report on progress in achieving Environmental Management System (EMS) goals is submitted annually to DOE Headquarters, goals include objectives related to the following:
  - Reducing greenhouse gas emissions
  - Reducing energy consumption and intensity in site buildings
  - Increasing the use of clean or renewable energy
  - Enhancing water use efficiency and management
  - Managing fleets to reduce petroleum use and increase alternative fuel and vehicle use
  - Promoting sustainable acquisition
  - Preventing pollution and reducing waste

Workers place final load of X-326 debris in the On-Site Waste Disposal Facility

Decontamination and Decommissioning Program: Process Buildings and Other Facilities

- Demolition of buildings and structures
- Demolition of underground manmade features
- Treatment as needed to meet requirements for either on-site or off-site disposal
- Packaging of generated waste for final disposal either on- site or off site
- Transportation and disposal of waste either on-site or off-site is recorded in the waste disposition record of decision

Demolition of Process Building at PORTS site

Results/Conclusion

- The X-326 Process Building was the first of the three process buildings to be demolished
  - Demolition began in 2021 and was completed in June 2022
  - Reduction of the X-326 demolition debris continued in 2022 and 2023 to meet waste acceptance criteria for the On-Site Waste Disposal Facility
- The final load of demolition debris from X-326 was placed in the On-Site Waste Disposal Facility in August 2023

The ASER Summary Project is funded by a grant from the U.S. Department of Energy Office of Environmental Management Portsmouth/Paducah Project Office

Public Awareness Program

Skyle South and Mackenzie Barrett, Waverly City High School

PORTS Programs

- The Portsmouth Environmental Information Center (EIC) provides greater accessibility for residents interested in learning more about DOE's environmental management activities at the Portsmouth Gaseous Diffusion Plant
- PORTS is committed to their community relations and public participation program
  - Programs are created to help with openness and credibility between PORTS operations and the public
  - They offer opportunities for the public to be involved in decision making about environmental issues at PORTS
- The PORTS Envoy program matches employee volunteers with the site's fence line neighbors to provide them with information and answer questions

PORTS Site Open House

Community and Educational Outreach

- PORTS has a comprehensive community relations and public participation program
  - Its purpose is to foster openness and credibility between PORTS officials and local citizens, elected officials, businesses, the media, and the public
- The PORTS Annual Science Alliance event brings more than 1,500 high school juniors to PORTS for an interactive science fair that includes scientific demonstrations and information on careers in STEM fields
- DOE and PORTS contractors also support an academic competition for high school students, the annual South Central Ohio Regional Science Bowl
  - Student teams answer questions about high school science and the regional winners advance to the National Science Bowl in Washington, D.C.

Site Specific Advisory Board

- The PORTS Site Specific Advisory Board (SSAB) provides public input and recommendations to DOE
- The board holds regularly scheduled meetings with DOE that are open to the public
- You can always find more information on the website https://www.energy.gov/pppo/ports-ssab/portsmouth-site-specific-advisory-board

Site Specific Advisory Chairs Meeting 2023

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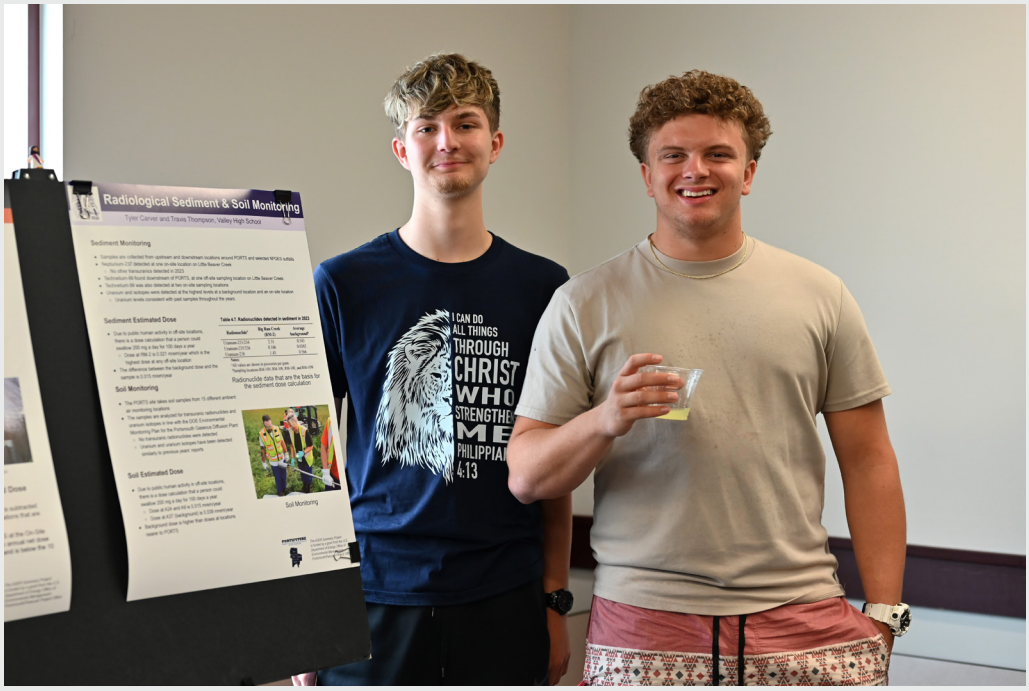


Environmental Radiological Protection and Monitoring

Radiological Air Monitoring:
Kylee Newland and Gracie Willison

Radiological Sediment and Soil Monitoring:
Tyler Carver and Travis Thompson

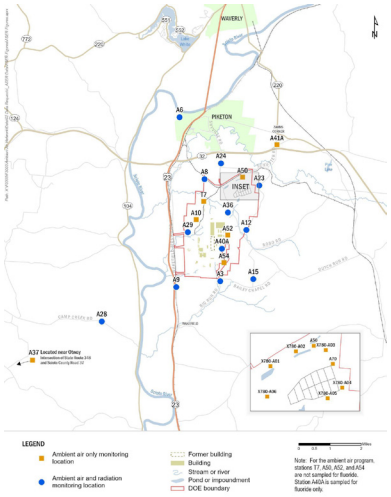
Radiological Plant and Animal Monitoring:
Andrew Metzler and Tristan Wood

Radiological Air Monitoring

Gracie Willison and Kylee Newland, Waverly City High School

Air Monitoring

- Radionuclide emissions and ambient air radionuclides are used to calculate the annual dose to the public
- The maximum annual dose allowed by U.S. EPA is 10 millirems (mrem).
- Some buildings have vent emissions which are used for sampling
- Total emissions for airbourne sources in 2023 for:
  - - Fluor-BWXT: 0.0516 Ci (curie)
  - - Mid-America Conversion Services: 0.000000562 Ci
  - - Centrus: 0.00000363 Ci



Map of Radiological Air Monitoring Locations

Air Estimated Dose

- Calculating the effective annual dose to the maximally exposed individual (MEI, the individual who occupies the most exposed point near the plant) and the entire population within a 50-mile radius of the plant helps determines the effect of the radionuclides
- A computer program called the *Clean Air Act Assessment Package-1988 (CAP-88)* uses models to calculate the levels of radionuclides in the air, ground, and fauna of the area (deer, fish, etc.) related to dose

Air Monitoring Sample Location

Ambient Air Monitoring

- Measures pollutants in the outdoor air including levels of radionuclides
- There are ambient air monitoring stations surrounding the PORTS site
- Radionuclides are monitored independently in conjunction with Ohio Department of Health (ODH) with separate sampling equipment and a separate lab to measure airborne activity

Ambient Air Estimated Dose

- The dose at background station is subtracted from a dose calculated at the stations that are close to PORTS
- The northeast corner of PORTS at the On-Site Waste Disposal Facility has an annual net dose on site, at 0.0088 mrem/year and is below the 10 mrem/year limit

The ASER Summary Project is funded by a grant from the U.S. Department of Energy Office of Environmental Management Portsmouth/Paducah Project Office

Radiological Sediment & Soil Monitoring

Tyler Carver and Travis Thompson, Valley High School

Sediment Monitoring

- Samples are collected from upstream and downstream locations around PORTS and selected NPDES outfalls
- Neptunium-237 detected at one on-site location on Little Beaver Creek
  - No other transuranics detected in 2023
- Technetium-99 found downstream of PORTS, at one off-site sampling location on Little Beaver Creek.
- Technetium-99 was also detected at two on-site sampling locations
- Uranium and isotopes were detected at the highest levels at a background location and an on-site location
  - Uranium levels consistent with past samples throughout the years

Sediment Estimated Dose

- Due to public human activity in off-site locations, there is a dose calculation that a person could swallow 200 mg a day for 100 days a year
  - Dose at RM-2 is 0.021 mrem/year which is the highest dose at any off-site location
- The difference between the background dose and the sample is 0.015 mrem/year

Table 4.7. Radionuclides detected in sediment in 2023

Radionuclide[a]	Big Run Creek (RM-2)	Average background[b]
Uranium-233/234	2.31	0.543
Uranium-235/236	0.166	0.0383
Uranium-238	1.45	0.566

Notes:
[a]All values are shown in picocuries per gram.
[b]Sampling locations RM-10N, RM-10S, RM-10E, and RM-10W

Radionuclide data that are the basis for the sediment dose calculation

Soil Monitoring

- The PORTS site takes soil samples from 15 different ambient air monitoring locations
- The samples are analyzed for transuranic radionuclides and uranium isotopes in line with the DOE Environmental Monitoring Plan for the Portsmouth Gaseous Diffusion Plant
  - No transuranic radionuclides were detected
  - Uranium and uranium isotopes have been detected similarly to previous years' reports

Soil Monitoring

Soil Estimated Dose

- Due to public human activity in off-site locations, there is a dose calculation that a person could swallow 200 mg a day for 100 days a year.
  - Dose at A24 and A9 is 0.015 mrem/year
  - Dose at A37 (background) is 0.039 mrem/year
- Background dose is higher than doses at locations nearer to PORTS

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Radiological Plant and Animal Monitoring

Andrew Metzler and Tristan Wood, Valley High School

Wildlife, Animal Products, and Crops Monitoring

Vegetation
- Uranium-233/234 and uranium-238 were detected in some samples
- No transuranic radionuclides detected

Deer
- No radionuclides above the detection limit

Fish
- No transuranic radionuclides detected
- Uranium-233/234 and uranium-238 were detected in fish from Big Beaver Creek

Crops
- A very low level of uranium isotopes were detected.

Milk and Eggs
- No radionuclides were detected in the samples taken

Fish Sampling

Wildlife, Animal Products, and Crops Estimated Dose
- If radionuclides are detected, dose is calculated in accordance with the exposure scenarios in *Methods for Conducting Human Health Risk Assessments and Risk Evaluations at Portsmouth Gaseous Diffusion Plant*
- The estimated dose for radionuclides found in fish samples at RW-13 was 0.004 mrem/year.
- Radionuclides were not detected at upstream locations

Biota Monitoring and Estimated Dose

Aquatic and Riparian Animals
- DOE was in compliance of specified radiation dose limits: 1 rad/day (aquatic animals), 0.1 rad/day (riparian animals)

Terrestrial Plants and Animals
- No transuranic radionuclides were detected
- DOE was in compliance of specified radiation dose limits: 1 rad/day (terrestrial plants), 0.1 rad/day (terrestrial animals)

PORTS Site

PORTSFUTURE

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Environmental Non-Radiological Programs

Non-Radiological Air Monitoring:
Emilie Barr and Grace Keating

Non-Radiological Surface Water Monitoring:
Kylie Clark and Alyssa Hopkins

Non-Radiological Air Monitoring

Grace Keating and Emilie Barr, Valley High School

Airborne Discharges

- PORTS releases gaseous air pollutants due to decommissioning and decontamination of the site from numerous sources
- Sources of these pollutants include plant roads and parking areas as well as the X-627 Groundwater Treatment Facility
- PORTS emissions released 6.76 tons of particulate matter and 1.18 tons of organic matter compounds

Ambient Air Monitoring

Particulate Matter

- Particulate matter is found on the PORTS site as very small solid particles and liquid droplets in air
- DOE monitors two different sizes of these particles, PM_{10} or less, and $PM_{2.5}$ or less

Metals

- Metals are found from coal burning in the air, dispersion in the soil from excavation, and numerous industrial processes
- All detected metals were present at less than associated maximum acceptable ground level concentrations (MAGLC)

Volatile Organic Compounds

- Volatile organic compounds are present due to car and truck exhausts as well as natural gas and coal burning power plants
- Concentrations of volatile organic compounds were detected below MAGLC requirements

Asbestos

- Asbestos may be present due to decontamination and decommissioning of the site, brakes and car exhausts, and demolition of buildings
- Asbestos fibers are not found directly in ambient air; if fibers are detected, they are then further analyzed for asbestos

Air Monitoring Station

On-Site Waste Disposal Facility

- Air monitoring also occurs at the On-Site Waste Disposal Facility to measure particulate matter and hazardous air pollutants
- No areas of concern were found across eight monitoring stations

Fluoride

- Fluoride is monitored at 15 stations
- Fluoride was detected in 35% of air samples
  - There is no standard for fluoride concentrations in ambient air

Map of DOE and Ohio EPA co-located air monitoring stations

PORTSFUTURE

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Non-Radiological Surface Water Monitoring

Alyssa Hopkins and Kylie Clark, Waverly City High School

Surface Water Monitoring

- PORTS meets the Clean Water Act regulations through National Pollution Discharge Elimination System (NPDES) permits granted by Ohio EPA for contaminated water, known as effluent discharges
- Non-radiological surface water monitoring mostly consists of sampling water discharges at the PORTS site for
  - Fluor-BWXT Portsmouth
  - Mid-America Conversion Services
  - Centrus
- The monitoring data are submitted to Ohio EPA in a monthly monitoring report collected for NPDES permits
  - These monthly monitoring reports are provided to the public on the PEGASIS website
- Surface water is monitored in the On-Site Waste Disposal Facility project area
- Downstream of the cylinder storage yards, surface water is monitored for polychlorinated biphenyls (PCBs)

Surface Grab Sample Water Monitoring

On-Site Waste Disposal Facility Surface Water Monitoring

- The monitoring plan for the On-Site Waste Disposal Facility (OSWDF) was created to ensure that performance standards for the protection of human health and the environment are met during operation of the facility
- The two types of surface water monitoring are
  - stormwater discharge monitoring
  - surface water environmental surveillance monitoring

Surface Water Tour with PORTS Site Officials

Surface Water Monitoring (Cylinder Storage Yards)

- Water samples (both filtered and unfiltered) are collected quarterly from four locations in the drainage basins at the PORTS site
- These locations at the PORTS site are not accessible to the public
- Samples are analyzed for polychlorinated biphenyl (PCBs)
  - Detected at two locations
  - Were not detected in any of the other surface water samples collected in 2023

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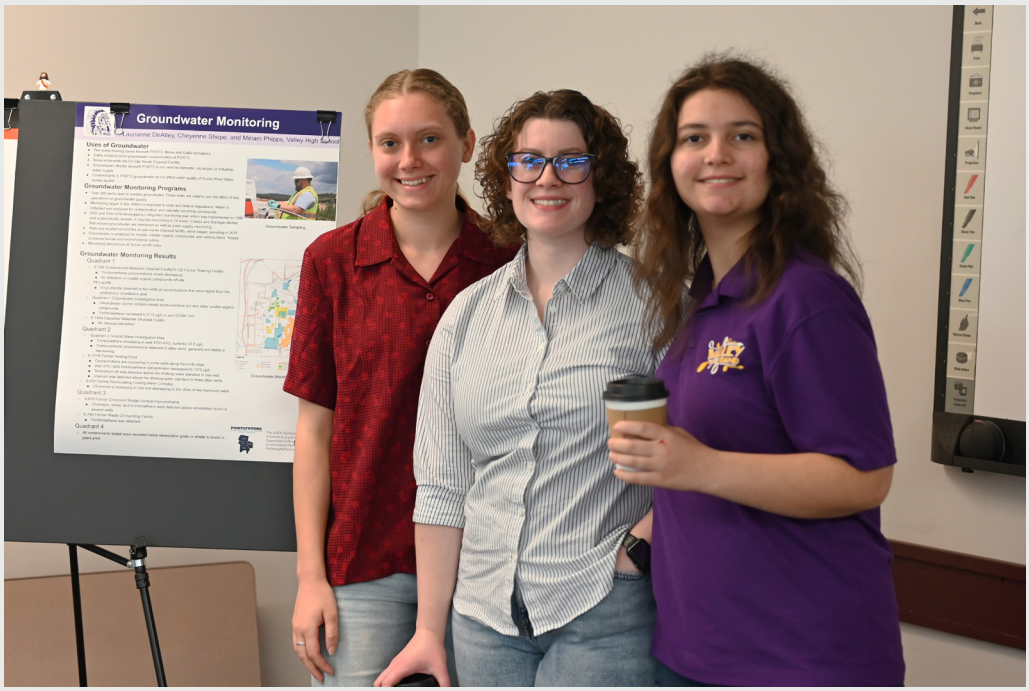


Groundwater Protection Programs

Groundwater Monitoring:
Laurianne DeAtley, Miriam Phipps, and Cheyenne Shope

Groundwater Treatment Facilities:
Kaeden Hooks and Ryan Schelske

Groundwater Monitoring

Laurianne DeAtley, Cheyenne Shope, and Miriam Phipps, Valley High School

Uses of Groundwater

- Two water-bearing zones beneath PORTS: Berea and Gallia formations
- Gallia contains most groundwater contamination at PORTS
- Berea is beneath the On-Site Waste Disposal Facility
- Groundwater directly beneath PORTS is not used as domestic, municipal, or industrial water supply
- Contaminants in PORTS groundwater do not affect water quality of Scioto River Valley buried aquifer

Groundwater Sampling

Groundwater Monitoring Programs

- Over 300 wells used to monitor groundwater. These wells are used to see the effect of site operations on groundwater quality.
- Monitoring began in the 1980's in response to state and federal regulations. Water is collected and analyzed for contamination and naturally-occurring compounds.
- DOE and Ohio EPA developed an integrated monitoring plan which was implemented in 1999 and is periodically revised. It requires monitoring in 14 areas. Creeks and drainage ditches that receive groundwater are monitored as well as water supply monitoring.
- Wells are located around the on-site waste disposal facility, which began operating in 2021
- Groundwater is analyzed for metals, volatile organic compounds, and radionuclides. Tested to ensure human and environmental safety.
- Monitoring also occurs at former landfill sites

Groundwater Monitoring Results

Quadrant 1

- X-749 Contaminated Materials Disposal Facility/X-120 Former Training Facility
  - Trichloroethene concentrations slowly decreasing
  - No detection of volatile organic compounds off-site
- PK Landfill
  - Vinyl chloride detected in two wells at concentrations that were higher than the preliminary remediation goal.
- Quadrant 1 Groundwater Investigative Area
  - Groundwater plume contains mostly trichloroethene but also other volatile organic compounds
  - Trichloroethene increased to 5.14 µg/L in well X230K-14G
- X-749A Classified Materials Disposal Facility
  - No releases identified

Quadrant 2

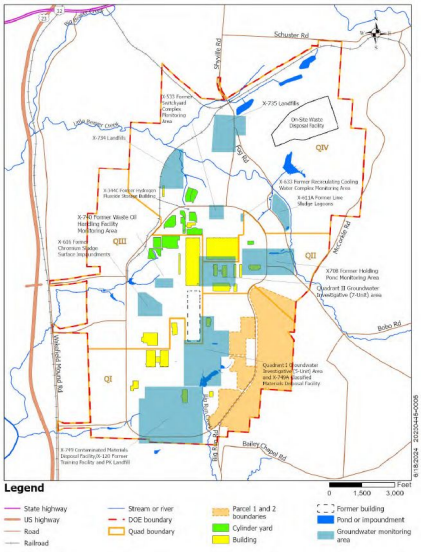
- Quadrant 2 Ground Water Investigative Area
  - Trichloroethene increasing in well X701-45G, currently 33.8 µg/L
  - Trichloroethene concentrations detected in other wells generally are stable or decreasing.
- X-701B Former Holding Pond
  - Concentrations are increasing in some wells along the north edge
  - Well X701-42G trichloroethene concentration decreased to 1070 µg/L
  - Technetium-99 was detected above the drinking water standard in one well.
  - Uranium was detected above the drinking water standard in three other wells.
- X-633 Former Recirculating Cooling Water Complex
  - Chromium is increasing in one and decreasing in the other of two monitored wells

Quadrant 3

- X-616 Former Chromium Sludge Surface Impoundments
  - Chromium, nickel, and trichloroethene were detected above remediation levels in several wells.
- X-740 Former Waste Oil Handling Facility
  - Trichloroethene was detected

Quadrant 4

- All contaminants tested were recorded below remediation goals or similar to levels in years prior



Groundwater Monitoring Areas

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Groundwater Treatment Facilities

Kaeden Hooks and Ryan Schelske, Waverly City High School

X-622 Groundwater Treatment Facility

- PORTS groundwater treatment facilities processed almost 16 million gallons of water in 2023 and removed about 8 gallons of trichloroethene from the water
- The X-749 Landfill has a groundwater collection system with X749-WPW sump and extraction wells X749-EW05G and X749-EW06G located on the southwest boundary
- Ten extraction wells in the Quadrant I Groundwater area were removed in 2021-2022 due to the soil excavation project in the Quadrant I Groundwater area
- Water from 14 additional extraction wells or sumps is treated in the X-622

X-622 Groundwater Treatment Trains

X-623 Groundwater Treatment Facility

- The X-623 Groundwater Treatment Facility has an air stripper with offgas activated carbon filtration and aqueous-phase activated carbon filtration
- The facility operated only in January and February 2023 to treat variety of water samples associated with site activities to comply with the National Pollutant Discharge Elimination System (NPDES) permit
- The facility treated 15,479 gallons of water in January and February 2023, and only removed less than 0.01 gallon of trichloroethene from the water

X-627 Groundwater Treatment Facility

- The X-700 and X-705 buildings are located above the Quadrant II Groundwater Investigative Area plume, and contaminated water is collected in the sumps located in the basement of each building
- Approximately 6 million gallons of groundwater were treated and processed during 2023, removing approximately 3.54 gallons of trichloroethene from the water

X-624 Groundwater Treatment Facility

- At X-624 Groundwater Treatment Facility, groundwater is treated by an air stripper with offgas activated carbon filtration and aqueous-phase activated carbon filtration
- The treated water from the facility discharges through NPDES Outfall 015, which discharges into Little Beaver Creek
- The facility processes groundwater mixed with trichloroethene from the X-237 Groundwater Collection System on the east side of the X-701B groundwater plume

Water Sampling at PORTS Site

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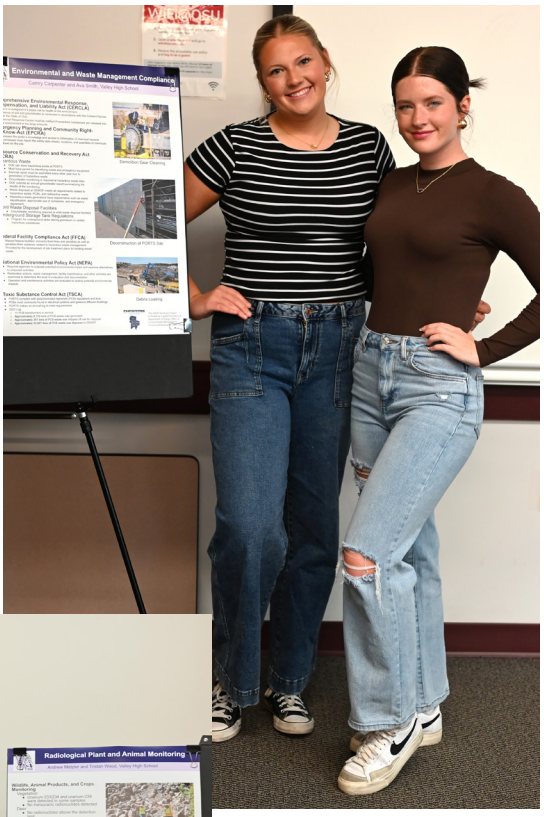
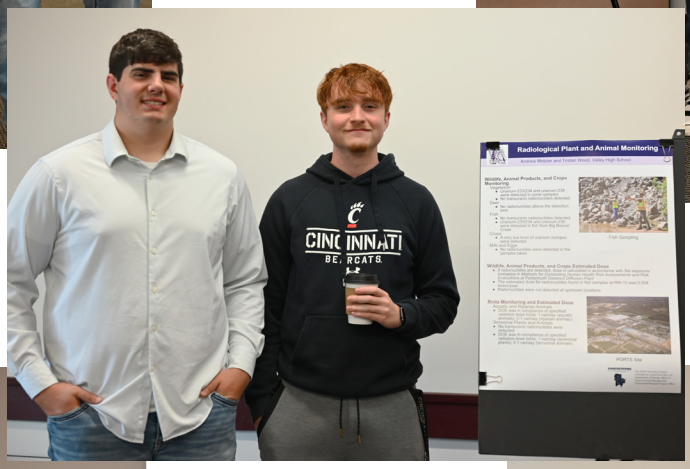
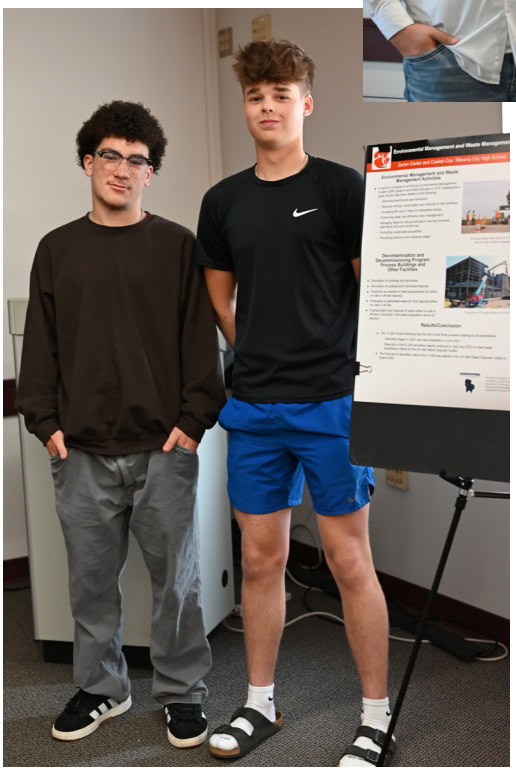
Groundwater Treatment Facilities


Environmental and Waste Management Compliance


CINCINNATI
BEARCATS

Radiological Plant and Animal Monitoring


Environmental Management and Waste Management Activities
Decontamination and Decommissioning Program: Process Buildings and Other Facilities
Results/Conclusions


Radiological Sediment & Soil Monitoring

Conclusion

The PORTS facility is a substantial, complex industrial site that played a significant historical role in national security from 1954 to 2001. It is one of only three uranium enrichment plants in the nation used for national security and the commercial nuclear sector. Since 2011, through science-based and well-regulated cleanup activities, it has been the mission of DOE and those involved with the D&D of the facility to safeguard the people of the region and surrounding environment from any potential dangers presented by facility operations, past or present.

Furthermore, DOE is working toward transferring facility property and land to reduce the federal footprint while fostering reindustrialization and revitalization for the region. The ASER is a key component of DOE's effort to keep the public informed about environmental conditions at PORTS.

The ongoing processes of D&D, monitoring, and remediation are intensive tasks that require a dedicated workforce and involved community. This summary emanates from the environmental monitoring activities at PORTS for calendar year 2023. The following are some of the highlights of 2023:

- Discharges of radionuclides, chemicals, and other potential contaminants to Little Beaver Creek, the Scioto River, or other water bodies were measured at 11 locations called National Pollutant Discharge Elimination System outfalls.

- External radiation was measured continuously at 29 on-site and off-site locations. The measurements were reported quarterly.

- Ambient air was sampled at 25 on-site and off-site locations and analyzed for radionuclides. Twelve ambient air monitoring stations monitored non-radiological air pollutants that could be released due to decontamination and decommissioning activities: metals, volatile organic compounds, and asbestos. Particulate matter was monitored at seven locations. Fluoride was monitored at 15 on-site and off-site locations.

- Surface water samples were collected from 22 on-site and off-site locations and analyzed for radionuclides. Samples from locations that monitor the On-Site Waste Disposal Facility were also analyzed for chlorinated organic compounds and PCBs.

- Sediment was sampled at 18 locations and analyzed for radionuclides, metals, and PCBs.

- Soil samples were collected at 15 locations, including on-site, fence line, off-site, and background locations and analyzed for radionuclides.

- Biota samples, including vegetation, deer, fish, food crops, milk, and eggs, were analyzed for radionuclides. Fish were also analyzed for PCBs.

- Approximately 340 wells were sampled at varying frequencies to monitor remedial actions, movement of groundwater contaminants, and groundwater quality.

Continuous environmental monitoring of the PORTS operations is critical to ensure an accurate assessment of human and environmental health and safety. The maximum annual dose that a member of the public could receive from radiation released by PORTS in 2023 is 0.11 mrem, compared to the 100 mrem/year limit set by DOE for all potential pathways. The maximum annual radiation dose that a member of the public could receive from all pathways of exposure associated with operation of the On-Site Waste Disposal Facility was 0.0088 mrem, compared to the Ohio Department of Health and DOE annual dose limit of 25 mrem. As shown by ambient air monitoring, contaminant levels for both radionuclides and fluoride continued to be either not detected, detected below DOE standards, or within background levels. Concentrations of most contaminants detected within the groundwater plumes at PORTS were stable or decreased in 2023. Concentrations of trichloroethene (TCE) or metals were increasing in a few wells in the monitoring areas; these locations continue to be closely monitored. Surface water monitoring contaminant levels for radionuclides at on-site and off-site locations upstream and downstream from PORTS continued to be either not detected or below DOE Order limits. PORTS operations have not affected the safety of drinking water outside the site boundaries. Concentrations of PCBs in on-site and off-site sediment samples were below the level of concern established by regional screening levels of the U.S. Environmental Protection Agency (U.S. EPA) and Ohio EPA. In 2023, PCBs were detected in fish caught in off-site creeks within the range of concentrations detected in recent years and were within the consumption advisory limits set by the Ohio Department of Health. Sampling of sediment in 2023 for metals indicated that no appreciable differences were evident in the concentrations detected at locations upstream and downstream from PORTS. Contaminant levels for radionuclides were within background levels or below DOE Order limits. Finally, contaminant levels for radionuclides in soil, food crops, and deer were within background levels or below DOE standards, and radionuclides were not detected in samples of fish, milk, and eggs collected in 2023.

DOE is committed to reducing environmental impacts from site operations through stewardship and sustainability of land, air, and water by integrating best management practices such as eliminating the amount of waste generated, minimizing the use of toxic chemicals, and maximizing the use of recycled materials. Each year a report of Environmental Management Systems (EMS) goals is submitted to DOE Headquarters. In 2023, the PORTS stewardship scorecard was yellow due to two infractions regarding proper labeling of containers in a storage area. Both infractions were immediately addressed, and U.S. EPA determined they were resolved with no further action required. Fluor-BWXT Portsmouth identified six Environmental Management System objectives for 2023; four objectives were met, one objective was partially met, and one objective was not met. The objectives that were not totally met were rolled over with additional efforts and action plans developed so that these objectives could later be attained.

References

- DOE 2024. U.S. Annual Site Environmental Report-2023, Piketon, Ohio, DOE/PPPO/03, U.S. Department of Energy, Piketon, OH, September 2024.

Acronyms & Abbreviations

ASER	Annual Site Environmental Report
Btu	British thermal unit
CAP-88	Clean Air Act Assessment Package—1988
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
D&D	Deactivation and Demolition
DOE	U.S. Department of Energy
DUF6	depleted uranium hexafluoride
EIC	The Portsmouth Environmental Information Center
EM	Environmental Management
EMS	Environmental Management System
EPCRA	Emergency Planning and Community Right-To-Know Act
ETAS	Enterprise Technical Assistance Services, Inc.
EXPO	Exposition
FBP	Fluor-BWXT Portsmouth LLC
FFCA	Federal Facility Compliance Act
GIS	Geographic Information System
HS	High School
LLC	Limited Liability Company
µg/kg	microgram per kilogram (equivalent to part per billion)
ug/L	micrograms per liter
MAGLC	Maximum Acceptable Ground Level Concentration
MCS	Mid-America Conversion Services, LLC
MEI	Maximum Exposed Individual
mrem	millirem
NEPA	National Environmental Policy Act

Acronyms & Abbreviations

NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission Ohio
ODH	Ohio Department of Health
Ohio EPA	Ohio Environmental Protection Agency
OSWDF	On-Site Waste Disposal Facility
OU	Ohio University
PCB	polychlorinated biphenyl
PEGASIS	PPPO Environmental Geographic Analytical Spatial Information System
PM	Particulate matter
PORTS	Portsmouth Gaseous Diffusion Plant
RCRA	Resource Conservation and Recovery Act
SODI	Southern Ohio Diversification Initiative
SOP	Standard operating procedure
SSAB	The PORTS Site Specific Advisory Board
STEM	Science, Technology, Engineering, and Mathematics
TCE	trichloroethene
TSCA	Toxic Substance Control Act
USEC	United States Energy Corporation
U.S. EPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

Definitions

Ambient air – the atmosphere around people, plants, and structures. Ambient air usually means outdoor air (as opposed to indoor air)

Biota – animal and plant life characterizing a given region

Clean Water Act – A primary federal law that sets regulations on discharges of pollutants into the nation's waterways, establishing water quality standards

Compliance – fulfillment of applicable regulations or requirements of a plan or schedule ordered or approved by a government authority

Concentration – the amount of a substance contained in a unit volume or mass of a sample

Contaminant – any substance that enters a system (the environment, food, the human body, etc.) where it is not normally found, including substances that spoil food, pollute the environment, or cause other adverse effects

Curie (Ci) – A unit used to measure the intensity of radioactivity in a sample of material

Decontamination and decommissioning – removing equipment, demolishing buildings, disposing of wastes, and investigating potential contamination in areas of PORTS that are no longer part of current operations

Dose – energy imparted to matter by ionizing radiation; a unit of absorbed dose is the rad, equal to 0.01 joule per kilogram

Absorbed dose – the quantity of ionizing radiation energy absorbed by an organ divided by the organ's mass; expressed in units of rad (or gray) (1 rad = 0.01 gray)

Effective dose – sum of the doses received by all organs or tissues of the body after each one has been multiplied by the appropriate weighting factor

Effluent discharge – liquid waste that does not come from kitchens, toilets, surface water, or domestic sewage Collective dose/collective effective dose – the sums of the doses of all individuals in an exposed population expressed in units of person-rem, also known as "population dose"

External radiation – the exposure to ionizing radiation when the radiation source is located outside the body

Gaseous diffusion – technology used to produce enriched uranium by forcing gases through a porous barrier

Groundwater – any water found below the land surface

Groundwater plume – a body of groundwater that is contaminated that flows from a specific source

Definitions

Ionizing radiation – radiation that has enough energy to remove electrons from substances that it passes through, forming ions

mrem – the dose that is one-thousandth of a rem

Monitoring – process whereby the quantity and quality of factors that can affect the environment or human health are measured periodically to regulate and control potential impacts

Outfall – the point of conveyance (e.g., drain or pipe) of wastewater or other effluents into a ditch, pond, or river

PPPO – Portsmouth/Paducah Project Office – manages the DOE cleanup efforts at two gaseous diffusion plant sites

Polychlorinated biphenyls (PCBs) – man-made chemicals that range from oily liquids to waxy solids. PCBs were used in hundreds of industrial and commercial applications due to their chemical properties until production in the United States ceased in 1977. PCBs have been demonstrated to cause a variety of adverse health effects in animals and possibly cause cancer and other adverse effects in humansRadioactivity – the spontaneous emission of radiation, generally alpha or beta particles or gamma rays, from the nucleus of an unstable isotope

Radionuclide – radioactive nuclide capable of spontaneous transformation into other nuclides by changing its nuclear configuration or energy level; accomplished by the emission of photons or particles

Release – any discharge to the environment. "Environment" is broadly defined as any water, land, or ambient air

Rem – unit of radiation dose that reflects the ability of different types of radiation to damage human tissues and the susceptibility of different tissues to the damage

Remediation – the process of improving or correcting something, particularly in relation to environmental damage Soil excavation – the creation of a man-made cut into the surface of the Earth

Surface water – all water on the surface of the earth, as distinguished from groundwater

Uranium enrichment – the process of enrichment by separating isotopes of uranium

Volatile Organic Compounds (VOCs) – organic (carbon-containing) compounds that evaporate readily at room temperature. These compounds are present in solvents, degreasers, paint, thinners, and fuels. Due to a number of factors including widespread industrial use, they are commonly found as contaminants in soil and groundwater. VOCs found at PORTS include TCE, vinyl chloride, benzene and dichloroethanes.

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